



# RADIOWORLD

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## Who's Got the Biggest, Meanest AM Flamethrower?

More broadcasters than you might realize are helping keep the ionosphere warm (and the power companies happy)

BY JAMES E. O'NEAL

In the May 9 issue of Radio World, I reported on a recent power upgrade at TWR's Bonaire AM facility that brought that station close to the half-megawatt level (440 kW), allowing the

station to make the claim that it is the most powerful medium-wave (MW) operation in the Western Hemisphere. After the dust settled, I thought it might be interesting to poke around a bit in the data available to see if they have a

close (or even not-so-close) contender for second place for this title.

### HISTORICAL BACKGROUND

With only a few exceptions, U.S. stations have been capped at 50 kW

since this power level was authorized by the Federal Radio Commission in the late 1920s. Powel Crosley Jr.'s WLW 500,000 kW 1930s "experimental" operation is one very well-known example, as it received a lot of publicity during the five years or so during it operated before being powered down. However, there was another much less well-known

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#### HIGH HONORS

- The SBE names Mark Persons and Jeff Welton to receive special recognition. — Page 3



#### INTERNATIONAL

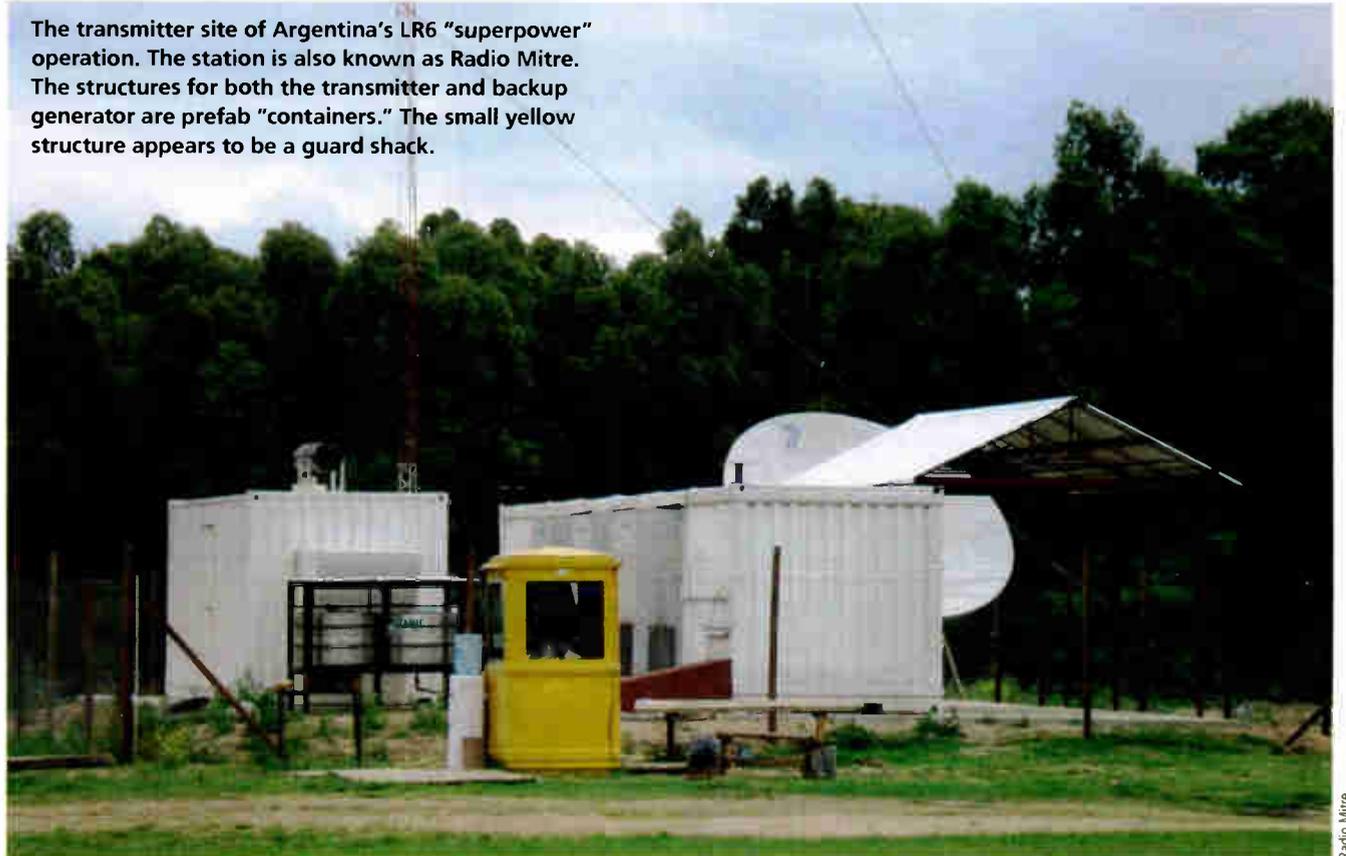
- Thaw? What thaw? — Page 22

#### ALSO INCLUDED

- Look for our Fall Product Planner accompanying this issue!



The transmitter site of Argentina's LR6 "superpower" operation. The station is also known as Radio Mitre. The structures for both the transmitter and backup generator are prefab "containers." The small yellow structure appears to be a guard shack.



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# SBE Names Persons Engineer of the Year

## Veteran technologist and RW contributor to receive society's honor for 2018

BY TOM VERNON

Mark Persons, CPBE AMD CBNT, has spent his entire life around broadcast engineering. His father, Charles B. Persons, worked in radio engineering as far back as the 1920s, and one of Mark's earliest projects was helping his dad build KVBR(AM) in Brainerd, Minn., in the 1960s, when the son was just 16. It is in his DNA.

A half-century later, Persons has been named the Robert W. Flanders SBE Engineer of the Year for 2018. The award recognizes a member who has excelled in his or her career while furthering the mission of the SBE.

RW spoke with Persons about his lifelong career in radio.

As far as his technical knowledge, Persons is largely self-taught. "I was never much for formal education," he said. "Whenever I had a new project, I just figured it out as I went along. My dad also taught me a lot, and I



Mark Persons in his natural environment.

built around 30 Heathkits."

Persons also became involved with amateur radio at age 16. "It's just a natural extension of being an engineer," he said. "Back in the day, virtually all broadcast engineers were hams." He built most of the equipment and

(continued on page 4)

# Jeff Welton Is SBE Educator of the Year

## Nautel sales exec brings his expertise and lifetime habit of curiosity to others

BY TOM VERNON

Ongoing education is essential for engineers trying to keep pace with nonstop technological developments. But some people make it their mission to help keep others abreast of the changes too.

The Society of Broadcast Engineers has named Jeff Welton, CBRE, to receive the James C. Wulliman SBE Educator of the Year Award for 2018. The honor recognizes outstanding service and excellence in sharing knowledge through teaching other broadcast engineers.

Welton is the central U.S. sales manager for Nautel. Growing up on a farm in rural Nova Scotia, Welton was urged by his parents to explore and experiment with new things.

"I put together a Radio Shack crystal set, which I used to listen to the rock stations in Halifax. I furthered by education in electronics around age 13, when my father put up an electric fence. I found out the hard way what an electric fence can do."

Welton completed basic electronics and high school physics but originally planned on becoming a small engine mechanic. "Then I talked with a recruiter for the new Radio

College of Canada that was opening in Toronto."

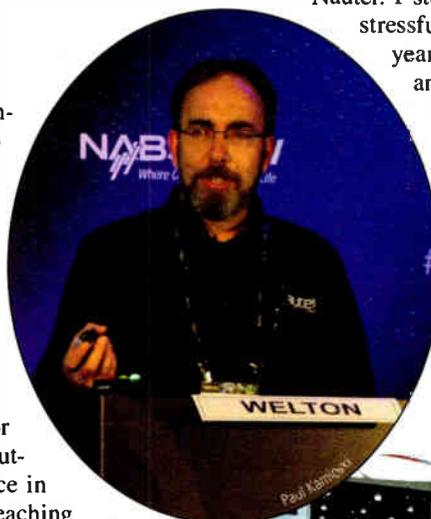
In 1990, Welton was hired by Nautel as a field support engineer. "Previously, the tech support had been done by engineering, so this was a new position at Nautel. I stayed in field support for 17 years. It's a stressful job, and most people burn out after 10 years. Then I was offered a position in sales, and a chance to get into marketing. And I've been there ever since."

Welton recalls that the transition into training and education was more a

(continued on page 5)

Left: Jeff Welton is shown speaking during the 2018 NAB Show.

Below: Welton, left, joins Nautel colleagues John Whyte, Matt Herdon and Ed Sylvester in helping to wrap up after an NAB Show.



## PERSONS

(continued from page 3)

was always more interested in making circuits work than talking on the radio.

He made a brief exodus from broadcasting to serve a stint in the U.S. Army. Persons taught electronic component-level troubleshooting at Ft. Monmouth, N.J., and then spent a year in Vietnam as sergeant-in-charge of an avionics repair shop, keeping OV-1 Mohawk surveillance aircraft flying.

### MORE THAN A JOB

His broadcasting career took an unusual turn when he returned to civilian life. After working briefly in his family-owned station and doing contracting on the side, he jumped into contract engineering full time.

"The timing was right," he said. "In the late '70s, the FCC began deregulating the industry, and stations weren't required to have a full-time engineer on staff. I always treated the engineering business as a profession. I dressed the

part and acted the part, and soon got a reputation as the guy who could build and fix things. I started out covering the entire state of Minnesota, but gradually had to shrink my service radius as the customer base grew."

Persons and his wife Paula wound up taking care of more than 100 stations. Along the way, he built 12 stations, mostly in the Midwest. That work included building phasors from the ground up for four new AM directional stations. While this was going on,

countless other stations were rebuilt or upgraded.

Radio World readers know his articles featuring technical tips; he has written over 175 engineering articles for regional and national publications, and was involved in the design of eight broadcast products manufactured by Zercom Corp., including the Max-Z Remote Broadcast Telephone.

At age 71, Persons has closed his contracting business and declares himself formally retired. Nevertheless, he continues his interest and involvement with broadcasting, as a mentor to four young broadcast engineers and as a participant in the NRSC's committee on AM improvement. He also maintains [www.mwpersons.com](http://www.mwpersons.com) featuring answers to many engineering questions.

SBE's national meeting this year will be held in October near Boston. The Engineer of the Year award was named for the late Robert W. Flanders in 2011; he was director of engineering at WRTV(TV) in Indianapolis for many years and was fifth president of the SBE.

Six winners of the SBE Chapter Engineer of the Year Awards were automatically nominated for this national honor. Persons represented Chapter 17.



On the job in 1967 ...



... and 1988.



Photo courtesy of Marcos O'Rourke

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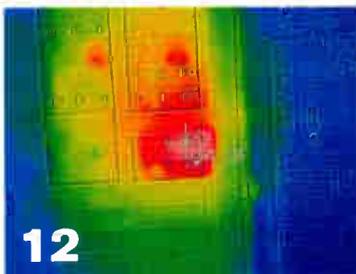
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Jeff Welton is seen conducting training with visitors from Australia, Papua New Guinea, Guam, China and the Philippines.

**WELTON**

*(continued from page 3)*

series of accidents than a planned career move. "In the early '90s, Nautel was on CompuServe. I was assigned to monitor the site and answer any questions that came up. My parents were both teachers, so I feel compelled to tell everyone the answers to questions. Being on the sales end led to attending more trade shows, so I started signing up to give presentations, and it just took off."

While many of his presentations are driven by the work at Nautel, Welton also draws inspiration from his occasional duties as co-engineer at CKVE(FM), a community broadcaster in Hubbard,

Nova Scotia. "We have an all-volunteer staff, most with no prior broadcast experience. That colors a lot of what I do, and it reminds me of the value in keeping things simple."

When he's not working on or talking about transmitters, Welton has a number of hobbies. He does a good bit of gardening, has a fully equipped woodworking shop, and enjoys fishing and walking his two dogs. He has restored two Zenith console radios from the 1970s, and has a growing vinyl collection that numbers in the hundreds.

While many of Welton's seminars are about transmitter safety, he is quick to remind attendees that they are often driven by lessons learned the hard way. "Ninety-nine percent are the result of

my blowing something up. Fortunately, Nautel transmitters are low-voltage devices, so I am still alive to give these seminars."

The SBE's educator award is named for James C. Wulliman, a past president of the SBE who helped found the society's certification program.

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## FLAMETHROWER

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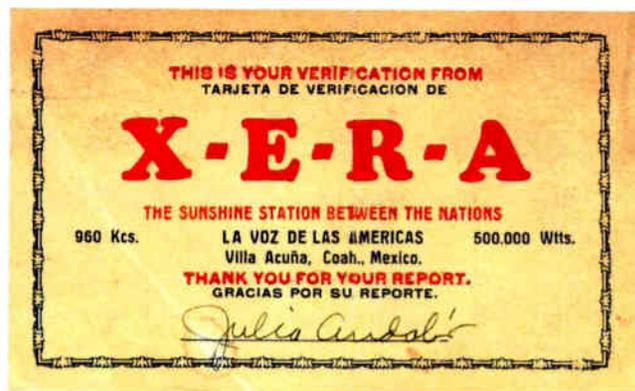
superpower operation during that period (it actually beat WLW to the punch by putting 400,000 Watts on the air about three years before Crosley was ready to belt out his hundreds of kilowatts).

I'm referring to the Pittsburgh's KDKA, which made the cover story of the April 1931 Radio News magazine. The article itself was titled: "KDKA: Radio's New 500 Horsepower Voice." (Why the writer took the "horsepower" approach to power isn't really known. Perhaps 500 horses might seem slightly more impressive than 400 kilowatts. But if you do the math, one horsepower is equivalent to about 745 watts, so 500 hp would amount to some 373 kW instead of the 400 the article claimed.)

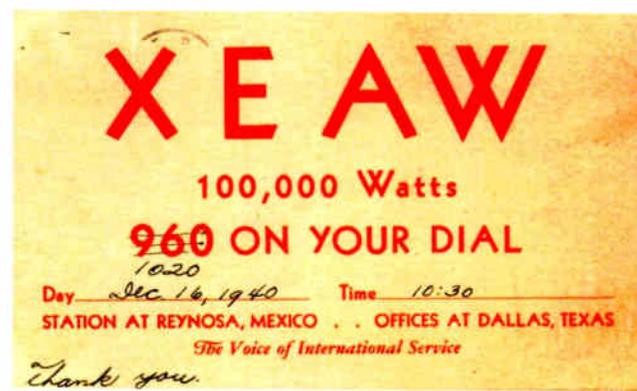
Also, it's not clear why the station took on the construction of a 400 kW rig without some assurance they could operate at that level. Perhaps it was a "proof of concept" that turned out to be not that successful, or possibly the economic realities of the Great Depression killed the project before it got past the experimental stage.

Here's an excerpt from that account:

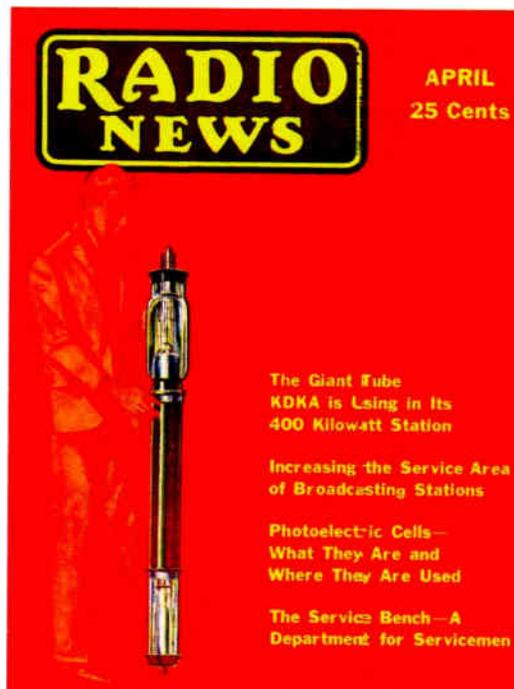
*"KDKA Builds for Tomorrow" — Anticipating the continuing and increasing rapid growth of broadcast service, KDKA has recently built a new 400,000-watt transmitter at Saxonburg, Pa. The new station has been operating experimentally between 1 a.m. and 6 a.m. For normal operations, however, the power will be held at 50,000 watts as required by the Federal Radio Commission.*



This 1930s QSL card indicates that Dr. Brinkley's XERA was equaling Cincinnati's WLW in terms of RF output.



According to this 1940 QSL card, Mexico's XEAW was bettering the most powerful U.S. stations on the air at that time by 50 kW.



The April 1931 issue of Radio News heralded the arrival of the first U.S. superpower broadcaster.

Actually, the Radio News article seemed to place more emphasis on the specially designed 200 kW tube engineered by Westinghouse to power the new transmitter:

*One of the most important innovations is the new tube with a capacity of 200 kilowatts. This tube is not merely an enlarged edition of a smaller tube, but is thoroughly engineered as a tube of larger size and of a distinctly novel design.*

This tube was known as the AW-220, and was not "vaporware," as it remained in the tube industry's registry for some time. It weighed in at 60 pounds, was 72-inches tall and had an eight-inch diameter. According to the article, two were used in the KDKA "big rig."

While WLW's superpower operation turned out to be more of a reality than KDKA's, a stroke of the pen in 1939 relegated the Mason, Ohio big rig to collecting dust and taking up floor space.

### THROWING BIG FLAMES IN THE 21ST CENTURY

That was then. This is now. So who's got the >50 kW action now (aside from TWR's Bonaire facility)?

Surprisingly, there is one U.S. AM station that has the necessary paperwork and equipment to operate at 100 kW fulltime. However, it's not listed in the FCC's AM database. I'm referring to the

VOA's "Radio Martí" in Marathon, Fla. which operates on 1080 kHz.

The VOA station (it sports no call sign) appears to be the only operation in its class in the U.S. and Canada, but if you cross the border into Mexico, you'll find "muchas estaciones de radio" that emit lots more than a puny 50,000 "vatios."

### BIG RIGS SOUTH OF THE BORDER

Some of these stations are obviously the remnants of the deep-voiced 1930s "border blasters." (I refer especially to the present-day station bearing a slight variation of the notorious Dr. Brinkley's original Mexican call sign, XER, now XERF.) Just as established by Brinkley, XERF is still located right across the Rio Grande from Del Rio, Texas in Ciudad Acuña. According to the FCC's database, it's licensed to operate at 250,000 Watts. During the 1930s, Brinkley's XER/XERA was described in radio publications at various times as operating at 75, 250, 300 and 500 kW.)

There's another Mexican border blaster with which this author is well acquainted. This is XEG, operating on 1050 kHz and with a full-time power of 150 kW according to current FCC information. During the 1950s and '60s when I was doing my growing up in southwest Arkansas, I suspect it may have operated with more power than this. I recall on many occasions as I tried to listen to the latest top 40 hits from New Orleans' 1060 kHz WNOE (now WLNO) operating with a nighttime power of 5 kW, XEG's powerful sidebands totally obliterating WNOE.

Looking at other high powers in Mexico, the FCC shows another with parity to XERF's 250 kW — Mexico City's XEW operating on 900 kHz.

### SOME CONTRADICTIONARY INFORMATION

Digging further into high-power stations south of the border, things get a bit interesting and potentially dicey. Before proceeding further, a description off my research is in order.

I first went to the FCC's database and did a pull of AM stations, and then

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# FLAMETHROWER

(continued from page 6)

picked out the >50 kW stations from the thousands listed. This was a bit of a challenge as the database is not set up for this sort of data mining, so I could have missed a few. My second source of information was the 2018 edition of The World Radio TV Handbook or "WRTH," again, a source not lending itself to quick searches of "ultra flamethrowers." In comparing the data retrieved, I did spot variances (in several cases extreme) between the FCC and the WRTH. As an example, the WRTH shows XERF at 100 kW instead of the FCC's 250 kW figure.

A possible explanation is that commission's info is either out of date, or wattage numbers shown are for "licensed," as opposed to "actual" power. Not having the resources to investigate each superpower one-by-one, I'm assuming it's the latter, with the WRTH info being indicative of the real number of watts exiting the various transmitter output ports. However, if anyone has better information, please come forward, as the power levels for a couple of stations could dethrone Bonaire's claim to highest power in this hemisphere. In the listings that follow, where there is a difference, I'm showing the FCC number followed by the WRTH figure in parenthesis. Here's a rundown of other Mexican superpowers located:

- XEROK - Ciudad Juárez – 800 kHz – 150 kW D/N (50 kW)
- XEWA - (San Luis Potosi – 540 kHz – 150 kW D/N)
- XEQ - Mexico City – 940 kHz – 150/50 kW (50 kW)
- XEX - Mexico City – 730 kHz – 100 kW D/N
- XEB - Mexico City – 1220 kHz – 100 kW D/N
- XETQ - Orizaba – 850 kHz – 100/50 kW (absent in WRTH)
- XEEP - Mexico City – 1060 kHz – 100/20 kW
- XETRA - Tijuana – 690 kHz – 77/50 kW (absent in WRTH; likely now XEWW below)
- XEWW - Rosarito Beach – 690 kHz – 77/50 kW (78/50 kW)

## GOING BEYOND MEXICO

Cuba has a number of AM "superstations," at least on the FCC's ledger. (Most, if not all, appear to have been created during the cold war and were used for either

propaganda purposes or possibly interfering with U.S. stations.) Here's the FCC's Cuban list:

- CMBV - Wajay – 550 kHz – 500 kW
- CMCA - San Antonio de las Vegas – 590 kHz – 150 kW
- CMKA - San Germán – 600 kHz – 150 kW
- CMKB - Cacocum – 900 kHz – 200/50 kW
- CMBX - Wajay – 1010 kHz – 500 kW

However, the WRTH doesn't support any of this information, showing only three "superpowers:

- CMBA - Chambas – 710 kHz – 200 kW)
- CMBC - Chambas – 890 kHz – 200 kW
- CMBA - Martí – 1180 kHz – 200 kW

(According to WRTH data, the CMBA call sign is duplicated numerous times.)

Venezuela lays claim to several superpowers. Here's the rundown for that country:

- YVKE - Caracas – 550 kHz – 100 kW D/N (50 kW)
- YVLX - Villa de Cura – 570 kHz – 100/50 kW (100 kW D/N)
- YVLL - Caracas – 670 kHz – 100/50 kW (100 kW D/N)
- YVKY - Caracas – 710 kHz – 100/50 kW (50/20)
- YVQE - Palomar – 720 kHz – 100 kW (absent in WRTH)
- YVKS - Caracas – 750 kHz – 100/50 kW (100 kW D/N)
- YVTB - Maracaibo – 800 kHz – 100/50 kW (absent in WRTH)
- YVKG - Caracas – 950 kHz – 100/50 kW (absent in WRTH)

Chile also boasts a couple of big ones:

- CB-106 - Santiago – 1060 kHz – 100 kW
- CB-114 - Santiago – 1140 kHz – 100 kW

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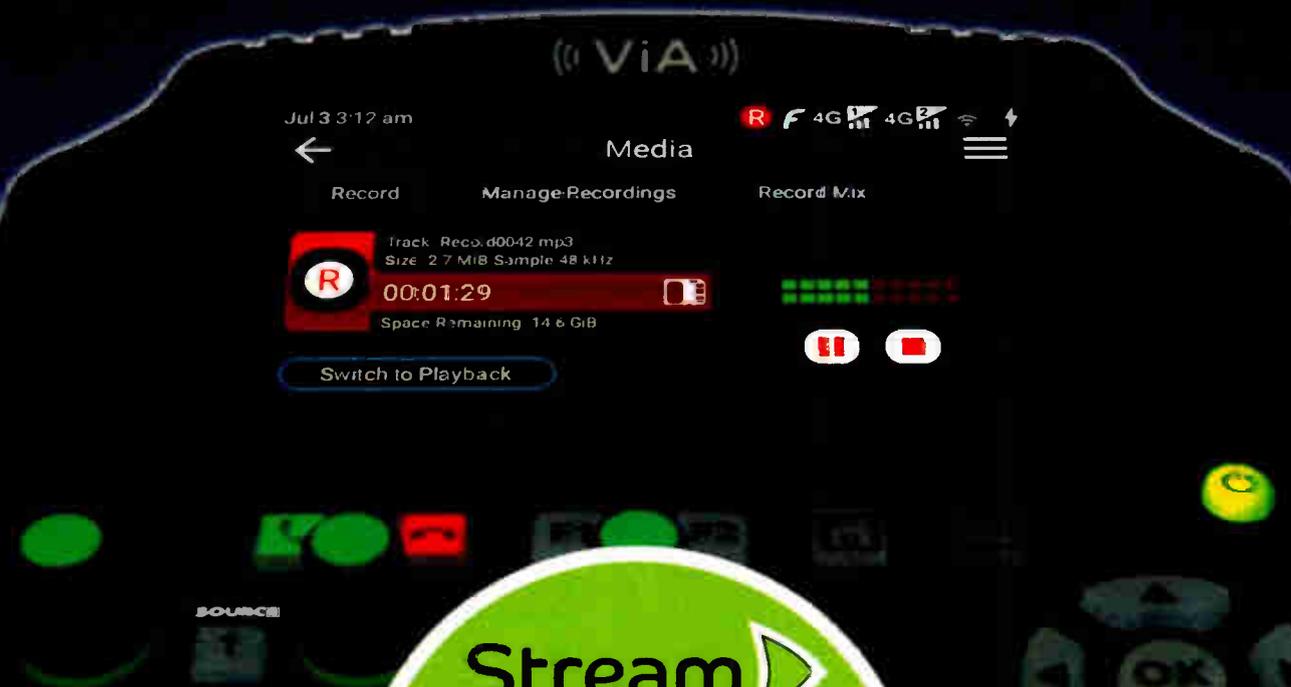
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- Navigation: Back arrow, Media title, Menu icon.
- Options: Record, Manage Recordings, Record Mix.
- Track info: Track: Reco.d0042.mp3, Size: 2.7 MiB, Sample: 48 kHz.
- Progress bar: 00:01:29, with a volume indicator.
- Space Remaining: 14.6 GiB.
- Buttons: Stop, Record, and a "Switch to Playback" button.

Below the screenshot is a circular graphic divided into three segments: a green top segment labeled "Stream" with a play button icon, a red bottom-left segment labeled "Record" with a record button icon, and a blue bottom-right segment labeled "Playback" with a play button icon. A central white circle contains a music note icon.

### Record

- Select & record any input, return audio or file playback
- Stream, Record & Play simultaneously
- Record to SD card
- View & manage recordings

### Playback

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- Route file playback to any output or record media
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# (( ViA ))

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# FLAMETHROWER

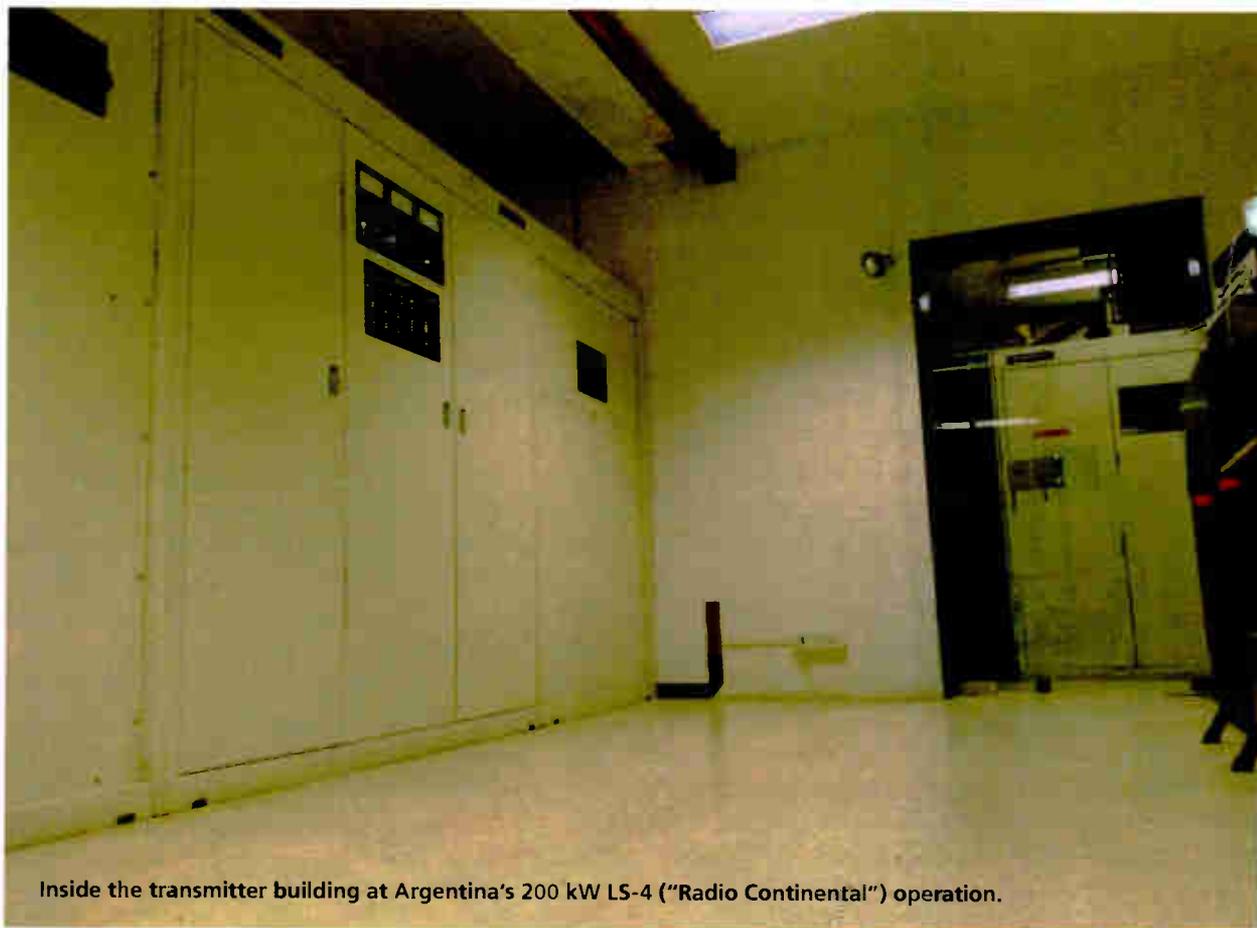
(continued from page 8)

Colombia is supposedly home to some superpowers, but the FCC and WRTH again are at odds:

- HJND - Bogotá – 570 kHz – 100 kW
- HJCR - Medellín – 590 kHz – 100/50 kW (50 kW)
- HJBW - Zambrano – 680 kHz – 100/50 kW  
(not in WRTH)
- HJCY - Cali – 700 kHz – 120/50 kW (30 kW)
- HJBW - Bucaramanga – 800 kHz – 100 kW  
(FCC records say 10 kW)
- HJCY - Bogotá – 810 kHz – 250 kW (60 kW)
- HJHN - Magangué – 960 kHz – 120/50 kW (10 kW)
- HJES - Cali – 980 kHz – 100 kW (FCC says 10 kW)
- HJDB - Medellín – 990 kHz – 150/50 kW  
(WTRH says 50 kW and gives call as HJCH)

Ecuador is a real “puzzler,” with the FCC showing nine >50 kW operations, but the WRTH showing no stations in that country with more than 50 kW and omits a couple of the FCC-listed stations altogether. For the record, here’s what the FCC shows:

- HCMJ1 - Quito – 610 kHz – 100/50 kW
- HCXY1 - Quito – 640 kHz – 100/50 kW
- HCJB1 - Quito – 690 kHz – 100/25 kW
- HCQR1 - Quito – 760 kHz – 100/25 kW
- HCPN1 - Quito – 1600 kHz – 100 kW
- HCLG2 - Guayaquil – 660 kHz – 100/10 kW
- HCRS2 - Guayaquil – 710 kHz – 100/50 kW
- HCDE2 - Guayaquil – 940 kHz – 100/50 kW
- HCAH2 - Guayaquil – 960 kHz – 100/50 kW



Inside the transmitter building at Argentina’s 200 kW LS-4 (“Radio Continental”) operation.

Valentin Trainotti

Paraguay sports two stations in the greater-than-50 kW class:

- ZP-1 - Asunción – 920 kHz – 100 kW
- ZP-9 - Asunción – 970 kHz – 80 kW (FCC says only 5/1 kW)

Argentina also makes the FCC’s list with at least two “biggies”:

- LRA7 - Córdoba – 750 kHz – 100 kW
- LRA1 - Buenos Aires – 870 kHz – 100 kW
- LS11 - Buenos Aires – 1270 kHz – 100 kW (WRTH only;  
not shown in FCC records)

I was able to get some first-hand information about Argentina’s superstations from a friend living there, Valentin Trainotti. According to his information, there are more than a dozen >50 kW stations in that country, with five running at 200 kW: LR5 (910 kHz), LR6 (790 kHz), LRL202 (710 kHz), LS4 (590 kHz) and LV3 (700 kHz).

Even though the FCC database indicates five >50 kilowatters in Uruguay, the WRTH is again not in agreement:

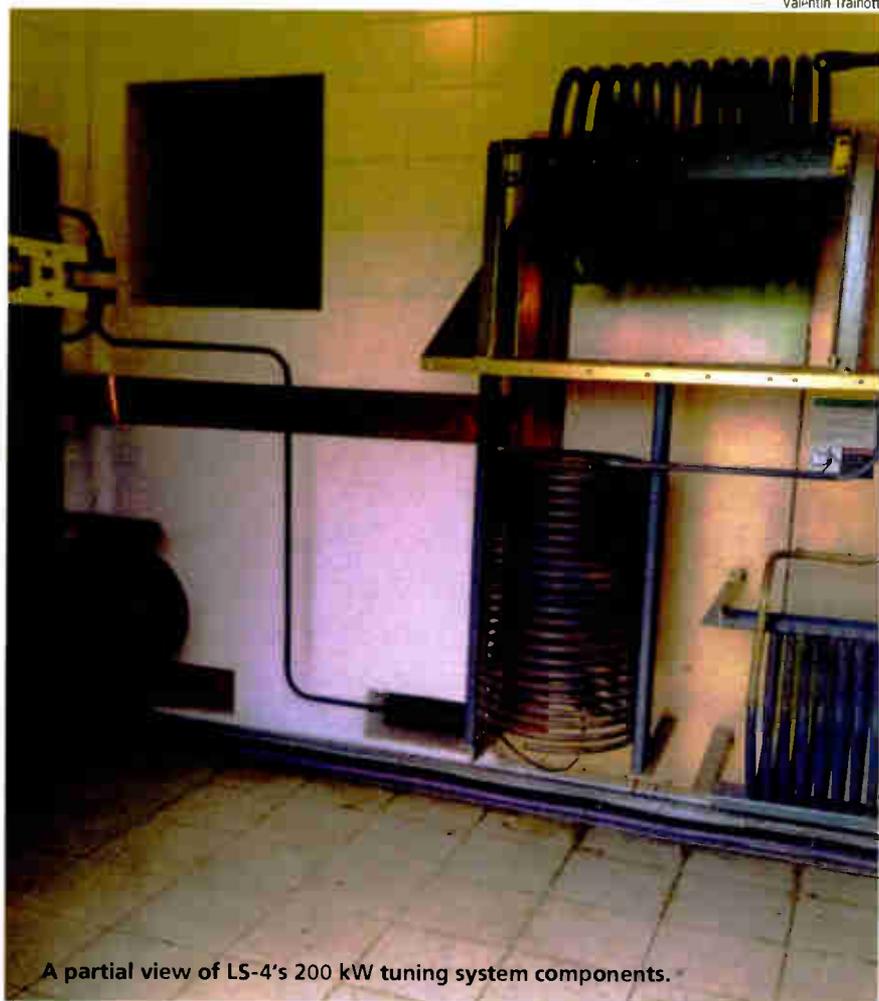
- CX6 - Montevideo – 650 kHz – 200 kW (25 kW)
- CX12 - Montevideo – 770 kHz – 125 kW (100 kW)
- CX14 - Montevideo – 810 kHz – 100 kW (50/25 kW)
- CX16 - Montevideo – 850 kHz – 100 kW (50 kW)
- CX26 - Montevideo – 1050 kHz – 100 kW (50 kW)

However, both of these information sources are disputed by my Uruguayan friend, Rafael Sotelo, who worked at the television facility owned by CX16. He says their big AM rig (at least between 1991 and 2010) was a 50 kW Continental. Also, he’s not really aware of anyone running more than 50 kW in Uruguay today, concluding that “the business of the AM radio is not what it used to be.”

The island of Montserrat is another anomaly, with the FCC showing two very high-power operations (neither having a call sign):

- 740 kHz – 300 kW
- 930 kHz – 500 kW

But the WRTH shows no AM broadcasting there.



A partial view of LS-4’s 200 kW tuning system components.

Valentin Trainotti

There's another anomaly with St. Kitts/Nevis. According to the FCC, there are two >50 kW ops there:

- No call sign - Conaree - 820 kHz - 100 kW
- No call sign - Conaree - 1260 kHz - 100/50 kW

(The WRTH reports only a solitary AM—an 860 kHz station running 10 kW.)

**LOTS AND LOTS OF AM WATTS DOWN IN BRAZIL**

I've been saving Brazil for last for special reason. There's an old song with the line "They've got an awful lot of coffee in Brazil." And while that's true, it seems Brazil also rules the roost for kilowatts of AM radio. There are many, many medium wavers down there running at all sorts of power levels. These superpowers stand out from the crowd:

- ZYK-275 - Porto Alegre - 600 kHz - 100 kW (the WRTH gives the call as ZYK-278)
- ZYK-276 - Porto Alegre - 720 KHz - 100 kW
- ZYI-770 - Recife - 720 kHz - 100 kW
- ZYA-446 - Salvador - 740 kHz - 100 kW
- ZYH-705 - Brasília - 800 kHz - 50 kW day/600 kW night (not a typo) (WRTH, however, says 10/1)
- ZYJ-457 - Rio de Janeiro - 800 kHz - 100 kW
- ZYK-687 - São Paulo - 840 kHz - 100/50 kW
- ZYJ-459 - Rio de Janeiro - 860 kHz - 100 kW
- ZYL-275 - Belo Horizonte - 880 kHz - 100 kW
- ZYJ-453 - Rio de Janeiro - 940 kHz - 100 kW
- ZYH-707 - Brasília - 980 kHz - 50/600 kHz (not a typo either; but WRTH says 50/300 kW)
- ZYJ-460 - Rio de Janeiro - 990 kHz - 100/10 kW (WRTH call it ZYJ-461)
- ZYK-522 - São Paulo - 1000 kHz - 200 kW
- ZYJ-467 - Rio de Janeiro - 1030 kHz - 100/5 (FCC says it's 50/5)
- ZYK-537 - São Paulo - 1040 kHz - 200/100 kW
- ZYK-694 - São Paulo - 1100 kHz - 150 kW (WRTH says it's 50/50)
- ZYJ-461 - Rio de Janeiro - 1130 kHz - 100/50 kW (WRTH gives the call as ZYJ-460)
- ZYJ-458 - Rio de Janeiro - 1220 kHz - 150 kW
- ZYK-688 - São Paulo - 1260 kHz - 100/50 kW (100/40)
- ZYJ-455 - Rio de Janeiro - 1280 kHz - 100 kW
- ZYK-766 - São Paulo - 1370 kHz - 100/20 kW (not in FCC database)

So, there you have it — a compilation of all (I hope) of the really heavy-hitter AM players in this hemisphere. And with the possible exception of Brazil's ZYH-705 and ZYH-707 (I'm going to go with the World Radio TV Handbook's version of the facts), it looks as if the new 440 kW voice of Bonaire (call sign PJB) is still king of the kilowatts on this side of the planet!

James O'Neal is a longtime contributor to Radio World and former technology editor of our sister publication TV Technology. In October, he will be elevated by the Society of Motion Picture and Television Engineers to its membership grade of Fellow.

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

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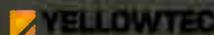


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# Join This Great Debate in Wisconsin

Also: There's no controversy over these power protection tips

## WORKBENCH

by John Bisset

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

Do you remember the Processing War debates between the big audio processing companies a number of years back? The discussions could get quite heated, but the points discussed were useful among engineers — if not downright entertaining.

If you enjoy a good debate, consider coming to the Wisconsin Broadcaster's Clinic, Oct. 16–18 in Madison.

On Wednesday evening, Oct. 17, the local Society of Broadcast Engineers chapter will meet at 5 p.m. for dinner. Following the dinner, Nautel's Jeff Welton and Rohde & Schwarz' Don Backus will debate the benefits and drawbacks of air-cooled versus liquid-cooled transmitters. The discussion should be lively, as well as informative!

Don provided some good content in our July 25 Workbench column, archived at [www.radioworld.com](http://www.radioworld.com). This

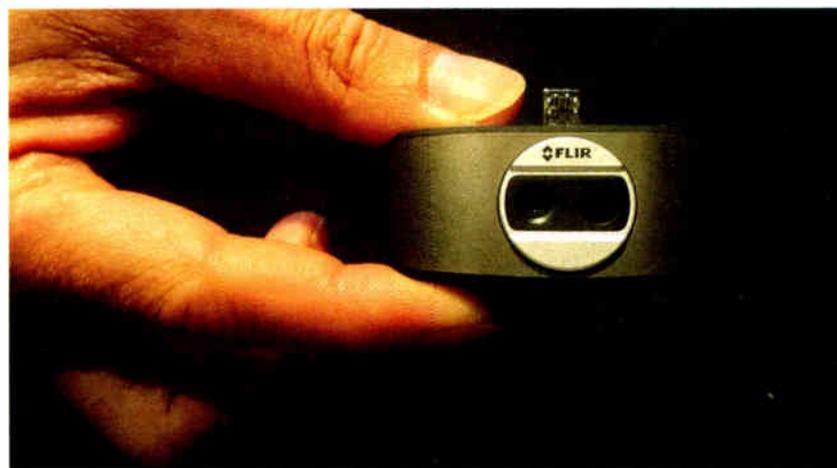


Fig. 1: The FLIR Infrared camera snaps onto your smartphone.

will be an opportunity to hear both sides from these industry leaders, as well as audience interaction.

Wisconsin Association of Broadcasters Vice President Linda Baun offers free registration for the SBE dinner/debate, but you must pre-register at [www.wi-broadcasters.org](http://www.wi-broadcasters.org). You do not

need to be a member of SBE or of the Wisconsin Broadcasters Association to attend, just be sure to register so Linda has a head count for dinner.

If you're within driving distance of Madison, the three-day Wisconsin Broadcasters Clinic is worthy of your consideration. In addition to practical top-notch engineering sessions, equipment exhibitors will have products on display. If you sign up, tell Linda you heard about the event through Workbench!

**RC** Woolfenden is the operations director for Newcomb Broadcasting's WFAX(AM/FM) in the Washington, D.C., area. RC commented on the AC cord problem covering up the ground fault interrupter outlet/trip/reset buttons.

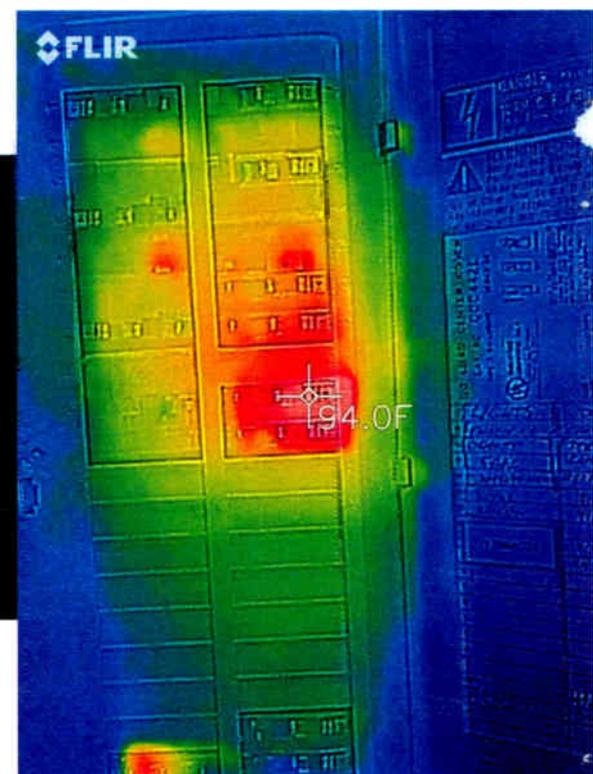


Fig. 2: The infrared image helps you zero in on hot spots like this bad circuit breaker.

about infrared cameras.

Jeff Welton of Nautel showed me his FLIR One Pro LT, seen in Fig. 1. This infrared camera plugs into a smartphone and provides thermal imaging (shown in Fig. 2).

Fig. 2 features an electric breaker box with an over-heated circuit breaker. During transmitter site inspections, as a courtesy to his customers, Jeff takes the temperature of circuit breaker and disconnect panels. Jeff told me he hasn't been to a site yet where his camera hasn't disclosed some kind of anomaly.

**Even if the UPS is beefy enough to withstand the motor load, a significant transient event can propagate back into all of the loads that are connected to it, possibly causing other problems.**

RC has used a short AC cord extension such as the one offered by QVS. Enter "QVS-PP-ADPT" in the Amazon search block for information. QVS offers single, dual and triple outlet extension cords.

RC adds these are great for keeping the "wall warts" from taking up too much space on power strips, UPS units, etc. He always keeps a couple around.

**A**t the recent Ennes Workshop in Lincoln, Neb., we had a discussion

This model costs about \$300; consider it insurance for your station cluster. If you're a contract engineer, here is another service you can offer and bill to stations in your region.

**G**reg Muir is a principal of Wolfram Engineering of Great Falls, Mont. Greg asks readers if they've had this experience:

It's the evening or the weekend, everything is humming along on auto-

(continued on page 14)

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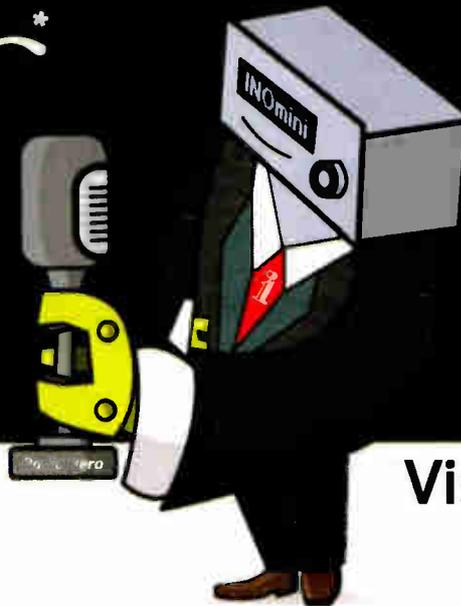
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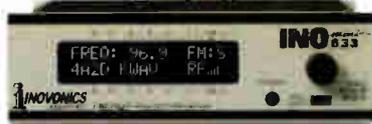
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# The Rabble-Rousers of Early Radio Broadcasting

Take a look at some of radio's less-remembered provocateurs

## ROOTS OF RADIO

by John Schneider

Today's provocative "Hot Talk" radio commentators are not a new phenomenon. The first decade of broadcasting witnessed the rise of many equally strident and controversial personalities who tested the limits of the government's tolerance and the public's good taste. They were the prototypes of today's conservative radio commentators and talk show hosts.

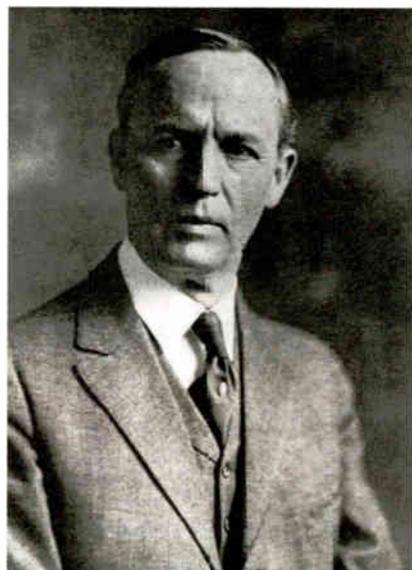
While early radio was endowed with many colorful but otherwise harmless characters, a handful of crusading firebrands used the airwaves to gain favor with the public for their viewpoints. The early airwaves were also home to a number of hucksters, like the infamous Kansas goat gland doctor John R. Brinkley. But radio also hosted a number of other troublemakers and agitators who abused the power of the media to try and influence public opinion. Let's take a look at some of radio's less-remembered provocateurs.

### THE "OREGON WILDCAT," KVEP

Soon after the 1929 stock market crash, Robert Gordon Duncan acquired a small station — KVEP, the "Voice of East Portland" in Oregon — from its financially distressed owner.

A populist firebrand vying for the Republican nomination to Congress, Duncan used his station to broadcast daily profanity-laced tirades. Calling himself the "Oregon Wildcat," he reportedly kept a gun at his side while on the air. He railed against Sears & Roebuck and the other "chain stores" that were running local mom-and-pop retailers out of business. To bolster his cause, Duncan sought "donations" from small retailers, and lambasted those who rebuffed him for selling poor quality merchandise and cheating their customers.

After losing the Republican primary to the incumbent, Frank Korell, Duncan attacked the congressman on the air,



**Robert Gordon Duncan, the "Oregon Wildcat," broadcast over Portland's KVEP from 1929 until his station license was revoked in 1930.**

questioning his sexual orientation. If these actions weren't disruptive enough, Duncan also refused to sign off KVEP

so that the station with which he shared his 1500 kHz frequency could broadcast.

Letters of complaint about KVEP flooded into the Federal Radio Commission, and a license renewal hearing was scheduled. Representatives of the American Legion, the Chamber of Commerce, local churches and other civic organizations joined forces at the hearing to demand cancellation of KVEP's license.

Portland judge J.C. Kendall complained, "There is a mad dog loose in the city of Portland. For two hours every night, we have had a persistent series of talks so utterly indecent that they offend every human sensibility."

On May 30, 1930, the commission ordered KVEP off the air because of "profanity, obscenity and the vilification of particular individuals." The coup de grâce came in July, when Duncan's creditors repossessed the station's equipment. If that wasn't enough, he was arrested and convicted of indecent broadcasting, violating the Radio Act of 1927. He was sentenced to six months in the county jail and fined \$500.

## WORKBENCH

(continued from page 12)

mation with no personnel to be seen anywhere in the studios. Then the custodial staff arrives to attend to their assigned duties. The new guy on the staff enters a studio to vacuum. He looks around for a source of power for his vacuum, and eyes a neat little box under a console with numerous unused outlets. How handy! He plugs his vacuum into one of the outlets, hits the switch, hears a *pop!* and then silence.

Now the engineer is roused from his limited "quiet time" (we get that at times, don't we?) with a call from the silence detect system or from the air talent who responded to the studio to find out what has happened. The engineer arrives to find the automation computer dark, the reliable UPS dead and the custodial staff members trying to avoid eye contact.

Note that, given some of the design approaches used for surge protection in UPS units on the market today, switching a motor load off can place that transient on the downstream side of the surge protection. This is because of its accompanying horrendous inductive transient.

Even if the UPS is beefy enough to withstand the motor load, a significant transient event can propagate back into all of the loads that are connected to it, possibly causing other problems.



**Fig. 3: Child-proof safety caps dissuade unauthorized AC use.**



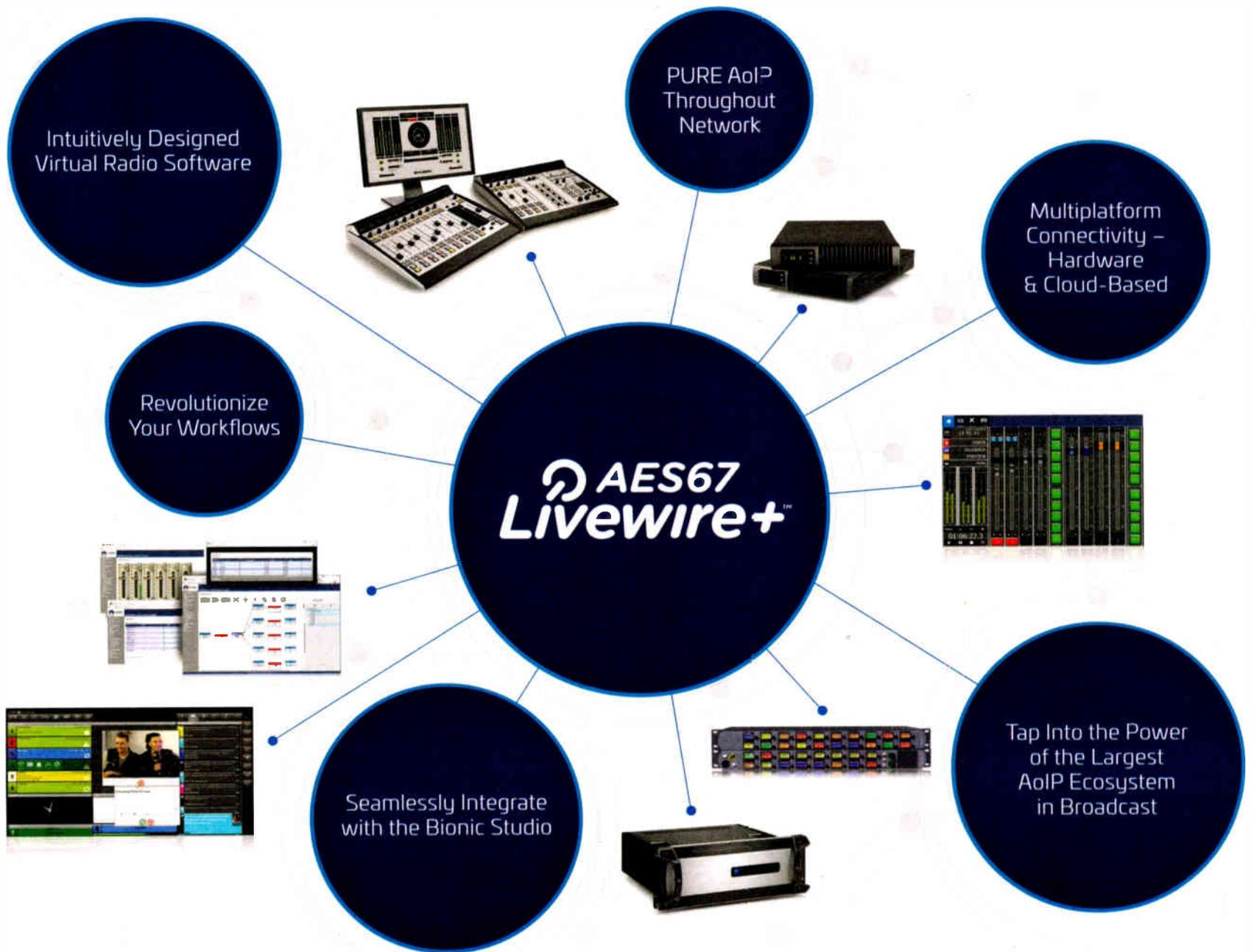
**Fig. 4: Load up the empty sockets, such as those found on UPS.**

The lesson? Child-proof your spare UPS outlets! Stop by your local hardware store and pick up a quantity of outlet safety caps intended for that purpose (Fig. 3). A dozen or so can run as cheap as \$2 and they're excellent insurance (and provide great peace of mind). Check out the "protected" UPS outlets in Fig. 4. If you find that the safety caps do not clear some of the closer outlet spacing, as found on some UPS units, trim their edges to fit as shown in the photo.

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## RABBLE-ROUSERS

(continued from page 14)

Wilcox, a supporter of Bowles' "hands-off" policies. Buckley's nightly tirades criticized Bowles, Gillespie and Wilcox, and decried the unlawful graft taking place behind the scenes. Buckley's program soon became Detroit's most popular show.

In 1930, Buckley began to campaign for a recall election to remove Mayor Bowles from Office. As support for the idea grew, Buckley was offered a \$25,000 bribe to "lay off" the mayor,

which only caused him to double his efforts. Ultimately, a special election was scheduled for July 22. Buckley urged his audience to vote "yes," and when the ballots in the bitterly-fought election were counted, Bowles was removed from office — 120,863 to 89,907 votes.

Two hours after the recall results were announced, Buckley got a phone call from a woman who promised a tip on a new story. She asked to meet him in the lobby of the LaSalle Hotel, where the WMBC studios were located. About 1:50 a.m., as Buckley waited in the

lobby, three men entered the hotel and pumped 11 bullets into his body.

As the investigation into his murder mounted, Commissioner Wilcox attempted to smear Buckley's reputation with an affidavit claiming he was paid \$4,000 in "protection money" by a bootlegger, but the affidavit was quickly discredited as being coerced. Ultimately, several members of the notorious Licavoli Gang were arrested, but a conviction for Buckley's murder was never obtained.

A crowd of over 50,000 attended his funeral on a rainy July afternoon —



Author's collection

**Gerald Buckley, evening commentator on WMBC in Detroit in 1930, exposed the corruption in city government and led a successful recall election against Mayor Charles Knowles. The night of the election, he was murdered by gangland assassins.**

mostly faithful members of his "Common Herd" audience.

One listener commented, "These days, I hardly know how to act when 6 o'clock comes. I feel as if I had lost a loving friend. Jerry Buckley was the only man in Detroit who was so strong for the common people. Will these people forget him? They will not."

### FATHER COUGHLIN, WJR & CBS

Father Charles Edward Coughlin, the crusading radio commentator of the 1930s, was the forerunner of Rush Limbaugh and other modern talk radio hosts. The controversial Catholic priest burned up the airwaves from 1926 until he was forced off the air in 1939.

Pastor of the Shrine of the Little Flower church in Royal Oak, Mich., he began his radio career as a radio preacher on George A. Richards' station WJR in Detroit, and in 1930 gained a national audience when his program was heard on CBS.

Encouraged by the politically conservative and anti-Semitic Richards, his topics soon changed from religion to politics, becoming increasingly inflammatory. At first, Coughlin took aim at communism and the KKK, but his attacks soon expanded to include mainstream targets like the banking industry and Jews.

When CBS required Coughlin to submit his scripts in advance for network approval, Coughlin refused and the network cancelled his program. But, backed by Richards, Coughlin established his own 36-station hookup for his "Golden Hour of the Shrine of the Little Flower" program, with WJR as the key station. Soon, Coughlin had a weekly audience estimated between 16 million and 30 million listeners.

(continued on page 18)

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## RABBLE-ROUSERS

(continued from page 16)

By 1934, he had to build his own post office to handle the 10,000 letters he received daily.

On the air, Coughlin faulted greedy bankers for causing the Depression and pleaded for Roosevelt to nationalize the Federal Reserve Bank and reform the monetary system. When FDR ignored his advice, Coughlin became one of his harshest critics, denouncing him as a “tool of Wall Street.” In 1934, he created



Author's collection

**Father Charles Coughlin, the crusading radio commentator of the 1930s, was the forerunner of Rush Limbaugh and other modern talk radio hosts. The controversial Catholic priest was heard nationwide from 1926 until he was forced off the air in 1939.**

the “National Union for Social Justice,” a nationalistic workers’ rights organization, and in 1936 he backed an unsuccessful fringe presidential candidate.

In one of his broadcasts, he stated, “I have dedicated my life to fight against the heinous rottenness of modern capitalism because it robs the laborer of this world’s goods. But, blow for blow, I shall strike against Communism, because it robs us of the next world’s happiness.”

In the later 1930s, Coughlin increasingly targeted Jews while praising Hil-

ter and Mussolini. After one particularly inflammatory and inciting 1938 speech, a number of stations dropped his program, which incensed his faithful followers.

At WMCA in New York and WDAS in Pittsburgh, crowds of Coughlin’s fans protested outside the studios, yelling anti-semitic statements, like “Send Jews back where they came from in leaky boats!” and “Wait until Hitler comes over here!” It was later documented that Coughlin was receiving funding from Nazi Germany.

Numerous political organizations petitioned the FCC to remove Coughlin from the airwaves, but ultimately, it was the National Association of Broadcasters that forced him off the air. In October of 1939, the NAB adopted a new industry self-regulation code that prohibited its stations from discussing controversial issues in sponsored programs. The clause was specifically written to stop Coughlin.

Some NAB member stations, including WJR, WGAR and the Yankee Network, threatened to quit the association instead of observe the code, but when Coughlin’s contracts expired at the end of the month, most of his stations did not renew.

Although Coughlin continued crusading for fascism through his “Social Justice” newsletter, his influence was clearly diminished. Once World War II began, he was all but forgotten. Coughlin continued as a parish priest until his retirement in 1966. He died in Michigan in 1979 at the age of 88.

### “FIGHTING BOB” SHULER, KGEF

Robert P. Shuler was another demagogue preacher, broadcasting from the Trinity Methodist Church in Los Angeles over his station KGEF starting in 1926.

At various times, his controversial broadcasts denounced Catholics, Jews, blacks, politicians, the police and dozens of other targets. He defended the Ku Klux Klan; he condemned the University of Southern California for permitting evolution to be taught on campus; he claimed that Catholics were “plotting to murder Protestants in their beds;” he attacked the public library for lending books “not fit to be read in heathen China or anarchist Russia;” he railed against the YMCA for permitting dances for girls that lasted until early hours of the morning. He announced that he had damaging personal information about certain individuals, but promised to not reveal it if they would send “donations” to KGEF.

The Los Angeles Times wrote that “‘Fighting Bob’ operates the most controversial religious radio station of all time. Politicians fear him, criminals avoid him, newspapers deplore him, and



Wikipedia Commons

**Evangelical Minister Robert P. “Fighting Bob” Shuler, pastor of the Trinity Methodist Church in Los Angeles, lost his license for KGEF in 1932 for broadcasting slanderous attacks on public officials and others. Shuler fought the decision unsuccessfully for three years, ultimately as far as the Supreme Court.**

many ministers criticize him.”

Like Buckley in Detroit, Shuler attacked the considerable corruption of the city government and its cooperation with underworld figures. In 1929, Shuler’s attacks against Los Angeles Mayor George E. Cryer prompted a libel suit. But after a highly contentious and well-publicized trial, a jury found Shuler not guilty on one count and could not reach a verdict on the second count.

In 1931, Hearst’s Los Angeles Examiner and others petitioned the Federal Radio Commission to revoke KGEF’s license. In November, the commissioners voted to not renew the license, due to the character of Shuler’s broadcasts and his use of the station for personal attacks. KGEF was just the second station to have its license revoked for cause — the first being “Doc” Brinkley’s KFKB in Milford, Kan.

Shuler appealed the decision based on his station’s property rights and the right of free speech, but the D.C. Appeals Court upheld the FRC’s action in 1932. The court wrote that Shuler’s broadcasts were “sensational rather than instructive,” and that, if the airwaves could be used for such purposes, “radio will become a scourge and the nation a theater for the display of individual passions and the collision of personal interests.” A further appeal to the U.S. Supreme Court was rejected in 1933.

After two unsuccessful runs for political office, Shuler again began to broadcast his tirades in 1943 over KPAS in Pasadena, Calif. But no sooner had the broadcasts begun, than the FCC, declaring that his programs were hurting the war effort, directed the station to submit transcripts of Shuler’s broadcasts, and

he was forced off the air for the last time. Shuler retired as the pastor of his church in 1953 and died in 1965.

### “OL’ MAN” HENDERSON, KWKH

William K. Henderson was the wealthy owner of the Henderson Iron Works and Supply Company in Shreveport, La. Developing an early interest in radio broadcasting, he acquired part-interest in local station WGAQ in 1922, and then bought out his partners in 1925. Incorporating his initials, he renamed the station KWKH and installed a powerful 10,000 watt transmitter on the grounds of his estate, “Kennonwood.”

Blessed with high power and a clear channel and broadcasting only at night, KWKH’s signal blanketed the country. Henderson was the station’s only disc jockey, interspersing recorded music with his folksy commentary. He opened each broadcast with the chiming of a clock and his catch-phrase “Hello World!” He alternately referred to himself as “Dog-gone” Henderson, “Ol’ Man” Henderson and “Hello World” Henderson.

Before long, his rustic chats increasingly turned into commentaries on social and government issues. He castigated the Federal Radio Commission for favoring the assignment of frequencies to the big chain stations instead of independent local stations. He denounced the commissioners as “crooks, skunks and grafters.” Like Duncan, he mounted a spirited campaign against the “chain stores” for running small retailers out of business, and for the “ruinous and devastating effect of sending the profits out of our local communities to a common center, Wall Street.”

Henderson’s tremendous popularity hinged in part on his penchant for insulting his listeners. They would taunt him in telegrams, and he would fire back at them over the air in his coarse “country boy” language.

“People don’t care about gentle modest talk,” Henderson said. “They want it strong. They want to hear you ride somebody. If not, why do they spend their good money for telegrams? They want to be entertained. They razz me and wait for me to bawl them out over the radio. I never disappoint them if they sign their names.”

People tuned in because they never knew what he was going to say next. He developed such a following by 1928 that “Radio Digest” magazine named KWKH the South’s most popular station.

Not surprisingly, Henderson’s mixture of political diatribes and personal insults resulted in a flood of complaints to the Federal Radio Commission. One listener complained, “I listened for about three hours to a tirade of billings-gate, semi-profanity and vulgar abuse

(continued on page 20)

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## RABBLE-ROUSERS

(continued from page 18)

from the man who does most of the talking or announcing from this station. I had listened to this man's peculiar, characteristic utterances several times before, but this night, as near as I could judge, he was drunk and repeated his abusive remarks over and over again. I listened in for the purpose of seeing how long he would keep up this disgusting sort of thing and to the best of my recollection it was almost three hours."

The Radio Commission began monitoring Henderson's broadcasts and sent agents to Shreveport to record KWKH, but it took no action against the renegade broadcaster.

Henderson's ability to fend off the authorities was due to his friendship with Louisiana Governor Huey Long. Henderson contributed \$10,000 to Long's 1928 campaign and afforded him liberal amounts of free air time on his station. In turn, Long warned the FRC that he wouldn't tolerate any sanctions against KWKH: "You're going to have to fight Louisiana and other states too, buddy, and you won't get away with it. We are going to expose you and not allow you to steal the air." He assured Henderson that the Louisiana State Militia was at his disposal to protect



Internet capture, Henderson publicity photo

**"Ol' Man" William K. Henderson, the flamboyant owner and program host of KWKH in Shreveport, La., tore up the airwaves nightly from 1925 to 1932.**

KWKH against any threatened federal intervention.

Long successfully kept the FRC agents at bay until 1931, when a disagreement soured his relationship with Henderson. Now armed with recordings of his transmissions of "vile filth and profanity," and evidence that the station

was exceeding its authorized transmitter power, The FRC called Henderson to Washington to argue why his license should be revoked.

In 1932, after a series of lengthy hearings that also exposed some financial improprieties with listener, his lawyers informed him that his chances of keeping his station license were nil. By now nearly bankrupt, Henderson sold KWKH for \$50,000 to a group of Shreveport businessmen, who moved the station back to town and affiliated it with the CBS network. KWKH had become a domesticated station and Henderson's radio voice was silenced. His threats to start a Mexican "border blaster" station never came to fruition.

No off-air recordings are known to exist of W.K. Henderson, but there is a surviving phonograph recording that he distributed in 1930 that allows us to hear his Southern drawl and his tirades against the big broadcasting stations.

Listen to it at: [https://www.youtube.com/watch?v=wP\\_8acCbPKA](https://www.youtube.com/watch?v=wP_8acCbPKA).

### EPILOGUE

By the mid-1930s, radio broadcasting had matured into a mainstream commercial industry, and its gentrification had eliminated most of the outliers from the airwaves. With the exception of Father Coughlin and a few others,

the radio medium had been tamed, with stations and networks alike voluntarily avoiding controversy.

In its 1941 Mayflower decision, the FCC declared that radio stations needed to remain neutral in matters of news and politics, and prohibited them from supporting any particular position or candidate.

In 1949, the commission upped the ante with its implementation of the Fairness Doctrine, which required broadcasters to give equal time to contrasting views on controversial issues. This effectively drove most political debate off the air, except for a few carefully crafted "management editorials."

The Fairness Doctrine was repealed in 1987, a victim of the new broadcast deregulatory environment. This opened the floodgates and controversy again began to flourish on the country's airwaves, particularly on today's popular "hot talk" AM stations.

Although they may not be aware of it, today's commentators are following on the heels of the pioneer radio provocateurs of the late '20s and early '30s, and are thriving in today's environment of lax regulation and extreme political polarization. Will history repeat itself in some future era with the re-regulation of the media, or has broadcasting been forever changed — for better or worse?

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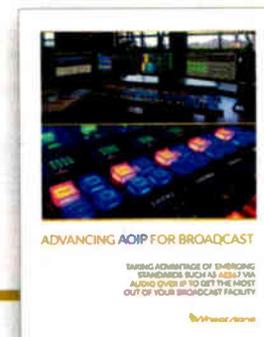
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World Radio History

# Has There Been a Thaw in the Inter-Korean Radio War?

The two countries agreed to cease "hostile actions" in May, but jamming and propaganda broadcasts persist



## INTERNATIONAL

BY HANS JOHNSON

Has there been a thaw in the inter-Korean radio war of "hostile" radio broadcasts and jamming?

Hopes were raised coming out of the April 27 summit, as the leaders of the Democratic People's Republic of Korea and the Republic of Korea declared that the nations would "cease all hostile acts against each other in every domain."

Specifically, "ceasing as of May 1 this year, all hostile acts and eliminating their means, including broadcasting through loudspeakers and distribution of leaflets in the areas along the Military Demarcation Line."

The loudspeaker broadcasts have indeed stopped, with Seoul going so far as to dismantle its loudspeaker network. It was thought that this might lead to a decrease or even elimination of radio broadcasting directed by the Koreans at one another, especially as the programming on the South Korean loudspeaker network has also been transmitted via FM to North Korea. As such, they might be considered a "hostile act" occurring at the Military Demarcation Line as the transmissions

could be received in this area. In addition, South Korean police prevented an activist group from launching leaflet-laden balloons towards North Korea on May 5, according to press reports.

### BROADCASTING, JAMMING AND MONITORING

There is a history of cross-Korean border broadcasts and jamming FM, AM and shortwave going back decades.

Jamming has also been used by both sides in all of these bands and usually consists of some sort of noise jamming. These stations' purpose is to influence the other side, and the jammers seek to prevent that influence from taking root.

Monitoring, particularly of the widely heard shortwave services, will indicate if stations have been shut down or if there is a decrease in jamming. Such monitoring does have its limitations, even in a world with many remote receivers, especially with regards to FM.

North Korea presents its own special challenges. Apparently due to power shortages, the country is not always able to transmit on every listed frequency, nor able to jam them. So an absence of either activity might be due to lack of electricity rather than a change in policy. Also, North Korean transmitters in poor condition are sometimes heard, apparently due to inability to repair such emitters.

Radios sets are widely available in South Korea, so North Korean stations can be tuned in to them. There is a single station transmitting from North Korea to South Korea known as Echo of Unification. The station is still active,

and it is still being jammed by South Korea. One of its shortwave transmitters is in poor condition and putting out a wobbly signal.

South Korea also jams certain North Korean domestic services that can be received in South Korea. There are no signs that this jamming has stopped.

The radio receiver situation is quite different in the North. The government sells fix-tuned sets that can only receive domestic broadcasts. While some tuneable sets have been smuggled in or clandestinely made, the bulk of sets are fix-tuned. There can be stiff penalties for tuning in to "foreign" broadcasts, so many broadcasts directed to North Korea are scheduled for the middle of

the night, which is described as a "safe" time to listen. Like its neighbor to the South, North Korea jams some South Korean domestic services.

### SOUTH-NORTH BROADCASTING

Despite the lack of receiver sets, there are several South Korean government-run stations broadcasting to North Korea. Voice of Freedom is operated by the South Korean military, and until recently, was also broadcast in part via loudspeaker. But the end of the loudspeaker broadcasts has not meant an end to the station's transmissions on FM and shortwave. Nor has it brought an end of North Korean jamming of the station.

There are four stations reportedly operated by South Korea's National Intelligence Service: Echo of Hope and Voice of the People are on shortwave only and operate on a number of frequencies. They remain on the air and continue to suffer from North Korean jamming. Both the AM station, Radio Free Korea and the Freedom FM Radio appear to still be available as well.

For the moment, the Koreans appear to be limiting the predicted "broadcast thaw" to loudspeakers and leaflets. Such bans on loudspeaker broadcasts are not unprecedented, nor is their eventual resumption.

If the ban last this time, the next break might be an end to their services targeting one another and the jamming associated with these services. Even in such a scenario, North Korea would still face a number of radio services it considers hostile. The countries might then stop jamming each others' domestic broadcasts.

Only time will tell if the thaw will expand to include inter-Korean radio broadcasts and jamming, or if the countries will return to their old, cold behavior.

## OTHER VOICES

In addition to stations run by South Korea, there are a number of other broadcasts that North Korea objects to and attempts to jam. These include mainstream and well-known stations such as the BBC's recently established Korean service and the U.S. government's Radio Free Asia.

There are also two stations produced by the Japanese government and directed to North Korea: Sea Breeze and Wind From the Homeland. They are broadcasting on shortwave to Japanese citizens believed to have been kidnapped by North Korea and thought to still be held there.

There are also a number of NGOs broadcasting to North Korea.

Among them is National Unity Radio, a station using shortwave transmitters in Tajikistan. It is reportedly part of the Unification Media Group, which received over \$500,000 in grants from the National Endowment for Democracy last year.

North Korea Reform Radio is broadcast on shortwave via Uzbekistan and received over \$300,00 from the NED in 2017. North Korea jams these services.

Communist North Korea also objects to some religious broadcasts. Voice of the Martyrs and FEBC are among the stations that have been jammed.

So even if South Korea were to end all its radio services to North Korea, the jammers in the North would likely remain quite busy.

An advertisement for NVLT Series nautel radios. The ad features a row of several radio units. Text on the ad includes: "NVLT Series nautel", "3.5 kW - 40 kW", "Outstanding Efficiency at Exceptional Value", "Now upgradeable to HD Radio", and "nautel.com/NVlt".

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World Radio History

# Power Generators: The Rest of the Story

How the unit performs is where the rubber really hits the road

## TECHTIPS

BY MARK PERSONS

Fellow writer Charles S. "Buc" Fitch penned a multi-part series on backup power generators in the Feb. 7, April 18, June 13 and Aug. 8 issues of Radio World Engineering Extra. (Read them at [radioworld.com](http://radioworld.com), keyword "Fitch.") Buc did a great job explaining the theory behind generators.

But let me tell you the rest of the story; the important part is how well a generator performs in the field.

### POWER QUALITY

A backup power generator's job is to emulate utility power as closely as possible. Fig. 1 shows an oscilloscope looking at the almost sinusoidal voltage

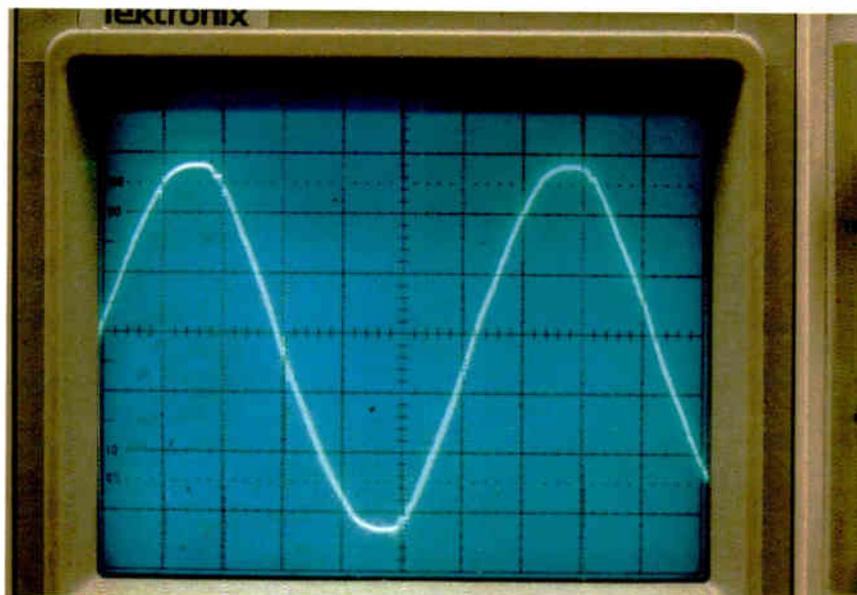


Fig. 1: Utility power with 2 percent harmonic distortion.

ing the peak voltage down. Fully loaded transformers can overheat and fail, if the waveform is not a clean sine wave.

Many uninterruptible power supplies are rated to have an output with 6 percent or less harmonic distortion when they are online (Fig. 2 illustrates that). I measured just under 2 percent distortion on an APC SmartUPS 3000, with a 1500 watt load, which made it slightly better than utility power because the peaks were not rounded off. Voltage peaks are a bit jagged, but the overall picture is a sine wave.

Fig. 3 shows a 22 kW Kohler model 22RY backup power generator loaded to about 60 percent, including a three-ton air conditioning unit. The manufacturer put tight electronic controls on engine speed and the voltage regulator. Fig. 4 shows that with just 2.5 percent distortion, Kohler did the smart thing by utilizing a Ford four-cylinder four-cycle industrial engine in this unit. It has proven its reliability over the past 14 years while running on propane fuel.

(continued on page 26)

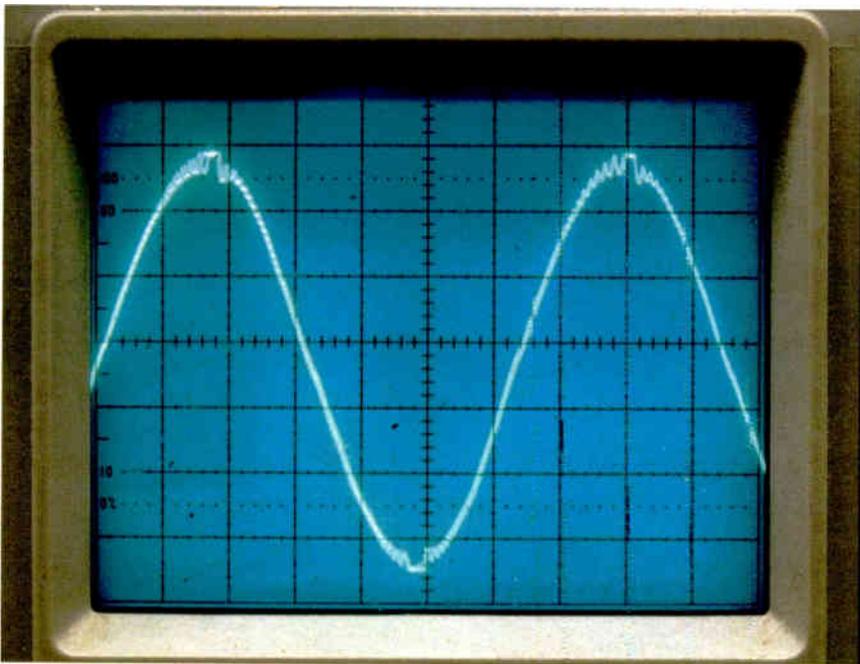


Fig. 2: The output of an APC SmartUPS 3000 when it is running on battery power.

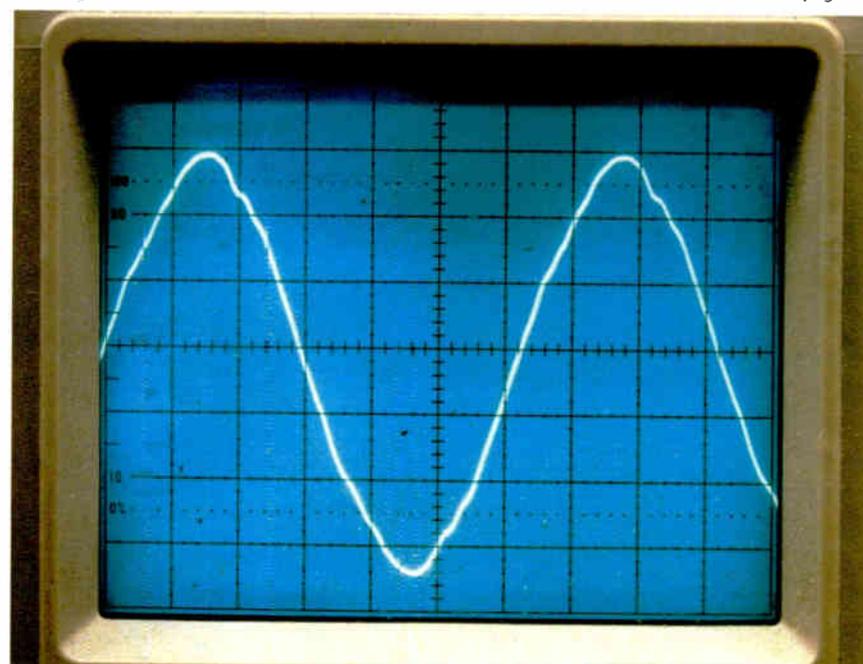


Fig. 3: A Kohler 22RY generator supporting air conditioning.

waveform from my local power company. Measured harmonic distortion was 2.0 percent. Anything up to 6 percent is acceptable in my book. When I say harmonic distortion, I mean unintended energy at two, three and four times the 60 Hz fundamental frequency plus noise. Pure 60 Hz would have zero distortion.

Waveform appearance will vary depending on what loads are present on the power line. Those loads are inside a facility and outside where other customers are using power from the same line.

Some of those loads might be in an industrial park causing the waveform to be worse. In this case, wave tops are rounded off because current drawn is greatest on the voltage peaks, thus pull-



Fig. 4: Harmonic distortion 2.5 percent on generator at 60 Hz.

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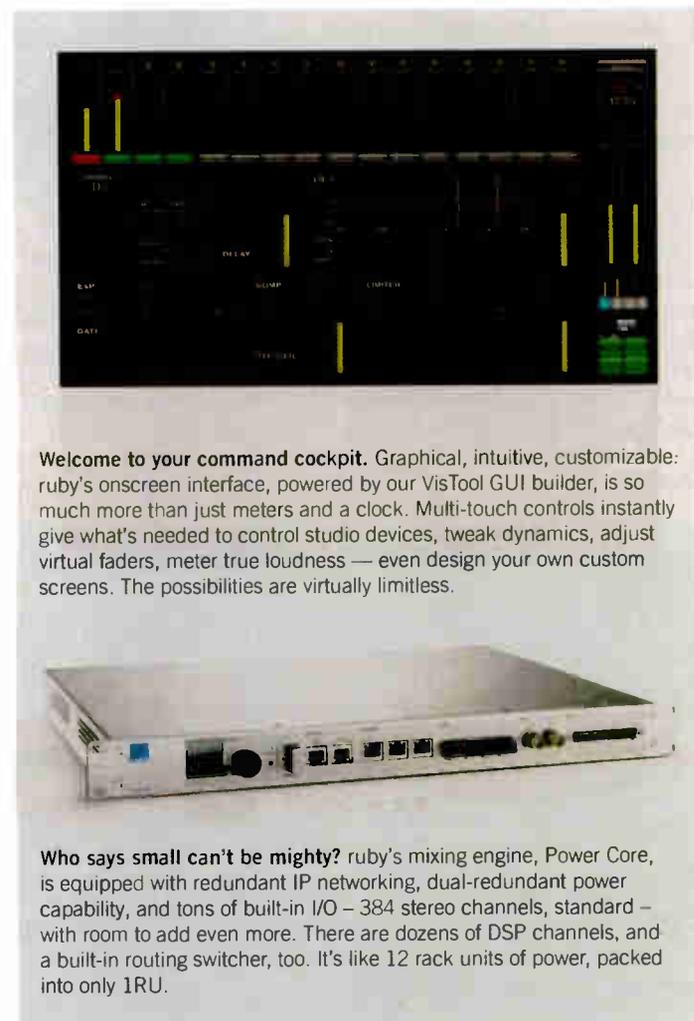
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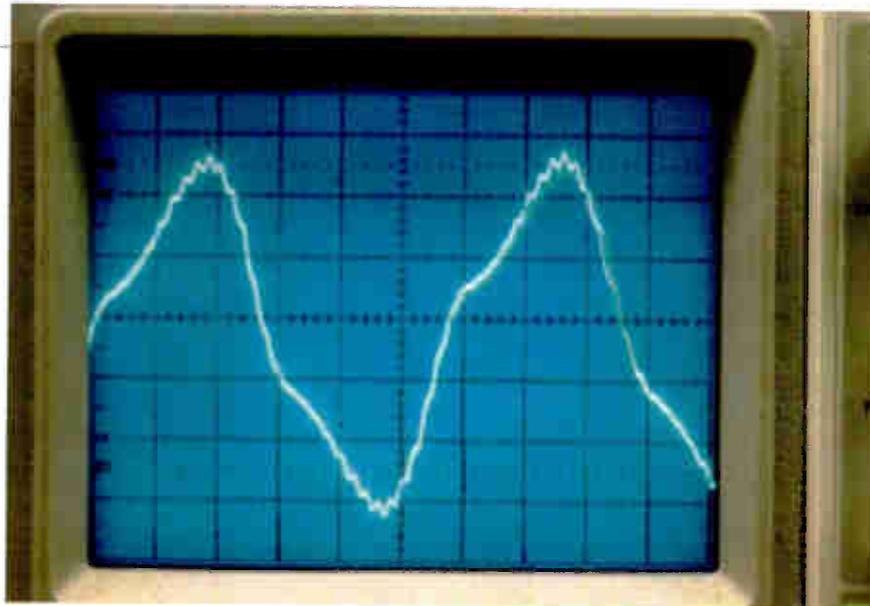


Fig. 5: A Sportsman Gen 4000 plant with a 50 percent load.



Fig. 6: A Winco PSS8000 generator ragged waveform.

## GENERATORS

(continued from page 24)

### PROPANE'S ADVANTAGES

What I like about propane or natural gas is the fact that they last forever. These fuels do not degrade with time. My opinion is that gasoline is the worst choice. Even with fuel stabilizing additives, gas goes bad and may not still be good enough when needed most.

A friend brought over a Sportsman brand Gen 4000 gasoline-driven portable generator. The waveform looked good until it was loaded to 50 percent with an electric space heater. Then the wave shape changed. In Fig. 5, harmonic distortion went past 10 percent at that point. This unit is OK for keeping many appliances running, but required careful selection to find a UPS unit that would not stay on battery with this kind of power.

Fig. 6 shows the output of a Winco 1999 vintage PSS8000, 8 kW ground-mounted (3 feet x 2 feet x 2.5 feet) generator plant. The jagged waveform pegged the needle on my distortion analyzer, which can only measure to 10 percent. The picture changed little from no

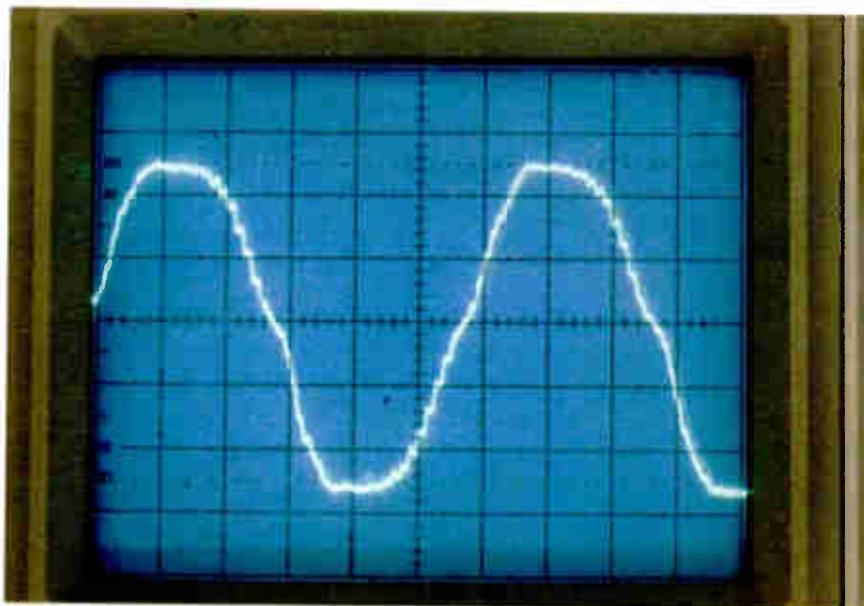


Fig. 7: A typical traditional 3 kW generator waveform.

load to 4 kW when I tested it. Like many generators with a cost-conscious design, an air vane near the engine flywheel is used to regulate engine speed. The goal is to have 60 Hz at the generator output terminals. Engine speed can vary with temperature, humidity and load conditions, thus affecting frequency. Better plants use electronic controls to regulate

engine RPM.

I also tested a gasoline-powered Honda EU2000i Generator, with inverter technology, which came in at about 1 percent harmonic distortion with a 70 percent load. Basically, it is a UPS that is gas driven. Its inverter is clean because it electronically creates 60 Hz with low waveform distortion. The pen-

alty is higher cost. Fig. 7 shows a typical 3 kW gasoline driven plant at half load. Measured harmonic distortion came out to 6 percent, my benchmark for good versus bad.

### UPS SELECTION

Meanwhile, you'll need an uninterruptible power supply to keep computers running for seamless programming. Each UPS has its own tolerance to line fault conditions. It is more than coming online when power fails.

Let's say your backup generator is putting out power at 58 Hz instead of 60 Hz. Many UPS units will switch to and stay on battery even when there is 120 VAC power. A similar thing happens when the waveform is something other than a sine wave.

For some "less than great" backup generator plants, one client had to test five UPS units until one was found that would accept less-than-ideal power.

### FULLY AUTOMATIC?

Who is to say that you or another technically qualified person will be there to run a backup power generator the instant utility power fails? Not likely. After all, a 40-hour work week represents less than 24 percent of the total time in seven days.

The hospital standard requires a generator to automatically start and come online in just 10 seconds. Yes, it can be done. Some systems take longer.

Fig. 8 shows a Kohler 240 VAC/200 ampere automatic transfer switch. It measures in at 24 inches high x 18 inches wide x 11 inches deep — likely that would be all you need at a studio.

### SOME OR ALL?

Most electricians, in my experience, think in terms of supporting the most important part of a facility with a generator plant. That leaves many circuits with no power during an outage. Human desire to keep everything running will result in extension cords running down

(continued on page 28)



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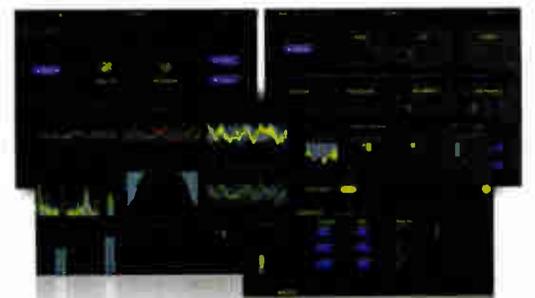
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# GENERATORS

(continued from page 26)

hallways and under doors. This is a bad scenario, if only from the standpoint of creating a trip hazard.

You can do facility load calculations, but my recommendation is to use a clamp-on AC ammeter to measure actual current draw on incoming power cables in a building's electrical load center. (See Fig. 9.) Do it with air conditioning and all other loads turned on. Plan on an automatic power transfer switch to interrupt and replace *all* power to the facility.

AM transmitters require better generator regulation, as they draw about 50 percent power more while being modulated. A generator needs to be able to keep up with that changing load.

Compare pricing on power generators. You'll find that the up charge for doubling a generator size is not twice the price.

You might pick one that can handle everything except the air conditioner. In that case, a relay to sense a power outage can be used to interrupt the low voltage/low current control line to the air conditioner's compressor. Everything will continue running, except the actual cooling, which is easy enough to do.

### LONGEVITY

My hometown of 13,000 people (80,000 market size) suffered a 24.5 hour power outage after a tornado came through in 2001. The entire city was shut down. Supermarkets threw out food by the ton.



Fig. 8: A Kohler 200 ampere automatic transfer panel.



Fig. 9: A clamp-on ammeter measuring actual current draw.

Photos by Mark Persons

One radio group of three stations stayed on the air with backup power while five other stations did not. My records show a 20 kW generator, loaded to 70 percent, will use about three gallons of propane per hour.

### TRY BEFORE YOU BUY

Ask a generator salesman for a list of local users. Take an oscilloscope to one or more of those locations to see a generator in action under load conditions. If the waveform does not closely resemble a sine wave, then try another brand.

At the very least, use several UPS

units as a test instruments. If they accept generator power, then likely it is OK.

### SUMMARY

The power quality of generators varies substantially. Know what you are getting into before spending money. It makes perfect sense.

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

*Mark Persons, W0MH, is an SBE Certified Professional Broadcast Engineer and is now retired after more than 40 years in business. His website is www.mwpersons.com.*

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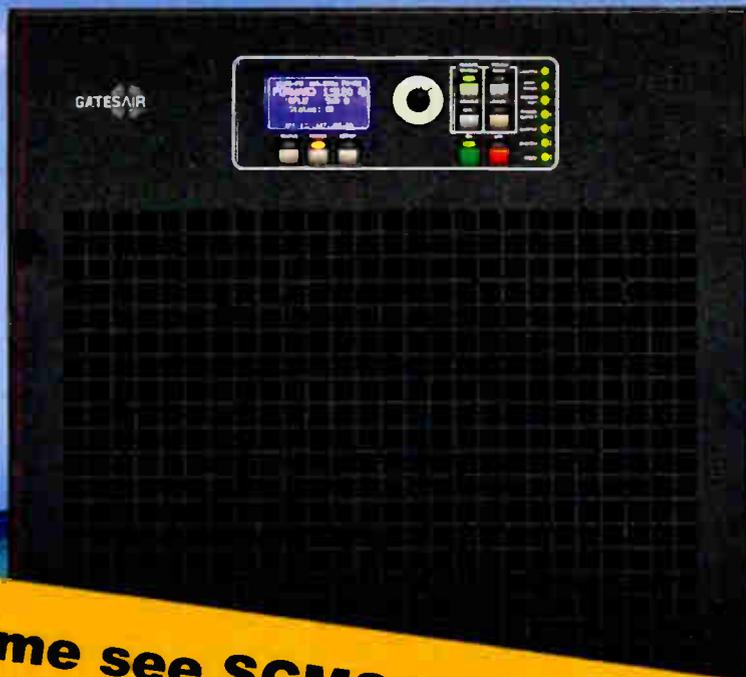
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# Omnirax Time Capsule in San Francisco

A series of rebuilds over the years allows a full view on evolving studio design practice

## SPECIALREPORT

BY DAVID HOLLAND  
Vice President, Design  
Omnirax Furniture Co.

**SAUSALITO, CALIF.** — These five images from two iconic addresses in San Francisco radio history offer a revealing window into the changing shape of radio broadcasting furniture design. Studios at 201 3rd Street and 865 Battery Street have seen a series of ownership swaps and shuffles with Entercom and Bonneville being the current stewards.

The shot of KFRC from 2004, Fig. 1, illustrates the end of one era colliding with the dawn of the next. CDs were the dominant format, but cart machines and even tape players were lurking in the background. Monitors were CRT and stacked wherever space permitted. The furniture is the familiar oak and blue of so many PR&E studios from that era.

Omnirax Furniture Co.'s first build in San Francisco in 2005, Fig. 2, ushered this studio into the computer age. Under the guidance of legendary chief engineer Phil Lerza, the studio layout was reconfigured

around monitors and keyboards, but paper still had a prominent position in front of the board op. There was still an abundance of rack space — some designated for a future use that never materialized.

Across town on 3rd street a similar shift occurred as Shingo Kamada oversaw a complete overhaul of 10 studios with familiar call letters including KOIT, KDFC and KZBR. Fig. 3 shows how KDFC's extensive CD library dominated

people in a free-wheeling lively format. It certainly did not hurt, when in 2016 KGMZ became the flagship station for the Golden State Warriors.

KGMZ's tenure on 3rd Street proved to be short lived as the station's ownership and location was swept up in the swaps resulting from Entercom's merger with CBS Radio. And where was it moving — cross town to Battery Street, replacing the KFRC Studio A from 2005. KGMZ's cross-town move afforded a second chance to do a good thing better. Since it's rare that we rebuild the same studio for the same station is such a short

time frame, we asked Michael Smith, the longstanding chief engineer at Battery Street to check whether the talent moving into his plant approved of their set-up. Getting their approbation gave us license to create this latest iteration of monitor-centric talk furniture with sound and sight lines now optimized for cameras and web streaming (Fig. 5).

This visual time capsule shows a flip frame view of trends in studio design. Less wire, less rack gear, less paper. More monitors, more cameras and more modes of delivering the content that only radio can provide.

For information, contact David Holland at Omnirax in California at 1-415-332-3392 or visit [www.omnirax.com](http://www.omnirax.com).



Fig. 1: KFRC, Battery Street, circa 2004.



Fig. 2: KFRC, Battery Street, circa 2005, first Omnirax build.

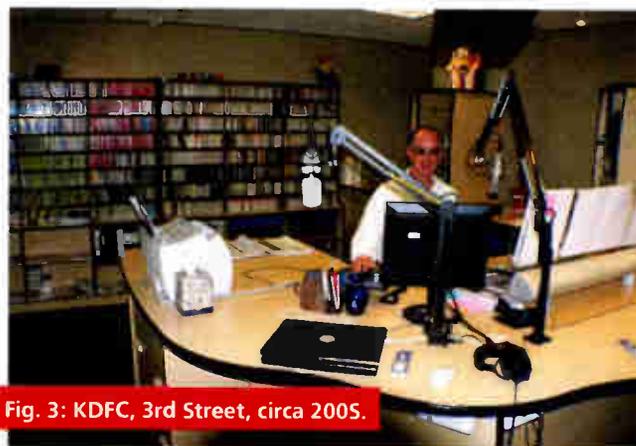


Fig. 3: KDFC, 3rd Street, circa 2005.



Fig. 4: KGMZ, 3rd Street, circa 2016.

the background of this classical station's air studio yet the facility's design fully embraced computer's infiltration into the airwaves.

Fast forward a decade. In 2016, Shingo brought Omnirax back into his facility to build furniture for a new feel, new format, fresh take, now called KGMZ(FM)/95.7 "The Game" (Fig. 4). From a design standpoint, we wanted to build furniture that reflected these changes: gone are the CDs, gone is most of the paper, as well as most of the rack gear. In its place, five pods with monitors front and center at each position. This stand-up studio supported a revolving cast of up to five



Fig. 5: KGMZ, moved to Battery Street, circa 2018.

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**OPXONE**

# Wheatstone QuickLine Serves Itsy Bitsy Studio

Price and flexibility fit for Romanian children's radio station



## USERREPORT

BY LIVIU PREDA  
Broadcast Engineer  
Itsy Bitsy Radio

**BUCHAREST, ROMANIA** — Itsy Bitsy FM's studios in Bucharest, Romania, are a long way from California, where our new QuickLine studio furniture was made. Initially, we thought of having a local cabinetry maker custom design and manufacture the studio furniture for us because we didn't want to have to deal with the bulk and cost of shipping. But we quickly ruled that out. Local furniture makers don't know the details of how a studio operates, such as how much surface space or rack space is needed for equipment.

We weren't sure what to do for our small studio, and then we heard about Wheatstone's QuickLine furniture.

We were in the process of replacing our older on-air studio with a new WheatNet-IP audio networked studio, and QuickLine seemed like a good fit.

Here was a studio equipment manufacturer with a lot of experience designing and building out new studios, and they just so happened to have a furniture line.

Our studio was small. We had our main Wheatstone L-12 console,

three Wheatstone TS-4 talent stations and several I/O boxes that make up a WheatNet-IP audio network. We needed rack space below the counters for the I/O units and we required a free-form countertop that was rugged and fit the

flow of our busy format. Itsy Bitsy broadcasts kids programming out to more than 60 percent of the country.

### FLEXIBILITY

We liked that the QuickLine furniture fit small studios like ours, and the five modules that make up the furniture line can be configured 32 different ways. We could change the layout of the furniture, even from a sit-down to a stand-up position, if we decided to add on or change our studio later. It had rack cabinets we needed, the right center space for the console, and the right-sized base, plus easy access to the back, which was important for being able to get to all equipment and cabling when needed.

We also liked the price. We might have been able to find an affordable alternative locally, but if so, it wouldn't be by much.

The furniture was delivered in a small knock-down container that kept the shipping costs reasonable. All the hardware and assembly instructions were included, making it snap to put together. The furniture has been in place for two months and is proving to be very durable.

For information, contact Jay Tyler at Wheatstone in North Carolina at 1-252-638-7000 or visit [www.wheatstone.com](http://www.wheatstone.com).

## TECHUPDATE

### ARRAKIS ADDS FLAIR WITH ACCENT PANELS

Arrakis Systems says that its Accent furniture collection is teeming with beauty and function. Its aluminum frame, attractive panels and gorgeous tabletops, makes it an enviable solution for any broadcast studio, the company adds.

Built for durability and functionality, Accent furniture works well for any studio. The custom configurations allow users to decide what fits best for their needs, and the available custom features give it a fingerprint that is matchless, Arrakis says.

Cabinetry and electronic equipment complement each other in such a way as to create a bold visual environment for talent, guests, and clients alike.

Accent is available in standard models as well as custom configurations. The hybrid metal frame and structural panel design combined with Arrakis' state of the art CNC manufacturing systems tailors the final product to fit a studio's exact size and shape. Clients choose the colors and textures to match their décor.

Arrakis says that because of its ori-

gins in the console market, it pioneered the metal post and wood panel construction found in so many high-end radio studio furniture in use today. The internal metal structure dramatically improved manufacturing tolerances and made high-quality modularity possible.

For information, contact Arrakis Systems in Colorado at 1-970-461-0730 or visit [www.arrakis-systems.com](http://www.arrakis-systems.com).



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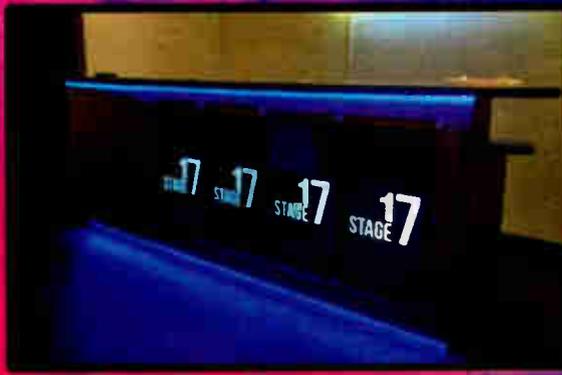
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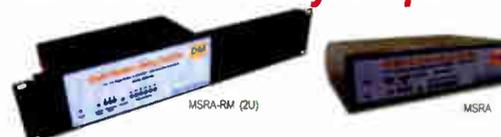
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# Approach Listener Survey Data With Caution

Some estimates dramatically minimize AM/FM radio; but just how accurate are they?

## COMMENTARY

BY RANDY BROWN

*The author is vice president of Edison Research.*

AM/FM radio is dead! Everyone is listening to audio over the internet now!

Looking at some recent studies of the audio landscape, you might think that, or your advertisers might think that. However, if you take a closer look at how some audio research is being conducted, it should give you pause before you prepare your eulogy for AM/FM radio.

Spotify/etc.), owned music (CDs, vinyl, digital downloads), SiriusXM, music channels on TV, music videos on YouTube, podcasts, and any other listening.

Share of Ear has been conducted since 2014 and asks respondents to complete a 24-hour diary, entering for every 15 minutes if they have done any listening. It is updated regularly, allowing subscribers to spot trends quickly.

Various other companies produce estimates that dramatically minimize the size of AM/FM radio in comparison to streaming or other digital products. The following are two possible reasons why that is, and why you should make sure you dig deeper into data and how it is collected.



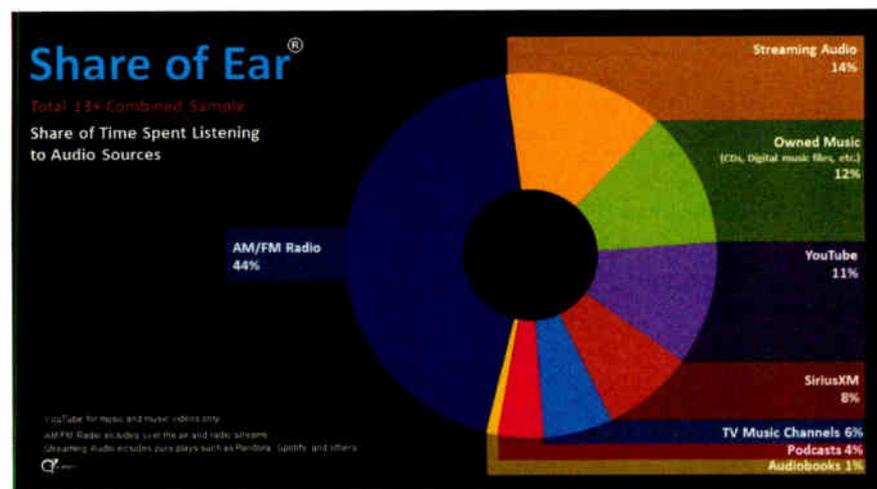
Randy Brown

not have to think back to what they were doing or how long they were doing it.

When we have tested surveys that ask respondents to think back to how long they did something, we have found that they cannot provide reliable estimates. Respondents can tell you if they listen to a platform or what their favorite platform/AM/FM station is, but they struggle with remembering with precision how long they listen to various platforms.

If you are asking people time spent listening questions and trying to determine shares, it is best to ask it in a real-time diary product. Surveys that don't should be viewed with a skeptical eye.

**Make sure you question how a survey was conducted, both in the way a survey finds its respondents and in the way the respondents are asked about how they consume audio.**



The Share of Ear graph showing listening trends for Q1 2018.

Edison Research prides itself on providing the audio industry with high-quality data that helps explain what people are listening to and why they are listening to it. One of the ways we do that is our Share of Ear product.

Share of Ear works to determine what people are listening to, where they are listening, and on what device they listen for both music and speech. It is the only product we know of that measures the entire audio space, including AM/FM (radio listening and listening to a stream of a station), streaming audio (Pandora/

### ONLINE-ONLY SAMPLES VS. ONLINE AND OFFLINE SAMPLES

A number of the estimates we've seen are surveys that were performed entirely online, which have the potential to bias results in a dramatic fashion.

Recently, we prepared a presentation for the American Association for Public Opinion Research (the preeminent organization regarding survey research) that showed that if you conduct a survey of online-only respondents, online behavior increases in ways that don't reflect the total market.

Share of Ear is conducted online and offline, and we make the effort to include respondents who don't have internet access or are not heavy internet users. Then we weight our data to make sure it properly reflects Americans' internet usage. This allows us to represent the entire American 13+ audience, not just the Americans who use the internet or just those who heavily use the internet. To show how important this is, consider the total Share of Ear graph for only Quarter 1 2018 (shown at left).

We then ran an experiment removing all of the respondents who did not take the diary online; these are respondents who either don't have internet access or used the internet for one hour or less in the prior 24 hours. When we did that, the results were dramatic.

Using this dataset, AM/FM listening decreases to 37 percent (a decrease of 16 percent) and streaming audio listening increases to 21 percent (an increase of 50 percent). Clearly the skewed (or incorrect) estimates that result from using an online-only sample would have a dramatic impact on how people view the audio landscape. Not including respondents in the sample who don't have internet access or are light internet users will bias results and should not be relied upon when comparing AM/FM vs. streaming audio.

### DIARY VS. RECALL

Share of Ear asks respondents to fill out a diary; this allows them to enter their listening in real time. Respondents do

Even worse, we have seen surveys in which people are merely asked to report percentages of listening time, without taking into consideration how much time people spend in total. Thus a lighter listener is counted the same as a heavy listener — which is an egregious mistake when creating estimates of "share of time spent."

Audio listening is in a constant state of flux, with new products constantly appearing and disappearing in the landscape. Streaming audio is certainly on the rise, and AM/FM needs to continue to take steps to become a bigger part of the streaming world.

Don't forget though that AM/FM is, as of today, by a significant margin the largest audio or music platform in the total U.S. audio universe, and for now you should question data that says otherwise. When consuming data about the audio listening landscape, make sure you question how a survey was conducted, both in the way a survey finds its respondents and in the way the respondents are asked about how they consume audio.

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We have been inundated with notices from various satellite program carriers about the latest fiasco with the FCC over use of C-band satellite frequencies as an ancillary terrestrial frequency band for cellphone and automotive data conveyance. Hence, the concern over interference with all of our C-band satellite program delivery from these outside sources.

What I don't get is why thousands of broadcasters and home C-band satellite TV hobbyists have to foot the bill for "registering" their earth stations for protection with the Federal Communications Commission? This to me is akin to paying a more powerful mob for protection from other mobs in old Chicago back in the 1920s.

It seems to me our taxpayer dollars — along with licensing fees for every RF conveyance under the sun in radio and TV — should already be paying for this kind of protection from the big boy on the block.

Why is it that the FCC is totally unaware of the entire C band's use for the broadcasting industry? Seems like there had to be a CFR agreement somewhere about international usage of this band for broadcaster use around the globe.

You can't tell me the FCC was unaware of the tremendous use placed on this band for delivery of hundreds of radio talk shows and hundreds of TV shows, both network and syndicated, not to mention that this is the band on which local TV stations depend to do local uplinks back to the studio when they are on live remote in their community or across the country. TV and radio networks using this band abound, and it's crowded with all kinds of programming in vertical and horizontal polarizations on dozens of transponders.

So why wouldn't the FCC automatically protect this band from terrestrial interference as a matter of natural course? After all, it is *their job* for God's sake! Why charge us individually to protect us from outside interference when protecting the bands from interference is supposed to be the mission of the FCC? Did I miss something here? Is this a modern-day kind of mob?

*Marvin Walther  
Chief engineer, Carroll Broadcasting  
Program director, WIOS(AM)  
Tawas City, Mich.*

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**AM'S LAST COFFIN NAIL**

The National Association of Broadcasters' recommendation to change the ownership rules sounds the death knell for the already terminally weakened AM radio sector ushered in by the 1996 Telecom Act allowing expanded station ownership.

I commend iHeartMedia for opposing the new recommendation. The ownership consolidation resultant of the 1996 Act promoted homogeneous programming at the expense of live-and-local origination. The statement that "NAB argues in its own request that 'increased common ownership should enhance radio programming diversity'" is preposterous. In fact, history shows the exact opposite is true.

Common ownership means canned, vanilla, common-denominator programming to minimize costs. The public is walking away from such generic non-local programming.

Under the ruse of AM revitalization, the once-bright hope for AM's future, FCC Chairman Ajit Pai, appears to be a Trojan horse for enemies of AM. First, he champions FM translators — AM's poison pill — which seduce AM listeners away, then he champions this latest effort to debase AM property values giving consolidators the freedom to snap them up and take them dark.

Melodie Virtue hit it squarely: "I would expect such a change would increase the value of FMs ... AM properties would go down in value." As night follows day. This is in every respect like watching a slow-motion train wreck. RIP AM.

*James B. Potter  
Owner and CEO  
Cutting Edge Engineering, Radio Station Technical Services,  
The Little Spot Shop and JBPotter Agency  
Kimberling City, Mo.*

**NO AUTOMATION HERE**

I enjoy and learn something from each issue of Radio World.

The Tom Vernon article on McMartin and SCA applications ("McMartin Muzak Memories," June 20 issue) brought back my exploration of the technology while I was in high school.

It was in these earlier radio days that I was able to befriend staff at a number of FMs in Chicago, in particular WFMF, which programmed only instrumentals and "simulcast" these arrangements minus commercials to businesses for a fee. Using sub-audio tones to custom receivers, this so-called "simplex" methodology reliably muted or un-muted the audio output during voice messages to the main-channel public. The music/spots were on tape and with the mute/unmute functions were controlled by an engineer. (Obviously, no automation here!)

During my adolescent interest, I successfully built a heterodyne SCA adapter, which I would use on my home FM tuner after adding a multiplex output at the discriminator. Proudly, I shared my project with my buddies, the engineer on duty, Ralph Olsen and the chief engineer, Ivan Bukovsky.

What I did not know at the time and was sad to discover years later was that the station was in court with the FCC, which challenged the many years of this station's successful programming with its adult audience on the grounds that the station was engaged in "transmissions" and not "broadcasting," the latter intended for the public and not a targeted subscription group. To me it seems they were doing both.

Anyway, the station and license was ultimately transferred, staff went their separate ways, the background music accounts were picked up by the local Muzak franchisee, and I went on to better my technical skills with much unspoken appreciation to the staff of this and other Chicago radio stations who gave me their time.

*Peter A. Garcia  
Network communications engineer (retired)  
University of Illinois at Chicago  
Chicago*



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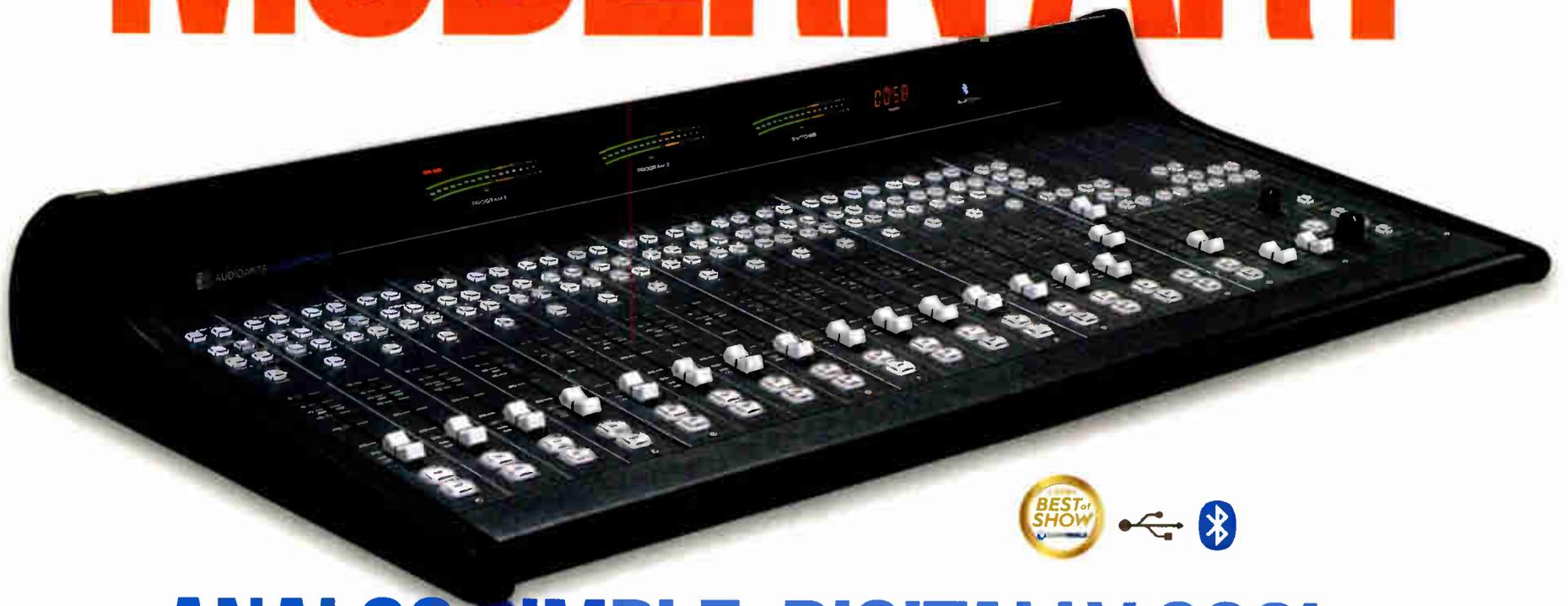
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