



# RADIOWORLD

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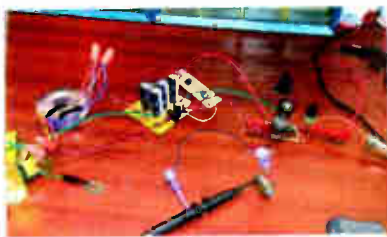
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### DO IT YOURSELF

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## Is Diversity in Radio Engineering Possible?

Presumably yes, but we found no coordinated industry effort to change the situation

### RADIO DIVERSITY

BY RANDY J. STINE

*In this issue we continue our coverage of racial diversity in U.S. radio tech, focusing for now on the experiences of Black engineers. As a followup to last issue's conversations with several African American engineers, we sought out broadcast companies and organizations to invite their perspectives and ask what, if anything, should be done about the situation.*

It's uncontroversial to assert that there is a lack of Black engineers in technical positions across the U.S. radio broadcast landscape.

Radio is not unique in this regard. Its lack of diversity mirrors that of

many technology-based industries. But a quick peek into any engineering session room at a major trade show makes clear how dramatic the disparity is.

"I've only worked with a few Black engineers through my entire career,"

one corporate-level engineering professional told Radio World. It's a common observation for many in the field.

A diverse workforce is the backbone of successful organizations in various industries, according to many business experts. So how can U.S. radio — often criticized for a lack of diversity in ownership and upper management, especially

(continued on page 3)

## "I Saw That I Could Build Something ... Anything"

Mondy embraced a technology apprenticeship in order to be an effective station owner later

Zipporah Mondy completed the Technology Apprenticeship Program run by the National Association of Broadcasters Leadership Foundation in September of 2018. Her family owns KJLW(FM), which is licensed to Helena, Ark.

"My goal was to understand every aspect of the business so I could be an effective owner whenever my dad passed the baton to me," she says.

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## DIVERSITY

(continued from page 1)

in commercial radio — better reflect the world around it by diversifying technical hiring?

Social activism during the COVID-19 pandemic has raised the issue of systemic racial inequities throughout society, and many companies in and out of radio are making public gestures toward doing better.

But for technical people, this comes at a time when the overall numbers of broadcast engineers and engineering jobs appear to be shrinking thanks to industry consolidation and retirements.

And data is scarce. The Society of Broadcast Engineers and the National Association of Broadcasters do not collect demographic information on membership. Nor do they collect data like the number of broadcast engineering jobs held by African Americans.

“SBE recruitment efforts are aimed at all within the

David Honig, president emeritus and senior advisor at the Multicultural Media, Telecom and Internet Council, said that issue has existed for a long time.

“For decades there have been pipeline issues impacting African-Americans in all STEM [science, technology, engineering and mathematics] career paths. African-Americans face entry barriers at every stage. High school course assignments, college counseling and lack of mentors,” Honig said, “plus out-and-out employment discrimination, both conscious and unconscious.”

Honig said a good starting point would be the development of partnerships and relationships, including internship and for-credit externships, for minority candidates.

Ernesto Aguilar, program director of the National Federation of Community Broadcasters, said radio broadcasters need to “look at themselves” when searching for solutions to improve diversity within their organizations.



Getty Images/widpixel

broadcast engineering and media community, regardless of color, race or gender,” according to a statement from SBE.

But Mike Cooney, chief technology officer for Beasley Media Group, told us the broadcast industry is well positioned to attract a more diverse workforce.

“Given the incredible technological advances that continue to evolve on a daily basis within our industry, there are more opportunities than ever before. I think having engineering and technology-based training facilities and organizations dedicated to promoting diversity in the workplace are great ways to attract diverse candidates,” Cooney said.

Beasley Media Group, which has 64 radio stations in 15 markets, is committed to a diverse workplace and encourages anyone with a passion for pursuing a career in broadcast engineering to do so, Cooney said.

Recent attention to race and social justice should only spur more creative ways for the industry to achieve a more diverse workplace, he said.

Radio World reached out to several other leading radio groups. Queries to iHeartMedia and Entercom for comment were not answered. Cumulus Media “respectfully declined” to comment.

**“BASIC BENCHMARKS”**

The problem may not be a lack of candidates but a broken “pipeline.”

**This takes time, but if the radio industry is sincerely interested in moving the needle, it can happen.**

— Michelle Duke, NAB

“There are the obvious things, such as outdated recruitment efforts, problematic workplace culture and frankly not really trying that hard. But then there are more subtle issues. Quite a few organizations hire engineers purely as contractors with no benefits.

“In addition, contractors may not receive the investment that regular staffers do, so there can be power disparities, out-of-pocket expenses for training and issues that make these roles less desirable,” Aguilar said.

There are things Black job candidates can do, Aguilar said, that can benefit their job search and to find employment within engineering ranks.

“I’d encourage any prospective candidate of color

(continued on page 4)



## DIVERSITY

(continued from page 3)

to ask to see the diversity, equity and inclusion goals of anywhere they're interviewing; to request a copy of the organization's staff audit to see its hiring trends the last five years; and to talk with staffers of color.

"With that in mind, this is an opportunity for those broadcasters who are serious about diversity to have some of the basic benchmarks above," Aguilar said.

The NFCB, which serves community radio stations within the public media system, in July released a guidebook to its members on issues of diversity. The Diversity Equity and Inclusion in Community Radio guide offers community radio stations "a simple, actionable framework to implementing training, setting up a DEI committee, doing programming audits, managing resistance to change at your station, and potential initiatives you can work on."

Aguilar said it remains to be seen whether recent racial justice protests foster a greater practical commitment from broadcast managers and executives, mostly White, to hire and retain executives, leaders and staff across gender, race and generation.

### MOVING THE NEEDLE

NAB Chief Diversity Officer Michelle Duke says one key obstacle facing Black applicants hoping to enter broadcast engineering is a lack of experience.

"When we have had students of color graduate from our Technology Apprenticeship Program, one issue we have faced with hiring is that many

the Society of Broadcast Engineers Certified Broadcast Technologist Exam.

Addressing the lack of Black broadcast engineers begins with education, which won't happen overnight, Duke said.

"It has to be a cohesive industry-wide effort to partner with organizations and schools that train student engineers.

**There are the obvious [problems], such as outdated recruitment efforts, problematic workplace culture and frankly not really trying that hard. But then there are more subtle issues.**

— *Ernesto Aguilar, NFCB*

stations aren't able to hire entry-level engineers," Duke said, adding that it's not a problem unique to minority candidates.

The NAB Leadership Foundation's Technology Apprenticeship Program, a six-month program that includes a diversity component, provides hand-on training and prepares a person to take

Building ties with organizations like the National Society of Black Engineers would give our industry more exposure to Black engineering students who are looking for their first job opportunity," Duke said.

The next step, Duke said, is for the industry to find ways to keep potential Black engineers engaged.



"Either through hiring them or creating contract positions that these students can strive toward acquiring. We are doing our best to lay the groundwork, and we need radio stations and companies to work with us to get the best results," she said.

"This takes time, but if the radio industry is sincerely interested in moving the needle, it can happen."

*See related commentary, page 30.*

*Comment on this or any story. Email [radioworld@futurenet.com](mailto:radioworld@futurenet.com) with "Letter to the Editor" in the subject field.*

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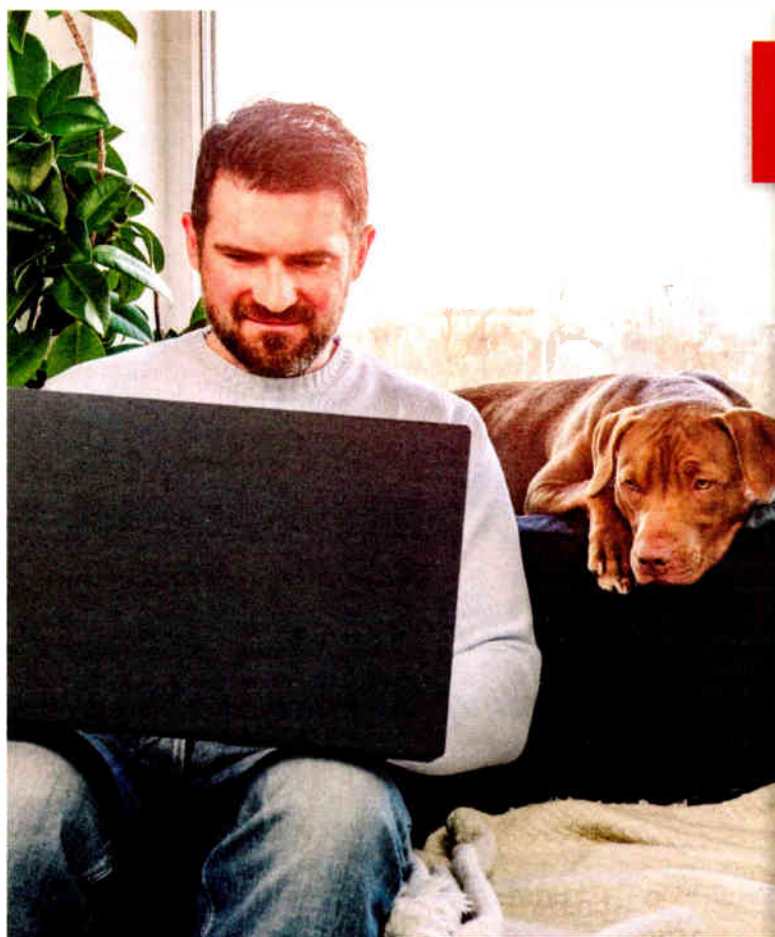
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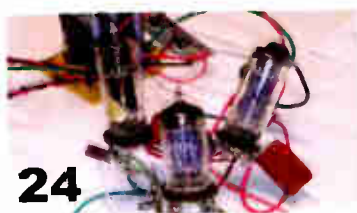
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## RadioDNS Adds Geo-Fencing to Its Standard Ecosystems in support of hybrid radio continue to be built.

BY PAUL McLANE

From RadioDNS comes news of two more developments in hybrid radio.

RadioDNS is a non-for-profit that promotes standards for combining OTA radio and internet technologies that enable interoperability. Its website says the goal is that "content from one radio station can reach a multitude of devices, and devices can get content from a multitude of radio stations.

First, the organization has published an update to its Service and Program Standard to add controls for listening based on location, or geo-fencing.

"This was a function requested by some U.S. broadcasters to minimize use of streaming within areas where there's good FM radio coverage," said Project Director Nick Piggott.

He gave these examples of where stations would want to control listening based on location:

- A station prefers listeners not to stream where there is good FM coverage, because streaming is more expensive (technical and rights costs). They define their FM coverage area and "deny" access to streaming within that area. Now streaming should only happen outside the good coverage area.
- The same station may have a known "hole" in their FM coverage, so they can "allow" streaming within the coverage hole, within the good coverage area. So their geo-fencing can contain nested areas.
- A different station may have rights to a sports event but only within their country. They can "allow" streaming within their country, and "deny" it everywhere else. If they're clever, they can have an alternate stream with different content that is provided outside their country instead.

Piggott said these controls are applicable not just to streaming but to any analog, digital or streaming distribution platform and to a whole service or to individual programs. "We'll be working to help everyone understand what a good implementation looks like."

Details can be found at <https://radiodns.org/news-campaigns/> in the entry about controlled listening.

Second, RadioDNS has now published its Radio Metadata Terms of Use.

"We're really hoping this provides the template for the global industry to come to a common understanding of 'fair use,' which removes some of the uncertainties on using metadata to enhance broadcast radio," said Piggott.

This document is template that broadcasters can adopt if they think it describes how they'd like their metadata and content

to be used by device manufacturers.

Piggott wrote about this recently in a commentary in Radio World. "We think a standard is valuable because it dramatically reduces the complexity of working out what 'OK' looks like, and establishes a consistency that allows manufacturers to make a radio that works for the majority of radio stations globally," he wrote.

Read more about it at [radiodns.org/news-campaigns/](https://radiodns.org/news-campaigns/) in Piggott's Sept. 1 post.

Piggott also noted that the Automotive User Experience Working Group of WorldDAB has just published its recommendations on metadata, and that the National Association of Broadcasters has been helping U.S. broadcasters to understand hybrid radio and how it may affect them, as with a recent webinar on the topic.

## What is Hybrid Radio?

A video explaining hybrid radio concepts is on the RadioDNS website at <https://radiodns.org/introduction/>

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## MONDY

(continued from page 1)

Mondy answered our questions via e-mail about the apprenticeship experience and her experience of being young, Black and female in the field of radio technology:

**Radio World:** Where did you serve your apprenticeship?

**Zipporah Mondy:** I did two apprenticeships. I shadowed Ed Czelada, CEO of the Smile FM chain of stations in Michigan, and the consulting engineer for KJIW(FM) in Helena, Ark. I also job-shadowed Alonzo Pendleton at iHeartMedia in Memphis, Tenn.

**RW:** Describe the experience and what you learned.

**Mondy:** My experience was an awakening! I grew up in radio and was always around the technology of it, but when I got in the program, the dots connected and the lights came on for me.

We received a crash course on broadcast engineering from top industry professionals. The experience showed me so much about myself because I was not the super-smart math or science whiz with a strong background in electricity. I didn't see myself as being able to do certain things.

However, Mr. Ed had my brother and I assist him in building radio antennas from scratch, which now sit at the top of my family's 499-foot radio tower pushing 50,000 watts of power toward Memphis, Tenn. This was a huge deal!

I saw that I could build something ... anything. I just needed to understand what I was doing. I realized that I could learn anything if I listened, focused and followed a master. I got to see firsthand the process of building a radio tower, and I had too much fun helping paint the tower before it went up.

I also learned a lot about artificial intelligence in the broadcast field. Our TAP class was assigned the task to research this topic and complete the program by presenting a live webcast on AI in broadcasting from the NAB headquarters in Washington, D.C.

The life of an engineer is so unpredictable. My brother and I loved going to the different tower sites and watching them troubleshoot and solve problems. We even had a random out-of-place chicken walking around the transmitter building one morning.

The program also exposed me to the Society of Broadcast Engineers and the Institute of Electrical and Electronics Engineers. I later had an opportunity to be a founding member of the new SBE Arkansas chapter.

**RW:** Where did your interest in pursuing



**Zipporah Mondy** cuts stainless steel pipes for an antenna bay during her apprenticeship in 2018 for Smile FM, a network of non-commercial, contemporary Christian radio stations in Michigan.

... a technical career in radio come from?

**Mondy:** I grew up working in my family's radio business. When I reached a certain age, I wondered what I would do if something happened to my parents. I realized how much I didn't know in the business.

I started seeking to learn whatever I could in every area. I always liked the idea of getting more in the engineering part of it, but I spent most of my time helping where I was needed.

When I learned of TAP, I felt like this was my opportunity to dive in radio engineering completely focused. It was so exciting for me because it was the one area I didn't know very well. I felt like I was starting a new career in the same place.

**RW:** Could you share some thoughts about why you think broadcast engineering has a low percentage of Black professionals?

**Mondy:** When I first saw Alonzo Pendleton, my eyes bucked wide. I was so surprised because he was a Black man and so was his assistant, Tony Guy. I had never seen black radio engineers,

**My goal was to understand every aspect of the business so I could be an effective owner whenever my dad passed the baton to me.**

if I'm honest.

I think there are two main reasons for why there are few Black broadcast engineers: lack of exposure at a young age and the absence of fathers' influence.

When I was growing up, my dad was constantly telling me and my siblings to learn computers. He got us books and software and always made sure we had a computer. He also had us hold the light while he would solder something,

or would always tell us about pieces of equipment, even if we weren't interested at the time. He drilled in our minds the idea of entrepreneurship.

This is not an uncommon story. Fathers or father figures play a huge role in exposing their kids to things. I'm not saying that to negate the mothers and grandmothers that do this too, but the absence of fathers really has an impact.

**RW:** What will it take to change that? Are programs like the NAB's a positive step?

**Mondy:** Honestly, the way our culture is today, offering mentorships and apprenticeships would have to be a way of life for industry professionals. It would take master craftsmen (and women) caring enough of the next generation to take a young person under their wing and say, "Let me teach you how to do what I do." That means real commitment from industry professionals, regardless if they're a part of a school or program. Again, I believe exposure is key. Young people have to be exposed to something before they can cultivate a desire for it. If there is no exposure, there is often not much interest.

For example, how many Black hockey players are currently on the NHL rosters? Not too many, since they are not exposed to it growing up. I think education is a factor — more specifically, I mean developing skills. My dad always told us "learn a skill." When I listen to the stories of engineers, I hear the skill sets they learned in school and they had the confidence to try certain things and fix broken things.

Schools used to have subjects like electric shop and carpentry. That's how my dad learned fundamentals. Learning to work with one's hands, build things, and solve problems does so much for that individual.

So there has to be a foundation of skill-building, a recruitment mechanism, or sphere of influence, to develop an interest in these fields early while young minds are impressionable. To answer your second question, I definitely think the NABLF TAP program is a positive step. It gives a boost to those who desire to get into this field. NABLF will take a college graduate and link him or her to the professional industry. They bridge that gap for the graduate. I love that! I also think there should be more programs like this but geared to a younger age.

I think there would be a larger pool of applicants for TAP if young people were catching the bug earlier. This is also important because a lot of college students don't know what they want to do. Broadcasters need to be more intentional with allowing young people in their communities to be exposed to

(continued on page 7)



**MARKETPLACE**

**NAUTEL, TELOS TOUT "NEW APPROACH" TO TIME ALIGNMENT**



Getty Images/DigitalPub

Technology manufacturers Nautel and Telos Alliance are collaborating on what they describe as a new approach to HD Radio time alignment.

They say their solution, demonstrated in an August webinar, eliminates alignment issues "completely" by locking the FM and HD1 outputs from the audio processor through the rest of the HD Radio air chain into the transmitter.

Omnia Product Manager Geoff Steadman at Telos Alliance was quoted in the announcement saying that many vendors offer "complex solutions with add-on or built-in receivers that generate correction signals to attempt to minimize blending issues." He said such solutions can affect the signal by covering up delay drifts.

Nautel CTO Philipp Schmid said, "Our solution locks the FM and HD1

outputs at the audio processor, and keeps them locked as they pass through the remainder of the HD Radio air-chain right into the transmitter. No extra boxes, additional audio codecs, radio receivers or correction methods are needed, and the Nautel/Telos Alliance solution utilizes proven 'Made for Radio' standards

including MPX,  $\mu$ MPX, and E2X."

The solution, he said, allows a station's HD Radio equipment to be "location-agnostic," located either at the transmitter or the studio, without needing external time sync.

In the webinar, the companies showed Telos Alliance Omnia Enterprise 9s

high-density audio processing software, Gen4 Importer/Exporter and Nautel technology running on a Nautel HD MultiCast+.

Nautel Head of Marketing John Whyte pointed out the open environment of the latter product and said the company plans to develop products based on these technologies. Nautel also announced support on HD MultiCast+ for the Telos Alliance Omnia Enterprise 9, which centralizes audio processing and virtualizes operation. It's a tool for high-density server-based systems for customers with a large volume of signals to process.

**MONDY**

(continued from page 6)

every part of their business more frequently. It may be inconvenient on the front end but broadcasters have to think about the future.

*RW: Where are you working today and what types of jobs are you performing?*

**Mondy:** I still work for my family at KJLW(FM) in Memphis. I like to say my title depends on who calls and what's needed. I work in sales and marketing, production, programming, and my brother and I tag team in IT. I guess you could say I'm the assistant general manager who enjoys going to the tower site.

*RW: What are your future goals?*

**Mondy:** Well, definitely on my bucket list: I want to climb to the top of our tower one day and change the light bulb! Ha ha ha! I want to extend my parents' radio network. I would love to own a Christian-Spanish radio station and have stations in other countries. I want to have afterschool (or in-school) media boot camps, where I give kids in underserved communities an opportunity to have hands-on exposure to media and technology broadcasting. I would like to build a production and broadcast content-generating company. And I want to obtain a pilot's license.

Learn about the Technology Apprenticeship Program at [www.nabfoundation.org](http://www.nabfoundation.org). This year's TAP will start later than usual and include a virtual classroom setting. Applications close Oct. 4.

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# Use DRM on India's FM Band

Industry expects huge domestic demand and is ready for massive exports

BY YOGENDRA PAL

*The author of this commentary is chair of the India chapter of the DRM Consortium.*

All India Radio (AIR) has adopted the Digital Radio Mondiale (DRM) standard for digital terrestrial radio broadcasting in MW and SW bands. Thirty-eight high-power DRM transmitters are carrying regular digital transmissions, either in pure digital and/or in simulcast mode.

Sometime back, AIR had issued instructions to increase the transmission hours of such transmitters in pure digital mode. Also each of the four metro cities had been asked to operate one transmitter in Pure Digital Mode. Over 80% of the Indian population was expected to be able to receive radio programs in digital. And this is before most of these transmitters started operating in pure DRM digital mode.

The COVID-19 lockdown has adversely affected the digital transmission schedule in pure digital as I write this, but we are confident that it will be restored soon.

The stakeholders' efforts are also paying off, as the ecosystem for DRM digital receivers has evolved in India, from domestic chipset development to receiver design and production.

The Indian auto industry has responded very positively. Over 2 million cars on Indian roads have line-fit DRM receivers, and this number is increasing every day.

Five leading automotive manufacturers — Maruti/Suzuki, Hyundai, Mahindra, MG Motors and Toyota — are rolling out cars with built-in DRM receivers. Most of the other leading car manufacturers are understood to be in the process of incorporating them but are waiting to see the demand first.

Development and production of standalone DRM receivers is also being taken up fast by Indian as well as foreign companies.

Made-in-India Avion DRM receivers are already available online at Amazon. The DRM receiver prototype by Inntot, another India company, has been successfully demonstrated. The company paired with Clarion for manufacturing DRM car receivers and is looking for partners for starting large-scale production of standalone DRM receivers.

Foreign companies — Gossell, Starwaves, Titus and Nedis — have come out with a number of models of standalone as well as car models of DRM receivers. Cambridge Consultants in the U.K. have just unveiled the prototype of a low-cost DRM receiver. Korean companies RF2Digital and AlgorKorea are also developing software-defined DRM radios.

To further boost the presence of digital radio in the country, AIR has taken a number of initiatives and it held a DRM Stakeholders Meeting in February, which was addressed by the CEO and Member (Finance) of the Prasar Bharati. A Project Management Unit (PMU) has also been constituted to ensure that DRM Digital

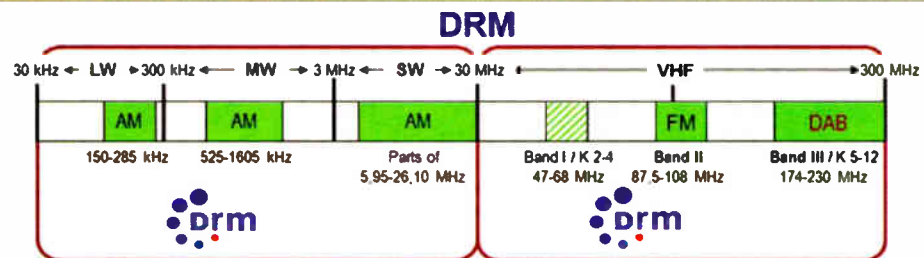
Radio is rolled out successfully.

AIR is broadcasting in the FM band also for local coverage. It provides about 43% coverage of the 1.3 billion population. Private broadcasters in India are allowed to broadcast in FM only but it is not possible to meet their demand for additional FM services, particularly in big cities, due to limited spectrum available for FM broadcasting. Their coverage is also limited to about 40%.

Therefore, the Telecom Regulatory Authority of

Using DRM, in the allocated 200 kHz bandwidth, a broadcaster can transmit up to six high-quality audio services along with a host of value-added services and Emergency Warning Functionality (EWF). All digital services work without disturbing the existing analog FM services.

DRM standard can be supported natively on all mobile phones based on the already available tuners for analog FM reception. No additional hardware and, therefore, no



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  - Simulcast analogue / digital
- **Excellent audio quality**
  - No distortion
  - Stereo and 5.1 surround sound
- **Multimedia Applications**
  - Great listener benefits
  - Extra revenue opportunities for broadcasters
- **Good coverage area and robust signal**
  - Supporting SFN (Single Frequency Networks)
  - Green and energy efficient
- **Automatic tuning**
  - by station name, no longer by frequency
  - re-tunes when leaving coverage area
- **Emergency warning & alert**
  - All stations switch, present audio and text information



additional design or component cost is required to enable DRM digital FM support on these phones.

The DRM App for mobile phones has already been developed and demonstrated by a number of organizations. Only the mobile phone manufacturers need to provide access of the baseband digital output. The mobile phone industry is also expecting the clear policy announcement for the country to start incorporating this functionality in future phone models.

For legacy phone models, external FM front-end dongles have been developed. These dongles along with the already developed DRM radio app can be used to receive full DRM FM functions. This has been demonstrated successfully by a number of developers.

As the DRM standard works in all the broadcast bands, most of the DRM desktop receivers available today or in development are already prepared for DRM in the FM band. Several of them have demonstrated their working in all the broadcast bands, including FM band.

The designers/manufacturers of DRM receivers are thus eagerly waiting for the official policy announcements of the Indian government to finalize the digital FM support in their DRM receiver models. Use of DRM in FM band by AIR and private broadcasters in India would motivate them further to incorporate DRM FM facility in the receivers being produced and/or designed by them.

It is thus the right time for India to go for digital broadcasting in the FM band, too, using the DRM standard already adopted in MW and SW bands. Indian industry is looking towards meeting the huge domestic demand and is ready for massive exports.

India (TRAI), the broadcasting sector regulator, has recommended that private FM broadcasters be allowed to broadcast in digital in the white spaces in the VHF band II (FM band). Though TRAI has not specified which digital broadcast standard is to be used, it is recommended that white spaces may be auctioned by 200 kHz bandwidth blocks.

India is currently carrying out trials of ITU-approved standards, including DRM, in the FM band. DRM is fully compatible with the existing FM band transmissions. It utilizes the unused white spaces in the spectrum, technically unavailable for further analog FM expansion.



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# Codecs Offer Redundancy, Backup and Failover

Entercom's Eric Fitch on how his operation has benefited from trends in codecs and STL

A Radio World ebook recently explored trends in codecs and STLs. This interview is excerpted from that, which you can find at [radioworld.com/ebooks](http://radioworld.com/ebooks).

Eric J. Fitch is director of technical operations for Entercom New England. He has been a broadcast engineer for 35 years, working in Syracuse, Albany and Boston. Today he is responsible for 14 stations in five markets.

**Radio World:** What's the most important trend in codecs?

**Eric Fitch:** Redundancy, backup and failover.

With more facilities being managed by fewer people, there is a huge need for systems to be able to recover from outages without human intervention.

Remote access via a web GUI, as well as having logging, SNMP and e-mail capabilities are critical for managing equipment at remote locations.

**With cable modems and fiber service, we sometimes have better internet connectivity at our homes than we have at our studios and transmitter sites.**

**RW:** How are these technologies helping you solve practical problems?

**Fitch:** We are able to connect our studios in Boston, Providence, Springfield and Worcester to their associated transmitter sites and the Westwood One Satellite NOC in Denver, which uplinks the WEEI Sports Radio Network and the Red Sox Radio Network, via GatesAir IPL-200 Audio

over IP systems.

Our GatesAir IPL-200 systems have replaced our Intraplex T-1 STL systems. Each site has three ISPs to provide triple redundant paths for the audio streams.

We have a fiber-based MPLS system



Eric Fitch

as the primary connection to each location. That is backed up by a wireless internet connection at the studio and cable modems at transmitter sites. We have a third connection to each ISP via our business network on a second fiber network from the studio.

The IPL-200 is able to have three separate audio streams that can failover if one or two of the streams drops, keeping the station on the air, while notifying us via e-mail or SNMP that there is a fault. The system has an optional redundant power supply, which is great if and when the UPS fails.

The ability to access all 28 nodes of the IPL-200 on our network from work or home makes configuring and troubleshooting a breeze. We can see when an ISP has a failure at any of our

sites because there are multiple ways to log into the codec.

**RW:** What role are codecs playing in the new normal of at-home broadcasting?

**Fitch:** We are lucky that high-speed internet is available in most people's homes. Just 10 years ago we were struggling with DSL and 56 kb dialup modems.

Now with cable modems and fiber service, we sometimes have better inter-

backed up with a wireless hotspot to ensure a stable connection. The ability to remotely control the codec in the field from the studio and have the codec email if there is a problem.

**RW:** How many ways are there of making connections?

**Fitch:** We use whatever connection that is available to us: FIOS, cable modems, private MPLS networks, public and private WiFi and Plum cases that bond two cellular carriers.

**RW:** How have AoIP technology developments been reflected in codecs?

**Fitch:** Since we have 15 of our show hosts broadcasting from home due to COVID-19, ease of use and control is the most important function that I have seen. We have to make sure that the codecs are as simple as possible to set up and operate.

Three of our morning shows each have three co-hosts connecting to the studio before 6 a.m. That is nine simultaneous remotes using Comrex Access codecs. Having one-button pre-programmed connections is a necessity to make sure everyone can connect themselves.

We use Comrex Fleet Commander and Comrex Switchboard to monitor and connect all of the codecs that our hosts are using from home. We can see the quality of the connection and make changes on one app, so we don't have to login to multiple codecs to check connectivity issues.

Newer consoles are able to provide multiple mix-minus feeds so multiple hosts and phone callers can all be on the air simultaneously. We used to struggle with one remote and one caller, now we do three remotes and two callers without batting an eye. No echo or "I can't hear you" complaints any longer.

The board can be set up by anyone, since the mix-minus is done by the consoles automatically.

net connectivity at our homes than we have at our studios and transmitter sites. The connections are so good that our listeners don't notice that the hosts are doing the shows from home.

Consoles that are capable of doing multiple mix-minus feeds have been invaluable. We have been able to keep our staff healthy and sounding great on the air.

**RW:** What functions and features are being offered that engineers who haven't bought a codec in awhile should know about?

**Fitch:** The ability to use multiple internet connections to back up the codec's connection. The codec can use error correction and buffering to make sure that lost packets are recovered, which is a great asset. A cable modem can be

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Read more expert commentary about trends in codecs and STLs.

Read the ebook at [radioworld.com/ebooks](http://radioworld.com/ebooks).



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# How Michael Bolton Can Be 300 Times Worse

Also, a way to troubleshoot nitrogen leaks in pressurized transmission line

## WORKBENCH

by John Bisset

Email Workbench tips to johnpbisset@gmail.com

Dan Slentz has been trolling the internet again.

This time he has come across a very interesting audio clip on YouTube. "Nickd2011" took an MP3 recording of Michael Bolton's "How Am I Supposed to Live Without You" and compressed it up to 300 times.

Nick reminds us that every time an MP3 is recompressed, some of the audio is thrown away. In his example, Nick opened a FLAC file of the song in Adobe Audition, then saved it as a 128k MP3.

He then opened the MP3 he just saved, and resaved it as a 128k MP3 with a new file name. Nick repeated that process 300 times.

When you listen to the fifth generation you'll notice artifacts in the audio. By the 10th, the audio sounds terrible. And with each subsequent compression, the audio quality only gets worse.

Nick compares the degradation to the game of "Telephone" in which a large group of people line up and the first person whispers something to the second person, who whispers it to the third and so on. By the time the message gets to the last person, the meaning would have changed.

A similar process happens when an MP3 file gets compressed over and

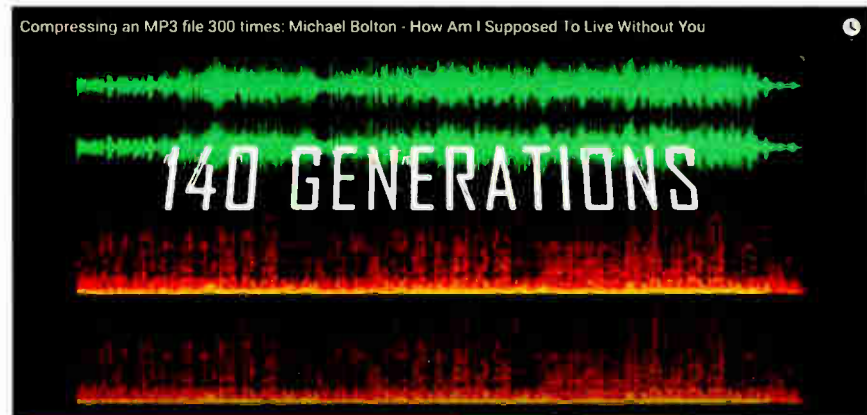


Fig. 1: A YouTube video shows what happens when an MP3 recording of Michael Bolton's "How Am I Supposed to Live Without You" is compressed over and over ... and over.

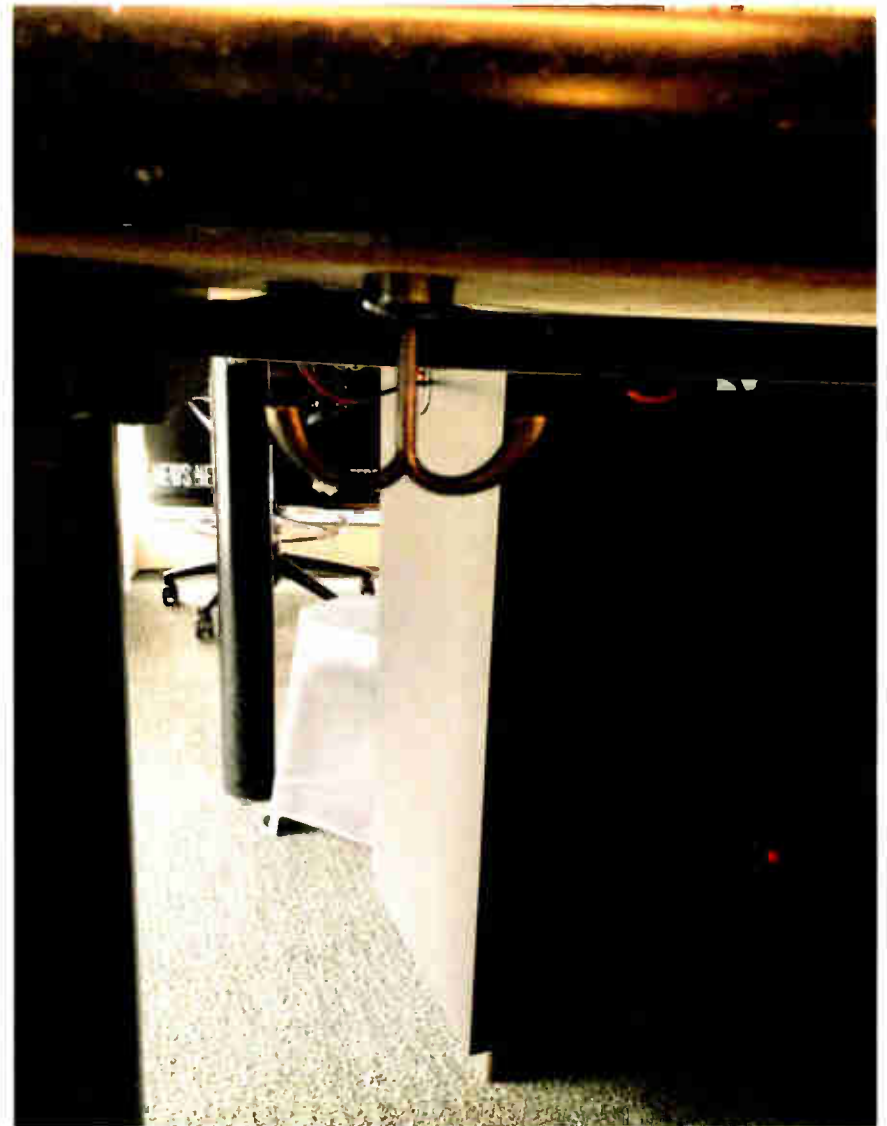


Fig. 3: A sturdy hook under your interview table, like the one in the upper foreground of this photo, has several uses.



Fig. 2: Amprobe has developed an Ultrasonic Detector for leak detection.





over. Each generation introduces new artifacts in the audio, as the decoder imperfectly approximates what audio was thrown away. Wait till you hear the 300th generation!

This is a great clip to share with your programming folks. Go to YouTube and search "Compressing an MP3 file 300 times."

**A**mprobe probably is most familiar to broadcast engineers for its line of clamp-on ammeters the company builds. Their innovation doesn't stop there, however.

The company has developed an ultrasonic leak detector to help troubleshoot leaks. Initially designed for air conditioning technicians, this probe also can be used to sense nitrogen or other gas leaks in pressurized transmission line.

The **ULD-420** has a frequency range from 20 kHz to 90 kHz, the optimal range for detecting a variety of leaks.

The ULD-420 has a frequency range from 20 kHz to 90 kHz, the optimal range for detecting a variety of leaks. Three switchable filters help remove noise frequencies in noisy environments, and a headphone output is provided.

The tool runs about \$1,000 on Amazon, so it may be better suited for group broadcaster purchase. You can find out more at the Amprobe website [www.amprobe.com](http://www.amprobe.com).

Coming up the end of this month, Amprobe is sponsoring a webinar on using the ULD-420 for leak detection. Register at [www.amprobe.com/webinars](http://www.amprobe.com/webinars).

**L**ooking for a less expensive means of leak detection? Radio World Technical Advisor and veteran engineer Tom McGinley reminded me of a simpler method: a bottle of soapsuds.

Even dishwashing liquid cut with water will work. Put it in a spray bottle and spray your connections and junctions of nitrogen tubing with the soapy water. If there's a leak, little bubbles will appear at the leaky junction. Wipe the water off and tighten the connection.

**J**ust presented a Generator Maintenance program for members of the SBE Mentor Program, which is designed to

help broadcast engineers new to the field by partnering them with seasoned professionals. The goal is for the more-experienced person to share his or her gained knowledge, both empirical and practical, with someone new to the field.

Mentor Committee Chairman Chris Tarr says, "For the seasoned mentor, it's a chance to give something back. For the freshman mentee, it's an ideal way to gain inside knowledge and understanding that can sometime take years to accumulate."

Program participants also are invited to join the SBE Mentor Group on the

SBE Facebook page. This is a member-only benefit. Mentor program participants also receive monthly newsletters and have access to a special Mentor program quarterly webinar series.

Interested in learning more? Contact Education Director Cathy Orosz at [corosz@sbe.org](mailto:corosz@sbe.org) or 317-846-9000.

BGS Sales Associate Mary Schnelle sent us the photo in Fig. 3. It's a view of the underside of an interview table installed at WTOG in Washington by Rob Goldberg and RadioDNA last fall.

Just a simple hook intended for hold-

ing headphones. The hook quickly morphed into another use as a place for guests to hang their purses (or murses). Off the floor and easily within reach!

*John Bisset has spent over 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. Workbench submissions are encouraged, qualify for SBE Recertification, and can be emailed to [johnbisset@gmail.com](mailto:johnbisset@gmail.com).*



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# Sherri Powers Excels for Beasley Detroit

We asked the cluster's new chief engineer about her career and current projects

BY PAUL McLANE

Beasley Media Group recently promoted Sherri Powers to chief engineer at its Detroit-based radio properties. She oversees the engineering and IT departments at the four-station cluster, which includes FM stations WCSX, WRIF, WMGC and WDMK, the last of which has three translators fed by its HD2.

Vice President and Market Manager Mac Edwards was quoted in the announcement as saying, "She epitomizes dedication to her craft and devotion to getting the job done right. Sherri has taken the lead on many significant projects in her storied career here." That includes contracting with Greater Media to build new studios for WCSX(FM) and WRIF(FM) before she was hired full-time at the

stations in 1998.

This summer, Radio World checked in with Powers to learn about her 29-year career to date. This interview, which originally appeared at [radioworld.com](#), is one in a series of interviews with radio technologists about their work.

**Radio World:** How have you reached this point in your career?

**Sherri Powers:** I've been very fortunate to be a part of Beasley Media, formally Greater Media, most of my career.

I started interning with WCSX(FM) in the summer of 1992. My first paid job was with WRIF, where I worked part-time setting up remotes. At the time, WCSX and WRIF were each with different companies.

I landed my first full-time engineering job in 1993 at WYCD, which

was owned at the time by Alliance Broadcasting. While I was working there, I had the opportunity to help build the studios for Greater Media after they purchased WRIF. I finally officially came back "home" in 1998 and have been here ever since.

**RW:** What originally prompted your interest in broadcast engineering?

**Powers:** I actually got into engineering because I went to the wrong seminar! I signed up for an open house at Specs Howard School of Media Arts because I was really interested in video editing; but after hearing the benefits of engineering, I became intrigued.

I really like the idea of staying at a company for the long haul. Two of the things they kept stressing to the attendees was job security and the fact that engineers generally didn't move around a lot. Upon completing my summer internship at WCSX, I was hooked.

**RW:** Any early mentors or particularly influential people in your career?

**Powers:** Yes, actually several. I have to say, all the chief engineers I've had made me the engineer I am today.

I actually got into engineering because I went to the wrong seminar!

— Sherri Powers

Bill Vellner, who at the time was the chief engineer at WCSX, gave me my first shot. He was willing to teach me anything I wanted to learn. Jeff Breitner, the chief at WYCD, also helped me

## WorldCast Secures National FM

Old and new APT codecs keep Romanian network transmitters connected

### USERREPORT

BY MARIAN DICU

The author is technical manager of National FM. This article was received too late for inclusion in our recent Buyer's Guide on codecs and STLs.

**BUCHAREST, Romania** — National FM is a Romanian national FM radio network consisting of 40 frequencies covering most of the nation.

In 2007, at my yearly visit to the IBC show I met Simon Daniels from APT, a company that I knew nothing about.

At the time, we were using a software solution from another company to broadcast a morning show from one city to another. Simon told me that they had a hardware solution for "every now and then" audio transmissions.

One of APT's tech wizards, I believe it was Willie Woodside, warned me that he wouldn't recommend a 24/7 transmission via plain internet but that I should still try out a pair of their encoders. A couple of months later I

port between our studios and we kept the software solution as a backup.

A few years later APT became part of WorldCast Systems and I was delighted to see that Simon and Willie were still there ... answering my occasional emails.

In the meantime, we bought more encoders for our infrastructure. We are now using a pair of APT IP Codecs with MPX over AES to transport music

currently doing the morning show from outside, in a natural environment, until the situation stabilizes or winter comes.

The old Horizons are still doing an excellent job, over 4G or public internet, depending on what's available in different locations.

We are very pleased also with WorldCast Systems' Eceso family of transmitters. We have in service more than 10 units, 100W, 300W, 750W, 1000W, 2000W and 3000W models. The web interface works like a charm



The APT IP Codec

received a message saying that a pair of APT Horizon codecs (renamed as APT IP Codec) were on their way to me for testing purposes ... no strings attached.

After a few days of indoor testing I decided to put them on the air so I sent one of the units to another city 500 kilometers/300 miles away from the main studio.

Even knowing that the internet in Romania is one of the best in the world, I still had my doubts about the stability of the connection during a three-hour show. Remember that this was happening in 2008!

After a buffer increase, creating bigger delay but better stability, the Horizons became the main signal trans-

ported from the main audio processor to our Bucharest transmitter site. The transmitter there is an Eceso Helios FM 2000 (now named Eceso FM 2000W).

Another pair of APT IP Codecs connect Bucharest and Oradea via the public internet.

Our sister network, Favorit FM, uses the APT Silver "simplex — one-way solution" to bring the signal from the studio to the satellite uplink site.

And ... the big surprise ... the pair of APT IP Codecs that started it all are still in service.

In this pandemic time, we built a mobile studio in our off-road Rover. It is able to broadcast from anywhere where there is an LTE (4G) signal. We are

and the options can be very helpful (sound processor or Smart FM option).

The company's only products that we haven't used so far are the Audemat monitoring equipment that look to be quite exquisite. But the Eceso transmitters have great onboard monitoring tools for modulation, audio and other parameters.

*Radio World User Reports are testimonial articles intended to help readers understand why a colleague chose a particular product to solve a technical situation.*

For information, contact Tony Peterle at WorldCast Systems in Florida at 1-305-249-3110 or Christophe Poulain in France at +33-5-57-92-89-28 or visit [www.worldcastsystems.com](#).

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Sherri Powers is shown at the main transmitter site for WDMK and backup of WMGC. The staff nicknamed the site "Gotham." Powers was replumbing the old WDMK transmitter to feed the WMGC antenna.

realize my full potential. He taught me that radio was fun and would say, "It's just radio, no one ever dies."

The person I learned the most from was Mike Kernan. He's not just a mentor or a boss, he's my friend. I still talk to him several times a week. He's actually helping me work on our transmitter build. He teaches me new things all the time. I wouldn't be where I am today without him.

**RW:** How has COVID-19 affected broadcast operations for Beasley in Detroit, and what do you think the long-term implications for facility management are?

**Powers:** Thankfully, we were prepared and able to get ahead of things, before the state of Michigan shut everything down.

We were able set up one of our station morning show hosts, who lives in Canada, with all the equipment he needed to do a live show with remote

gear before they closed the borders.

In addition, we updated our automation system to WideOrbit, to enable personalities to record live breaks and import them into the system. This way, the PDs could go in and program them.

In the future, I think we just need to be conscious of ways to do things even better. Everyone needs to work together to improve what we are doing today to make us be even better tomorrow.

**RW:** Any significant technical projects on the horizon?

**Powers:** Prior to COVID, we installed

WideOrbit. We are still getting familiar with the automation system and all it can do. I also have some big transmitter projects going on, including installing a new 30 kW GatesAir FAX transmitter for WDMK, the station we just purchased last year. And I am working on moving our backup transmitter site for them to our transmitter site across town. In addition, I am taking one of the transmitters we used for 105.9 and making that the backup site transmitter for 105.1.

If just installing the transmitter wasn't enough to do, we have to rewire

all the remote controls and make sure everything works like it should. So it's been quite busy.

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

**Powers:** My husband and I love to travel! Whenever we have the chance to get away, we love to go to Mexico. Every time we go, I always say I need to start my Spanish lessons again. I wouldn't mind retiring there one day.

*Related: For more perspectives on broadcast technical careers, see the recent ebook "Radio Engineering in Crisis" at radioworld.com/ebooks.*

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# WWJ in Detroit: A 2020 Centennial Station

Iconic AM has already celebrated the 100th anniversary of its first broadcast

BY JOHN SCHNEIDER

It was shortly after World War I that Clarence Thompson, a partner of Lee de Forest, formed a new company Radio News & Music Inc. in New York. His goal was to encourage newspapers to broadcast their news reports by wireless, using de Forest transmitters.

The franchise offer — available to only one newspaper in each city — offered the rental of a de Forest 50-watt transmitter and accessories for \$750. Just one newspaper signed up for the deal; it was the Detroit News, led by publisher William E. Scripp.

He had been interested in wireless since investing in Detroit experimenter Thomas E. Clark's wireless company in 1904. Scripp's son, William J. "Little

Bill," was an active ham radio operator, operating a station in the Scripps home.

## PEOPLE MIGHT LAUGH

Scripp proposed accepting the Radio News & Music offer and building a Detroit News radio station in 1919, but he met resistance from his board of directors. It was not until March of 1920 that he was given the go-ahead to sign a contract.

The de Forest transmitter was shipped to Detroit on May 28, 1920, but was lost in transit; a second transmitter was constructed and sent on July 15. This delayed the installation of the station until August.

Radio News & Music hired a Detroit ham operator, 19-year-old Michael Lyons, to install the transmitter on the

second floor of the News building and to erect a rooftop antenna. A license was needed, but broadcasting in 1920 was just an experimental activity, and broadcast licenses did not yet exist.

The handful of pioneer broadcasters were operating under a variety of license classes, including amateur, experimental and "commercial land station." The News decided that an amateur license was the most expedient option, and a license was quickly obtained with the call sign 8MK.

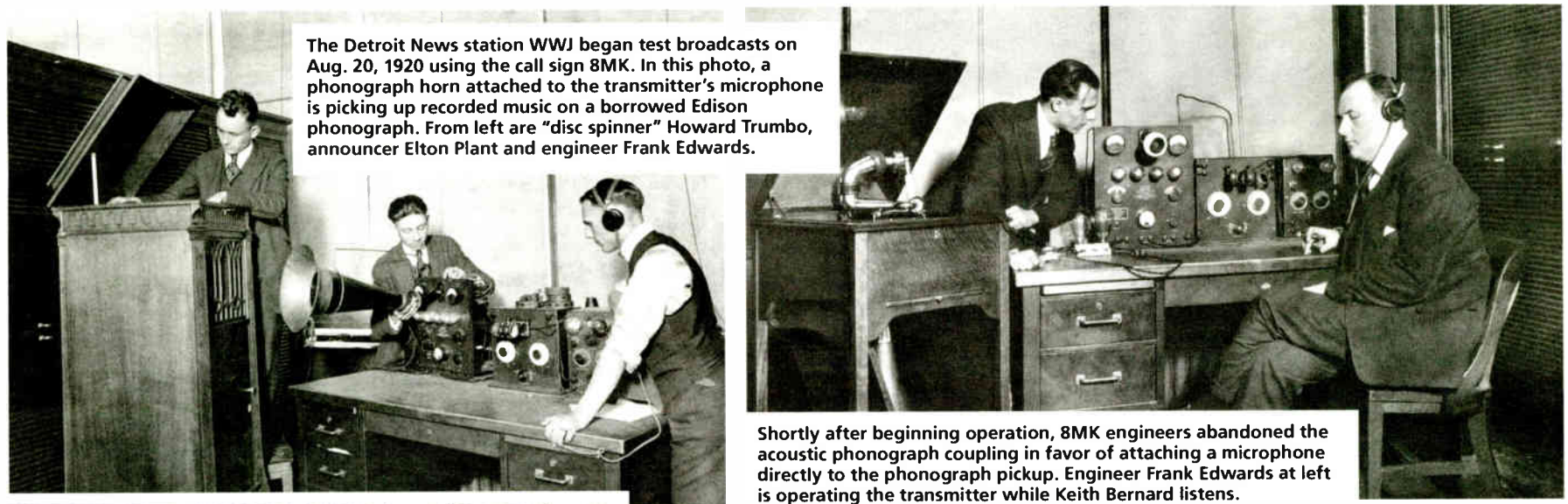
Scripps initially worried about the optics of a newspaper giving away its news reports for free over the air, and so he wanted the appearance of an arms-length relationship with the station. For this reason, the 8MK license was registered in Lyons' name.

In a 1973 letter, Lyons recalled:

*I'll never forget the Tuesday we started broadcasting, and the reporters would not publish the fact, because they were afraid people would laugh at the Detroit newspaper. Besides, I was told, there was a chance the radio news would deter people from buying newspapers to get the news.*

8MK made its first transmission on Aug. 20, 1920, on a frequency of 200 meters (1500 kHz), the bottom of the amateur band. It was just a test of the new equipment, and so it was not publicized. It is estimated that no more than 30 people heard the broadcast that night.

(continued on page 20)

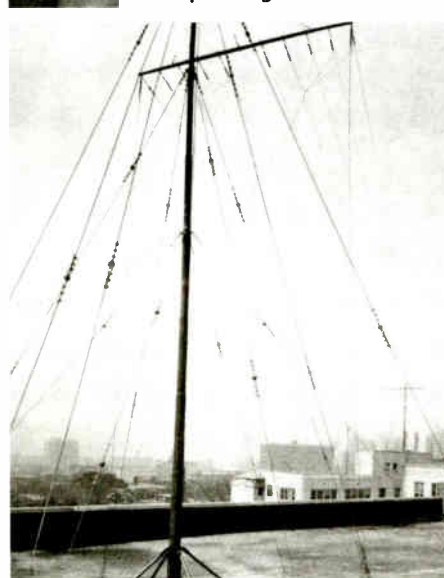


The Detroit News station WWJ began test broadcasts on Aug. 20, 1920 using the call sign 8MK. In this photo, a phonograph horn attached to the transmitter's microphone is picking up recorded music on a borrowed Edison phonograph. From left are "disc spinner" Howard Trumbo, announcer Elton Plant and engineer Frank Edwards.

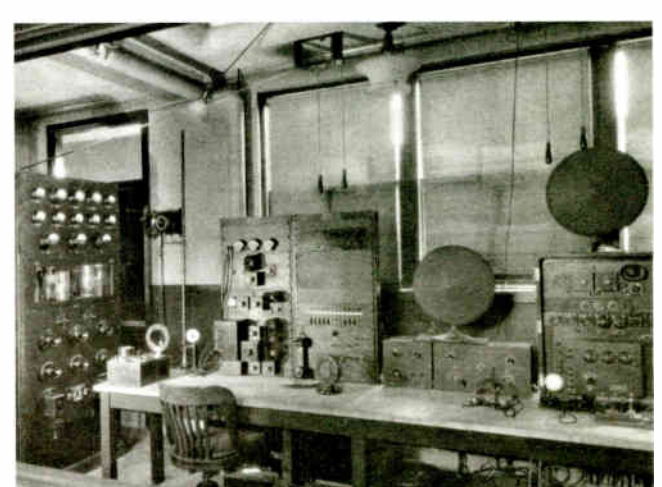
Shortly after beginning operation, 8MK engineers abandoned the acoustic phonograph coupling in favor of attaching a microphone directly to the phonograph pickup. Engineer Frank Edwards is operating the transmitter while Keith Bernard listens.



Operator Fred Lathrop is at the controls of WWJ in 1922. The Western Electric 1-A 500-watt transmitter is rear left, with its electrical control panel at right. The desk contains only a microphone, audio amplifier, radio receiver and a wavemeter (frequency monitor). A room behind the transmitter contains a motor-generator set and banks of storage batteries, which supply DC power to the transmitter; power rectifier tubes had not been invented.



This was the 8MK antenna in June, 1921 — a 10-wire end-fed assembly that ran between two adjoining Detroit News buildings.



In 1925, WWJ's power was increased to 1,000 watts with a new Western Electric 6-B transmitter (far left). The latest in broadcast technology, it featured 100% Heising low-level modulation, a water-cooled final amplifier tube and crystal frequency control. Only one of its two cabinets is visible. The assembly of audio control and monitoring equipment has grown considerably in three years.



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**WWJ***(continued from page 18)*

Elton Plank, a 16-year-old office boy, was given the task of being the first announcer because of his pleasing voice. At 8:15 p.m., Plank placed a megaphone against the transmitter's mouthpiece and announced, "This is 8MK calling, the radiophone of the Detroit News."

He then signaled Howard Trumbo, operating a borrowed hand-crank Edison phonograph, to play two records: "Roses of Picardy" and "Annie Laurie." Listeners were asked to telephone in their signal reports to the newspaper, and 8MK signed off the air.

**ELECTION BULLETINS, AUGUST 1920**

After several more test transmissions verified the equipment was working properly, 8MK made its first publicized broadcast on Aug. 31, 1920, the night of the state's primary election.

A front-page announcement in the

News alerted the public to the upcoming broadcast: "Miscellaneous news and music will be transmitted from 8 until 9 o'clock so that operators may adjust their instruments. Election bulletins begin at 9 o'clock and will continue on the hour and half-hour until midnight."

An estimated 500 listeners heard that night's broadcast.

After that auspicious debut, 8MK began a schedule of two broadcasts per day, six days a week, featuring news and weather summaries from the pages of the Detroit News combined with entertainment from phonograph records.

Each day, the program schedule of the "Detroit News Radiophone" was published on the front page of the newspaper. Encouraged by the positive results of his radio experiment, Scripps transferred the 8MK license into the name of the newspaper and dedicated more resources towards his fledgling operation.

A staff of three was assigned — two engineers and a program manager. New program concepts were tried; in September, there was a remote broad-

cast of live dance music by the Paul Specht Orchestra, and the results of the Dempsey-Miske boxing match were announced. The Brooklyn-Cleveland World Series baseball play-by-play scores were sent out in October.

On Nov. 2, 8MK broadcast the Harding-Cox presidential election returns, the same night as KDKA's famous first broadcast. Live Christmas carols were broadcast in December. Lectures, dramatic readings and poetry were added in 1921, and live music was increasingly being heard.

Although still operating under an amateur license, 8MK was a commercial broadcaster in all aspects, operating from a business establishment with a paid staff and professional content.

**NATIONAL COVERAGE**

In the fall of 1921, new government regulations were issued that prohibited amateurs from broadcasting news and entertainment.

This meant that the Detroit News, along with dozens of other pioneer broadcasters,

were required to apply for a new class of license called "Limited Commercial." Subsequently, in November, 1921, the "Detroit News Radiophone" received a new license with the randomly-assigned call letters WBL, and it moved to the new shared broadcasting frequency of 360 meters (833 kHz). But when listeners had trouble hearing the call sign correctly, a new call sign was requested, and the Detroit News station became WWJ on March 3, 1922.

Scripps now poured considerable resources in his radio operation. A new WWJ studio/office suite was built on the fourth floor of the building. A 290-foot antenna was stretched between the News building and the Fort Shelby Hotel in 1921, and a 500-watt Western Electric transmitter was installed in 1922, only the second factory-made broadcast transmitter in the country.

With these improvements, WWJ was now being heard across the country at night. By summer, there was a full-time

*(continued on page 22)*

A broadcast of the program "With the Masters," March 15, 1931, at the WWJ studios. The studio featured an arm-and-pully system that could place the condenser microphone at any location and height.



The WWJ operating staff in 1922. Back row, from left: unknown; Walter Hoffman, engineer; Genevieve Champagne, secretary; Keith Bernard; Elton Plant, announcer. Front: Charles Kelly, station manager; Howard Campbell, engineer; Bill Holliday, program manager; G. Marshall Wittchell, reporter. Four more engineers are not shown.

A view of the WWJ studio with an orchestra concert in progress, as seen through the control room window, late 1920s.



Renowned sports announcer Ty Tyson. Tyson joined WWJ as an announcer in 1922 and broadcast a variety of events before being recognized for his sportcaster abilities. He broadcast Tigers games on radio from 1927 to 1942, then on television from 1947-51, and then returned to radio. Tyson retired in 1953 and died in 1968.



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# WWJ

(continued from page 20)

staff of nine. Live broadcasts of the Detroit Symphony Orchestra began in February, and in May a new 16-piece WWJ Orchestra was organized, consisting mostly of symphony musicians. Regular church services were broadcast on Sundays.

Star performers appeared on the station, including Fanny Brice and Fred Waring and his Pennsylvanians. Nightly news reports with running commentary were delivered by Albert Weeks, billed as "The Town Crier." Children's bedtime stories were being read nightly.

As local live talent was hired to broadcast on WWJ, some refused to believe there was really an invisible audience hearing their performances. They were accustomed to the immediate feedback of a live audience, but the microphone offered only silence.

When future radio comedian Will Rogers made his first ever radio broad-

cast over WWJ in October, 1922, he didn't believe that people were really listening: "I don't think you can hear me," he announced. "If this isn't the bunk, let me know if you can hear me."

To his great surprise, he received letters and postcards from all over the Midwest. Even Henry Ford had heard him, using a receiving set he had built himself.

Live remote play-by-play broadcasts on WWJ began in October, 1924, when Chief Announcer Edwin "Ty" Tyson called a University of Michigan football game from the stadium. The university allowed just this one broadcast because the stadium was already sold out, but when they were flooded with ticket requests for the next game they agreed to allow regular broadcasts.

In 1927, Tyson broadcast the entire season of Detroit Tigers home games over WWJ. He soon became one of the country's foremost early sportscasters, and called both the 1935 and '36 World Series games for NBC.

In 1923, WWJ moved to 517 meters

(580 kHz), sharing the frequency with the new Detroit Free Press station WCX (now WJR), and then in 1925 it moved to 850 kHz, operating full-time with a new 1 kW transmitter. After the company's new parking garage was completed across 3<sup>rd</sup> Avenue in 1926, the transmitter moved into the garage building, and two new towers suspended the antenna 265 feet above street level between the garage and the paper warehouse.

(WWJ was shifted to 920 kHz in 1928, and then to its current 950 kHz frequency in the NARBA Treaty realignment of 1941.)

## SHOWCASE STATION

As radio entered its "golden age" in the 1930s, backed by the ample resources of the Scripps-Howard newspaper chain, no expense was spared to make WWJ a first-class station.

When the NBC Red Network was organized in 1926, WWJ became its Detroit affiliate. In 1936, a new show-place five-story studio building was built for a cost of \$1 million, and an

opulent 5 kW transmitter building and new tall tower were inaugurated. Both structures were designed by the famed Detroit architect Albert Kahn.

Frequent remote broadcasts originated from a fleet of remote trucks and the Detroit News aircraft. "Radio Jake," the WWJ Interference Engineer, prowled the city in his own vehicle, solving interference complaints for citizens as a free public service.

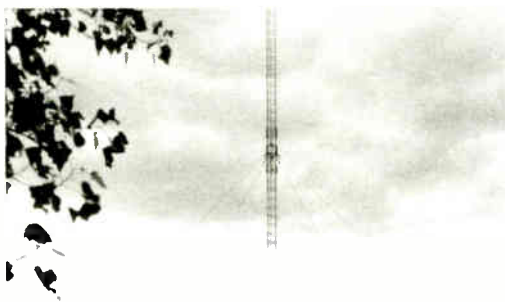
The Detroit News had operated WWJ entirely as a goodwill service to the public. By 1928, it had reportedly invested \$466,000 in the station, despite earning not a penny in return.

There was no way knowing if WWJ benefitted the company through increased newspaper sales. This was the conundrum of radio in the late 1920s — it was now an essential public service, but had no clear source of revenue. It was not until advertising was permitted in the early 1930's that radio became a profitable medium.

WWJ was continually at the forefront experimenting with new broadcast technologies. In 1938, it transmitted a



Above, an aerial view of the WWJ towers on the roof of the Detroit News building, 1937. The Detroit River and Ambassador Bridge are in the background. By this date, the main transmitter was located on Eight Mile Road and these towers were used for backup. They were dismantled in 1943, their steel donated to the war effort.



In 1936 WWJ raised power to 5,000 watts and moved from the News building to this new transmitter building and tower on Eight Mile Road. Like the studio building opened that same year, the transmitter building was designed by Albert Kahn. Its granite block façade was highlighted by leaded glass windows towering above the doors.



A new studio building, designed by Detroit architect Albert Kahn and built at a cost of \$1 million, opened in 1936. It was across Lafayette Boulevard from the Detroit News buildings. An underground tunnel connected the structures.



WWJ outfitted this news truck in 1938, containing the latest technology for live broadcasting and photojournalism. It contained a custom-built 100-watt shortwave transmitter and receivers. A reporter wearing a backpack transmitter could transmit back to the truck for rebroadcast to the WWJ studios via shortwave.



radio newspaper during overnight hours to facsimile printers in local residences. In 1936, it inaugurated an experimental "Apex" high-fidelity AM station, W8XWJ, broadcasting on 41,000 kHz from the top of the Penobscot Building skyscraper.

In 1940, this was converted to W45D, one of the nation's first FM stations (now WXYT-FM). And in 1947, WWJ-TV took to the airwaves (now WDIV).

The 65-year relationship between WWJ and the Detroit News ended in 1985, when The Gannett Company bought the newspaper and spun off WWJ/WJOL to a group of local businessmen. Then in 1989, they were purchased by CBS Radio, who invested in a major power increase to 50 kW in 2000.

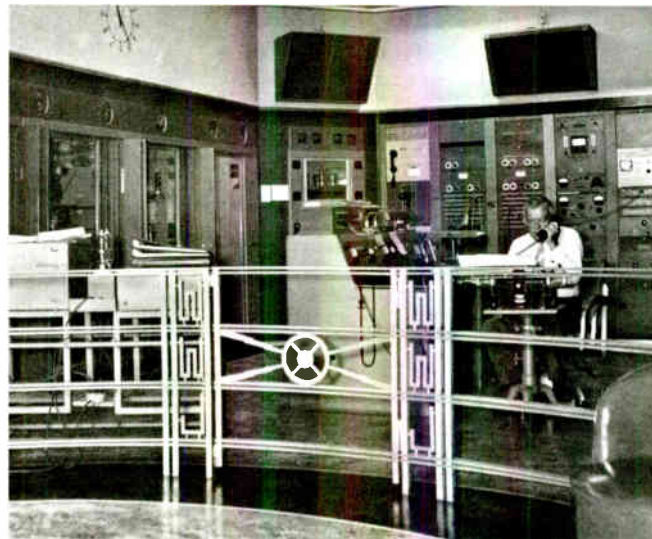
In 2017, CBS Radio merged with Entercom, today's owner of WWJ,

which coincidentally also owns pioneer stations KDKA and KNX. The original WWJ de Forest transmitter was donated to the Detroit History Museum in 1959, where it can be seen on display today.

For more of John Schneider's history articles (including other centennial stations that were heard prior to the famous KDKA broadcast of 1920), visit [www.radioworld.com/author/john-schneider](http://www.radioworld.com/author/john-schneider).



WWJ's ultra-shortwave "Apex" station W8XWJ broadcast from 1936 to 1940 on 41,000 kHz. Chief Engineer C.H. Messer attends to the 500-watt high-fidelity AM transmitter in the Penobscot Building. Carroll Leedy operates the control console. W8XWJ later became W45D, one of the nation's first FM stations (now WXYT-FM).



The WWJ transmitter room in 1963. Transmitter engineer Ed Boyes is at the control desk.

## PHOTO CREDIT

All images are from author's collection

## RESOURCES

WWJ, *The Detroit News*, by the radio staff of the Detroit News, 1922

*Historical Dictionary of American Radio* by Frederic Leigh

*The Roaring Twenties* by Edmund O. Stillman

*Michigan History*, Dec. 1960: "WWJ — Pioneer in Broadcasting" by Cynthia Boyes Young

"Radio Digest," 4-15-1922, 10-14-1922, 6-20-1925

"Broadcasting After World War One (1918-1921)" by Thomas H. White

"WWJ, A Jesuit and the Bomb" by Jeffrey McQueen Revised January 2003

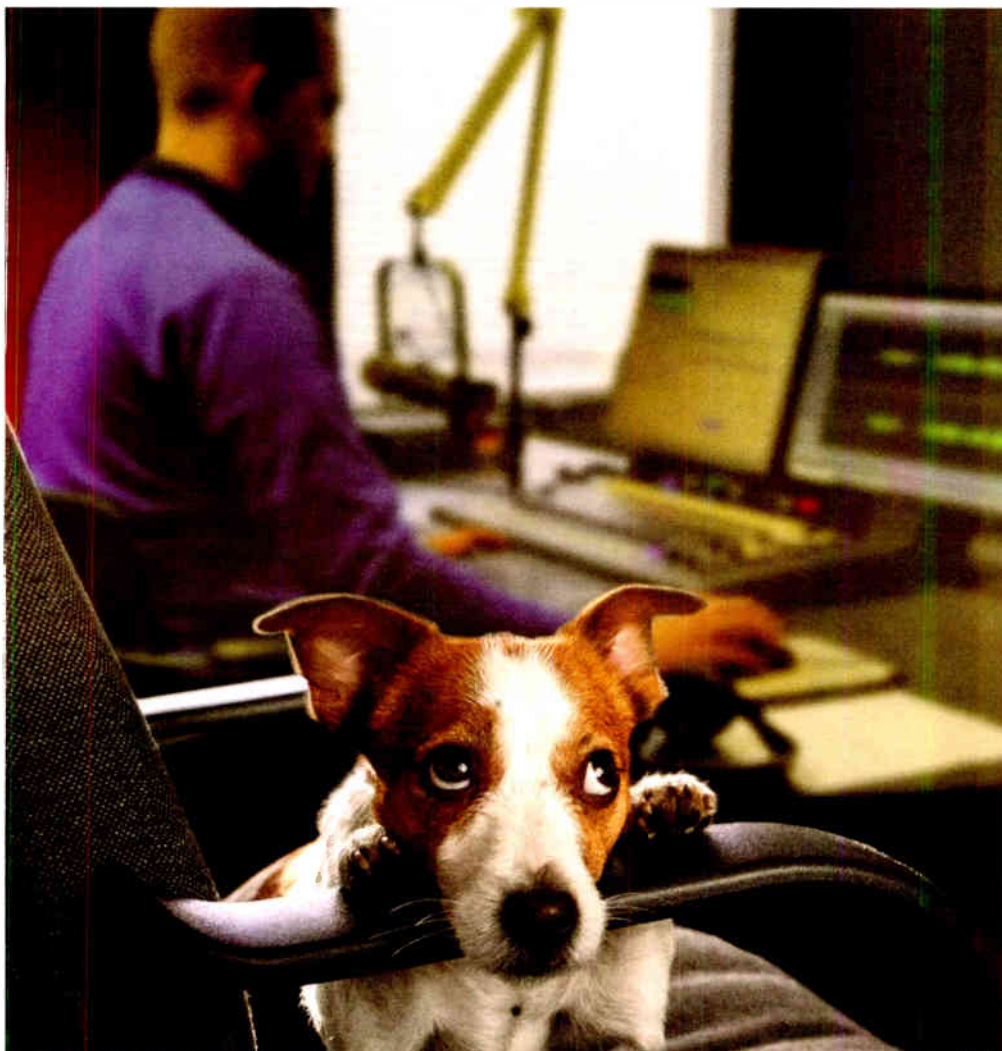
"WWJ, 'The World's First Radio Station': A History" (Thesis for the Degree of Master of Arts) by Robert Preston Rimes, Michigan State University, 1963

"Happy Birthday WWJ! World's First Radio Station Turns 99" — WWJ web site

"WWJ: The Detroit News Station" by Brian Belanger, Radio and Television Museum News, May, 2007

"WWJ-AM History," Wikipedia

"Broadcasting," 12-9-1985, 3-27-1989



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# My Vacuum Tube Headphone Amp Project

Curt rummages in his discard stash and finds he can build something interesting

## DIYPROJECT

BY CURT YENGST

Like most of us during what advertisers like to call “this difficult time,” I was compelled to spend a fair amount of it “working” from home.

Truth be told, I *hadn't* worked so hard in years. My wife kept me so busy with household projects that I was begging to go back to work just to get some rest!

But there were the inevitable frequent bouts of boredom. I often found myself at my workbench, staring at the various boxes and bins of parts, wondering what I could do with them.

Fortunately, my wife had given me a copy of “Designing High-Fidelity Tube Preamps” last Christmas. (Yep, she’s a keeper!) The book is by Merlin Blencowe, known on the internet as The Valve Wizard ([www.valvewizard.co.uk](http://www.valvewizard.co.uk)). It’s a rather ponderous tome for a guy like me who barely passed Algebra; but it’s loaded with lots of great design ideas.

One chapter toward the back discusses a transformerless headphone amplifier built around a White cathode follower tube stage.

As I rummaged through my parts stash, I came across some spare tubes and decided to issue myself a challenge: Could I build a working vacuum tube headphone amp with only the parts I had on hand?

### BREAKING THE RULES

With Blencowe’s text as a starting point, I then stumbled across a similar design by Pete Millett ([www.pmillett.com](http://www.pmillett.com)). His design was a bit more complex and included some high-end output transformers. It had been reworked by another fellow DIYer, Ian Thompson-Bell ([www.customtubeconsoles.com](http://www.customtubeconsoles.com)), for use in his tube console.

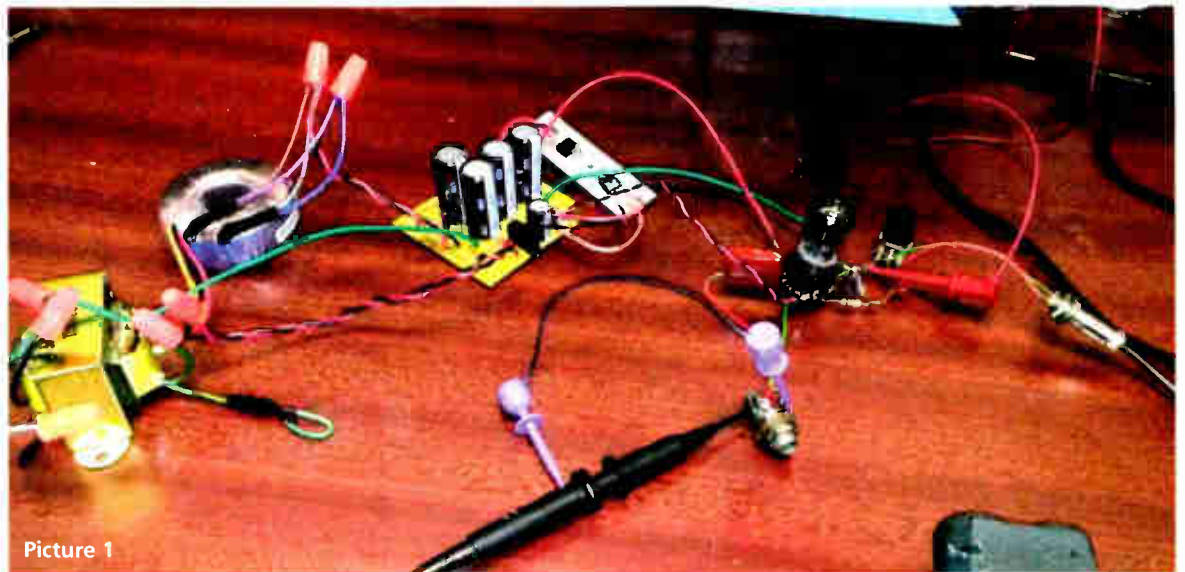
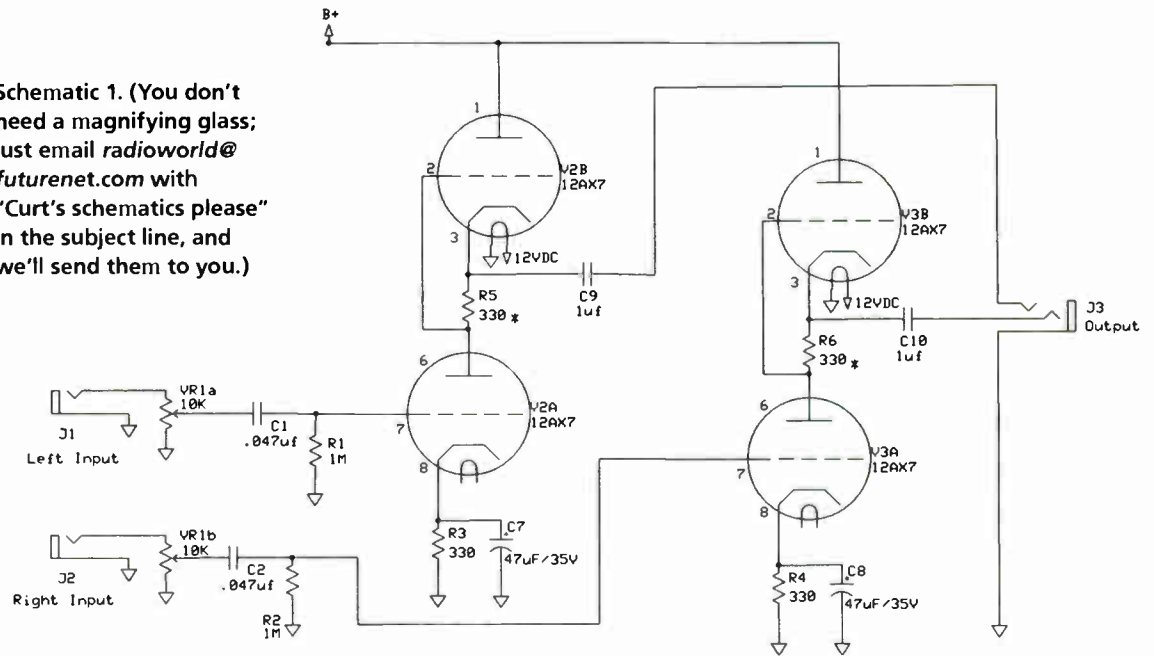
Ian has been very helpful to me with past tube projects, so I had a good look at that.

Eventually, I came up with a schematic, shown small in Schematic 1. You can obtain the schematics for this story by emailing [radioworld@futurenet.com](mailto:radioworld@futurenet.com), with “Curt’s schematics please” in the subject line.

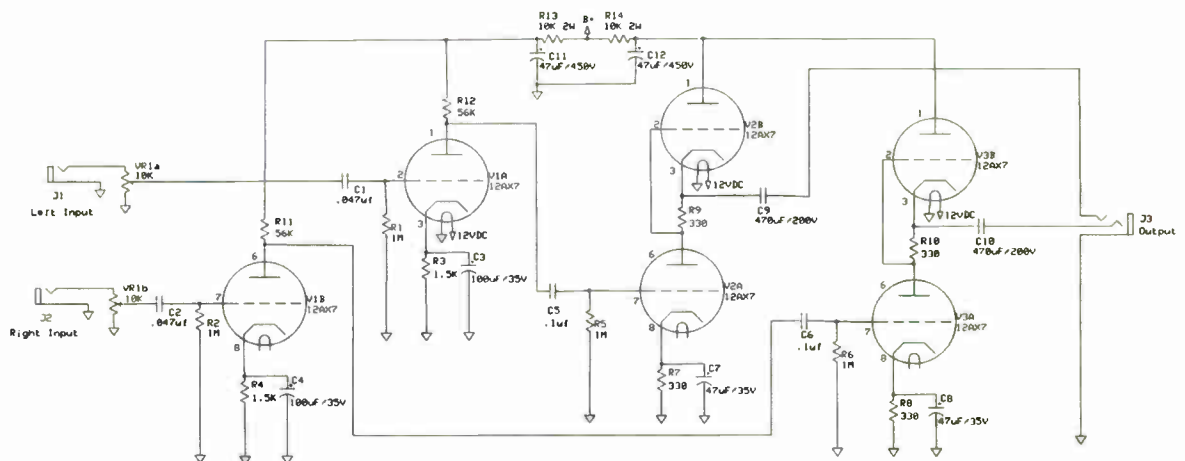
When you look at the schematic you’ll see that it breaks a few design rules. Remember, it’s based on what I had, not what I wanted!

Normally, no one in their right mind would build such a thing using 12AX7s, which are normally used as high-gain preamps (especially guitar amps). Obviously, the high impedance of the output would have a hard time driving a typical pair of headphones.

Schematic 1. (You don’t need a magnifying glass; just email [radioworld@futurenet.com](mailto:radioworld@futurenet.com) with “Curt’s schematics please” in the subject line, and we’ll send them to you.)



Picture 1



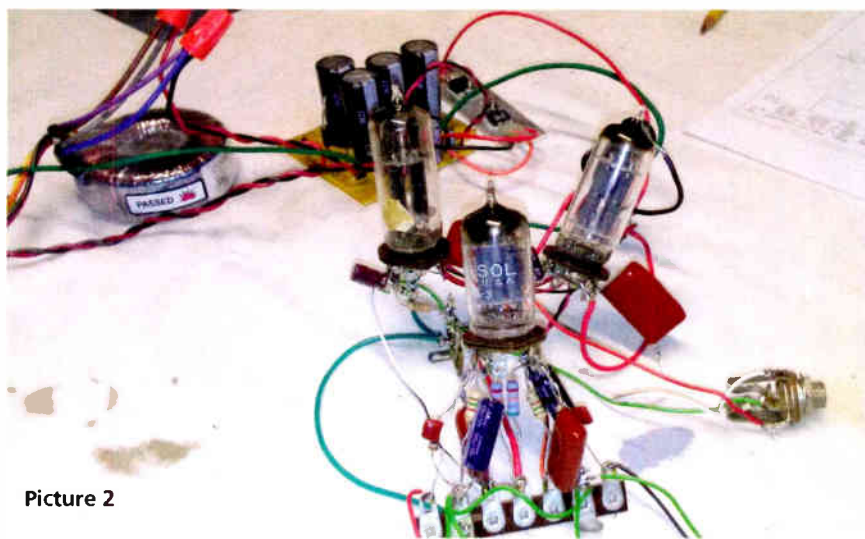
Schematic 2

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Picture 2

the volume control, so I had to substitute two regular 10 kohm pots and adjust each channel separately. The coupling capacitors on the inputs are an oddball value, because, again, they're what I had. Other designers vary the value of the cathode resistors on the output stages anywhere from 160 ohms to 470 ohms. I had a few 330 ohm resistors on hand, so we land somewhere in the middle. I found a couple solder lug strips to make the point-to-point wiring a little neater. See Picture 2.

This version passed much more signal, owing to its nearly 60 dB of gain. That's clearly overkill for a headphone amp, but it was able to drive a pair of AKG K240 headphones. This was likely due to sheer brute force, as the imped-

**When you look at the schematic you'll see that it breaks a few design rules. Remember, it's based on what I had, not what I wanted!**

without the TL783 regulator for the plate supply, but it was handy. In fact, it was already bolted to a heat sink with a 78S12 regulator that I could use for a nice, clean, DC filament supply. I mounted the other components to a piece of perf board. I didn't have a 100 ohm 2 W resistor, though; so I had to connect a 47 ohm and a 56 ohm in series. Close enough for rock and roll.

See Schematic 3.

Ideally, the output tubes would be 12BH7s, which are common in this setting.

Wouldn't you know it? I came across a box of old radio tubes, and buried under the pile were two 12BH7s! Amazingly, they both still worked! They also happen to have the same exact pinout as a 12AX7, so no rewiring was necessary.

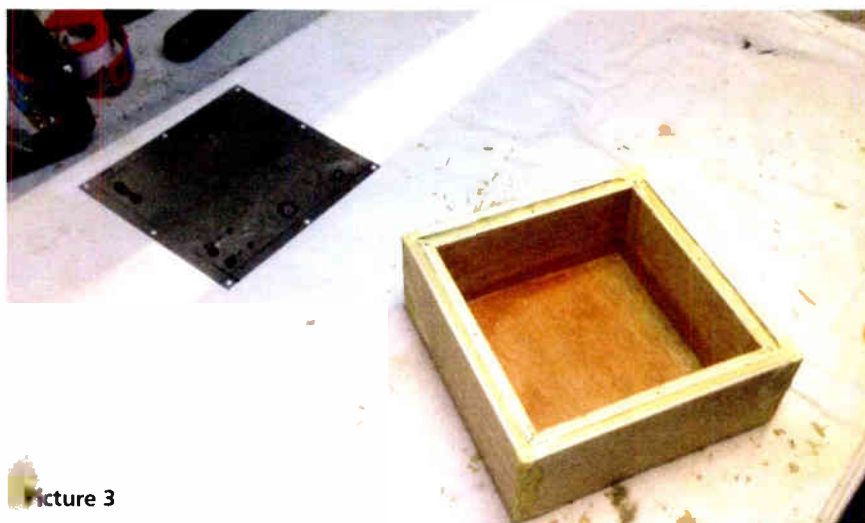
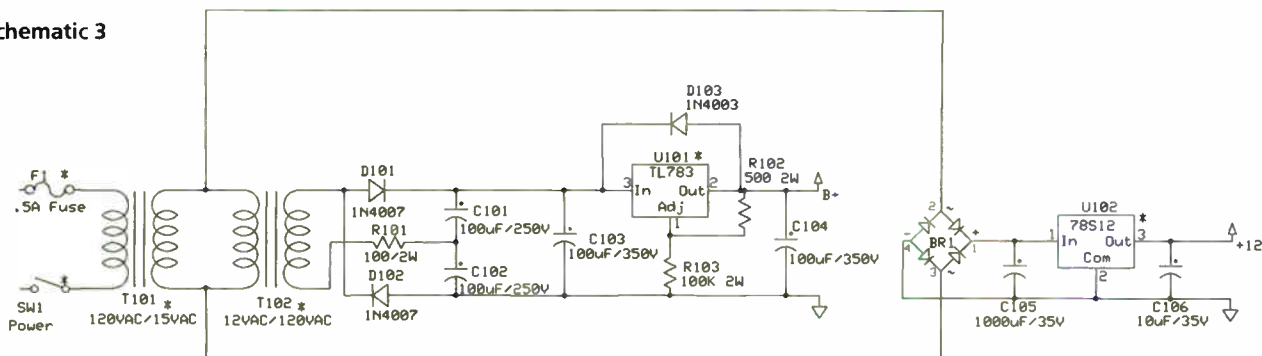
Granted, they were mismatched, which led to one channel being slightly louder than the other. I also found out the hard way that those tubes get HOT when working. I'm told this is normal.

So now I had a working device, but it was a terrifying looking pile of parts on the workbench.

I set about constructing a proper enclosure for it. I had recently built an equipment rack for my studio using a sheet of cabinet-grade birch plywood. I used some scraps to assemble a small box. Digging through a storage bin, I found a few square metal plates someone had given me years ago. Hated to just toss them ... (I swear, I'm not a hoarder!) One of these plates would be perfect for a top panel for the jacks, tube sockets, and such. See Picture 3.

(continued on page 26)

Schematic 3



Picture 3

ance mismatch would make any proper designer's hair stand on end!

A colleague suggested much larger electrolytic capacitors for output coupling to handle that a little better. The closest thing I had was a pair of huge 470  $\mu$ F/200 V power supply caps. The 12AX7s on the output certainly gave it some "crunch" at higher volumes. If you're going for a "tube" sound, I suppose it would work.

The power supply was put together using some parts I had stripped from an old tube project I was no longer using. The supply design is lifted directly from that project.

It's fairly simple as tube supplies go. I suppose I could have gotten away

Still, I soldiered on, slapping it together with a power supply I managed to assemble. See Picture 1.

I was amazed it actually passed audio, but not surprisingly, the output was anemic at best.

I went ahead and added an input stage based around two halves of another 12AX7, one for each channel. (I have no idea how I acquired so many spare 12AX7s. If I didn't know better, I'd swear they were breeding!) See Schematic 2.

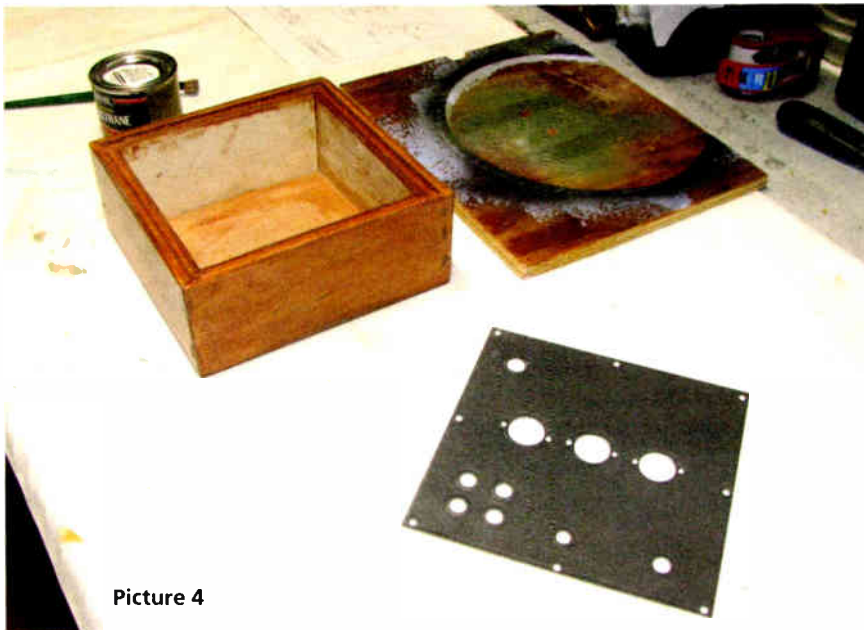
The input stage is a very common design, seen in numerous mic and instrument preamp stages. The plate resistors could stand to be larger, but I happened to have a pair of large 56 kohm resistors. What I didn't have was a stereo pot for

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Picture 4

# AMP

(continued from page 25)

A little punching and drilling, a coat of Testor's model paint, and some lettering, and the panel was done. Some stain and a coat or two of polyurethane, and the box was completed. See Pictures 4 and 5.

I managed to fit everything inside, which was a surprise, considering I simply based the size of the box on the dimensions of the metal plate (about 7 1/2 inches square), and how much scrap wood I had. I decided to mount the tubes on the outside, mainly for the coolness factor; but also for the other coolness factor, as in keeping the 12BH7s cool. This definitely gives it an antique vibe.

The finishing touch was a Bakelite knob from a stash of old radio knobs an even older friend gave me years ago. See Picture 6.

So, it works, if only barely. What improvements can be made to the design without breaking the bank and reinventing the wheel in the process?

For starters, I will likely order a matched pair of 12BH7s. Some of the output transformers I researched gave me sticker shock, but Ian Thompson-Bell suggested a pair of Ecor XSM Series transformers. They are very reasonably priced, just under \$20 each, and could be bolted to the top of the enclosure, behind the tubes. They would eliminate the giant coupling caps, which would then be replaced with much smaller 1  $\mu$ F polyesters.

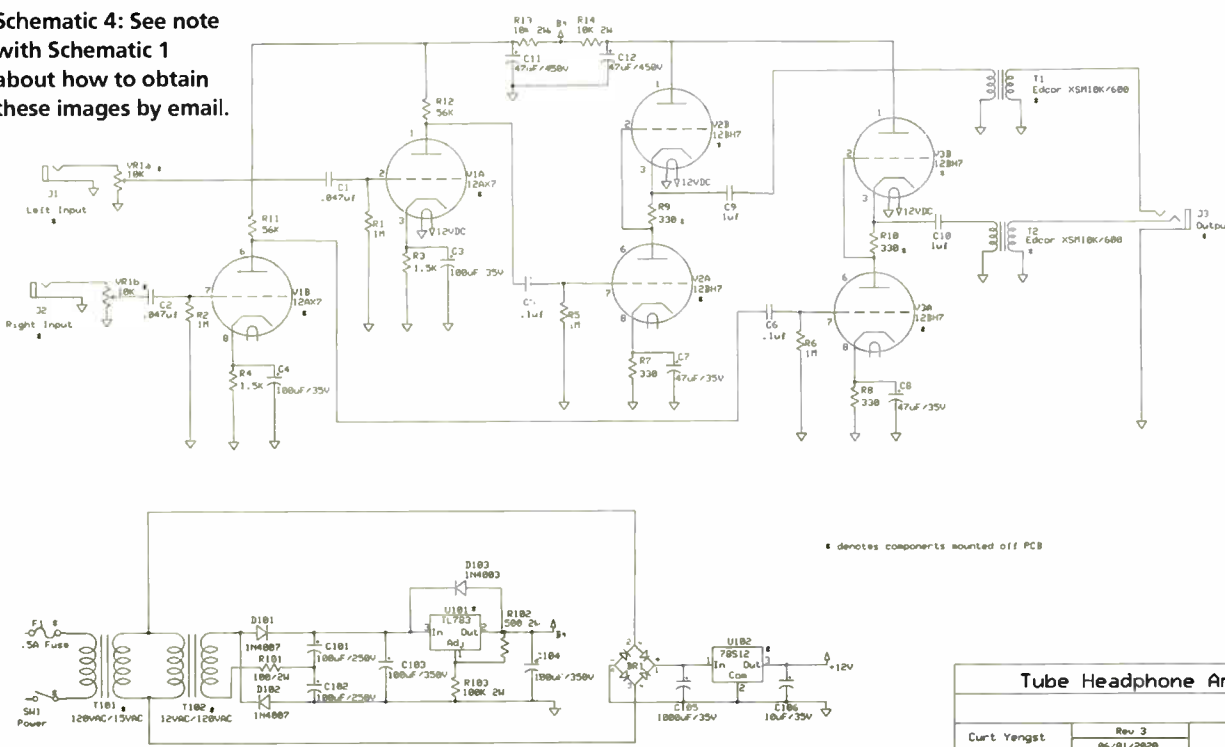


Picture 5



Picture 6

**Schematic 4:** See note with Schematic 1 about how to obtain these images by email.



**A little punching and drilling, a coat of Testor's model paint, and some lettering, and the panel was done.**

I'd also replace one power transformer with a toroidal type, to match the other one. Then, in the interest of neatness, I might go to the trouble of designing a PCB for the rest of the circuit. See Schematic 4.

But, for something thrown together with what was on hand, it was a fun and interesting project and a great conversation piece.

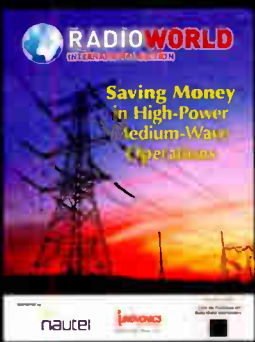
*Curt Yengst, CSRE, is engineer for Lighthouse TV in Allentown, Pa., and a longtime RW contributor.*

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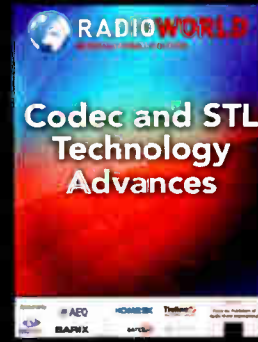
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Curt Yengst	Rev 3 06/01/2020



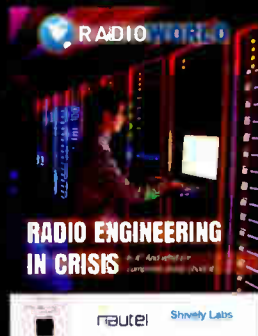
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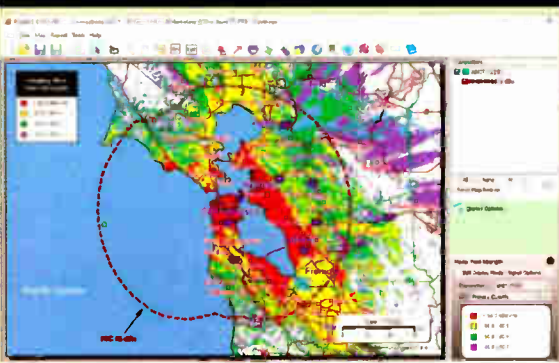
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WYBG 1050, Messina, NY, now off the air is selling: 250' tower w/building on 4 acres; 12' satellite dish on concrete base; prices drastically slashed or make offer. 315-287-1753 or 315-528-6040

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

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

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 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 San Francisco radio recordings from the 1920's through the 1980's. For example newscast, talk shows, music shows, live band remotes, etc. Stations like KGO,

KFRC, KSFO, KTAB, KDIA, KWBR, KSFX, 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](mailto: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](mailto: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](mailto:ronwtamm@yahoo.com).

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### WANT TO BUY

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### RECEIVERS/ TRANSCIVERS

#### WANT TO BUY

AM Stereo radio. Call 417-881-1846.

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Schnader telescriptions 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.

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READER'S FORUM

ILLEGAL LOW-POWER

As has been addressed in articles in Radio World, many churches and other groups this spring began to broadcast "drive-in" services and events.

As a local broadcast engineer I received several inquiries about how to do this. As you have reported, the only option is under the FCC "Part 15" rules, which allow for signals of very low power in the AM or FM band.

After explaining rules and limitations, the people I talked to instead opted for live streaming services. Clearly, however, most don't seek out advice of local radio staff but seem simply to search the internet for "drive-in church" or similar.

This is where the trouble lies, as a search brings up thousands of churches that are doing this, along with countless articles in church and religious magazines or websites telling how easy it is, and a raft of YouTube videos of pastors, ministers, church assistants, youth ministers and others demonstrating their installations.

Basically they tell you to order an FM transmitter from eBay or Amazon, plug it into the church audio board and you're on!

The problem is the FCC's lack of ability or desire to stop the sale of illegal FM transmitters in the United States via these sellers. Nearly all FM "Part 15" transmitters being sold actually are illegal in this country. Many use misleading advertising: "Long-range FM transmitters," "No license required," FCC compliant," "Perfect for churches" and so on.

A real FM Part 15 transmitter sold in the United States must be certified by the FCC. Most sold are not.

Over the years I have done testing of many of these and found that not only are they substantially over the legal limit, sometimes by 100 times and more, but that they also generate spurs and harmonics.

This of course causes interference to other, licensed stations on the FM band, as well as public service frequencies and, most often, the aviation band — interference with aircraft communication and navigation.



Such interference is one of the ways illegal transmissions are discovered and tagged by the FCC; airport tower operators contact the FCC to complain.

While interest in Part 15 may have settled down since the early weeks of the pandemic, I suggest that local engineers continue to keep their eyes and ears open for churches or organizations advertising drive-in broadcasts.

It's not just churches; we have a local arts center that launched live broadcasts of concerts with no audience in the theatre but an audience in cars in the parking lot.

Do a bit of legwork with a field intensity meter and spectrum analyzer and see if their broadcasts are legal.

The Part 15 FM limit is 250 uV/m at 3 meters from the transmitting antenna. Basically if you can hear them more than 250 to 300 feet from the site, they're not legal.

Then look for harmonics, spurs and overmodulation. Usually these transmitters either have no modulation indicator, or have one consisting just of a blinking LED that is horribly inaccurate.

Operators with no experience tend to overmodulate substantially, causing splatter to adjacent frequencies. Usually if they're illegal it's blatantly obvious.

For those using Part 15 AM transmitters — not as popular but offering substantially greater legal range — the legal limits are easier for the layman to measure, with a maximum allowed of 100 milliwatts to the final amplifier and a maximum of 3 meters length for antenna and any ground lead (if used) combined. Under good conditions, a half-mile or more is possible with legal Part 15 AM.

If you do discover someone operating illegally, reach out politely and let them know they are violating FCC rules. If you have the ability and desire, you can offer to help them make their broadcast legal.

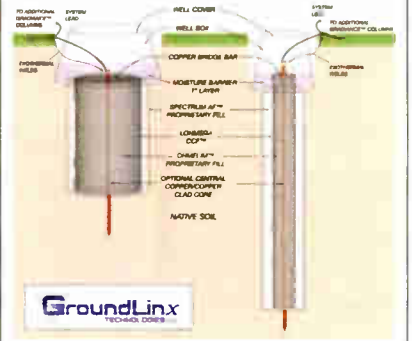
Based on my observations, there were thousands of brand-new illegal FM transmissions on the air this spring.

Tim Edwards  
Chief Engineer  
KOZY(AM), KMFY(FM), KBAJ(FM)  
Grand Rapids, Minn.

GROUNDLINX

Thanks for keeping up the quality of the RW family of broadcast publications in this difficult time.

Just a quick comment. I liked your article "GroundLinx Advocates for New Approach," and I do think it was informative and accurate.



The article did give the impression — it was my perception for sure — that their grounding system was unique. It is not, and the chem ground approach has been around for decades. Two links as an example; see <https://tinyurl.com/rw-grounding> as well as <https://tinyurl.com/rw-grounding-1>.

The problem has been that, unfortunately, buyers do not normally want to spend the money to install these types of systems.

Clarence M. Beverage  
Communications Technologies Inc.  
Marlton, N.J.

MODULATION LIMITS

I very much enjoyed reading "Audio Processing Before the Wars" in the July 22 issue of RW.

However, I have to take exception to one sentence in this excellent article. Tom Vernon stated: "When the FCC passed regulations allowing AM stations to increase their positive peak modulation from 100 to 125%, their days were numbered."

I was involved in broadcast engineering back then. Prior to sometime in the late 1960s or early 1970s, I don't recall that the FCC had any limit on positive modulation in their rules and regulations. There were some AM stations where positive modulation peaks greatly exceeded 100%. The only prohibition I recall was a 5% limit on carrier shift.

Unless my memory is faulty, I remember when the FCC placed a 125% absolute limit on positive modulation peaks. I even recall filing comments when the rule was proposed.

Gary Peterson  
Rapid City, S.D.

FLY IN THE MILK

(continued from page 30)

But there are no new Black engineers coming along. Maybe in western and southern cities, but I haven't seen it in the north. There have been some IT pros and some remote engineering guys I have met. Not many.

WHAT TO DO ABOUT IT?

Discussion on race as with any discussion needs to be followed with action plans. We need every major learning center in this country to open their doors with scholarships and grants to allow young Blacks and Latinos to attend college or trade school.

This would go a long way to helping young people find their way. We need to use our schools and universities as training and "melting pots," learning from each other while we learn our particular craft.

And radio and TV companies should hire young people

to fill their empty studios and buildings, especially at night. Where will the future radio DJs and workforce come from if we keep automating and cutting people?

The most startling fact I've heard about population lately is there are more young people under the age of 30 living on this planet than ever. They need guidance and mentors and education.

Removing the names of former presidents from buildings because of their racial misdeeds is good, I guess. But these universities need to make tuition free, especially at state-funded schools. Offer free education to young inner-city youth. Support inner-city schools, especially high schools and top-performing charter schools.

President Kennedy once said "Ask not what your country can do for you but what you can do for your country."

I would amend that to "What more can I do to help my country?" Help young people succeed by mentoring, educating and offering them an alternative to the negatives they see.

I had the same encouragement and it worked for me.

Comment on this or any story. Email [radioworld@futurenet.com](mailto:radioworld@futurenet.com).



# Perspectives of a Fly in the Milk 2020

Our mere presence in the radio world has always been a form of protest to me

## COMMENTARY

BY BEN HILL

*The author is chief engineer for Entercom Communications station WIP(FM) in Philadelphia.*

I wrote an opinion piece in Radio World almost 20 years ago that I headlined "A Fly in the Milk," hoping to draw attention to the lack of opportunity for minorities in U.S. radio engineering. The issue didn't gather much steam.

Today, much national attention is focused on racial issues. Recent stories in Radio World have been exploring the professional experiences of Black radio engineers. It seems a good time to update my earlier commentary and share my own.

### GETTING HERE

Dr. King's work nationally, and local civil rights efforts in my city, certainly influenced me growing up. It was North Philadelphia and the 1960s. Police and parents were on the same page for "law and order."

It seemed a time of innocence; and then came the Vietnam War. Everything changed.

Growing up a young Black person in America, the pressure can be intense; but my mother never allowed us to wallow in self-pity or to be afraid to venture out in the world and accomplish things. There was no playing the race card. But we had to stand up for ourselves.

My family had a lot of dignity and grace, since most of my relatives were housekeepers, maids and butlers. My high school was 90% white, and there were heavy racial tensions and fights.

I couldn't wait to get out of there. No proms or sports really; it wasn't good to be around after school. I was busy tinkering and trying to fix broken mechanical and electric appliances.

As a kid I could fix things, especially electronic items; I was working on radios and TVs by the age of 14. I attended a tech trade school for electronics that nurtured and taught me. The school was 50% black in the student body, which helped me to fit into it.

My professor Mr. Wortham told us, "Boys, you will learn all the technical stuff you will need; but dealing with people and co-workers? That will be a bigger challenge for you." Boy he was right.

A couple of electronic repair jobs brought in some income but I was

bored. I liked radio. I liked to play on-air radio contests; and I won a lot.

My radio career began because a morning show host wanted employees who looked like the predominately Black audience the station served. A noble cause indeed! A friend of mine told me about the job. I went to work at WHAT, a 1 kW AM station in Philadelphia. It was a crazy exciting place. The FM was WWDB.

This lasted about a year before I was let

who'd heard that a job was open at a 1 kW station in Camden, WSSJ(AM). I applied. The African-American owner told me I was the only Black candidate he'd seen; he asked an engineering friend to interview me, not a radio guy but a nice person, and I was hired that day.

At WSSJ we built new studios and had to rebuild the transmitter site after an arson fire. The station was sold within two years. I decided to leave and take another teaching assignment at a trade school for electronics. Officially done with the radio business — I had had it! I was frustrated again; the career in radio



Getty Images/Deagrez (person)/Mike\_Kiev (background)

**Black engineers remain few in U.S. broadcast engineering. "We need every major learning center in this country to open their doors with scholarships and grants to allow young Blacks and Latinos to attend college or trade school," the author writes.**

go; why I don't know. Someone else was hired to replace me who wasn't Black; but he was a good engineer, I was told.

I interviewed for jobs but didn't get them. I knew things weren't right because some of the interviews didn't include a tour of the facility, no in-depth questions on my technical ability and not even eye contact in some cases.

But I also was interviewed and given a test by the legendary engineer Glynn Walden at KYW. He said I was very good; but he wasn't hiring me because the job was a board operator position, and he said I was better than that. He told me to find an engineering job. He was right. Thanks Glynn!

### ALWAYS BACK TO RADIO

These interviews took me all over the Philly and New Jersey area. Meanwhile I taught broadcast electronics for the First Class engineering license. I had gotten mine by passing the tests for the Third, Second and then the First, which later became a General license.

I met a guy teaching at the school

didn't seem to be happening.

This chapter went well, and I actually relearned electronics by teaching it, especially RF electronics. But a friend called me and said there were a couple of radio engineering jobs open in Philly.

I interviewed at the WSNI(FM)/WPGR(AM) combo. I got the job. The manager said that he liked that I came to the interview with my suit jacket over my arm and my sleeves rolled (it was a hot day). They took me right in as soon as I arrived.

We clicked the day I became chief at those stations, dealing with high-power FM and a 50 kW AM.

From there and over 40 years I have prospered at some of the biggest and best stations in the Philly area.

And I did eventually get to work for Glynn Walden, at WIP and KYW Newsradio for CBS Radio, which had been a dream job.

### CREATING POSITIVE CULTURE

I've been known as something of a Radio Mr. Fix It, but I try to be more

than that, remembering Mr. Wortham's advice about people.

I walk around the station several times in the morning to make sure all is good — with the facility, but also with my co-workers. Someone's memory is jogged by seeing me walk by. I get early warning of an impending issue. I ask not only "What else needs fixing" but also "How is your family?"

A friendly approach is always better than the alternative. Mom used to say you get more with a cup of sugar than a bowl of salt.

I tried to create a culture, a way to let young board ops and DJs and announcers know that someone was looking out for them. If they needed a pair of headphones or advice on building a home studio. Or cooking BBQ or one of my famous fish fries.

My friendly approach helped so much with making friends in a White world that was so different to the one I grew up in. Positive attitude and uplifting approach, even when I was not happy or pleased with the situation, really made a difference for me. No one was going to accuse me of a bad attitude or a chip on my shoulder.

I have wondered over the years how I was regarded by my engineering peers. I always felt concerned to fit in and be recognized as competent and knowledgeable, like they were. Not a token. Black.

This wondering — about whether we fit in or will be accepted — is added pressure we have to cope with daily.

### START WITH EDUCATION

I have not seen a lot of racism but I've seen racial bias. I have been heard the question in a crowd, "Who is the chief?" and seen their surprise when I identified myself. I've been at a convention and had someone think I couldn't comprehend or understand how antennas or transmitters work.

Also I questioned why I could never seem to get a promotion. A dear friend, an industry stalwart who is White, told me, "They prefer to hire and promote those who look like them." I appreciate him for telling me that. (This was not the 1970s or '80s but far more recently.) He personally didn't hire that way, saying he felt diversity was important for all of us.

I think that my Black peers — the few I know and with whom I've spoken about this — are well aware of the spotlight on us to succeed. Our mere presence in this radio world is a great thing because we are succeeding and benefiting. It has always been a form of protest to me, my presence.

(continued on page 29)





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