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# C-Band Plan Aims to Limit Broadcast Disruption

Package includes provision for reimbursement to displaced users — if they registered

BY RANDY J. STINE

FCC Chairman Ajit Pai's aggressive timeline to reallocate part of the C-Band for advanced wireless services, including 5G, is now on full display. Radio entities are starting to look ahead to the possible infrastructure implications and costs.

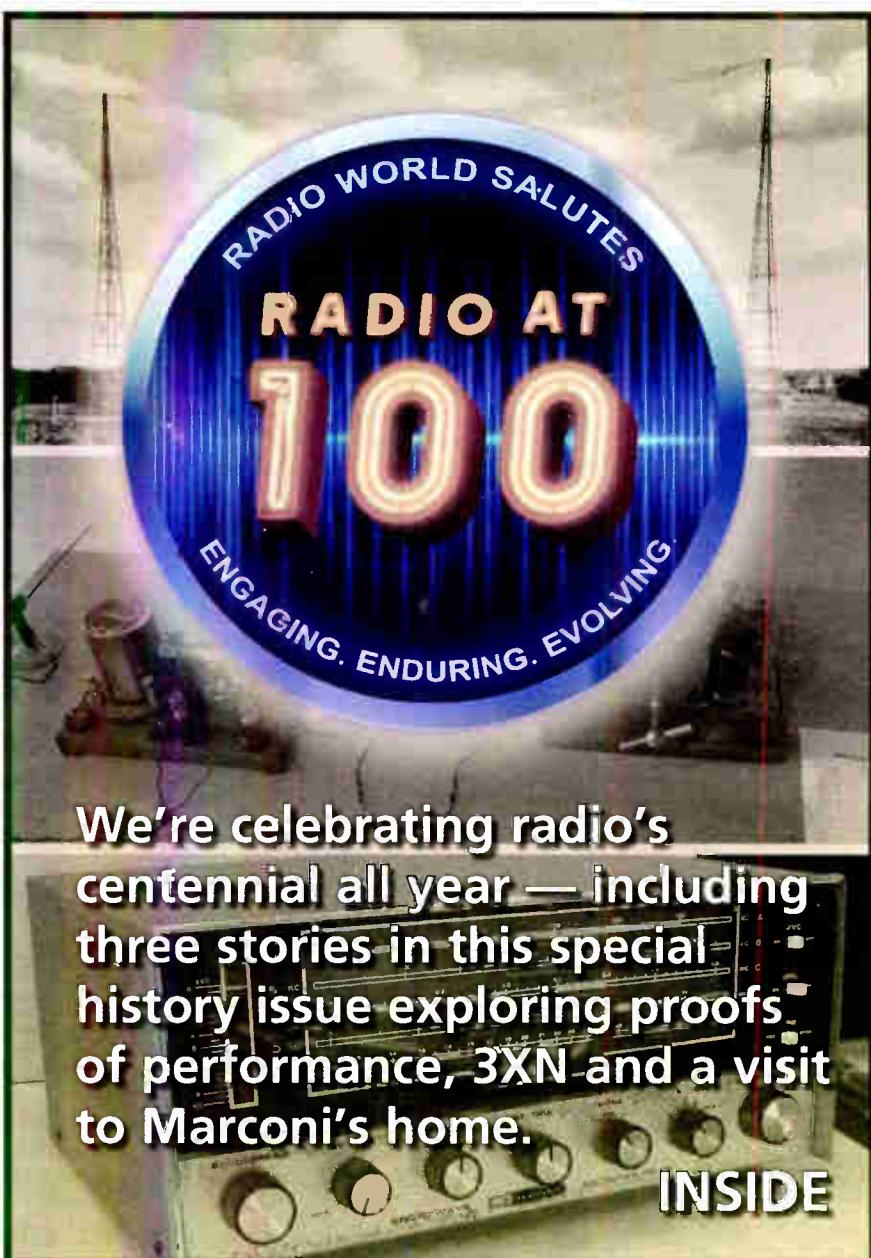
The C-Band is a 500-megahertz segment of spectrum now used by satellite companies to distribute audio and video content to broadcasters and cable systems. Pai's plan, which he detailed in February in draft form and which was approved in late February, would make the lower 280 megahertz of the C-Band (3.7-3.98 GHz) available

for flexible use, including 5G, through a public auction, which the chairman wants to begin in December.

Incumbent satellite services are to be repacked from that 500 MHz to the upper 200 megahertz of the band (4.0–4.2 GHz). The FCC's goal is for incumbent earth station operators to be adequately transitioned and able to continue operations without interruption.

In addition, there will be a 20 megahertz guard band (3.98-4 GHz) cleared during the process to prevent interference. The fixed satellite services community agreed with the FCC that 200 megahertz of spectrum is sufficient to support current satellite services

**satellite services**  
*(continued on page 6)*



We're celebrating radio's centennial all year — including three stories in this special history issue exploring proofs of performance, 3XN and a visit to Marconi's home.

INSIDE

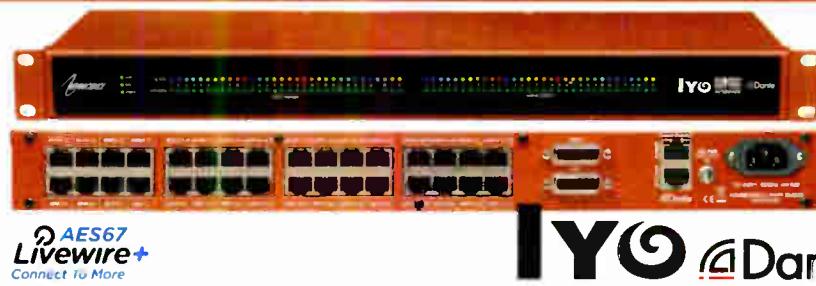
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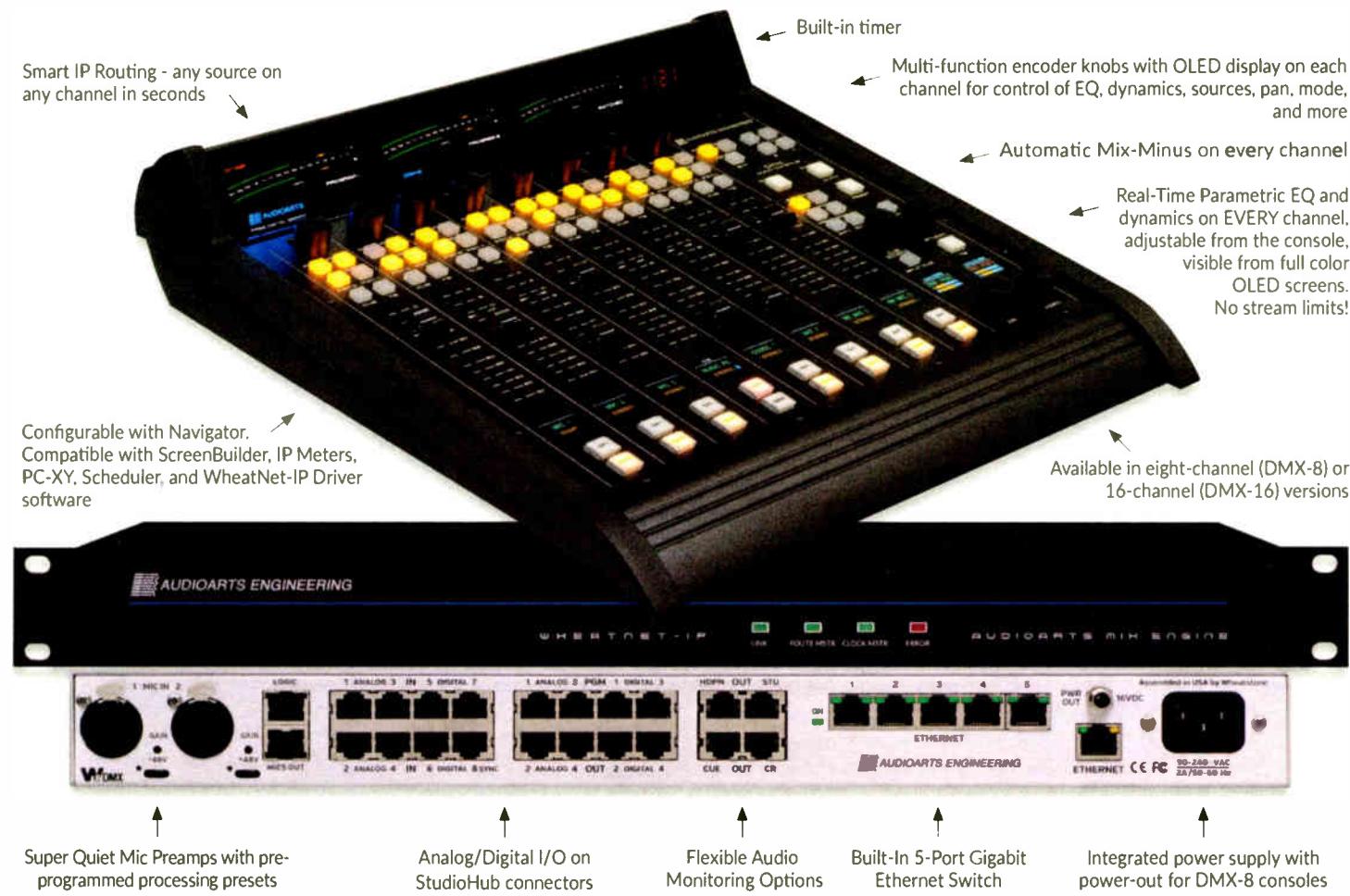
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## CONTENT

Managing Director, Content Paul J. McLane,  
[paul.mclane@futurenet.com](mailto:paul.mclane@futurenet.com), 845-414-6105

Senior Content Producer — Technology Brett Moss, [brett.moss@futurenet.com](mailto:brett.moss@futurenet.com)  
 Content Manager Emily M. Reigart, [emily.reigart@futurenet.com](mailto:emily.reigart@futurenet.com)

Technical Advisors Thomas R. McGinley, Doug Irwin

Technical Editor, RWEW W.C. "Cris" Alexander

Content Director — International Marguerite Clark

Contributors: Susan Ashworth, John Bisset, James Careless, Ken Deutsch, Mark Durenberger, Charles Fitch, Travis Gilmour, Donna Halper, Craig Johnston, Alan Jurison, Paul Kaminski, John Kean, Peter King, Larry Langford, Mark Lapidus, Jim Peck, Mark Persons, Stephen M. Poole, James O'Neal, Rich Rarey, Jeremy Ruck, John Schneider, Randy Stine, Tom Vernon, Jennifer Waits, Chris Wygal

Production Manager Nicole Schilling

Managing Design Director Nicole Coban

Senior Design Director Karen Lee

## ADVERTISING SALES

Senior Business Director & Publisher, Radio World

John Casey, [john.casey@futurenet.com](mailto:john.casey@futurenet.com), 845-678-3839

Publisher, Radio World International

Raffaella Calabrese, [raffaella.calabrese@futurenet.com](mailto:raffaella.calabrese@futurenet.com), +39-320-891-1938

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Head of Print Licensing Rachel Shaw [licensing@futurenet.com](mailto:licensing@futurenet.com)

## MANAGEMENT

Senior Vice President, Content Chris Convey

Vice President/Group Publisher Carmel King

Vice President, Sales John Bubello

Head of Production US & UK Mark Constance

Head of Design Rodney Dive

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## Proof of Performance, 1970s Style

A look back at broadcast test and measurement gear from 50 years ago

BY TOM VERNON

The FCC-required proof-of-performance was an annual ritual for broadcast engineers from the earliest days of radio up to deregulation in the 1980s.

In the early 1970s, many engineers might have fantasized about making those measurements with high-end gear such as an HP 204 audio oscillator, 403 AC voltmeter, 330 distortion analyzer, a Hallicrafters communications receiver and a Tektronix oscilloscope.



took advantage of the FCC's designated experimental period from midnight to 6 a.m. Monday to tune up the entire broadcast chain. A lot of things could have gone wrong in the preceding seven days.

The emission of tubes could fall past the critical point, or they could become microphonic. Wax coupling and bypass caps could overheat and short out, often taking plate load resistors and other components along with them. Carbon composition resistors, particularly in grid circuits, could become noisy, generating lots of white noise. Electrolytic caps in power supplies or decoupling circuits would eventually dry out and lead to increased ripple or motorboating. And of course, any of the hundreds of contacts in tube sockets, audio and RF connectors could become noisy or intermittent.



The workbench of a 1970s small- or medium-market station might include a Waveforms 510-B audio oscillator, Daven VT-795-6 attenuation network and Heath IM-12 distortion meter.

The oscillator, voltmeter, distortion analyzer and communications receiver were required items for the annual FCC Proof of Performance measurements. An oscilloscope was useful, but not essential. The reality in the workshops of most small- and medium-market stations was usually a bit different than what the engineer might have wished for.

Pictured is an ensemble that might be more likely in a small- to medium-market operation in 1970. For the audio proof, a Waveforms 510-B audio oscillator, Daven Type VT-795-6 attenuation network and Heath IM-12 distortion meter. The RF portion of an AM proof might be accomplished with a Heath GR-54 communications receiver.

The audio oscillator and precision 600-ohm attenuator were often two separate units. As with many high-end oscillators, the Waveforms 510-B had a 0-10 volt variable output control and a 600-ohm balanced transformer output. The Daven VT-795 600-ohm decade attenuator provided precision attenuation in 10, 1 and 0.1 dB increments. The AC voltmeter and distortion meter functions for this 1970 package were provided by a Heath IM-12. Although of simple design and modest cost, the IM-12 could measure distortion down to 0.1%. The GR-54 was a six-tube, single conversion communications receiver covering 180 kHz to 30 mHz. It was Heathkit's mid-line shortwave receiver at the time.

## TUNING UP THE CHAIN

In the days of analog vacuum tube broadcast gear, this test equipment was used heavily. Most stations

The commission's requirements for checking harmonics and spurious radiation of an AM transmitter were about as open-ended as the audio portion was prescribed.

Between this ongoing maintenance and troubleshooting, a lot of test equipment was checked only once a year, usually right before the proof was conducted.

The good thing was that all measurements required by the FCC were relative, and not absolute. For example, frequency response is measured in decibels, and is really the relationship between two voltages, so the absolute value is irrelevant. It's the same idea with distortion. Harmonic distortion is a percentage of the original signal voltage. That being said, good engineering practice suggests that test equipment be kept as accurately calibrated as possible.

(continued on page 4)



## PROOFS

(continued from page 3)

The first step in getting test equipment ready for the proof was checking the response of the oscillator into the AC voltmeter. For an AM proof, that meant checking the response from 50 to 7500 Hz, referenced to 1 kHz. FM proofs required a flat 50 to 15,000 Hz response referenced to 400 Hz. Any deviations greater than 0.2 dB needed to be noted on a calibration chart, and these deviations were subtracted from the transmitter response deviations before logging them on the proof forms.

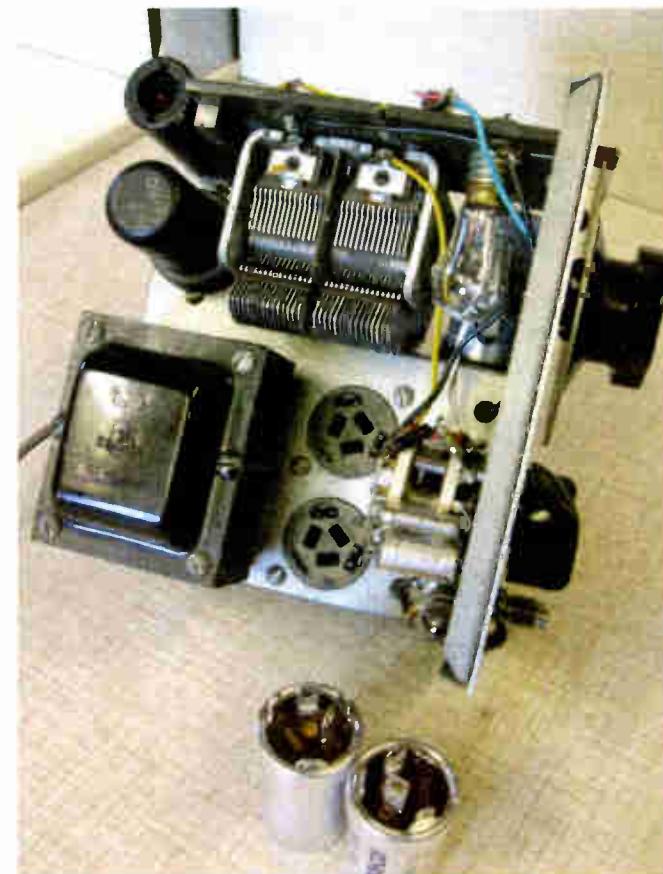
The next step was measuring the distortion level of the test equipment. The audio oscillator is connected directly to the distortion meter. The total noise, hum and distortion of the combo is measured, and for FM proofs, it needs to be 0.25% or less, for AM, 0.5% or less. For test equipment of the day, a figure of around 0.1% was average, as long as you were careful to avoid ground loops. With response and distortion checks complete, the model and serial numbers of the equipment could be recorded on the proof sheet, and the actual work could begin.

The commission's requirements for checking harmonics and spurious radiation of an AM transmitter were about as open-ended as the audio portion was prescribed. All that was stated was that the engineer needed to measure the transmitter's spurious and harmonic radiation, and that such emissions be suppressed sufficiently to avoid objectionable interference to other radio services.

Taking these measurements at the transmitter site was ill-advised due to the possibility of receiver overload. They were usually done at the studio with the communications receiver connected to an outdoor antenna. The receiver was tuned slowly across each band, checking at each harmonic of the station's carrier frequency. Checks were made of the first 10 harmonics, although the second and third were usually the most problematic. Issues with excessive harmonics were usually the result of capacitors in the harmonic traps that had gone open due



The Waveforms 510-B had performance specs comparable to HP audio oscillators of the day but it was much more compact.



No space was wasted inside the Waveforms 510-B. Note the sockets for easy replacement of twist-lock electrolytic caps. Why more manufacturers didn't use these is a mystery.

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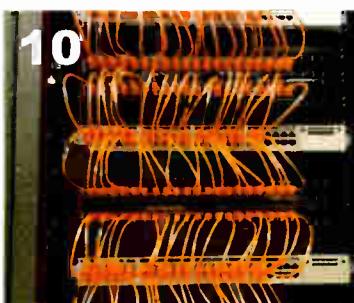
MARCH 18, 2020

## NEWS

- C-Band Plan Aims to Limit Broadcast Disruption ..... 1  
Proof of Performance, 1970s Style ..... 3

## FEATURES

- Choose Colors to Identify Cable Paths Efficiently ..... 10  
Marketplace ..... 12  
Business Watch ..... 12  
Brave New Radio Airs Live From Marconi's Home ..... 14  
When a Dairy Farm Became a Radio Blaster ..... 20



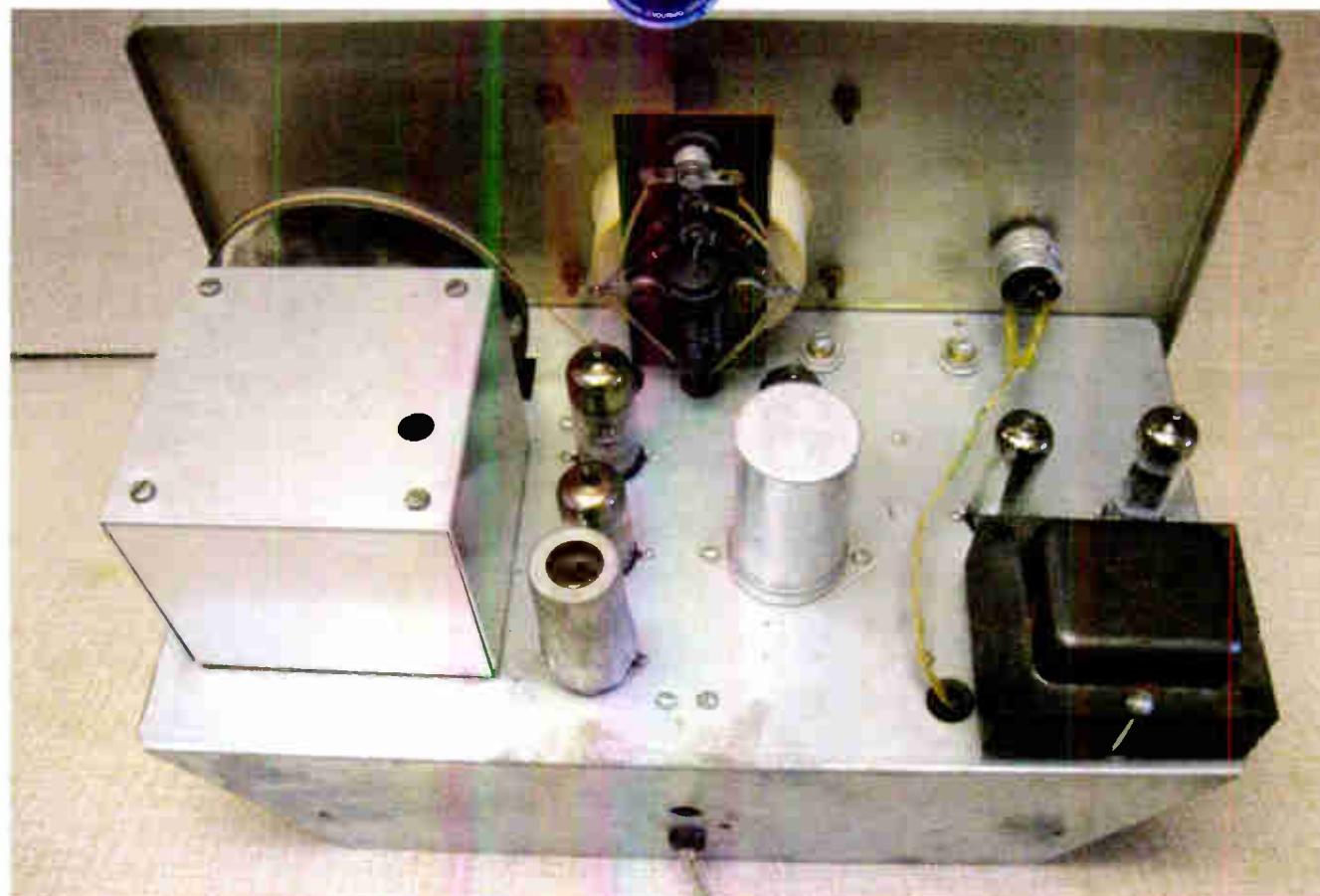
## BUYER'S GUIDE

- SBS FM Stations See Efficiency With GatesAir ..... 24  
WCLQ Leaves Tubes Behind for Nautel NV20LT ..... 26  
Rohde & Schwarz THR9 Is Cool and Quiet ..... 28  
Tech Updates ..... 28, 32, 34  
WorldCast Ecreso Transmitter Benefits Iowa Station ..... 31

## OPINION

- IP Security Considerations for Radio Broadcasters ..... 36  
Invest in People and Programming, Not More Signals ..... 37  
Reader's Forum ..... 38

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The simplicity of Heath test equipment is evident when looking inside the IM-12 distortion meter.

to lightning strikes, or loose or corroded hardware and/or connectors.

## WORKHORSE GEAR

The Wavetrons 510B audio oscillator was a real workhorse. It was a textbook resistance-capacitance tuned oscillator built very compactly, and with precision components. Tube lineup consisted of

a 6X5 rectifier, 6SJ7 oscillator, 6AK6 cathode follower and 6AK6 output.

Although sighted more frequently in manufacturing facilities, physics department labs and R&D environments, the 510 occasionally surfaced on radio station test benches. Specifications called for a range of 18 Hz to 1.1 mHz, a response of +/- 1 dB from 18 Hz to

200 kHz and distortion less than 0.2%. Noise was 60 dB below signal. These were the guaranteed specs, but the performance of some units was much better. Pictured with this 510-B is the T10 matching transformer, mounted on the bottom of the oscillator. It provided a balanced 150/600-ohm output and  
(continued on page 7)

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# C-BAND PLAN

(continued from page 1)

and even allow for some expansion of services.

Relocation costs of the band's current users will be covered, according to the chairman's plan. The FCC acknowledges new satellites will need to be launched and filters replaced on earth stations as part of the repack.

The Report and Order specifies "reasonable relocation costs of the C-Band's current users will be covered through reimbursement by the winning bidders in the C-Band auction," according to the FCC.

## STATION COSTS

There are provisions within the order that spell out reimbursements to incumbents, such as radio stations, that have C-Band earth stations that will be affected by the relocation of spectrum (see sidebar, page 8). There are approximately 20,000 receive-only dishes in the

ings and so presumably will be ineligible for reimbursement funds.

Groups like the NAB, SBE and Westwood One urged stations to register during the FCC's 2018 window. But the source, who works in the satellite infrastructure part of the industry, believes that possibly thousands of earth stations used by radio stations may remain unregistered because the application fee and burdens of registration were cost-prohibitive for some providers.

The FCC acknowledged such concerns in its draft but wrote that it will not open another window for the registration of earth stations.

"I estimate at least 25% of radio stations did not register their C-Band downlinks before the deadline, and they will be cut off from reimbursement of their costs to upgrade dishes," according to the source. "Their decision may have cost them each \$1,000 to \$5,000 because new equipment must be installed on their dish to block upcoming 5G cellular interference."



1,278 public radio stations.

"Because the process to clear the lower portion of the C-Band for 5G services and to repack incumbent C-Band users in the upper portion of the band will be extraordinarily complex, NPR has encouraged the commission to invite public comment at key points as satellite operators' transition plans and activities progress, so that any deficiencies may be identified and resolved," it wrote.

NPR, according to an ex parte notice about its communications with the FCC, proposed measures to ensure reimbursement of all transition-related costs incurred by current C-Band users and to mitigate interference from new 5G services.

The FCC, which says it has broad support for its C-Band plan across Capitol Hill, expects the cost for all incumbents to transition in a repack to range from \$3 billion to \$5 billion, which includes new satellites and filters on earth stations. Specifically, the FCC estimated earth station costs in the range of \$1 billion to \$2 billion for repacking transponders, filter installing, re-pointing earth station dishes and antenna feeding.

Pai says the FCC is committed to covering all relocation costs incurred by satellite operators and broadcast networks. His draft Report and Order cautioned: "We recognize that incum-

bents may attempt to gold-plate their systems in a transition like this. Let us be clear: Incumbents will not receive more reimbursement than necessary, and we require that, to qualify for reimbursement, all relocation costs must be reasonable.

"We expect incumbents to obtain the lowest-cost equipment that most closely replaces their existing equipment or, as needed, provides the targeted technology upgrades necessary for clearing the lower 300 megahertz."

In an ex parte notice of its own, the NAB said it understands the interest in "avoiding gold-plating of facilities during the transition," but "the commission should not require or allow the clearinghouse to second-guess specific commitments already made by the satellite operators that are necessary to ensure continued service, or specific technology choices made by programmers. This is particularly important because there will not be one-size-fits-all solutions for the transition."

Under an accelerated relocation incentive package, Pai's plan will allow fixed satellite operators and other incumbents to tap a pool of another \$9.7 billion if they meet the accelerated milestones. The FCC specifies it will offer incumbent space station operators the option to accelerate the repack process for the lower 120 megahertz during

(continued on page 8)

contiguous U.S., according to the FCC. "There has been extensive discussion of the work and costs that could be incurred by incumbent earth stations, those who were properly registered with the commission. And the possible costs they'll be reimbursed for, such as new filters, potentially labor costs to re-point antennas or installing of new antennas," according to a senior FCC official.

Details on eligibility requirements and how stations would submit for reimbursement are expected later in 2020.

At least one source believes that a substantial number of small rural radio and television stations and private networks that rely on C-Band programming failed to submit registration fil-

The insider says the FCC's reimbursement plan is "quite generous" and will protect the majority of radio broadcasters but that unregistered earth station owners will have to pay for the new gear out of their own pockets.

"That might be a \$500 dish filter and a few hundred dollars for labor to re-point it, but what happens if the dish has marginal reception already? It might become unusable, and then you need a new \$4,000 dish and more money for a new pad," he said.

## “EXTRAORDINARILY COMPLEX”

The National Association of Broadcasters called Pai's plan "an important step toward ensuring a stable C-Band ecosystem following reallocation," said NAB Executive Vice President of Communications Dennis Wharton.

National Public Radio has been pressing the FCC for clarity about the financial ramifications of a massive C-Band migration of satellite earth-stations. NPR has a lot riding on the FCC's decision since the Public Radio Satellite System depends on C-Band for distribution of programming to approximately



# PROOFS

(continued from page 5)

a response of 20 Hz to 50 kHz. The 510B's specs were comparable to the HP audio oscillators of the day, but the 510 was much smaller, measuring just 4 inches wide by 6 high and 6 deep.

The Daven VT-795 was simplicity itself, consisting of 10-, 1-, and 0.1- dB/step attenuators, wired up in series. Double banana jacks were provided for input and output. There were no other components, and no maintenance was required.

The IM-12 harmonic distortion meter was to be found on many workbenches. The theory behind these meters is rather simple. To determine how much distortion has been added by an amplifier, simply subtract the input signal from the output signal. What is left over was generated by the amplifier, mostly harmonic distortion, usually with a bit of hum and noise thrown in. A Wein bridge, with a negative feedback network across the bridge circuit is used to null out the fundamental frequency.

Regular maintenance for the IM-12 consisted of checking its six tubes, going over switch contacts and adjusting the tweaks for voltmeter calibration, coarse balance and hum balance.

The Heath GR-54 was in production in kit form from 1966-71, with the price increasing from \$85.00 to \$135. If assembled carefully, it would perform well, although sometimes it was not without "issues."

The GR-54 had all major components on three circuit boards: IF-audio, RF-oscillator-mixer and band switch. All of these boards relied on a solid mechanical connection to the chassis for grounding. This was never a good idea. If the kit builder didn't adequately tighten the mounting hardware, or left the lock washers off, erratic and unusual problems could result. The same thing occurs to most GR-54s after being stored for a few decades in a damp basement, as corrosion takes its toll.

Circuit updates for the GR-54 are readily available online. Full restoration can be a tedious but not complicated process. The result is a solid, well-performing receiver.

The 510-B and the Daven attenuator shown with this article came from a college surplus grab in the early 1970s. They saw regular use in contract engineering duties through the mid-'80s. The IM-12 was a gift from a fellow contract engineer, who was relocating, and didn't have room to pack it. The GR-54 was acquired about 20 years ago from a non-technical friend who purchased it at a yard sale. It didn't work well, and got handed off to me. After downloading a manual and rounding up the usual suspects, it was returned to good operating



The Heath GR-54 communications receiver could be used for the harmonic check portion of the AM proof, and to calibrate the FM modulation monitor prior to the FM proof by using the Bessel null method.

condition.

*Tom Vernon is a longtime contributor to Radio World. He wrote last September about the history of remote control systems; read it at <https://tinyurl.com/rw-remcon>.*

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## C-BAND PLAN

(continued from page 6)

Phase I of the accelerated relocation, which needs to be completed by Dec. 5, 2021. To be eligible for Phase II payments, operators must clear the remaining 180 megahertz by Dec. 5, 2023.

Pai's plan requires the 280 megahertz of spectrum to be transitioned to flexible use in the United States by Dec. 5, 2025.

"We find a mix of carrots and sticks best accommodates the need to clear FSS operations out of the lower 300 megahertz as quickly as possible to facilitate new terrestrial, flexible-use operations and the need to preserve the content distribution ecosystem now contained in the C-Band," according to the proposal.

The FCC for now will retain C-Band operation in areas outside the contiguous U.S. It excludes Alaska, Hawaii and Puerto Rico from being repurposed for terrestrial wireless use.

The lower 280 megahertz of the C-Band will be made available for flexible use, including 5G, through a public auction (Auction 107), which the chairman wants to begin in December. Pai did not disclose how much the FCC hopes to generate from the spectrum auction to 5G service providers.

The push for deploying advanced wireless services has been high on Pai's agenda, observers said. The FCC's 5G FAST plan is to free up more spectrum for wireless carriers and promote wireless infrastructure deployment, according to FCC filings.

The Report and Order establishes a Relocation Payment Clearinghouse to manage the intake, payout and auditing of relocation funds for incumbents. It also establishes a Relocation Coordinator to oversee the technical aspect of the transition and develop timelines, according to a senior FCC official. The commission will require satellite operators to submit a transition plan by this summer describing the estimated costs and the necessary steps needed to clear the bottom 300 MHz of spectrum.

The NAB in February asked the commission to allow satellite customers to comment on each satellite operator's transition plan before approving it.

The C-Band Alliance, which included satellite operators Intelsat, SES and Telesat, had originally proposed a private sale of the spectrum, which was rejected by the FCC. The C-Band Alliance has since dissolved.

SES and Telesat issued statements praising the FCC's leadership on the issue following the release of the Report and Order in February.

However, some industry observers still worry the FCC spectrum auction could face legal challenges and delays.

Bloomberg Law reported in early March that Intelsat is considering a possible Chapter 11 bankruptcy filing if the FCC fails to boost the compensation levels paid to operators for vacating part of the C-Band spectrum. The FCC has said it won't reconsider.

Intelsat is eligible to receive up to \$4.87 billion in proceeds, according to the Report and Order, which is about half of the compensation pool.

The FCC makes the argument that there is plenty of room for all of the lower C-Band to be repacked to the upper 200 MHz.

"In March 2019, the most recent month of data collected, the combined FSS downlink capacity and usage of the 66 satellites was, respectively, 59,427 megahertz and 33,138 megahertz in total with 19,961 megahertz of usage providing service to the United States (i.e., 33.59% of the total capacity of the 66 satellites)," a senior FCC official wrote in an email to Radio World.

The FCC adopted the C-Band Report

## REIMBURSEMENT CONSIDERATIONS

*Here's what the FCC C-Band Report and Order says about reimbursements for operators of incumbent earth stations:*

For incumbent earth station operators, we expect the transition will require two types of system changes that may occur separately or simultaneously: earth station migration and earth station filtering.

First, earth station migration includes any necessary changes that will allow the earth stations to receive C-Band services on new frequencies or from new satellites once satellite operators have relocated their services into the upper portion of the band. For example, in instances where satellite transmissions need to be moved to a new frequency or to a new satellite, earth stations currently receiving those transmissions may need to be retuned or repointed in order to receive on the new frequencies or from the new satellite. Such a transition requires a "dual illumination" period, during which the same programming is simultaneously downlinked over the original frequency or satellite and over the new frequency or satellite so that the receiving earth station can continue receiving transmissions from the original frequency or satellite until it retunes or repoints the antenna to receive on the new frequency or satellite.

Earth station migration may also require the installation of new equipment or software at earth station uplink and/or downlink locations for customers identified for technology upgrades necessary to facilitate the repack, such as compression technology or modulation.

Second, passband filters must be installed on all existing earth stations to block signals from adjacent channels and to prevent harmful interference from new flexible-use operations. Earth station filtering can occur either simultaneously with, or after, the earth station migration. All of these earth station migration actions must be coordinated with satellite transponder clearing in order for earth stations to continue receiving existing C-Band services during and after the transition. As such,

**The lower 280 megahertz of the C-Band will be made available for flexible use, including 5G, through a public auction (Auction 107), which the chairman wants to begin in December.**

and Order at its open meeting in late February, bypassing a notice of proposed rulemaking. The FCC expected to open a comment period on the auction procedures.

Chris Imlay, general counsel to the Society of Broadcast Engineers, said fairness in spectrum allocations decision-making is rare, because there is almost always a preferred outcome determined in advance.

we expect relocation costs to include the cost to migrate and filter earth stations, including costs to retune, repoint and install new antennas and install filters and compression software and hardware.

Some commenters request that the commission give incumbent earth station operators flexibility to replace existing earth stations with fiber in their transition planning. We agree that providing incumbent earth station operators flexibility may allow them to make efficient decisions that better accommodate their needs. But we also recognize that replacing existing C-Band operations with fiber or other terrestrial services may be, for some earth stations, more expensive by an order of magnitude.

As such, incumbent earth stations operators will have a choice: They may either accept reimbursement for the reasonable relocation costs by maintaining satellite reception or they may accept a lump sum reimbursement for all of their incumbent earth stations based on the average, estimated costs of relocating all of their incumbent earth stations. We require incumbent earth station operators (including any affiliates) to elect one of these two options, which must apply to all of each earth station operator's earth stations, in order to prevent any improper cost shifting. And we require the decision to accept a lump sum reimbursement to be irrevocable — by accepting the lump sum, the incumbent takes on the risk that the lump sum will be insufficient to cover all its relocation costs — to ensure that incumbents have the appropriate incentive to accept the lump sum only if doing so is truly the more efficient option. We direct the Wireless Telecommunications Bureau to release a Public Notice announcing the lump sum that will be available per incumbent earth station as well as the process for electing lump sum payments by September 30, 2020.

The commission will allow reimbursement of some soft costs — legitimate and prudent transaction expenses incurred by incumbents that are directly attributable to relocation. We define soft costs as transactional expenses such as engineering, consulting and attorney fees. We find it reasonable to establish rebuttal resumption that soft costs should not exceed 2% of relocation hard costs.

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# Choose Colors to Identify Cable Paths Efficiently

Also, learn about some savvy power strip options, capacitor best practices and more

## WORKBENCH

by John Bisset

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

**M**ary Schnelle sent along a few pictures from her visit to Entercom Philadelphia during the construction of a multi-studio project. Mary works for BGS, one of the project's vendors.

Of particular interest to Mary was Chief Engineer Don Melnyk's color-coding of the IP cable runs. Both the Ethernet cabling and the RJ45 jack-fields can be purchased in a variety of colors (see Fig. 1).

**Not only do the colors help distinguish different network paths, they can be very helpful in troubleshooting.**

course, use the typical grey cable, as seen in Figs. 1 and 2. Colored jumpers are used between switches and jack-fields in Fig. 3.

Not only do the colors help distinguish different network paths, they can be very helpful in troubleshooting. Large plants like Don's could be filled with tons of grey wire, but after those

controlled power strips also has increased.

Frank Hertel, a principal consultant with Newman-Kees RF Measurements and Engineering, sent along a link to an inexpensive Wi-Fi smart outlet power strip with surge protection for under \$30. The strip provides four AC outlets and the USB Homekit cord for Alexa or Google Home.

Neither Frank nor I would want to trust a transmitter site to one of these inexpensive units. However, if you need

To find similar products, Google "Wi-Fi-controlled power strips."

**F**rank also included a link to a beefier Wi-Fi power strip. The Pro Switch by Digital Loggers provides eight switched outlet sockets and two unswitched outlets. It uses oversize 40A relays for the switching. Control is by secured Wi-Fi or wired Ethernet.

An online manual is available from [www.digital-loggers.com/proman.pdf](http://www.digital-loggers.com/proman.pdf), but here are some of the salient features:

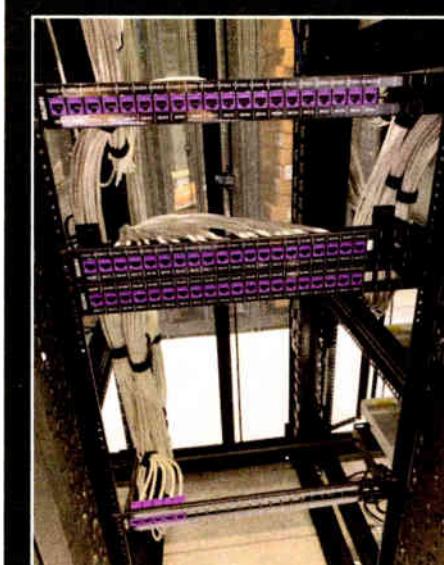


Fig. 1: The RJ45 jackfields can be color-coded.

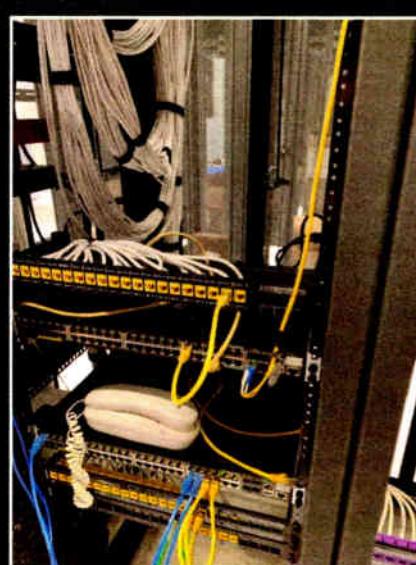


Fig. 2: An example of color-coding IP cable runs.

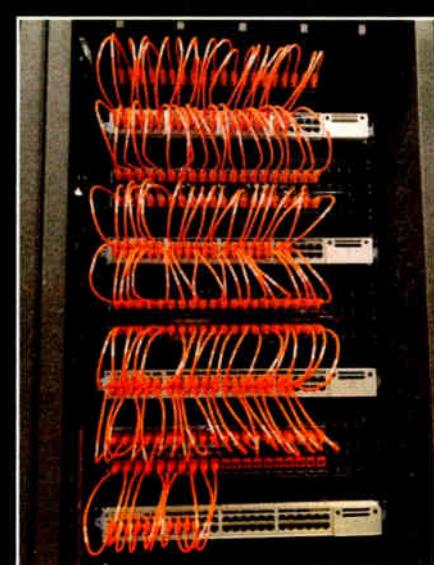


Fig. 3: Even jumpers can be color-coded, this time between switches and jack-fields.

As you plan an audio-over-IP installation you may want to consider this: The difference in the cost of colored and typical grey cable is negligible. The color choices are yours, but perhaps you could select yellow for the AoIP network, red for the phone system, blue for the automation and green for the internet. Inter-studio runs can, of

cable runs are pulled, using colors to identify the networks can make life simpler.

**A**s more houses are connected with Amazon Alexa or Google Home smart devices, the need for remote-

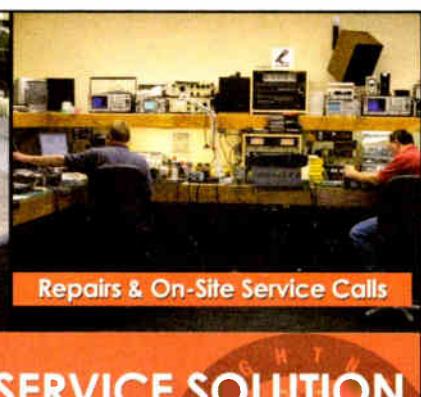
a low-cost Wi-Fi-controlled smart outlet power strip for a non-critical application, you may want to consider this option.

For more information, go to [www.aliexpress.com](http://www.aliexpress.com). Note that you must register to enter the site.

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The internal web server is accessible from any browser. Both configuration and control are web-based.

A neat element is the AutoPing Reboot. In this mode, a customer-entered IP address is continually monitored. If a server or other peripheral goes down, AutoPing will reboot the device without user intervention. What's more, the Pro will monitor several devices and multiple IPs simultaneously.

Access is limited by the administrator so that multiple users can be restricted as to which outlet(s) they can control. A built-in programmable delay timer can be used to switch outlets so they reboot in sequence.

All this for \$169. Here's the website to order one of your own: <https://ddirect.com/products/new-pro-switch>.

**R**etired engineer Michael Shovan, CBTE, writes that the subject of audio-path "clicks" caused by defective electrolytic capacitors reminded him of

(continued on page 12)

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# SOFIA 568

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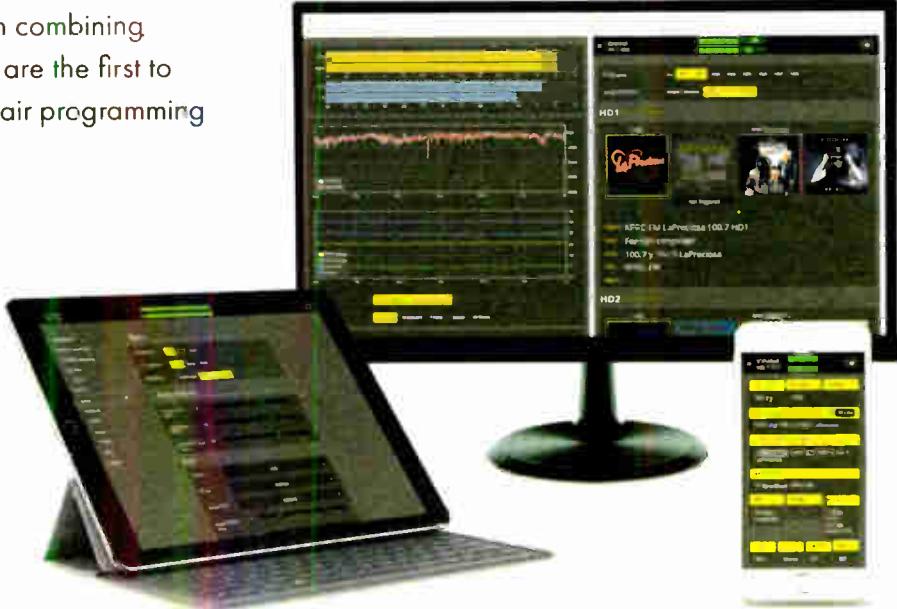


The new SOFIA 568 HD Radio SiteStreamer+ takes it up a notch combining remote off-air monitoring with a host of features to ensure that you are the first to know when there is a problem. You've got the tool to listen to the off-air programming and confirm that Artist Experience graphics are displaying correctly.

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## FEATURES

## WORKBENCH

(continued from page 10)

a problem he once experienced with distortion in an analog audio console. One could see spurious "fuzz" on audio peaks at the line outputs.

It turned out to be dried out caps on the Line Out module's three-terminal regulator load pins! Apparently, the ICs would oscillate on sudden current-draw peaks. Michael replaced the caps and banished the distortion.

More-recently, one of Michael's OTA "TV" decoder boxes lost sensitivity, and he saw ripples on one of its filter caps. He replaced the capacitors, and the ripple was gone and everything is back to "normal." Michael brings up a good point here: When you find one electrolytic to be "bad," it's best to replace them all, shotgunning the capacitors, if you will. The additional capacitors may be a bit more costly, but in the long run, the extra expense is worth it.

Just last week, Michael used two 100uf/35vDC electrolytics, back-to-back (as a 50uf/35vac "non-polarized" cap) to restore motor drive on his amateur-beam's Alliance HD-73 antenna rotator. To which Michael asks, "Isn't it great we have the 'capacity' to diagnose and repair this stuff?"

Michael sends all Workbench readers 73s. He's WB2KHE.

**N**ot only do we have the capacity to stay educated in broadcast engineering, but if you opt for SBE MemberPlus membership, you'll have access to all of the SBE Webinars — including the Workbench Tips Webinar. Access to the Webinars is an excellent resource for learning the latest in broadcast engineering. Head to [www.sbe.org](http://www.sbe.org) for more information.

*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.*

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## MARKETPLACE

**The New Switcheroo:** Getting out of the NAB Show gate early, antenna maker Dielectric is teaming up with remote control systems developer Burk Technology to add to its transmission support products line with a new dual RF switch controller.

According to a release, "The new DRFSC [Dual RF Switch Controller] device integrates SNMP and secure web-based capabilities to streamline the management of waveguide and coaxial transfer switch activation for modern TV and radio transmitters."

It adds, "Benefits include plug-and-play adaptability to accelerate installation, streamlined hardware requirements, and networked status monitoring with richer data sets."

The DRFSC can control up to two, four-port RF switches to provide RF routing in systems with auxiliary transmitters and/or antennas.

At the heart is Burk's specialized Plus-X protocol. This can provide connectivity to Burk's ARC Plus remote control system via a network connection, allowing engineers to centralize functions with other control and monitoring applications.

Dielectric explains, "Benefits include plug-and-play adaptability to accelerate installation, streamlined hardware requirements, and networked status monitoring with richer data sets." In addition, "The DRFSC's integrated SNMP control differentiates the unit from other RF switch controllers on the market. SNMP is a universal networking protocol integrated with most transmitter sys-



tems currently available."

Dielectric Western Regional Sales Manager Steven Moreen, noting the influx of modern, digitally controlled transmitters in the last decade, said, "All of these transmitters have built-in SNMP capability, and we are bringing this modernized solution to our customers for the purpose of simplifying how they remotely access, control, monitor and communicate with their RF systems."

Commenting on the technology and business partnership between the two companies, Burk Technology's Director of Sales Matt Leland said, "This powerful combination allows customers to integrate switch control into an overall facility view with graphical control screens, automated functions and flexible alarm reporting. The DRFSC represents the next-generation solution in switch controllers. We look forward to continuing our partnership and assisting our common customers with technical support and integration."

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

## Hairy Intro:

Equipment manufacturer

Samson is venturing into the broadcast market with the Q9U, a dynamic XLR/USB microphone.



Featuring analog and digital connectivity with an XLR output and USB C connection with 24-bit/96 kHz audio resolution, the new microphone is intended for broadcasting, podcasting and streaming.

The Q9U features a humucking neodymium capsule that is isolated from mechanical noise by an internal air-pneumatic shockmount. The capsule has a cardioid pickup pattern to provide off-axis rejection. The design includes a dual-layer windscreens to help minimize popping and plosives, while low-cut and mid-presence boost controls offer further onboard sound tailoring.

The microphone features a USB C connection for instant plug and play connectivity to a computer without any driver downloads required. Along with the onboard 24-bit/96 kHz A/D converter, the microphone body includes a zero-latency headphone output that allows users to monitor their voice directly from the source or from the computer, and offers an onboard mute switch.

The Samson Q9U will ship in Q2, 2020 for \$199.

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

## BUSINESSWATCH

## STUDIOHUB PRODUCTS NOW AVAILABLE FROM ANGRY AUDIO

"StudioHub is back, baby!" Angry Audio founder Michael "Catfish" Dosch has announced.

Radio World reported in October that Dosch's new company planned to acquire the StudioHub line of RJ45 adapters, cables and studio accessories from Radio Systems. That has now gone through.

"We purchased the IP [intellectual property] to all of the products formerly manufactured by Radio Systems under the Radio Systems and StudioHub brands," Dosch told RW this month. "We bought the StudioHub brand and trademarks, but did not buy the Radio Systems brand. We also purchased all remaining inventory of Radio Systems."

The terms were not disclosed. It was a three-party business transaction between Angry Audio, Radio Systems and Michael Sirkis, who owned most of the IP for the products manufactured by Radio Systems.

Earlier, Radio Systems had announced that it would no longer manufacture its own equipment but would instead serve as Lawo's exclusive U.S. distributor.

Angry Audio is now offering the StudioHub products on its website at its own brand page.

Angry Audio is not continuing the Millenium console line. "We will however provide spare parts support for owners of Millenium consoles on a 'best effort' basis, meaning as long as we have, or can reasonably obtain, inventory," Dosch said.

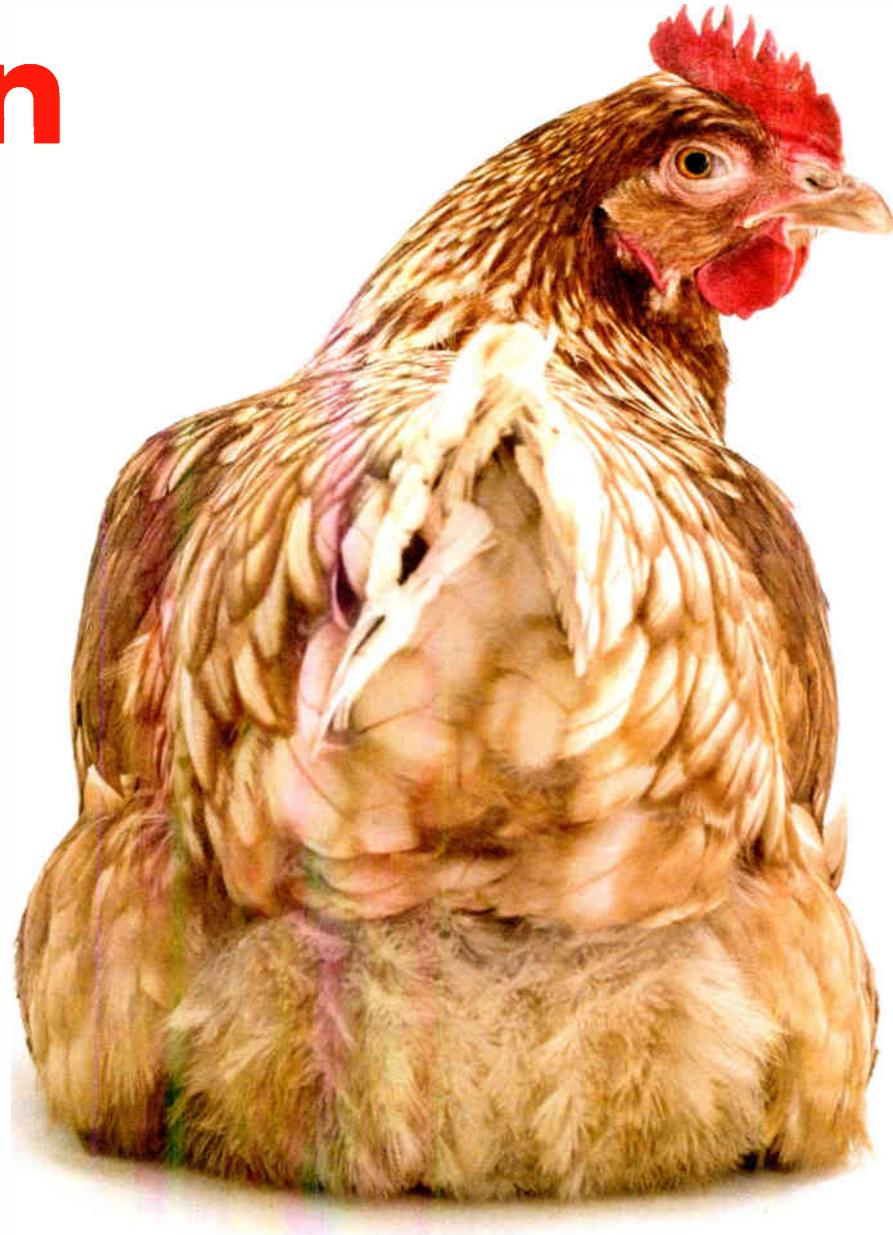
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World Radio History

## FEATURES

# Brave New Radio Airs Live From Marconi's Home



To celebrate World Radio Day, we traveled to Italy to broadcast live from the place where radio was invented

BY ROB QUICKE

### PONTECCHIO MARCONI, ITALY —

The first time I saw Guglielmo Marconi's childhood home, I felt as if I were entering hallowed ground.

After 30 minutes of driving from central Bologna, located in the Emilia-Romagna region northern Italy, the roads became smaller and the landscape of farms lined with pencil-shaped Cypress trees opened up. We were presented with a lush, rolling countryside accentuated with picturesque Italian villas, some of which are hundreds of years old.

Guglielmo Marconi's house is on an old bumpy road. Driving down the long driveway, we saw rising before us a magnificent buttery yellow house, with three floors, 17 front-facing windows and a circular driveway in front of its heavy, green doors.

### MAKING HISTORY

These are the same doors that a young Marconi would have used thousands of times as a child growing up in his father Giuseppe's house. The huge house, called "Villa Griffone," is a remarkable place in its own right, but what has secured its place in history and as a national Italian monument is the fact that it was in this house that radio as we know it was invented. The successful experiments that young Marconi conducted, remarkably without having received a college degree or much formal education, would reverberate around the world and forever change wireless communications history.

I was here with a small team from William Paterson University, where I am professor and chair of the communication department, to create a moment, albeit small, of radio history. Our radio station, WPSC — Brave New Radio,

**We would be broadcasting to the world in the very place that radio technology was invented.**

was here to broadcast a live, three-hour show on World Radio Day (Feb. 13), as well as to launch a brand-new radio station called Outside Radio.

To make the event even more remarkable was the fact that it was also happening in the 125th anniversary year of Marconi's first successful wireless transmissions from that very house in 1895. We would be broadcasting to the world in the very place that radio technology was invented. We would also be launching a radio station that we had somehow had a hand in inspiring from our own studios back at William Pat-

erson University, New Jersey.

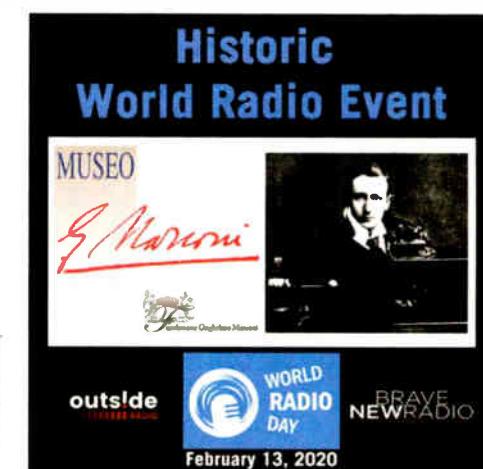
Back in August 2019, Giovanni Lenzi, an Italian student visiting us from Bologna, experienced two weeks at our radio station, Brave New Radio. That experience, as part of our Summer Youth program, proved to be a remarkable one. Under the guidance and training of one of our students at the station, Bridget Charlton, Giovanni was able to take to the mic at the end of the two weeks and have his own radio show.

Giovanni is autistic, and his ability to communicate so fluently and passionately on the radio astonished his family and friends. It was as if sitting in front of a microphone unlocked his ability to communicate. The radio station literally helped him to find his own voice.

Deeply moved by this event, Giovanni's father, Alberto, was inspired to create Outside Radio in Italy for his son, and others like him, who could present radio programming from their point of view and find inclusion for those who may struggle with special needs. It was a radio station for outsiders to create programming not heard anywhere else.

### COINCIDENCE

Shortly after Giovanni's summer experience, Alberto flew over to see our radio station for himself. As he was about to leave, we passed our trophy cabinet, and I pointed out our Marconi Radio Award that the National Associa-



The official promotional graphic for the event.

tion of Broadcasters had awarded us in 2018 for Non-Commercial Radio Station of the Year. It's an award that is considered the highest accolade possible in the radio industry, and we are very proud of it. Alberto responded with delight, "Wow! Did you know Marconi was born in the city where I live? Bologna."

That seemed like an unbelievable coincidence. I suggested an idea: What if we could help launch his new radio station at the Marconi house and also coincide the launch to celebrate World Radio Day 2020? He enthusiastically agreed to contact the Marconi Foundation and propose the idea.

Soon after, we were thrilled to hear that the Marconi Foundation embraced the idea, as it was also the 125th anniversary of Marconi's first successful wireless radio transmissions. It all seemed to come together in one, now potentially historic, event.

I contacted UNESCO, the organizers of World Radio Day, next. Alex Da Silva, at UNESCO's department of Media Development and Society, responded positively and shared that UNESCO "want to highlight your initiative of a radio run by students with autism." It seemed that our proposal resonated with their theme for WRD2020, which was "We Are Diversity Radio."

The project seemed absolutely compatible with this theme, as Outside Radio was giving a voice to those perhaps marginalized in society because of their special needs, and giving them an important outlet for their views and opinions.

### SETTING THE STAGE

At 2 p.m. on Wednesday, Feb. 12, the day before the main broadcast, I took (continued on page 16)

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The press conference at the University of Bologna. Pictured from left are Dr. Rob Quicke, Professor Corazza and Alberto Lenzi.

## MARCONI

(continued from page 14)

part in a press conference at the University of Bologna, along with Alberto Lenzi, Giovanni's father and founder of Outside Radio, and the President of the Marconi Foundation, Professor Giovanni Emanuele Corazza. The University of Bologna is the world's oldest university, founded in 1088, and home of over 85,000 students, who busily pass through the ancient corridors and lecture rooms.

I must be honest and admit that in the press conference I did not understand anything that the other two gentlemen were saying to the cameras, but a translation of Italian was not necessary when Alberto was very emotional talking about how his son Giovanni had found his voice on Brave New Radio and now was launching his own radio station. The next day we were on the Italian TV news as well as in several newspapers and websites.

The adrenaline of being at that press conference got my heart pumping but the next day, we found ourselves setting up our remote radio studio in a room

full of Marconi's wireless inventions and a life-size photo of Marconi, who seemed to be overlooking our efforts to make this broadcast happen. The combination of excitement, nerves, and adrenaline added urgency to our preparations, and it felt surreal that this was actually going to happen. We would go live at 2 p.m.

Villa Griffone is the site of the Marconi Museum, dedicated to the origins and development of radio communications. After Marconi died in 1937, the villa also became the home of the Marconi Foundation, set up in 1938, to keep alive the memory of the great inventor and to continue his work promoting innovation and creativity.

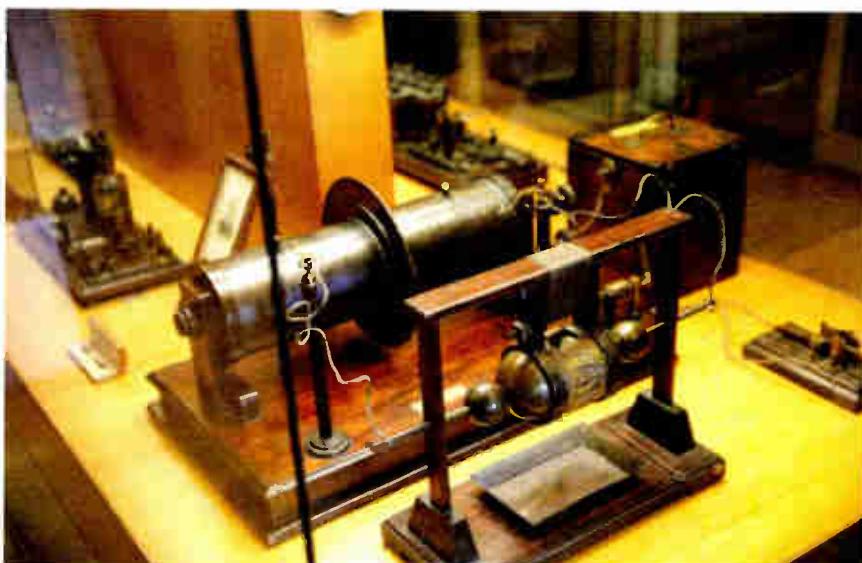
The foundation is closely tied to the University of Bologna. Its president, Giovanni Corazza, is also a professor at the university. We all felt honored by his participation in our broadcast.

### INTERNATIONAL PARTICIPATION

Now we were about to go live from the center of a room, which had Marconi's inventions literally surrounding us in display cabinets and on the walls. The air was thick with history and that



Brave New Radio's Sebastian Escobar (beneath window) co-hosts the radio show.



One of the many inventions in the museum.

Photos courtesy of Greg Mattson, William Paterson University

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only put pressure on us to make sure our broadcast would be successful.

Precisely at 2 p.m. local time in Bologna (8 a.m. in New Jersey), our mics went live and our broadcast began. Much that happened in the three hours we were on the air, and those that regularly broadcast on the radio know it feels like time goes by very quickly when you are on air. This broadcast was no exception.

Some highlights of our broadcast included greetings from all around the world, such as Hong Kong, Finland, Sweden, United Kingdom, the United States, Ireland, Oman, Spain, Italy and other countries, all recorded specifically for our program.

**We estimate at least 12 countries and more than 50 radio stations were a part of this historic broadcast.**

I was also deeply proud of our communication student from William Paterson University, Alyssa Robbins, who interviewed the Marconi Foundation's president live and asked him some great questions. My co-host was Brave New Radio Station Manager, Sebastian Escobar, who also did a brilliant interview with Barbara Valotti, the director of the Marconi Museum. She's an expert on Marconi's early years, and she gave some fascinating insights into the mind of a young Marconi in 1895.

In the second hour we officially launched Outside Radio, and we presented the team of eight students with an engraved trophy from the Brave New Radio team, congratulating them on launching their station. They were clearly delighted and surprised by the gesture.

#### GREAT CONTENT

The Outside Radio team had recorded some great content, which we played on the air, including an interview with Marconi's surviving daughter Elettra Marconi, who gave extraordinary insight into how she experienced her father's legacy firsthand. They also produced and played the "Impossible Interview with Guglielmo Marconi," a piece that imagined an interview with Marconi if he were alive today, and his thoughts about how far we've come with the technologies he invented.

I was also pleased with my interview

with Mirta Lourenço, chief of Media Development and Society at UNESCO. She was thrilled with our launch and congratulated the team on the event and the launch of Outside Radio. It felt that our efforts had been legitimated by our recognition from UNESCO and Mirta's kind words to us: "Congratulations! What a nice story! ... How important it is that these students will be able to access and express themselves and have their own radio station. I think Marconi would be proud!"

Similarly enthused, Alberto Lenzi was both moved and moving in his words, which paid tribute to his son Giovanni and the journey that Outside Radio was now embarking upon.

Then, just before the very end of the broadcast, we surprised everyone and presented them with specially engraved medals

(continued on page 18)



Student broadcaster Alyssa Robbins takes the mic

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# MARCONI

(continued from page 17)

that recognized the historic event and also the launch of Outside Radio.

When we finally closed the mics at 5 p.m. we knew that all had gone smoothly and we had accomplished something special and memorable. In the birthplace of radio itself, a new radio station had been launched. We had paid tribute to Marconi and his enduring legacy, and radio stations around the world had taken the livestream on their own airwaves and contributed material to the broadcast.

## MORSE CODE

It's hard to know for sure how many countries participated, but we estimate at least 12 countries and more than 50 radio stations were a part of this historic broadcast. We were able to use the World College Radio Day network of stations that I had co-founded to share the news of our broadcast and encourage their participation in the event.



A job well done! The team assembles outside after the broadcast.

Photos courtesy of Greg Mattison, William Paterson University

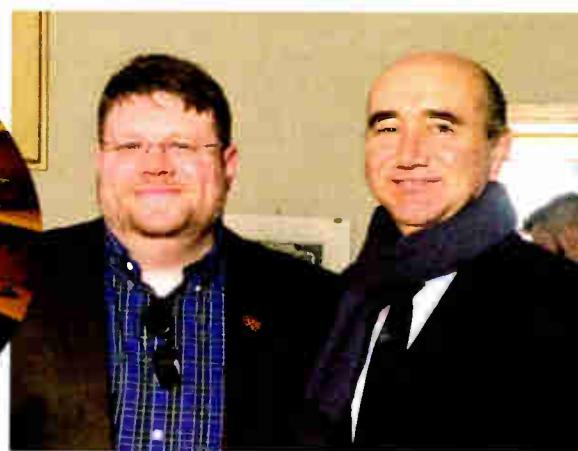


Presenting the Outside Radio team with medals celebrating their launch

As we packed away the last of the microphones and rolled up all the cables, I noticed something left on the table that we had used to broadcast from. It was something that had been given to us just before the broadcast began: A very thin strip of paper that could have easily been mistaken for trash and been thrown away.

The thin strip of paper had a series of dots and dashes on it, with letters written under each series of them, denoting their corresponding Morse code letter. It read "B R A V E N E W R A D I O."

Just before we went on the air, one of the tour guides had set up Marconi's equipment, the same as he had in 1895, and had tapped out our radio station name wirelessly, which then came out on a paper feed from a Morse printer



Rob Quicke, left, stands with Professor Giovanni Emanuele Corazza.

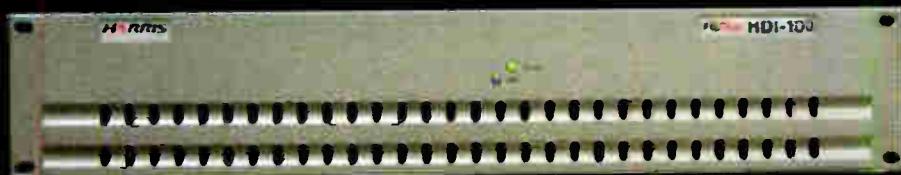
next to it.

We all watched with amazement, as likely those 125 years before us also had. I now held the tiny strip of paper in my hand and marveled at how something so small had been, in fact, so revolutionary. It had changed the world. Now, isn't that something?

*Dr. Rob Quicke is professor of communication, chairperson of William Paterson University's Communication Department and general manager of WPSC Brave New Radio. He thanks Alberto Lenzi and the Outside Radio team; producer Carlo Magistretti; the Marconi Museum and the Marconi Foundation; UNESCO; and William Paterson University.*



The Morse printer, still working more than 125 years after its invention.



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## FEATURES

# When a Dairy Farm Became a Radio Blaster

At 3XN, Bell Labs could operate high-power broadcasting tests, free of urban restrictions

BY MARK DURENBERGER

Online research can be frustrating yet often rewarding. Take the case of 3XN.

I had occasion recently to visit the ancient transmitter building of WCCO. In a rusty filing cabinet beside a dusty desk, I came upon a Western Electric pamphlet touting their new "107A transmitter." The descriptive text invited me to "visit the live testing labs at Whippny New Jersey to see the 50-kilowatt 107A in action."

The document was circa 1928 so I figured I had missed the boat and all the tickets were gone. But was there more to this invite from the three-year-old Bell Labs?

able and competitive WEAF. And once WEAF let the "commercials" genie out of the bottle, the imperative among licensees became to produce the biggest signal in order to attract the most advertisers.

Then in 1926 AT&T sold its stations to RCA (NBC) while it remained in the equipment market with Western Electric. Now its hands-on operating research would be limited to its smaller experimental stations. Many of those were impaired by their urban locations and Western Electric needed some breathing room to develop high-power hardware.

Enter Bell Labs.

**Soon planet-wide reception reports overwhelmed the tiny Whippny Post Office ... even though the station requested "no QSLs."**

I took to the keyboard.

In the late 1920s a number of major AM stations were planning power increases to as much as 50 kilowatts, and that created a competitive market for high-power transmitters. Early industry knowledge of high-power broadcast transmission was anecdotal and empirical — shared scattershot experiences among the stations of transmitter manufacturers General Electric, Westinghouse and AT&T.

AT&T's Western Electric manufacturing arm ("WECO") gained insight from its own stations, such as the vener-

## BELL LABS AND BROADCASTING

The corporate culture of AT&T's futurists was systematic research; such was the mission of the Bell Laboratories founded in 1925.

In support of WECO's transmitter development, Bell began looking for a new research site and found a dairy farm in Whippny, two dozen miles from Manhattan. Here Bell could operate high-power tests, free of urban restrictions. The site was licensed for experimental 50-kilowatt transmission with the call "3XN."

The original Whippny building was

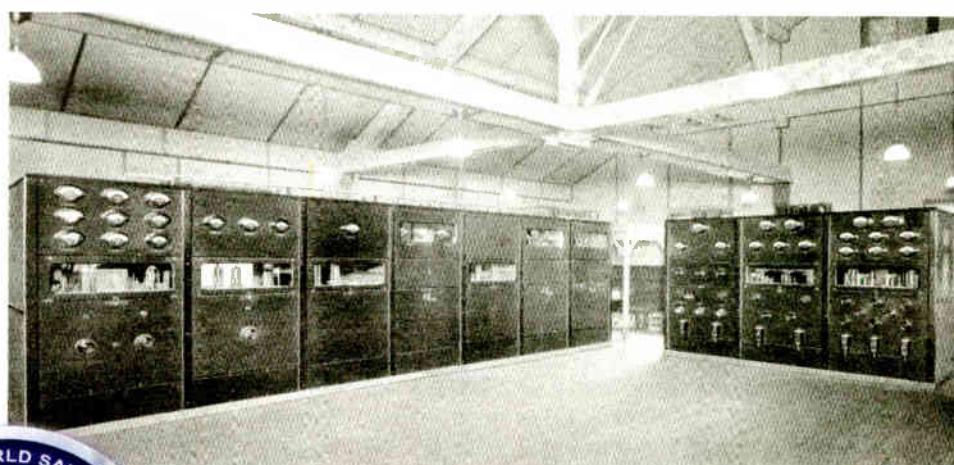


Fig. 1: The 107-A, commercial version of the Model 7.



a milking parlor. In a few short months of conversion work it became a test-bed for a 50-kilowatt transmitter project code-named "The 7A."

7A design work focused on the use of quartz-crystal controlled oscillators, stabilized feedback, superior harmonic rejection ... and, in the 7A, a transmitter design that for the first time was capable of sustained 100% modulation. It was a water-cooled behemoth that came to market as the Western Electric 107A (Fig. 1).

(At WCCO I stood in the ballroom-sized space that could accommodate a 107A. The shiny new Nautel "refrigerator" in the corner invited comparison and inevitable observations about progress.)

## THE 3XN ANTENNA

The original 3XN antenna system was a traditional "Flat Top" elevated about 250 feet (Fig. 2). The ground system was a 7,000-square-foot grid of intersecting wires in a rectangular pattern.

The curious among the staff soon

instituted an informal "antenna competition" to evaluate various antenna ideas and to raise the level of knowledge about antenna coupling-networks. One of those experiments, in which a wire was trailed from a balloon, led to the development of the vertical radiator; WABC was the first station to operate this "new vertical technology" in 1928.

3XN operation was limited to the "Experimental Period" after midnight. Soon planet-wide reception reports overwhelmed the tiny Whippny Post Office ... even though the station requested "no QSLs." Summer operations sought information about fading, skywave and performance during severe weather.

It was at Whippny that a lad by the name of William Doherty developed the "Doherty Linear" system that would revolutionize transmitter design. Meanwhile other engineers and scientists carried forward experiments of interest in the style that would characterize Bell Labs. Before long the 3XN site was being used to evaluate air-to-ground communications, underpinning the development of Whippny as a major defense-industry research site.

## TV ON RADIO

Whippny was probably best-known for a well-planned event that took place on April 7, 1927, when 3XN transmitted television by radio.

Engineers had designed a TV system prototype that used three separate information channels ("voice," "picture" and "synchronization"). The 3XN transmitter/antenna was apparently used for the aural and multiplexed sync information, and a separate 5-kilowatt transmitter and antenna were installed for the "picture." Both operated on standard AM channels (thorough details on this experiment are presented in typical Bell Systems

(continued on page 22)

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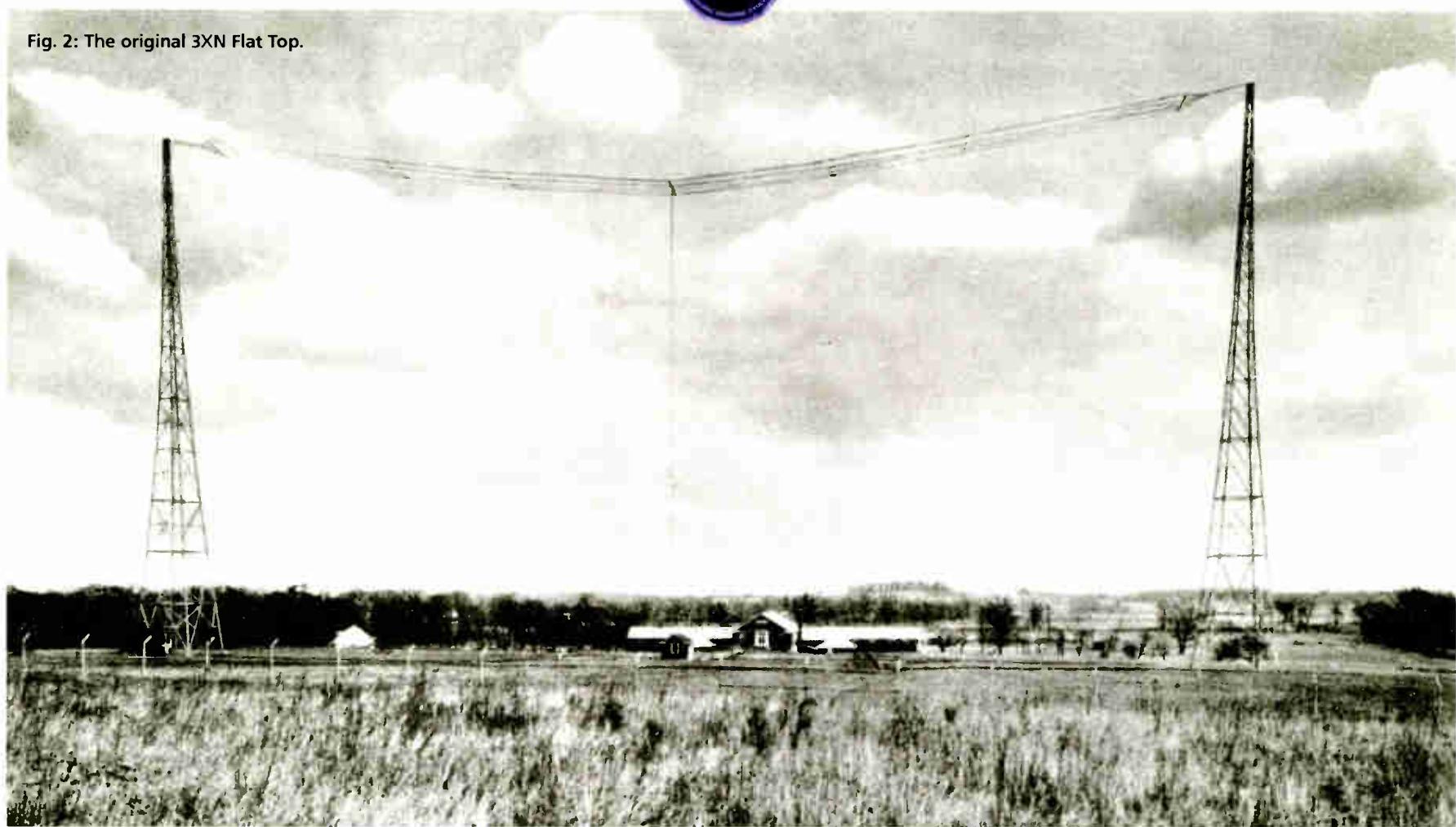
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World Radio History





Fig. 2: The original 3XN Flat Top.



## 3XN

(continued from page 20)

fashion in the Bell Systems Technical Journal for October 1927).

Herbert Hoover, whose live visage was used during the tests, became the first game-show contestant of the 20th century.

### QUESTIONS REMAIN

Little regulatory history remains within reach about the other technical operations of 3XN. For example, it appears the call letters 3XN were assigned in late 1926, yet "DX-er" reports of 3XN reception are sprinkled through their reports during the early 1920s. What signal were they hearing?

And why did The Talking Machine World of June 1928 report that Powel Crosley "intended to purchase 3XN if he was granted 50-kilowatt authority for WLW"? Was there an interference issue that had to be resolved to clear WLW for high power?

Online research is rewarding, but at the end of the day one is subjected to the possibilities of poor journalism or speculation and a grain of salt must remain on the menu. The available Bell records are thorough and detailed as to the first TV transmission, but sadly we've not found such detail on the work

behind the 107A and its successors.

It's likely that somewhere ... in some attic ... lie personal notes and diaries of those who were part of 3XN. It's less likely that a "visit to the vaults" of some Bell Labs facility somewhere will be illuminating.

But perhaps this report will stimu-

late your own interest in researching 3XN; if so, we trust you'll share your research success. (A search "non-hint": Given the highly competitive market for 50-kilowatt transmitters as major stations scrambled for signal superiority, it's unlikely you'll find much about 3XN in the RCA or GE publications.)

The Western Electric transmitters, particularly their Doherty systems, were "good iron"!

*Mark Durenberger is a technology consultant for the Minnesota Twins and a longtime contributor to Radio World. He can be reached at Mark4@durenberger.com.*

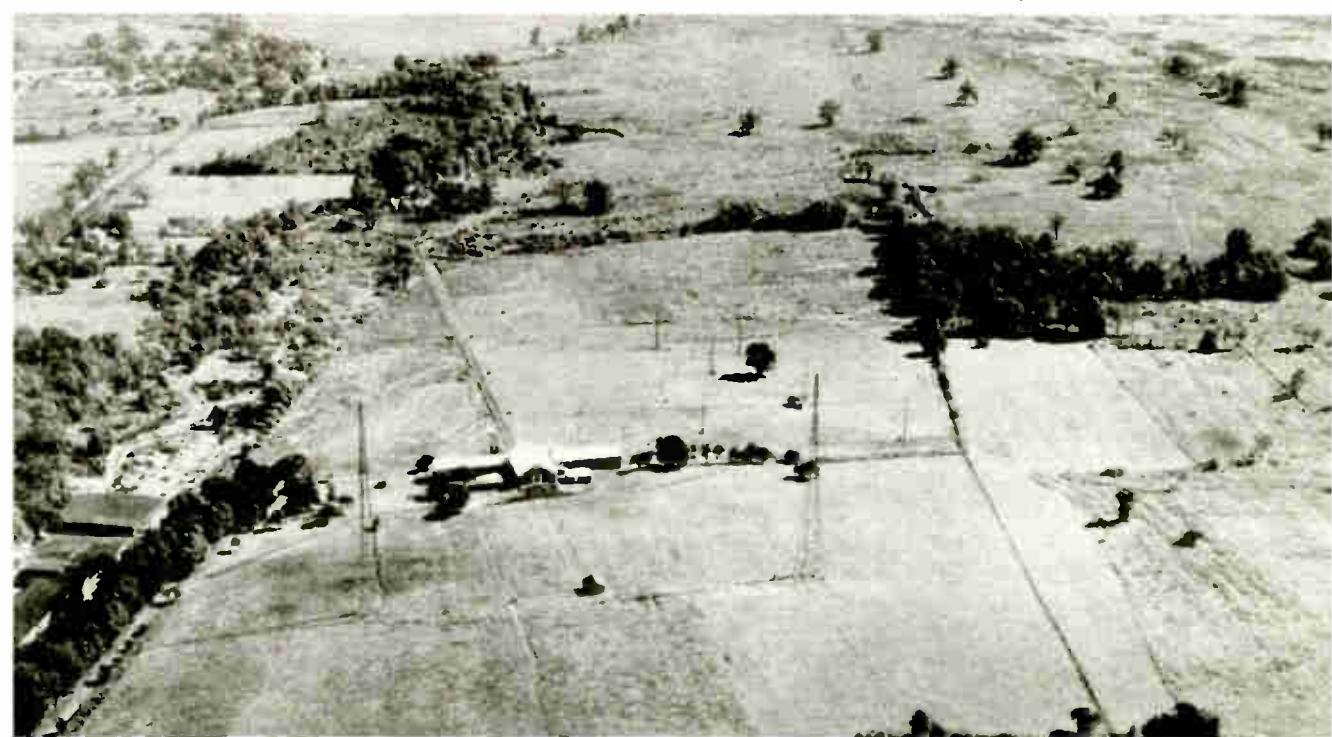


Fig 3: The Whippoorwill test site.



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# SBS FM Stations See Efficiency With GatesAir

Flexiva air-cooled units thrive in Miami weather; low maintenance worries as well

## USER REPORT

BY PIERRE JASPAR  
Vice President of Engineering  
Spanish Broadcasting System

**MIAMI** — As one of the largest Hispanic-controlled station groups in the U.S., the Spanish Broadcasting System Inc. operates 18 Spanish-language radio stations in top U.S. Hispanic markets including Miami, Chicago, New York, Los Angeles, San Francisco and Puerto Rico, along with the AIRE Radio Network, several TV stations and two internet portals.

In the Miami area, we operate three FM stations — WCMQ(FM)/Zeta 92.3, airing salsa, WRMA(FM)/Ritmo 95.7, airing Cubatón/Reggaeton and WXDJ(FM)/El Zol 106.7, airing Bachata and tropical music — making it a particularly hot radio market for us.

Last fall, we moved our transmitter facilities to the top of the Panorama Tower, a new 85-story skyscraper in Miami's trendy Brickell district. Compared to our previous Miami high-rise site, this exceptionally high perch — the tallest south of New York — is especially advantageous for over-the-air coverage.

By December 2019, we completed the construction of our new transmitter building atop the Panorama Tower, which now houses three new GatesAir Flexiva FAX-20 kW solid-state transmitters, one for each of our Miami stations. Two of these units serve as main FM radio transmitters for WCMQ and WRMA, while the third serves as a backup for WXDJ. We procured the transmitters and additional gear through SCMS, which provided outstanding customer support and service through the entire process. SCMS also brought in the experts from Klein White Engineering of Phoenix for installation services.

After evaluating the top FM radio transmitters on the market, we chose the 20 kW GatesAir Flexiva FAX20 solid-state air-cooled transmitters, primarily because their inherent PowerSmart Plus architecture enables greater energy efficiency. Over time, we expect that this energy efficient design will result in substantial energy savings that will contribute to a solid return on investment.

Since the rooftop transmitter building is only 26 by 15 feet, choosing transmitters that would pack all the features and functionality we needed into a compact size and footprint was paramount. In fact, we chose the air-cooled Flexiva FAX model because liquid cooling was not practical given that the site does not have sufficient space to accommodate the necessary plumbing.

With the Flexiva's low-maintenance design, we also find it easy to perform



**Last fall, we moved our transmitter facilities to the top of the Panorama Tower, a new 85-story skyscraper in Miami's trendy Brickell district.**

routine maintenance on the transmitters just by opening the front panel of their cabinets. Inside the transmitter, we can replace key components, such as power supplies and amplifiers, without having to interrupt the air signal because these modules are hot-swappable.

### EXCITERS

Our GatesAir package includes Flexiva software-defined exciters, which promote the reliability and stability that 24/7 operations require. With their inherent SNMP connectivity, this Flexiva transmitter model can be closely monitored from a remote location by our technicians. In fact, the system triggers alarms and notifications whenever immediate attention is required.

While WXDJ is already airing in HD Radio on its main transmitter, located at another site, we plan to enable HD Radio on its back-up transmitter in the near future. The other two stations, WCMQ and WRMA, will soon offer HD Radio for the first time. To facilitate

this, our new GatesAir equipment package includes the Flexiva FMX1 4g HD Radio platform, which comprises companion HD Radio Importer and HD Radio Exporter software.

Our HD Radio programming originates from our broadcast studios in Miami's Medley district, and the signals are transported to the transmitter site nine miles away via GatesAir Intraplex IP Link 200 codecs. These IP STL codecs use our two high-performance WAN services — AT&T and Atlantic Broadband — simultaneously, which permits signal failover to a redundant path whenever necessary. That is made possible by GatesAir's Intraplex Dynamic Stream Splicing software built into the codecs.

Once transported to the Panorama site, the program signals first pass through an Orban audio processor, which feeds them to the GatesAir HD Radio Importer/Exporter software that is downstream. At the transmitter site, our stations share a Shively

broadband panel antenna. With its two-input antenna panel design, this Shively antenna can broadcast RF signals according to two different profiles, such as omnidirectional and unidirectional, simultaneously.

### COMBINATION

In order for our three separate stations to share the same antenna, their respective Flexiva transmitter outputs must be delivered to the antenna via a complex workflow that performs high-level combining and bandpass filtering. WCMQ and WXDJ combine into a single RF signal that is broadcast in an omnidirectional pattern radiating from the Miami metro and Boca Raton south to Key Largo. WRMA's signal, which combines with the other two after passing through a bandpass filter, is broadcast from the antenna's hybrid side in a single direction, north towards Broward County.

With the Flexiva's compact, energy-efficient design, GatesAir enabled us to transition from our older, tube-based transmitters to this next-generation solid-state technology. And coupled with the other GatesAir RF products we've installed, this solution saves valuable space, streamlines routine maintenance, supports our HD Radio road-map, and boosts overall signal quality and reliability.

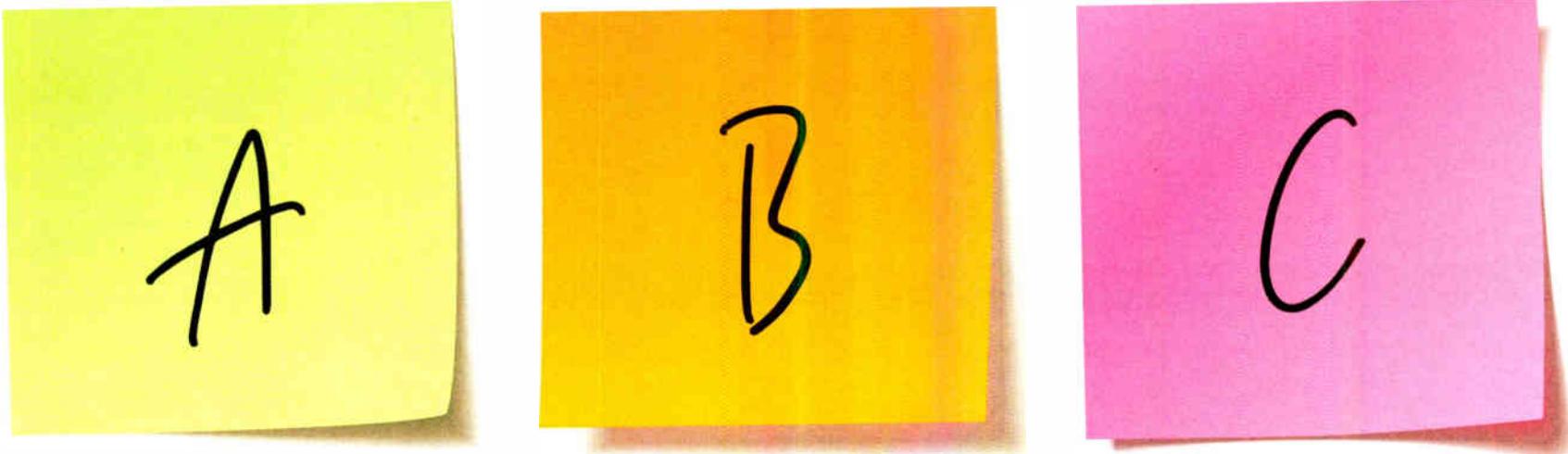
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# WCLQ Leaves Tubes Behind for Nautel NV20<sup>LT</sup>

Energy and maintenance costs lower from older tube transmitter

## USER REPORT

BY COY SAWYER  
General Manager  
WCLQ-FM

**WAUSAU, Wis.** — Our station, WCLQ, is a noncommercial 90 kW ERP Christian station in Wausau, Wis. As a noncom that relies on a steady stream of donations to meet expenses, staying on the air with a reliable signal is crucial to us. Our old Continental tube transmitter was working fine but we were starting to bump up against the realities of keeping it operational in the long term. Our budget for tube replacement and related maintenance kept going up.

We also had an interesting situation with the transmitter — we're on a hot tower with cell antennas and periodically have to reduce our power so maintenance people can climb the tower. This requires three to six hours of lower power operation, after which we would remotely call into the transmitter to increase the power again — and sometimes this didn't work.

Even worse, almost every time we went through this power reduction cycle, we had to send our contract engineering company out to retune the transmitter. The higher engineering costs involved in retuning, coupled with the higher tube costs and our power bill for keeping those tubes lit up all added up to the decision that it was time to purchase a new, more efficient solid state transmitter.

Our engineering firm, Optimized Media Group, is led by Alex Hartman. Alex now works for Nautel but was still an independent contractor at the time of our new transmitter purchase. Our conversation about a new transmitter began a discussion on tube costs. Alex told me



that in the tube market, it's "luck of the day" pricing — it can cost anywhere from \$1,500 to \$6,000 to replace a tube and the rebuilt tubes just aren't lasting like they used to. Back when new tubes were readily available, you could get close to 50,000 hours of life out of a tube. Now the typical life span is between 18 and 24 months.

The fact that our Continental was still working turned out to be one of the best reasons to replace it now. Alex noted that we could have an off-air situation at any time and potentially have to wait a long time for a critical part ... and during that off-air time we would not be bringing in any money. Alex's comment was "The time to do this is now, while the transmitter is working fine, and not

when it's a smoldering hot mess on the floor." We also discussed the potential of HD Radio operation — we aren't running HD channels yet but want to do that in the not-too-distant future. Purchasing an HD-ready solid-state transmitter and switching the Continental to a backup position made perfect sense to me.

At the Wisconsin Broadcasters' Clinic in Madison, we did some serious shopping. Nautel's NV20<sup>LT</sup> quickly jumped to the top of our list. The testimonials we heard from other users were all positive and from everything I have read and heard about Nautel, it was a confident move for us. We placed our order and the new Nautel unit went on the air in October 2019. It was a smooth switchover; our total off-air time was

less than five hours.

Dealing with Nautel in purchasing the new unit was fantastic. We had quality communication all around, absolutely no false salesmanship or technospeak that I wouldn't be able to follow. They knew how to speak to me as a GM. And, they were completely up front with the transmitter costs including shipping — nothing was hidden from me; there were no surprises.

Well, there was *one* surprise. The incredible quality of the packaging was mind-boggling. That transmitter was *so* well protected when it arrived! I am really impressed with Nautel's shipping department.

We were hoping that putting the new transmitter on the air would help our coverage area, and we have been very pleased in this regard. The signal is both consistent and competitive. There is another station on our same frequency about two hours south of us and they had squeezed us out of a pretty significant listening area when they went on air. Now we're getting good reports from people in that area that they can hear us nicely.

We're excited about the new Nautel. The periodic power reductions for the cellular phone guys are not a problem at all, we just make some keystrokes on a computer via Nautel's Advanced User Interface, and the return to full power is a painless process. Because the NV20<sup>LT</sup> is easily field-upgradable to HD Radio operation, we are now starting to plot out our HD operation ideas. We are looking into providing programming that will appeal to our full demographic and not just the younger people who like our current contemporary Christian music format.

We're getting some cost savings as well. In the few months that we've had the NV20<sup>LT</sup> on the air, our power bills have been consistently lower than in the same period last year. Even better, maintenance costs are going to plummet. Periodic maintenance can be scheduled rather than having an emergency visit to retune a transmitter that didn't return correctly to its full power. And, with a solid-state transmitter, swapping out modules can be done without going off-air at all!

So, to other general managers who are wondering about why to replace your tube transmitter even if it's still working ... I say look at your maintenance budget, tube replacement budget and power bill, and a switch will make perfect sense.

For information, contact Nautel in Nova Scotia at 1-877-662-8835 or visit [www.nautel.com](http://www.nautel.com).



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# Rohde & Schwarz THR9 Is Cool and Quiet

Initially nervous, Idaho broadcaster finds liquid cooling to work well

## ► USER REPORT

**BY BILL TRAUE, CSRE**  
Vice President, Engineering  
Riverbend Communications

**IDAHO FALLS, IDAHO** — One of our stations was operating with an older Harris transmitter, which was no longer supported, and it was due for replacement. We have two transmitters operating in the room, and it was so noisy you couldn't have a conversation in there. I was interested in replacing the transmitter with something that would run quietly. I have experience with one brand of solid-state transmitter, and it is definitely not quiet. And, naturally, I expected a new transmitter to bring cost savings in terms of using less electricity, reduced air conditioning costs and not having to purchase replacement tubes. The Harris needed a tube which would cost nearly \$3,000 rebuilt.

I surveyed the market for a solid-state transmitter that would check all my boxes. This meant considering liquid-cooled transmitters — a leap of faith for a guy used to working with forced-air cooled transmitters for 40 years. I knew the high-power UHF TV guys have been using liquid cooling with their high-voltage tubes for years but most of them seemed nervous. It was an attitude adjustment.

I reviewed the details for two brands of liquid-cooled transmitters, one of them the Rohde & Schwarz THR9, as well as the air-cooled transmitter I was already familiar with. I obtained price quotes for both the liquid-cooled units.

I did not pursue the air-cooled transmitter because it did not meet one of my requirements, since it exhausts all its heat into the room, it does not reduce the need



for cooling. It required the same amount of air conditioning that the previous Continental tube rig needed.

The liquid-cooled transmitters have an external heat exchanger that installs outside the building, and the heat goes there. There is no need to draw in outside air or provide tons of air conditioning. I ended up select-



ing the R&S THR9 20 kW transmitter, based on three factors: the splendid worldwide reputation of Dr. Ulrich Rohde and his company which includes high-end test equipment and VHF TV transmitters; the favorable price quotation; and warranty coverage that provided peace of mind.

The THR9 comes with enough coolant hose to install the heat exchanger up to 60 feet from the transmitter cabinet — it can be located further if necessary. I decided to locate it just outside the front of the transmitter building, and the THR9 sits in the middle of the room. It is compact and I wanted to retain access to all four sides of the cabinet, a decision I do not regret. The old Harris remained in place as a backup transmitter. It wouldn't have been possible to remove it anyway — it must have been installed before the walls went up.

R&S assigned a factory tech to support our installation, and he contacted me by email. He gave me a useful tip or two, but I did not find it necessary to contact them further during the install, which took me about one day after the electricians finished the AC hookup.

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I did read the factory manuals thoroughly before proceeding — they are translated from the German, and Google Translate was my friend.

Now that the THR9 is in operation, the transmitter room is much quieter than it was. The only sound in the room is the soft whoosh of the forced-air cooling in the grounded-grid transmitter of our other station at the site. The R&S transmitter is virtually silent. The only way to tell if it's running or not is to read its meters. And it has no physical meters. The front panel has an LED touchscreen with metering and control, which retracts inside the cabinet when not in use. This screen is available remotely and we can view it anywhere. The transmitter has two network connections available to use.

There are two coolant pumps inside the single cabinet. If one is removed from service the remaining pump will carry the load. Similarly, the heat exchanger has two cooling fans and if one fails, the remaining fan is sufficient to carry the load. There are four power amplifier modules in the 20 kW transmitter, and if one fails, the remaining amps pick up the load and operation continues uninterrupted. Amps can be easily and quickly removed without losing a drop of coolant.

We have two years of experience with the R&S THR9 transmitter now, and I am thrilled with its performance and reliability (and silence). And when the grounded grid transmitter is replaced, it will be with another THR9.

For information, contact Rohde & Schwarz in Maryland at 1-410-910-7800 or visit [www.rohde-schwarz.com](http://www.rohde-schwarz.com).

## TECHUPDATE



### BEXT INTRODUCES XD SERIES FM TRANSMITTERS

Bext Corp. is introducing the XD Series line of FM transmitters.

Models can be customized at the time of order. Buyers will be able to choose from a menu of features or options, selecting and paying only for the ones they need at the moment. Thanks to software-defined configurations, most other features or options can be activated later remotely, should the user need more down the road.

Features or options available for this line include digital audio modulation; built-in customizable audio processor and stereo generator; built-in FM receiver; built-in satellite receiver; onboard audio storage; built-in RDS encoder; and a built-in user manual file (USB accessible even with unit powered down or inoperable).

There's also the capability to accept audio via AES67, AES192 (MPX over IP), AES-EBU and web streaming; graphic user interface can be used via web; programmable email alerts; and built-in phase locking to GPS reference.

XD transmitters will be available in power levels of 150 W, 300 W, 600 W, 1 kW, 2 kW, 3 kW, 5 kW, 10 kW, 15 kW and 20 kW.

Models up to 5 kW are ultracompact, occupying two to four rack units. Models up to 1 kW can operate on 120 V AC power.

Bext offers phone tech support with live personnel during or after installation. The company also offers broadcast antennas, RF combiners and RF filters.

For information, contact Bext in California at 1-888-239-8462 or visit [www.bext.com](http://www.bext.com).

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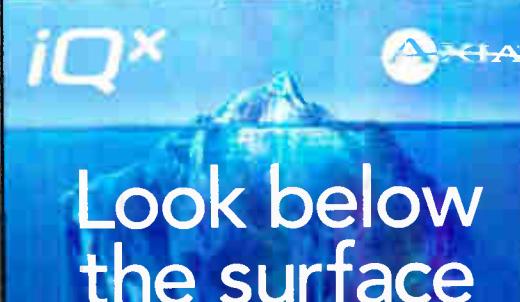
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# WorldCast Ecreso Transmitter Benefits Iowa Station

FM 3 kW packs efficiency and range of features into compact solution

## USER REPORT

BY STUART TELL  
Contract Engineer

**DUBUQUE, IOWA** — "You are kidding! That's a 3 kW FM transmitter?"

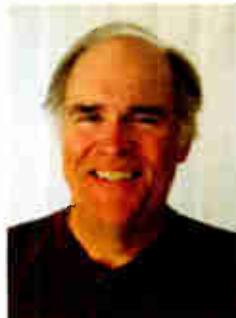
That's what I thought when I saw my first Ecreso at an FM station about 100 miles northwest of Dubuque, Iowa. It had recently hired me for some contract engineering work. To a guy who just returned to broadcast engineering after an 18-year absence, it was a wakeup call. This Ecreso unit, built by WorldCast Systems, is known as its FM 3kW. It recently replaced the station's older main transmitter.

While I cannot take credit for the purchasing decision or its installation, I can tell you that they made a great choice. It comes as a complete, compact, 3U by 19-inch rack mount unit. Modular by design, this unit boasts an efficiency of up to 76%. It is powered by a 20 A single-phase breaker (184 VAC or higher), and can also be wired for operation on three-phase power.

When I mentioned complete, you will not only have direct-to-channel digital modulation, you can license (free testing included for 30 days) a flame-throwing five-band sound processor with your choice of audio presets to match your station's format. Experimenting with the CHR and urban format settings, I was impressed how loud and competitive this baby was, all while automatically keeping the modulation peaking at 97%.

### COMPREHENSIVE SOLUTION

You can use direct AES or left/right analog in. with the optional five-band processing, or if you like your



current audio processing, use the MPX input. Other features you will like are digital MPX over AES, the dynamic RDS encoder, and audio backup from an internal micro SD card player. Remote control and monitoring can be accessed via an easy to use web interface, or hard-wired to your current remote control via the standard (in the United States) GPIO board. SNMP is supported. Local control is menu driven from the front-panel screen and button keys.

What about reliability? With Ecreso's FM 3 kW you have a standard version with two,

and download its tech guide titled "What Happens If?"

As rugged as this unit is, it's nice to know help is just around the corner. I have worked with Ecreso/WorldCast's Tony Peterle on a PSU software setting that needed changing. Tony said he could remotely change it, all he needed was IP access to the unit.

But this transmitter site has no network access. Tony's solution was to lend the station a 4G modem and a switch, and with a remote terminal access program on my lap top, he was able to remotely log in and change the setting. I really appreciate his help, creativity and patience.

Warranty-wise, three years; but for a small charge you can extend your warranty to 10 years. To me, with



hot-swappable, power supply unit modules with a load-sharing design. In the event of a DC power supply malfunction, the other PSU keeps the FM 3 kW on the air at about 1.900 W.

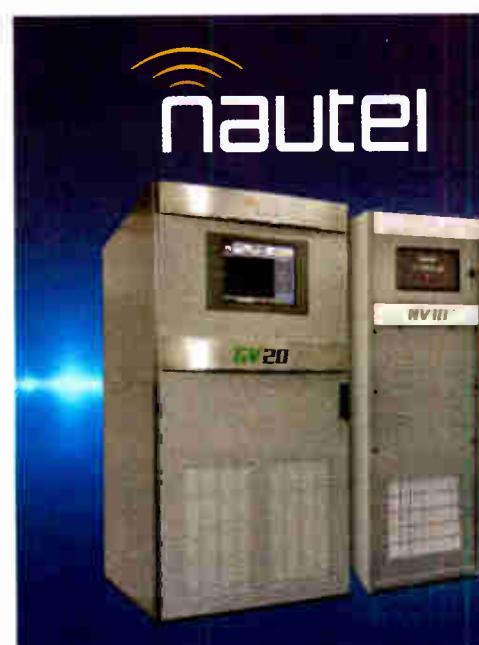
If you opt for the "+1" version, you will get an extra, or third PSU and if one is lost, you can still operate at 3.000 W RF output. RF amplification is also redundant and is capable of operating even in the event of a fault. You could lose a MOSFET and still be on air at a little over half power. In fact, Ecreso is very open about these scenarios. Go to the company's website

a warranty that long, Ecreso must be very confident of the equipment it is building.

The unit I am familiar with has been installed and running for about six months trouble-free. As for that older transmitter, the station's owner has new tubes for it and would like me to go through and get it ready for standby use. As reliable as the new Ecreso FM 3 kW is, I'm just not sure it will ever be needed.

For information, contact Tony Peterle at WorldCast Systems in Florida at 1-305-249-3110 or visit [www.worldcastsystems.com](http://www.worldcastsystems.com).

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## BUYER'S GUIDE

Transmitters

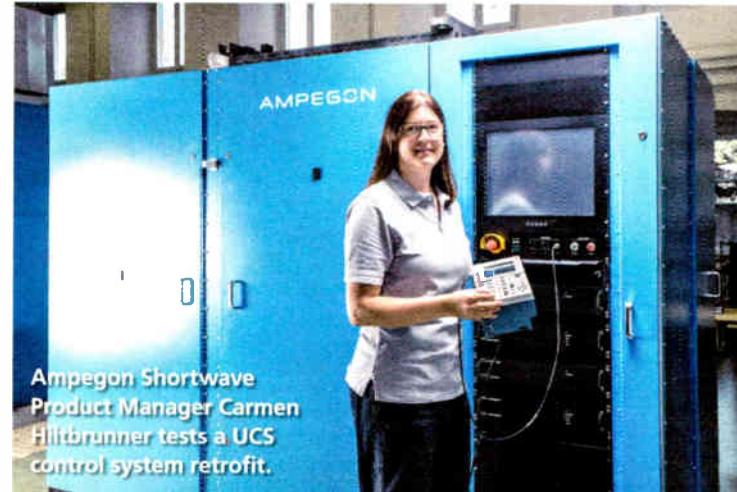
## ► TECHUPDATES

## AMPEGON PUTS FOCUS ON SHORTWAVE TRANSMITTERS

Ampegon Power Electronics highlights progress on the company's third-generation solid-state shortwave transmitters, which it says will offer "significant advances in efficiency."

The company says this work will pave the way toward higher-power broadcast outputs and meet current expectations of a shortwave equivalent to medium-wave and FM transmitters. "Combined, these two developments will bring FM-quality broadcasts with all the benefits of shortwave," said Simon Keens, Ampegon sales and business development manager.

Ampegon has also developed a retrofit upgrade to current UCS generation control systems for previous generation 100



kW, 250 kW, 300 kW and 500 kW transmitter systems.

"Given that the lifetime of Ampegon transmitters is measured in decades, many systems currently in operation — previous ECAM and ECOS-II generation transmitters supplied under the names Thales or Thomson (Ampegon's previous names) — either do not have DRM-ready control systems, or have a need for now-obsolete spares," said Keens.

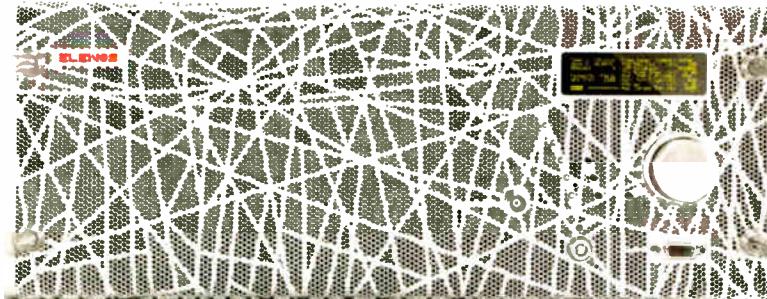
The upgrade promises to bring touchscreen technology, efficient PSM operations and "quick and precise" retuning with digital motor control to existing transmitters.

For information, contact Ampegon Power Electronics in Switzerland at +41-58-7104-400 or visit [www.ampegon.com](http://www.ampegon.com)

## ELENOS INDIUM PACKS POWER

The Elenos Indium line of efficient solid-state FM transmitters now extends to 60 kW. The company says that it has made major advances in its electrical, space and cost efficiency that will produce substantial savings for customers.

For example, by utilizing a 5 kW power block in just 4 RU, a 30 kW transmitter can be built in one 19-inch rack, complete with excitors and combiner.



Stripline (planar) technology is used in all RF stages. That improves efficiency and reduces space requirements, as well as mechanical instability.

Elenos says it has designed the power supplies to meet real-world transmitter site conditions, rather than the computer clean rooms most OEM supplies are designed for. Elenos power supplies are field-serviceable.

Its advanced Class F RF power amplifiers use LDMOS devices.

Thermal modelling and extensive thermal testing assure effective cooling and long component life, according to the company. The Intelligent Power Scheduling feature reduces running costs in less critical hours and calculates savings automatically.

A performance monitor watches assemblies for any deviations and takes measurements to optimize performance.

The Indium series is available with conventional analog or advanced direct-to-channel digital FM excitors and MPX-over-AES connections.

The remote web interface works with PCs and mobile devices. SNMP control capability is standard, along with messaging via SMS.

The series is compatible with complex SFN and N+1 designs. There is a detailed webinar of the Indium series at [www.elenosgroup.com/webinar](http://www.elenosgroup.com/webinar).

Elenos' Indium series is supported in the Americas by Broadcast Electronics and elsewhere by Elenos.

For information, contact Broadcast Electronics in Illinois 1-217-224-9600 or visit [www.bdcast.com](http://www.bdcast.com).



## RFE HAS NEW HOT-PLUGGABLE MEDIUM-POWER FM TRANSMITTERS

RFE Broadcast has introduced new hot-pluggable and redundant medium-power FM transmitters.

Part of the DS Series, the 2.2 kW and 3.3 kW units are designed to replace an amplifier module from an operating device easily so that users can continue their broadcast without service interruptions, even in the event of maintenance or temporary breakdown.

According to the company, the transmitters offer an internal design that features a "performance-packed engineering layout" in a compact size of 3 RU.

In addition, the units promise users low consumption and operating temperatures, resulting in reduced usage and maintenance costs.

The company said that its new medium-power FM transmitters are equipped with intelligent systems for device cooling, quality audio levels, enhanced digital tool interactivity, LCD touchscreens and configuration via remote control.

For information, contact RFE in Italy at +39-0968-1945299 or visit [www.rfebroadcast.com](http://rfebroadcast.com).

## ABOUT BUYER'S GUIDE

Radio World publishes User Reports on products in various equipment classes throughout the year to help potential buyers understand why colleagues chose the equipment they did. A User Report is an unpaid testimonial by a user who has already purchased the gear. A Radio World Product Evaluation, by contrast, is a freelance article by a paid reviewer who typically receives a demo loaner. Do you have a story to tell? Write to [brett.moss@futurenet.com](mailto:brett.moss@futurenet.com).

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## ► TECHUPDATES



### COMPACT BW BROADCAST V3 LINE FACILITATES OPERATION

The V3 transmitter range from BW Broadcast offers users a broad feature set and a compact, lightweight design. They are manufactured and tested in the United Kingdom.

Available in various power ranges, V3 transmitters feature as standard, a DDS exciter with AES3 audio or composite/MPX over AES192, analog left and right, and two configurable composite (MPX) program inputs and outputs. It's possible to configure composite inputs and outputs as MPX, SCA, RDS or pilot sync. Additionally an RDS encoder, built-in four-band DSP audio processor and stereo generator are included.

Slide-in power supplies are easily changed, allowing engineering personnel to change parts quickly without powering down the transmitter or requiring tools. All units have fault detection/protection for temperature and VSWR.

Standard Ethernet control with web browser, along with monitoring such as email alerts, SNMP monitoring, advanced alarms as well as configurable parallel GPI/O interface complete the package.

Full 24/7 technical support, free software upgrades for life and a two-year warranty are included.

For information, contact BW Broadcast in England at +44-208-253-0290 or visit [www.bwbroadcast.com](http://www.bwbroadcast.com).

### DB ELETTRONICA INTRODUCES PFG NEXT RANGE

DB Elettronica says its PFG Next FM transmitter series features hot-swappable PSUs for easy serviceability and maintenance.

According to the company, the modular transmitter features an efficiency of greater than 70%, is easy to configure and offers high redundancy. This, adds DB Elettronica, means the unit can operate effectively even in tough conditions.

Characteristics of the PFG Next range include low-maintenance costs, low-power consumption and efficient cooling.

In addition, PFG Next FM transmitters over 5 kW are available with a hot-swappable amplifier system so users can extract amplifier modules while the transmitter is running.

For information, contact DB Elettronica Telecomunicazioni in Italy at +39-049-870-0588 or visit [www.dbbroadcast.com](http://www.dbbroadcast.com).



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LA-3A's & LA-4's, Fairchild  
660's & 670's, any Pultec EQ's  
& any other old tube compressor/limiters, call after 3PM CST  
- 214 738-7873 or [sixtiesradio@yahoo.com](mailto:sixtiesradio@yahoo.com).

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

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

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

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 wom-

en'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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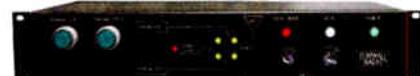
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# IP Security Considerations for Radio Broadcasters

Is your network adequately prepared to defend against "cybersecurity incursions? Not sure? Read on and discover if your network is adequately protected

## COMMENTARY

BY GLENN DAVIES

*The author handles marketing and technical communications for Tieline.*

It has never been more important to ensure broadcasters employ vigilant IT cybersecurity protocols in broadcast plants. If you are connected to the internet, you are at risk.

As unbelievable as it seems, many broadcasters still have a laissez-faire attitude to IP network security. Why?

Some of the main reasons for this include:

1. An incomplete strategic threat analysis.
2. Underinvestment in adequate security systems across the network.
3. A lack of investment in adequate human resources and training.

In the past, the broadcast plant was somewhat protected from external intrusions. Wayne Pecena from Texas A&M University is a frequent lecturer on IP networking and cybersecurity to the broadcast industry. "The broadcast technical plant has been relatively immune from cybersecurity threats as the traditional baseband signal design was difficult to penetrate from outside the station," said Pecena. "Overpowering a traditional STL path required very specific equipment located at a very specific location."

Given the integrated nature of broadcast and the IP world today, this is no longer the case.

### WHY CYBERSECURITY IS IMPORTANT

All broadcast operations these days are vulnerable to cyberattacks and some of the more obvious reasons to implement and maintain network cybersecurity include:

1. Protecting a company's assets: Threats include hackers, computer viruses, Trojan horses, worms, spyware, denial of service (DoS) attacks and more.
2. Staying on-air: If hardware is disabled by security threats it can take your network off-the-air.
3. Complying with broadcast regulations: Hackers have previously been able to take control of certain unsecured devices and streamed malicious content.

"Cybersecurity threats and mitigations must be addressed in a proactive manner by the broadcast engineer to allow the broadcast station to take advantage of the cost savings, features, and services offered by an IP based IT infrastructure," said Pecena.

These days it pays to be especially vigilant. Govern-

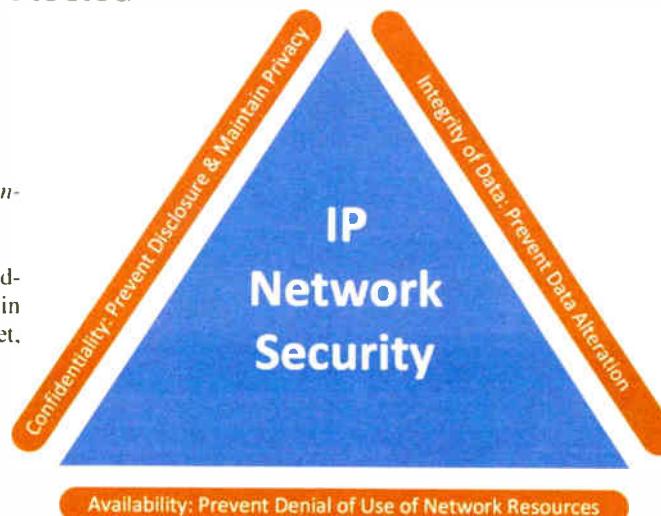


Fig. 1: The CIA triad of network security.

ment agencies and the banking sector have often led the way with cybersecurity and broadcasters must apply the same level of vigilance.

### THE LAYERED APPROACH

As studios have transitioned to IP-based environments a strategic approach to cybersecurity is essential. Broadcasting products are increasingly computer-based running Linux or Windows and controlled using browsers over a variety of IP networks. Utilizing a firewall on its own is simply not enough.

A "layered approach" to cybersecurity establishes security on several levels. Wayne Pecena recommends using the Data Flow aspects of the OSI [Open Systems Interconnection] model as an implementation guide:

- Layer 1: Physical Access — Restrict physical access to network infrastructure and control and monitor electronic access.
- Layer 2: Data Link — Control hosts that can connect to your equipment, e.g. port and MAC Address restrictions. Disable unused ports.
- Layer 3: Network — Network equipment security features such as Access Control Lists (ACL) e.g. administrator and lower level access. Firewalls, secure connectivity (IPSec) and application security.
- Layer 4: Transport — Implement TLS/SSL security.

This approach helps to ensure the Confidentiality, Integrity and Availability triad of Network Security Goals is achieved.

### SECURITY ZONES

A segmented network architecture adds another layer of security to your network. Zones with independent security layers make it much less likely that breaches will occur.

It also helps quarantine areas if there is a security breach in one zone. To achieve this, consider separating broadcast content and transmissions from financial, admin and email functions within a broadcast facility.

### THE GLOBAL PERSPECTIVE

Charlie Gawley, Tieline's VP Sales APAC/EMEA, has visited more broadcast plants than most. He has worked closely with broadcasters in Europe, Asia and

Australia, advising on streaming live audio over the internet with a variety of IP technologies.

"I have noticed that in the past 10 years many engineers' attitudes to cybersecurity have moved from somewhere between 'blasé and somewhat interested' to being 'highly concerned' about network intrusions from nefarious characters," said Gawley. "There is no doubt this correlates with the growth in reliance on IP throughout the broadcast plant."

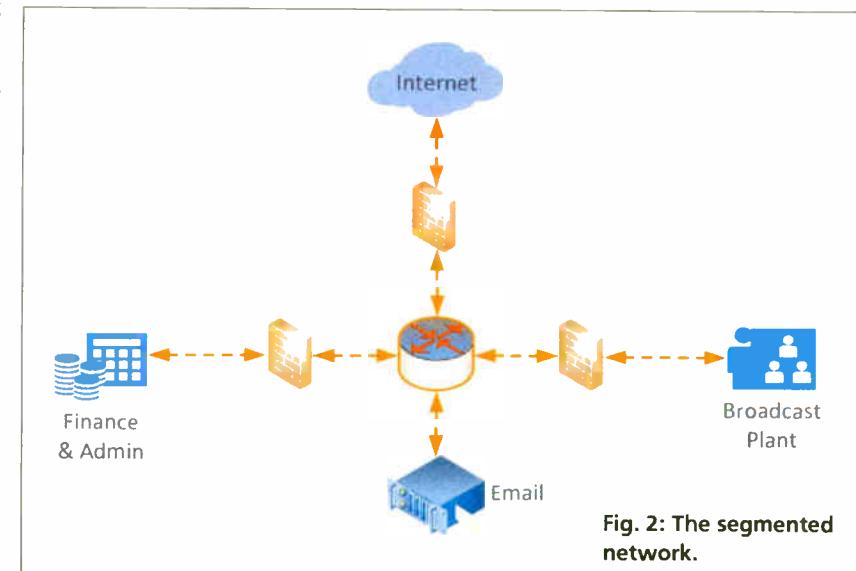


Fig. 2: The segmented network.

"As a manufacturer of devices that are very often connected to the open internet, Tieline believes in continual development of security features to avoid ever-present and continually evolving threats," he said. "These days broadcasters are not only asking more questions about the security features in our products, they also offer suggestions and actively engage in developing network cybersecurity strategies before their product is shipped. Forewarned is forearmed as they say."

### BEST PRACTICE

Tim Neese from MultiTech Consulting Inc. is a broadcast systems integrator with clients throughout the U.S. When connecting Tieline codecs to the internet he recommends a range of security procedures.

(continued on page 38)

# Invest in People and Programming, Not More Signals

Digital AM seems to be the answer to a question that listeners aren't asking

## COMMENTARY

BY DICK TAYLOR

I sat in on Radio World's presentation about "Digital Sunrise for AM Radio" hosted by Editor in Chief Paul McLane [<http://tinyurl.com/rw-sunrise>]. The webcast lasted almost two hours and was technically informative.

The question Paul kept asking the presenters about going all-digital on AM was one he hears numerous people asking him, "Has the horse left the barn?" In other words, has the world moved on and does anyone really care about AM radio anymore.

But that's not the question that was running through my mind.

### TOO MANY CHOICES

We live in a world with infinite choices when it comes to audio and video entertainment. Twenty-eight years ago, Bruce Springsteen released his song "57 Channels and Nothing's On." The lyrics are very telling of the condition we find ourselves in today.

*I bought a bourgeois house in the Hollywood hills  
With a truckload of hundred thousand dollar bills  
Man came by to hook up my cable TV  
We settled in for the night my baby and me  
We switched 'round and 'round 'til half-past dawn  
There was fifty-seven channels and nothin' on ...*

It's not unusual for people to spend an entire evening going through the program guide on Netflix only to finally retire for the evening having not watched a single program. We've all done that.

On just Netflix alone it was estimated in 2015 that it would take a person 34,739 hours to watch everything available on the streaming service. I'm sure that number has grown considerably when you consider in 2019 Netflix introduced 371 series and movies to view.

Add to Netflix more television streaming services like Amazon Prime, Hulu, Apple TV+, Disney+, YouTube and it means choice is not the TV viewer's problem, it's choice paralysis. (And maybe also how to pay for it all.)

### ALL-DIGITAL AM

The question running through my mind about investing in building out an all-digital AM radio service in America is, "Why?"

When I scan the AM band now, I can hear the same talk shows on station after station. The FM band is no different when it comes to everyone doing the same

### Write to RW

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type of programming.

It has me humming Bruce Springsteen's song in my head, only with a lot more channels of programming attached to the "nothing's on" part.

Digital AM seems to be the answer to a question that listeners aren't asking.

### LESS IS MORE

Many businesses fall into the trap of thinking that more products equal more sales and radio certainly can be accused of falling into that trap.

HD Radio was designed to offer a higher-quality broadcast signal for AM and FM radio stations. FM station owners didn't really get interested in HD Radio until they learned they could feed FM translators with HD2, HD3 signals and put more FM analog signals on the air in their market.

I learned that the all-digital AM service offers the opportunity for an HD2 signal that could feed another FM analog translator.

What Al and Laura Ries tell us from their research is how this strategy of adding more and more choice becomes a trap and can lead to negative consequences in the long term.

### ONE GOOD REASON

In media sales, we try to have our clients identify what one thing makes them special and unique. What makes their business so different that consumers will want to come to them instead of their competitors. You may know this process as finding a business's "unique selling proposition."

Back in the day, 66-WNBC put up a billboard that gave radio listeners one good reason to turn their radio dial to 660 AM. It simply said, "If we weren't so bad, we wouldn't be so good." This one simple sentence captured the essence of both Don Imus and Howard Stern. It was this radio station's one good reason to listen. It was this radio station's one good reason to advertise on it.

And speaking of one, I was told by the WNBC sales

manager that it only took one commercial on Howard Stern for an advertiser to see immediate sales results.

That's the power of a unique brand.

### MISPLACED PRIORITIES

Radio had a choice to make in the last decade, to develop unique powerful brands localized to the marketplace the FCC licensed them to serve, or build out more signals with programming that was virtually hard to tell apart from one another. Unfortunately, the radio industry chose the latter and as a result has turned the business into a commodity.

Something for everyone equals nothing for nobody.

Economics defines a commodity as goods or services that have fungibility, in other words something the marketplace treats as everything being nearly equivalent to each other, with little regard for who produces it.

This is why radio sales people will often hear advertisers say things like "all radio stations sound the same, now let's talk about your spot price."

Perception is reality.

Or should I say that the listener and advertiser's perception is accurate, with the reality today being all radio stations do sound the same.

### ELECTIONS & RADIO LISTENING

I read an article the other day that said what changes the outcome of any election is turnout. That the way someone wins an election is by getting people who normally sit it out on the couch engaged and out to the polls. It's not getting people to switch party affiliations.

I think radio may have a similar problem.

For the radio industry to be growing again, what radio needs to be focused on, and investing in, are its people and programming, not putting more signals on the air with nothing to hear.

*This commentary appeared at <https://dicktaylorblog.com/> and is published with permission.*

*Dick Taylor, CRMC/CDMC, is a retired broadcast professor who taught at Western Kentucky University.*

## READER'S FORUM

### TRANSLATOR PRETZELS

Larry Langford hit the nail on the head with his FX Pretzel Pattern commentary (RW, Feb. 5, 2020). Time and again I have seen both impossible patterns and cheats. I have observed firsthand a translator with a "penetrator" type antenna installed with no parasitics whatsoever and the antenna oriented toward the population center when the licensed pattern called for a significant null in that area. I have also observed a translator with a phased array of Kathrein yagis with the individual antennas properly aligned ... but the phasing between the antennas evidently reversed so that what should be a deep null area (unfortunately toward the adjacent large market) was in the radiated lobe and vice versa.

While requiring some installation and performance guarantees prior to licensing would increase the burden on and costs to the applicant, such would go a long way toward protecting spectrum neighbors. As it stands, it's pretty much anything goes.

*Cris Alexander, CPBE, AMD, DRB  
Director of Engineering  
Crawford Broadcasting Company*

*Cris Alexander is also technical editor of Radio World Engineering Extra.*



Getty Images/Jen Pollack Blanco/EyeEm

### AM IN DIGITAL: A TECH SOLUTION TO THE WRONG PROBLEM

Having been an AM broadcaster for a good part of my time in the business, I take with keen interest proposals for "fixing" what ails the senior band.

I agree with fellow RW reader Scott Dorsey that the AM band is overpopulated. I don't know that I support the commission taking licenses away from owners, but I believe that market forces are causing a thinning out of the band.

Will DRM be a better solution than MA3 for AM? I don't know enough about either system to offer an opinion, but I know for sure that the FCC has hamstrung AM radio for decades. You could go all the way back to the 1950s when AM stereo was being developed alongside FM stereo; when the commission decided only FM should have stereo service, that was the first nail in the coffin for AM.

As an aside, I wonder if concurrent AM and FM stereo would've avoided some of the problems the AM band has today, or at least delayed those issues by a number of years. Hindsight and speculation can be 20/20.

Perhaps AM will evolve with only Class A and Class D facilities left. The Class D facilities may end up as community radio stations, serving very targeted populations. The Class A stations may be thinned out; and we should revisit the idea of "super power" AM with signals that can cover large geographic areas. All those multi-tower directionals (Class B and C) on the high end of the band will be the first to throw in the towel and go away; we're kind of seeing that happen now in slow-motion.

Maybe we end up with an AM band with around 1,000 stations nationwide and no daytimers. That might clean up the band and lower some of the interference that ruins AM reception. Maybe moves like this will result in a healthier AM band and radio industry.

*Mark Carbonaro  
Monterey, Calif.*

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## IP SECURITY

(continued from page 36)

"We always recommend clients take full advantage of the built-in security options, have a schedule for password changes, and make use of a firewall. The ability to implement SSL connections is a great addition to the built-in feature set and in many cases removes the need for a VPN connection to securely administer the codec. For point-to-point connections, we recommend limiting, via a firewall, the IP addresses

that can connect to the codecs. In all situations, open only the necessary ports, maintain and review logs of connections and connection attempts, and implement firewall monitoring that generates alarms for excessive traffic on administrative addresses/ports."

Finally, it may seem obvious, but ensure you use secure and high-quality passwords to reduce the chance of passwords being compromised across your network. Using a good quality password manager helps to create strong and unique passwords. In addition, when an employee leaves your organization be sure to kill off all their passwords and create new ones for any shared accounts.

### WHERE TO FROM HERE?

This is well summed up by Wayne Pecena. "We are all aware of the advantages offered as the traditional baseband broadcast plant is transitioned to an Information Technology infrastructure based upon Internet Protocol transport. What is often not mentioned or even ignored is the downside. As an IT system, cyberse-

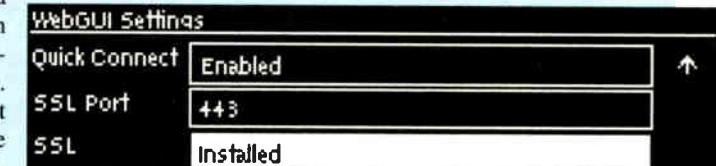


Fig. 3: SSL Certificate installed in a Tieline IP codec.

curity can no longer be an afterthought and must be a top of mind concern for the broadcast engineer.

The broadcast plant is no longer immune to cybersecurity threats. Cybersecurity concerns will only continue as the traditional rack room environment becomes an IT system, which may well live in the "cloud" whether on premise or not."

If you want to ramp up your IP cybersecurity knowledgebase the NAB has a good program, which offers an introduction to cybersecurity and the challenges faced in the broadcast station environment.

For more information see <https://education.nab.org/courses/9683>.

## ADVERTISING CONTACTS

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JOHN CASEY  
845-678-3839  
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