Franken FM | All-Digital AM Tests | Translator Waivers | Yamaha MG10XU

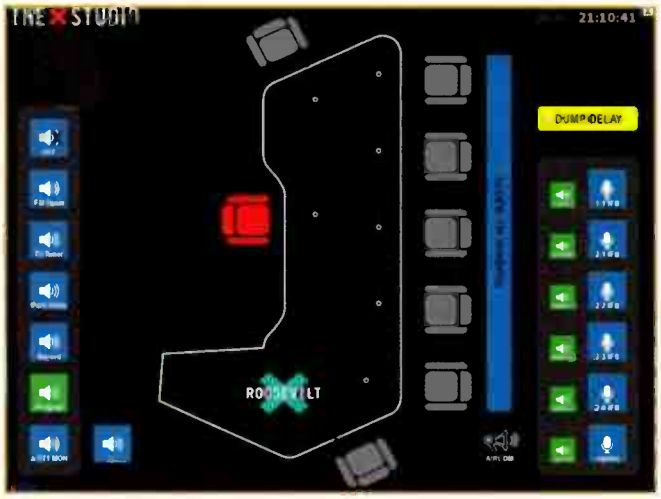
Radio

THE RADIO TECHNOLOGY LEADER

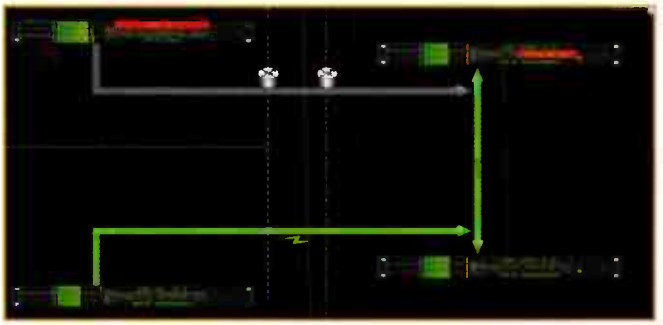
Radio for Milwaukee

A New Home Brings Community Together

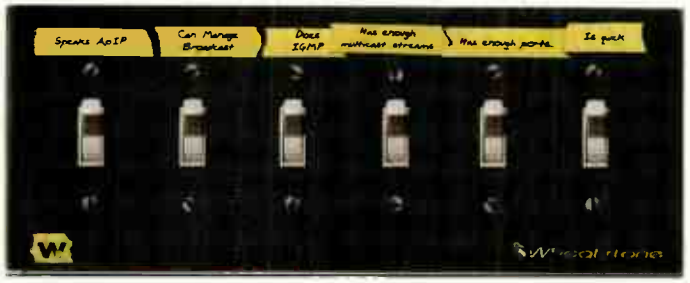
NOVEMBER 2014 | RADIOMAGONLINE.COM



The above producer control screen was built by our friends Agile Broadcast in Australia to control the room pictured on the right. Using Screen Builder's drag, drop and script interface, this screen is incredibly powerful and was completed in record time.



The screens at the left and above were created by our friends Save Diffusion in France. The map of France indicates radio stations around the country and their current status. The screen above delivers specific data about various transmitter sites. These screens were created with Screen Builder.



3 Things You Need to Know About Network Switches

You're about to embark on a social experiment.

You've selected the perfect control surfaces and the audio network is almost laid out for your new studios. Everyone and everything speaks broadcast and, so far, you haven't had to take up IT as a second language. But now you're about to drop a couple of network switches into the middle of it all and you're worried that things could erupt into a civil war between this newer IT world and the radio cavalry.

Discover the three most important characteristics Wheatstone engineers look for in a network switch...

Go to: INN16.wheatstone.com

What the #@& is Cable Certification?

We often use the term "certification testing" when referring to cable used in audio networks.

But if a person didn't know better, they'd think we were talking about guys in white lab coats running around with clipboards.

Hardly. This is just another way of saying that you should test your cables to make sure they're within manufacturer spec. Unlike the BNC and XLR world, Ethernet cable actually comes specified by The Telecommunications Industry Association (TIA) and the Electronic Industries Association (EIA) according to a "category," as measured every 100 meters (328 feet). The current standard is the TIA/EIA-568.

Here's what to test for and how...

Go to: INN16.wheatstone.com

Audio Performance Testing on the Cheap

by Wheatstone's Jeff Keith

There's nothing like a little audio performance testing to cap off a hectic week at the station, especially if you don't have to haul out the heavy (read "expensive") equipment to do it.

There are two main things I like to test: the flatness of the frequency response and the distortion added by equipment in the air chain. For this, you'll need clean test signals, and a way to measure those signals after they've passed through the air chain.

Here are some suggested tools and tricks:

Go to: INN16.wheatstone.com

When Radio Is Your Hobby

After talking with radio hobbyist Bill DeFelice, we're convinced that deep down inside all of us is a radio station wanting to get out.

Maybe that's why we jack up our stereo systems, have tuning forks for ears, and, for some of us anyway, make broadcast equipment.

Most of us fell in love with radio at a young age. For Bill, it started with his school's 330 watt FM (WMNR-FM, 88.1 MHz), where he ended up being the CE most of his high school years. He then went on to engineer a variety of stations, from a 1000 watt AM daytimer to a 50 kW FM blowtorch, before his current gig as IT support technologist for the Norwalk Connecticut Public Schools, where he was recruited to build a Part 15 AM and FM station as part of a high school renovation project.

Read more: INN16.wheatstone.com

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A warm and inviting public common area greets visitors to Radio Milwaukee. The space connects between the station's main entrance and a local coffee shop. Large overhead doors open and allow this common area to become an extension of the main performance venue for live events.

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On the cover: The main entrance to 88Nine Radio Milwaukee's new facility

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VIEWPOINT

Security, Automation Hijackings and EAS Follies

How secure is your station? No, really...give it some thought. You likely have taken certain measures to ensure physical security; many of you also have taken measures to ensure security for your IT systems (you DO have a firewall in place, right?) but can you ever be certain that your station is immune from some form of hijack from the outside world? Perhaps even a disgruntled former employee?

October brought us several reports of events that impacted or had the potential to impact stations. Most stations (fortunately) were not affected but a few unlucky stations were caught off guard.

The first event to cross my radar was not really all that widespread. An operator at a local public safety facility triggered an NUW alert (Nuclear Power Plant Warning). This code propagated via CAP to a number of other facilities in the region, and then was aired by a network of stations serving as a statewide relay. Since there are in fact several nuclear power plants in that region, some stations dutifully relayed the alert. Other stations ignored it since it was not for their local area or their EAS units were not configured to relay that code. Still, it could have been far more widespread if the EAS units were not properly configured.

The next event involved a cluster of stations that had its automation systems hijacked by a "ransomware" virus. This virus knocked the stations off the air, encrypted files, and locked personnel out of the systems as they struggled to bring the stations back online.

Finally, a syndicated morning show recently aired audio from the national EAS test several years ago. This in turn caused a number of EAS units at stations downstream (including at least one cable company) to receive and decode the alert audio. Since the code was EAN, depending on the manufacturer of the unit and how it was configured, that EAS test was either ignored, immediately relayed, or is still in the unit waiting to be relayed on the appropriate date (November 9th). If your station falls into that last category, I hope you were able to catch it before it was relayed again.

All of this underscores the importance of being aware of your station's infrastructure and where the weak points are. Certain things such as EAS are required by FCC rules, but check with your equipment manufacturer to ensure your unit has current firmware and is configured appropriately. As far as IT security, basic preventive measures include ensuring your software is up-to-date, regular backups are performed, networking firewalls are in place, and operators are trained on appropriate practices regarding e-mail and web browsing. Change passwords, remove old user accounts and check for unauthorized remote control software that could potentially be used as a back door by former employees.

Is there any foolproof guarantee to ensure your station will never become a target? No, but there are steps that you can take to make sure there is not a giant bulls-eye painted on your station's door.

Shane Toven | Editor

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Radio
THE RADIO TECHNOLOGY LEADER

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Franken FM Stations — A Post-Halloween Trick or Treat?

by Lee Petro

Earlier, we discussed the petition for rulemaking filed by SSR Communications, Inc., to create a new Class C4 radio service. Recently, the FCC issued a notice of proposed rulemaking that would address another new class of radio service. Instead of permitting radio licensees to change classes of service though, the FCC is considering permitting low-power television broadcasters to provide audio service.

These "Franken" radio stations have been providing audio signals on 87.7 and 87.9 MHz while providing analog television signals for several years. However, with the transition to digital television service, the ability of LPTV stations to continue to provide an analog signal is in jeopardy. The FCC had set a September 2015 deadline for LPTV stations to convert to digital operations and it was not clear how the FCC would address analog radio operations in a post-analog world.

So, in the context of addressing the final rules for the conversion of LPTV stations to digital service in the wake of the incentive auction involving the television spectrum, the FCC sought comment on whether it should adopt formal rules to permit such operations in a post-analog world. In proposing the rules, the FCC made clear that it would likely adopt rules that required digital LPTV stations to provide at least one free, over-the-air digital television signal regardless of whether the station also provided analog radio service.

In addition to establishing a threshold obligation for digital LPTV stations to continue to provide a free-over-the-air television signal, the FCC is considering the adoption of rules that would protect existing FM radio services. Specifically, the FCC sought comment on rules that would require LPTV stations that provide radio service to provide interference protection to the 60 dBu contour of noncommercial educational FM stations operating on the low channels of the FM band. In addition, the FCC sought comment on the adoption of rules that would require termination of the audio service in response to interference complaints, much like the rules currently applicable to FM translators and LPFM radio stations.

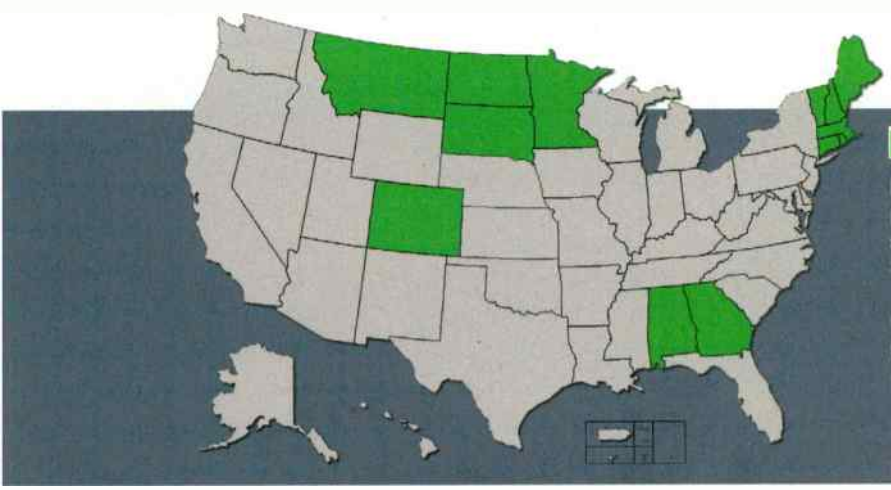
The FCC also tentatively concluded that these radio services would be subject to the same ancillary fee obligations that exist for digital television services that provide data or other subscription services. Specifically, Congress adopted statutory obligations for televisions stations to pay 5 percent of the gross revenues earned by digital television stations providing for-profit services on their digital streams. The FCC is seeking comment on whether the same obligation should be imposed on digital LPTV stations that use a portion of their digital stream to provide analog radio service. The FCC seeks information regarding the sources of revenue from the current operators, and whether it should require LPTV licensees to pay an ancillary fee on revenue that earned from providing this service.

Perhaps the most controversial proposal in authorizing the analog service will be the possibility of requiring these radio services to comply with all other rules associated with full-power FM radio services. The FCC is considering rules that would require the submission of construction permit applications prior to the commencement of service. In addition, the FCC may require these operators to maintain a main studio, retain a public inspection file, and coordinate their service in border areas with Canada and Mexico.

While the incentive auction will likely cause some LPTV stations to cease operations due to the repacking of full-power TV stations into the smaller TV spectrum band, it is likely some LPTV stations will provide audio services if the FCC authorizes the service.

Comments on the new service will be due 30 days after the NPRM is published in the Federal Register.

Petro is of counsel at Drinker Biddle & Reath, LLP. Email: lee.petro@dbr.com.



DATELINE

December 1, 2014 — Annual EEO Public File Reports placed in station's public file in Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota, and Vermont.

December 1, 2014 — Biennial Ownership Reports for Noncommercial stations in Colorado, Minnesota, Montana, North Dakota, and South Dakota must be filed with FCC and placed in public inspection file.

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Software-Defined Radio (SDR) In the Broadcast Environment

by Brandon Malatest

The software-defined radio (SDR) is redefining the way we look at information transmission and retrieval. SDR technology is capable of covering a huge part of the spectrum and displaying the information in a digital format. The world of RF communication has changed. SDR technology is affordable, high quality, versatile and available today.

The tools of SDR are simple: an RF front end, a method of converting the raw data into a digital format, and software to manipulate the digitized data. In the case of SDR in broadcast environments, the incoming RF signal is down converted to a lower frequency, typically the audio frequency band, determined by the input signal and the desired output. Once down converted, the signal is digitized and cleaned using digital signal processing (DSP). Using fairly simple software you can pick out one set of frequencies and process the information to decode audio, show a waterfall display or display text from an encoded signal.

Implementing a transmitter is just as simple. Software allows you to create a signal in any modulation style (AM, FM, QAM, SSB, PSK, etc) by arranging modules within the software. You then are able to package the signal and broadcast it on the desired frequency using the SDR hardware.

HARDWARE

There are many SDR transceiver products on the market today. Price and quality vary drastically, and there is a tough cost/benefit tradeoff to consider. For some applications in the hobbyist market, there are a number of options ranging from $50 up to $500. For those who are interested in using SDR for more advanced applications including medium- and high-end broadcast uses, however, one option is the Crimson SDR from Per Vices.

Per Vices is based in Toronto, Ontario. They recently launched the Crimson SDR, which offers a multichannel receiver and transmitter with four independently controllable RX and TX chains. Crimson uses four, dual-channel 16-bit ADCs with a sample rate of 320 MSPS and two quad-channel 16-bit DACs with a sample rate of 2500 MSPS which allows high bandwidth for receive and transmit applications. The device operates over a wide part of the spectrum enabling users to transmit and receive from 100 kHz to 6 GHz. Unlike traditional RF equipment with a single transmitter or receiver, Crimson can do multiple independent operations simultaneously. A multi-channel SDR transceiver such as this has the potential to replace several pieces of test equipment on the bench or in the field.

Figure 1: Crimson SDR

SOFTWARE

GNURadio is a commonly used, open-source, software development toolkit that provides a set of signal processing blocks to interact with software-defined radio hardware. The software itself is a collection of modules that can be easily reconfigured with relative ease. For those experienced in the Python and C++ languages, the software can be modified and enhanced to create a completely new modulation method.

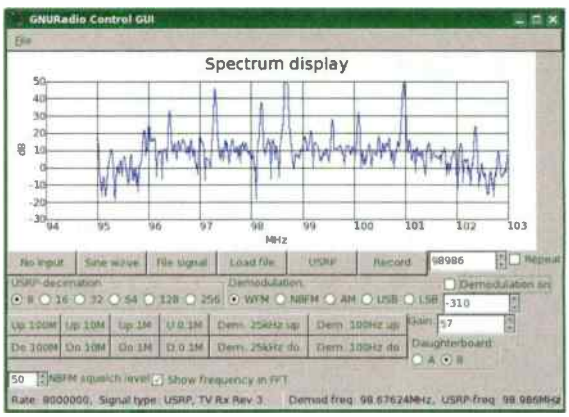

Figure 2: GNU Radio

OUT WITH THE OLD, IN WITH THE SDR

The beauty of SDR lies in its ability to be easily reconfigured. As digital communication modes mature and new ones are invented, they can be decoded by adding a software module as opposed to changing hardware. As the upper frequency range of digital processing chips continues to increase, new services can be accommodated. In an emergency, networks of transceivers can provide receive and transmit coverage similar to that of traditional repeaters, but with much more agility. Implementing such a system on a large scale using spread spectrum technology would create a very robust and secure network.

Having reached maturity, the existing world of communication technology is being turned upside down by the rapid advancement of SDR-based products. SDR technologies provide for future upgrades that adapt to new developments in RF communications.

Brandon Malatest is chief operating officer for Per Vices Corporation.

From one Environment to another

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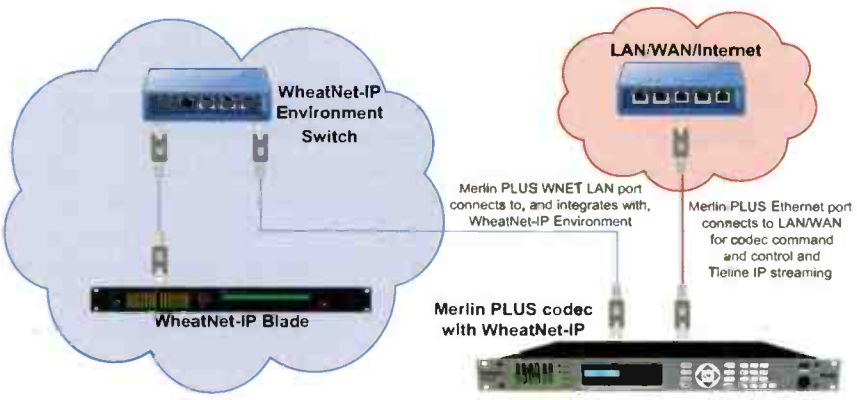

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Wi-Fi on Wheels: The Connected Car

by Shane Toven, Editor

1999 GM radio with cassette and external CD player

2015 GM "MyLink" with "Radio" and "Media" buttons

Aside from the office, think about where you spend the most time listening to radio. Studies show that the car consistently tops the list of locations where radio and other audio content is consumed.

While the car radio has remained largely unchanged over the years, one of the biggest shifts has been the use of external media sources in the car. Initially, manufacturers started to integrate technologies such as cassette and CD to allow listeners to bring their personal media collections into the car, assuming it was in whatever format the car radio happened to accommodate. As media technologies started to evolve faster than car radios did, we soon saw devices such as cassette adapters and RF modulators, which allowed users to bring other media sources into the car.

The biggest game changer in recent history, however, has been the introduction of the smartphone. Consumers rapidly started to bring their smartphones (and the media content from those devices) into their cars. Car manufacturers responded by adding auxiliary input jacks, followed soon by USB and Bluetooth integration. This integration was the beginning of truly merging the functions of the smartphone with those provided by the entertainment system in the car.

In the past few years, the dashboard interface has taken a radical shift. Since the invention of the car radio, a basic "two-knob" interface for "volume" and "tuning" has been the norm, perhaps with a few additional controls for other functions. While those two basic controls may still exist, a large LCD touchscreen that integrates functions such as climate control and other vehicle systems is now standard equipment in many new cars.

Now that the car (like the smartphone) has a large LCD touchscreen interface, the next logical progression was to further integrate the two. Many car entertainment systems will at the very least control music playback from the smartphone while displaying title and artist information, in addition to the obvious function of safely handling phone calls through the car's audio system. More advanced systems provide direct integration with streaming music apps on the smartphone such as Pandora. These changes have moved the control of apps from the smartphone itself to the car's entertainment system.

Car manufacturers have continued to build on this approach. The latest systems offer not only control of smartphone apps, but can utilize the modem in the smartphone to provide a data link for navigation, traffic, audio streaming, vehicle diagnostics, and other applications. Some vehicles even forego using the smartphone's modem altogether by integrating their own modem. GM recently introduced systems that essentially turn the vehicle into a "rolling Wi-Fi hotspot."

Where does all of this leave radio in the new "connected" car? With a few notable exceptions, manufacturers continue to include AM and FM radio in the dash as an available source for the most part. That being said, as a broadcaster, communication with car dealers about what options are available in new cars, and education of listeners is key. It may be getting more difficult in many of these vehicles to find "radio" among the myriad of new listening options so it is important to be informed in order to keep listeners connected to your station in their new car. I would encourage you to look at test-driving a few 2015 model year cars. You might be rather surprised about what is and is not available on the new "digital dashboard."

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HD Radio Transmission Update

by Doug Irwin, CPBE AMD DRB

Back in April, we looked at transmitters with a particular emphasis on LPFM. This month, we're going to take a look at recent developments in HD Radio transmission. It's capital budget time after all, and if you're looking at new transmitters next year, read on.

GatesAir has several lines of FM transmitters. Their solid-state transmitter line is known as the Flexiva, and is available at power levels up to 80 kW. Flexiva's RF amplifiers are designed around LDMOS FETs, which provide for high density and high efficiency. As with most modern solid-state transmitters, the design uses switch-mode power supplies that achieve an efficiency of around 96 percent. These power supplies are hot swappable and auto-ranging, an important feature for those of us at the end of long, long power runs up a mountainside. The Flexiva is completely broadbanded with no mechanical tuning required so it can easily fulfill the role of an N+1 transmitter at an auxiliary site.

Key features include:

- Identical power blocks provide for scalability; 5 kW or 10 kW power blocks use 16 rack units.
- Common dual 1800 Watt Power Amplifier and IPA modules for all power levels.
- Single-phase or 3-phase power, Delta or Wye configurations; 190 to 464 VAC.
- 1:1 power supply to power amplifier module ratio.
- Hot-pluggable, hot-swappable power amplifier and power supply modules.
- Distributed hardware based control architecture uses analog circuits to control critical transmitter functions. Critical functions are not reliant on a microprocessor.
- Variable speed fans optimize cooling, maximize efficiency and minimize noise.
- Redundant internal cooling fans draw air from front to rear with ducted air options available.
- Operates in the following modes: FM, FM + HD Radio, HD Radio only or DRM+.
- Maintains power up to 1.5:1 VSWR, with

proportional fold-back for safe operation at reduced power into marginal loads, such as an ice-bound antenna.
- Global monitoring and control via IP; graphic user interface (GUI) works with any PC, tablet or smartphone.
- Full SNMP support; in-depth diagnostics and setup via front-panel control.

Let's take a look at the output power capability of the Flexiva line.

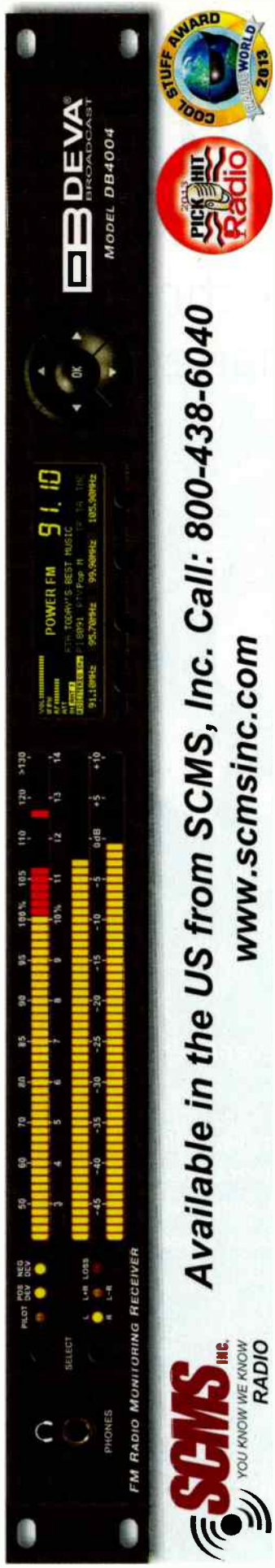
Output Power - Max Watts	FAX5K	FAX10K	FAX20K	FAX30K	FAX40K
Nominal Power	5,000	10,000	20,000	30,000	40,000
FM Analog Power Range	500-5 500	1,000-11,000	2,000-22,000	3,000-33,000	4,000-44,000
FM+HD -20 dBc	4,500	9,000	18,000	27,000	36,000
FM+HD 14 dBc	3,500	7 000	14 000	21,000	28,000
FM+HD -10 dBc	2,650	5,300	10,700	15,900	21,200
HD Only -20 dBc	2,000	4,000	8,000	12,000	16,000
HD Only -14 dBc	1,850	3,700	7,400	11,000	14,800
HD Only -10 dBc	1,550	3,700	6,200	9,300	12,400
50 ohms RF Output Connector Un Flanged * Optional Adapter	1-5/8 EIA	1-5/8" EIA	3 1/8 EIA	3-1/8 EIA	4-1/16" EIA 3-1/8" EIA*
Electrical	FAX5K	FAX10K	FAX20K	FAX30K	FAX40K
AC Input Voltage, VAC 47-63Hz Single Phase & 3-Phase (3-Wire) Delta 3-Phase (4-Wire)Wye)			190-264 330-460		
Power Consumption MAX Watts	8,127	16,254	32,507	49,500	66,000
AC-RF Analog FM Efficiency at Nominal Power Typical			72%		

Figure 1: GatesAir Flexiva power chart

One of the lower-power Flexiva line transmitters will easily fulfill the role of "exciter" in this case. The Flexiva "exciter" uses direct-to-carrier digital modulation. It features multiple AES inputs, composite program inputs, and analog inputs with failover switching. An internal stereo generator is included. Flexiva will also accommodate digital MPX via AES192. The Flexiva has its own complete remote control capability with an embedded web interface, SNMP support, and parallel GPIO. A GPS receiver for single frequency network synchronization is available as an option. You will need to add the optional Gen4HD board to the "exciter" in order to transmit HD Radio. This internal expansion board provides hybrid crest factor reduction, which is GatesAir's peak-to-average power reduction technology, as well as linear and real-time non-linear pre-correction. Other key features of the Gen4HD board include an RF spectrum analyzer display, asymmetrical sideband power control, and Modulation Error Ratio (MER) monitoring.

Broadcast Electronics is also a fan-favorite of many Broadcast Engineers. Like others in the "big 4" group of transmitter manufacturers, they have an extensive line. We'll examine the FMi-T, which is their high-power, vacuum tube series of HD transmitters. One of the most important facts to take away about the vacuum tube PA is that the cavity is a half-wave design, which eliminates the plate blocking capacitor and sliding contacts. These components are one typical failure point of high-voltage tube amplifiers. BE's peak-to-average power reduction method is called "Vector Power Enhancement." The technology increases the amount of HD power output while maintaining good overall RF efficiency. The FMi-T series also makes use of adaptive pre-correction.

Other features of the FMi-T series are as follows:
- Large PA tube used, providing for effective cooling, even in environments with high ambient temperatures
- Tuning and loading controls at zero volts DC potential



- Broadband neutralization eliminates the need for re-neutralization during tube changes
- Produces full rated power into 1.8:1 VSWR, capable of operating into higher VSWR with automatic power reduction; Protected against open and short circuit.
- Microprocessor-based controller allows remote access to monitor all operating parameters.
- RF efficiency 67 percent or better at rated power; overall AC-to-RF efficiency 57 percent or better at rated power.

Model #	FM Only (Watts)	FM+IBOC (-20dBc)	with VPe FM+IBOC (-20dBc)	with VPe FM + IBOC (-14dBc)
FMi 17T	25,000	17,500	20,400	14,600
FMi 21T	30,000	21,000	24,500	18,100
FMi 25T	35,000	24,500	28,600	20,400

Power outputs may vary with injection level and frequency

Figure 2: BE FMi-T power chart

Taking a look at the FM-T line power vs. HD injection levels:

The latest exciter design from BE (used for the FMi-T line of transmitters) is the STXe. With the addition of Vector Power Enhancement, this new exciter can operate in elevated HD injection level applications, or in DRM+ installations that desire an FM analog and DRM+ transmission from a single transmitter. STXe combines BE's peak-to-average power reduction scheme and real-time distortion pre-correction to yield higher transmitter efficiencies and output power. It has multiple program inputs with silence sense and failover, a built in RDS generator, an FSK IDer for translator applications, and a built-in audio delay for use with single frequency networks.

STXe has its own built-in controller with an updated GUI. If your transmitter site has IP connectivity, you will have access to all of the STXe parameters via a PC, laptop, tablet or smartphone. SNMP is also supported for remote monitoring and control.

Nautel's most recent design is the GV series. As with all Nautel designs, it is a solid-state transmitter. The GV series uses LDMOS FET RF amplifiers and redundant hot swappable power supplies. Common module types are used across the GV line and the NVLT series. This reduces spare requirements, assuming you have multiple sites with Nautel transmitters.

A 15 percent increase in RF efficiency has been gained, in part by the introduction of Nautel's "Spectrum/Efficiency Optimizer" which optimizes RF amplifier parameters dynamically to meet the demands for analog output power at higher HD injection levels. Nautel calls their peak-to-average power reduction technique "HD PowerBoost" This feature is standard in the GV.

Take a look at the power output vs HD injection levels for the GV Series:

GV SERIES		GV3.5	GV5	GV7.5	GV10	GV15	GV20	GV30	GV30	GV40
Analog Only	Max Power[1]	4.13kW	5.5kW	8.25kW	11kW	16.5kW	22kW	33kw	33kW	44kW
	Typical Efficiency	71%	72%	71%	72%	71%	72%	72%	71%	72%
Analog @ -20dB HD	Max Power[1]	3.75kW	5kW	7.5kW	10kW	15kW	20kW	30kW	30kW	40kW
	Typical Efficiency	70%	70%	70%	70%	70%	70%	70%	70%	70%
Analog @ -14dB HD	Max Power[1]	3.38kW	4.5kW	6.75kW	9kW	13.5kW	18kW	27kW	27kW	36kW
	Typical Efficiency	57%	57%	57%	57%	57%	57%	57%	57%	57%
Analog @ -10dB HD	Max Power[1]	2.5kW	3.3kW	5kW	6.6kW	10kW	13kW	20kW	20kW	26kW
	Typical Efficiency	52%	52%	52%	52%	52%	52%	52%	52%	52%
AC Input		1-Ph 175-265V or 3-Ph 175-265/303-459[2] (47-66 Hz)								
Power Modules		2		4		8		12	16	
Switching Power Supplies		4		8		16		24	32	

Figure 3: Nautel GV Series power chart

The GV Series features an integral direct to digital exciter, with an optional redundant exciter. The exciter supports adaptive pre-correction, and an optional Exgine card for HD Radio.

Monitoring and control is through Nautel's Advanced User Interface (AUI) via a 17" front panel touchscreen, web interface, or local "backup" control panel. The AUI offers comprehensive display of all transmitter parameters and detailed logging.

Transmitter parameters are set in "presets." These presets include the frequency, power level, operating mode, audio input options including failover, and a number of other settings. Remote GPIO control is also available. Using the transmitter's internal GPIO and AUI, the GV provides a built-in, fully integrated monitoring and control mechanism for external site-related equipment. This could include things such as air conditioning and generator status. The AUI can also notify station personnel via email if any monitored parameters transition to a fault state.

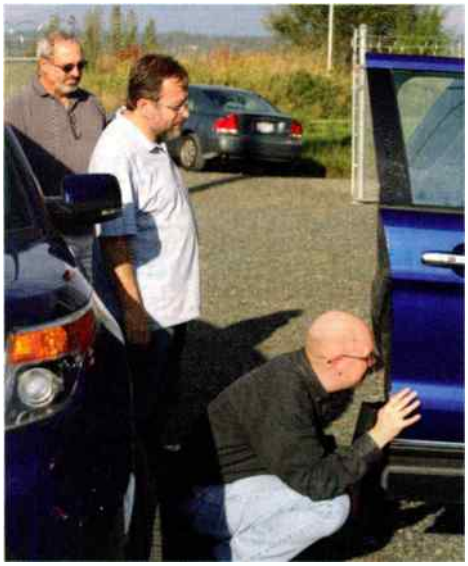
Functions accessible via the AUI include:

- Dynamic RDS scrolling, integral SCA generators
- New oscilloscope instrumentation
- MER instrumentation
- Livewire support
- MPX over AES input
- Shoutcast and Icecast streaming inputs
- RF and audio spectrum analyzers
- Audio input silence sense with smart source switching and return
- USB audio storage and playback system
- Optional Orban Inside multiband digital audio processor
- SNMP support
- Email notifications

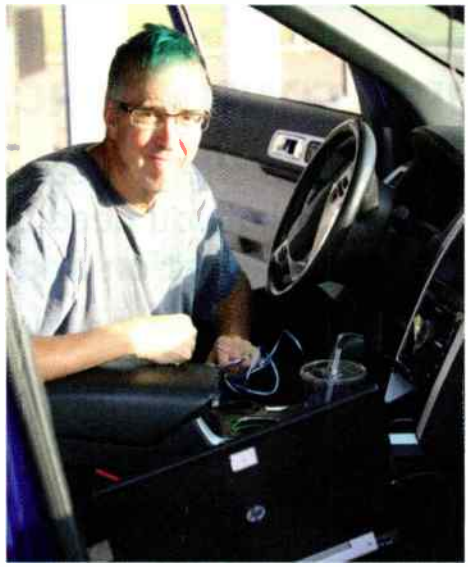
Real-time measurement of MER (Modulation Error Ratio) provides the ability to diagnose issues related to HD Radio transmission, even down to measuring the MER performance on specific sets of subcarriers.

Continental Electronics continues to produce their familiar line of high-power FM transmitters—the 816R series. Power levels range from 11 kW to 21.5 kW using the 816R-2C and up to 40 kW with the 816R-7C. A single tube is employed as the final amplifier—a 4CX15000A, 4CX20000E, or 4CX25000C depending on the power level. All of the transmitters are self-contained, except the 816R-7C, which uses a separate power supply cabinet and external harmonic filter.

The "HD-ready" 816R-HDR is a high-power combined amplifier for IBOC applications. You can buy it initially as an FM-only transmitter, while planning to add the Exgine equipped 802Ex digital FM exciter and an exporter for IBOC operation later on. Continental's D816HD Series Transmitters range in combined TPO from 18 kW to 56 kW at HD power levels of -20 dBc to -10 dBc. These combined transmitters use only one tube each, the final power amplifier tube. The D816HD Series Transmitters are also completely self-contained, including the harmonic filter. The 70 kW version has two high-voltage rectifiers and plate transformers



Preparing the test vehicles



David Layer (NAB Labs) in one of the test vehicles

Jeff Welton (Nautel) makes adjustments to the HD Radio exporter.

test on a commercial station (well, two stations here) because one of them had been on a test transmitter.

David Layer of NAB Labs is taking a very disciplined approach to all of this and he was a treat to work with.

One moment of excitement came with a loud "POP" as the KXA transmitter blew its rectifier stack. The show must go on though, so we cannibalized my KRKO transmitter in order to enable the KXA tests to happen as planned. We ran at 12 kW on KRKO until parts arrived on Tuesday. The rectifier failure had nothing to do with the testing, but it was fortunate that the Nautel factory engineer was on site to say, "Hey, it's your rectifier stack." Ok!

A LITTLE ABOUT THE HD RECEIVERS

I learned that there is a huge amount of variability in receiver capability. The Ford factory radios are really nice and keep a good lock. My Kenwood aftermarket radio, not so much. That could also be a function of the antenna in the vehicle, but I'm more inclined to think it is a receiver variation.

I also learned that some receivers locked on an all-digital signal that drops will never reacquire that signal again if they stay on that channel. There seems to be a timeout function where if the signal is gone for too long, the receiver assumes it will never come back and stays silent

The KRKO/KKXA towers at night just prior to a test run

Some of the engineers involved in testing: David Layer, NAB; Stephen Lockwood, Hatfield & Dawson; Mike Rhodes, Cavell Mertz; Tom McGinley, CBS Radio Seattle; and Andy Skotdal and Buzz Anderson, KRKO(AM)/KKXA(AM), Seattle

rather than continuing to sniff for the signal. You have to tune to another channel and then tune back.

TAKEWAYS FROM THE TESTING

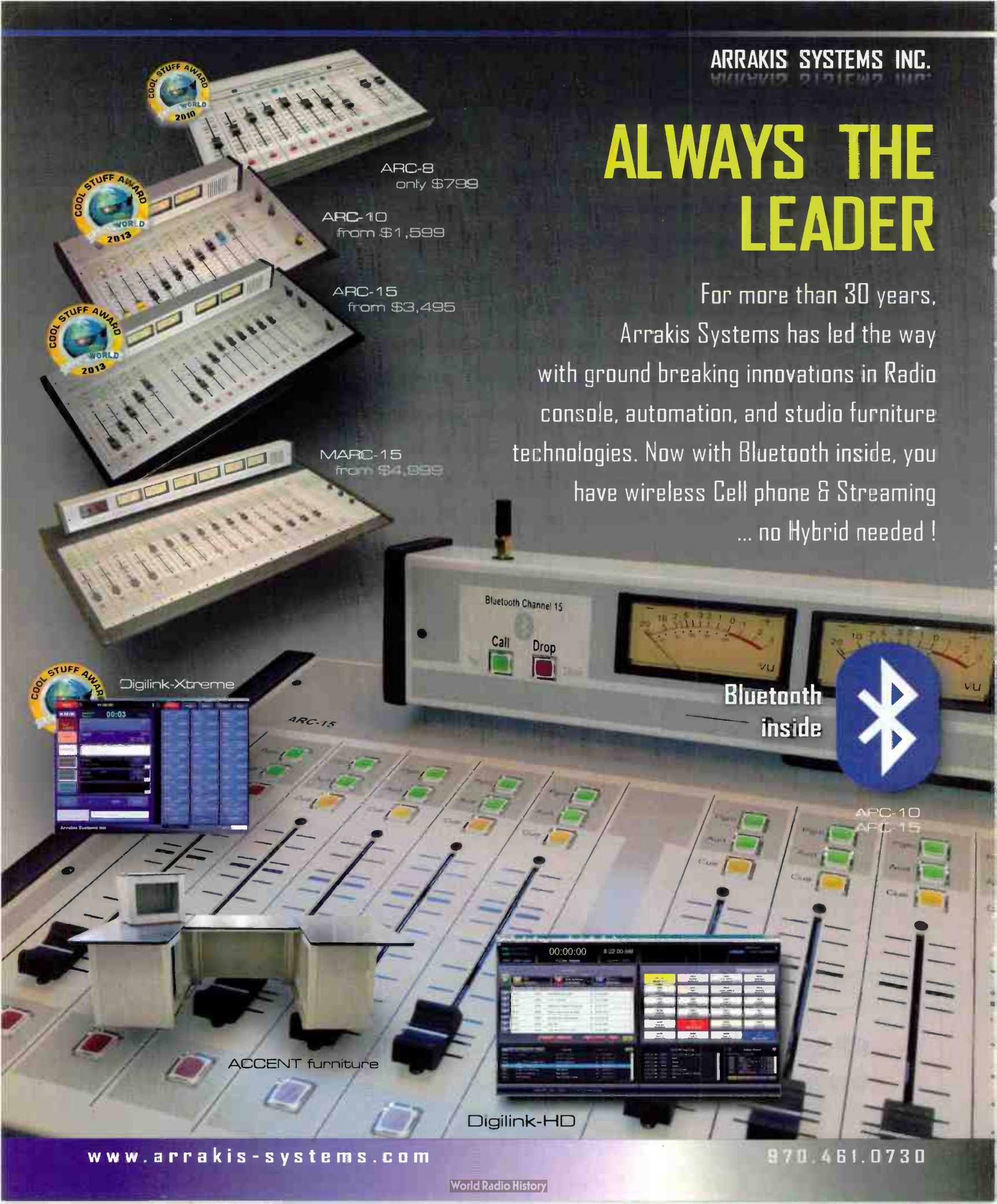
There is no equipment available to stations to allow them to see what the HD error correction level is in the field. This would give you an indication of what the HD carrier looks like leaving the transmitter site and give a field snapshot as to whether transmitter site modifications are making an improvement or not. If a receiver is working 2x as hard to decode your signal, it would be nice to know because that causes you to lose forgiveness when

Monitoring KKXA during a test run

you get to overpasses and power lines, for example, whereas if the receiver doesn't have to error correct, you have more headroom for correction when other variables creep in like power lines and bridges.

I learned that our gear was not programmed to allow for what I'll call all-digital demo mode, meaning if I want to go all-digital on Saturday nights by contact closure to promote the technology and encourage people to buy receivers, if the FCC allows that someday, the system won't allow that the way my exciter and exporter work right now. Nautel thinks they can make that correction, but it wasn't contemplated that stations would do something other than hybrid or all-digital.

The Everett all-digital AM HD Radio tests were the last of nine carried out by NAB Labs. Results of the tests will be processed and submitted to the Federal Communications Commission in 2015.



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Mattoon and Tell: A Tale of Two Waivers

by Jeremy Ruck, PE

The use of FM translators for AM stations continues to be a topic of great interest to many broadcasters. I frequently receive inquiries on what must be done, and how to proceed. This month we compare the two famous waivers, the so-called Mattoon and Tell City waivers, from an engineering perspective. While the Mattoon waiver continues to be somewhat reluctantly approved by the Commission, its Tell City cousin has been denied.

At the heart of both waivers is the relocation of a translator further than what would normally be permitted under minor change provision of the Commission's rules in order to provide fill-in service for an AM station. For a translator relocation to be considered minor, among other things, there must be overlap between the authorized and proposed 60 dBu service contours. Both proposals seek to waive this provision.

In the case of the Mattoon version, four "narrowly tailored" conditions were originally stated in 2011 as being required. Specifically they require no history of serial minor modification applications, mutual exclusivity between the licensed and proposed facility, no implication of LPFM spectrum concerns, and the rebroadcast of an AM station. The third condition, with the passing of the LPFM window, has been reduced in importance. Additionally some moves were slid through for FM facilities under condition four due to the original wording; however, the Commission has since tightened this criterion to state explicitly that the Mattoon Waiver is to be utilized for AM stations only. Although there have been some rumblings of further tightening the Mattoon policy due to perceived abuses, it at present appears to be a viable proposition. The technical ability to utilize the Mattoon waiver revolves around the mutual exclusivity between the licensed and proposed facilities. Mutual exclusivity is the fancy term for the concept that two facilities cannot coexist due to the violation of some provision of the Rules, which typically would be the contour overlap provisions of Section 74.1204. In 1945, a Supreme Court case known as the Ashbacker Doctrine, required equal opportunity for potential applicants when filing for a new frequency. In the Mattoon situation, Ashbacker is satisfied since the licensed facilities of the translator would necessarily preclude the grant of an application for a new facility equivalent to the proposed translator.

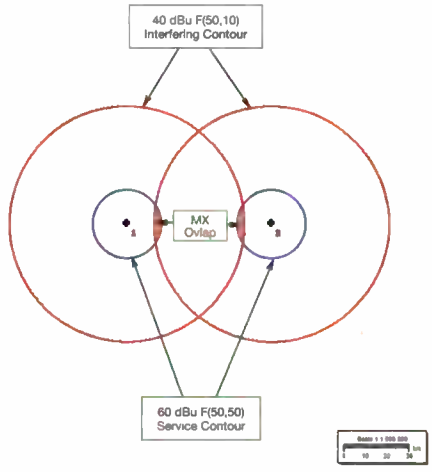

Figure 1: Mattoon co-channel illustration

Technically speaking in applying Mattoon, the greatest relocation distance winds up being in situations where the licensed and proposed facilities are co-channel. (Figure 1) Contour overlap in that case would arise when the 40 dBu F(50,10) contour of either has some overlap with the 60 dBu F(50,50) contour of the other. Assuming uniform terrain at both sites, relocation

distances in the neighborhood of 30 to 40 miles are not out of the question. This is a huge contrast between the 60 dBu to 60 dBu overlap distances, which tend to be closer to fifteen miles or so. Because of the reduced protection ratio, a first-adjacent situation still affords an applicant greater distance than the standard overlap provision, albeit to a lesser degree than being on the same channel.

In reality, a Mattoon Waiver could be considered a series of minor changes. (Figure 2) Assuming a 60 dBu contour radius of approximately 8 miles, a site relocation of 40 miles could theoretically be accomplished in a couple of hops. By allowing Mattoon, the Commission has additionally created the effect of reducing the processing burden on the Staff, while at the same time staying in line with Ashbacker.

Tell City sought to expand the Mattoon concept by not only increasing the potential relocation distance, but also by proposing a simultaneous channel change that was significant

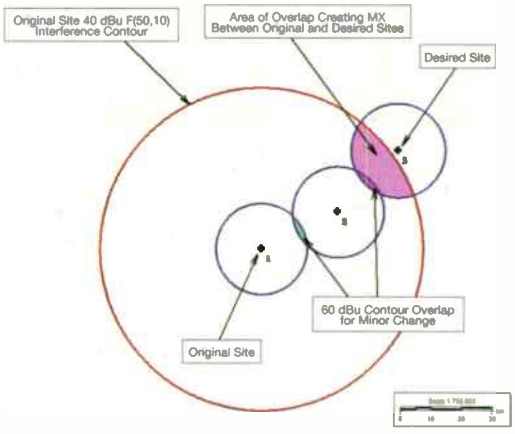

Figure 2: Mattoon as a series of minor changes

in nature. Instead of the mutual exclusivity situation between two translator authorizations, the proposed metric was relocation anywhere within the 0.025 mV/m interfering contour of a licensed AM station. (Figure 3) If the assumption is made that the AM station in question operates on 1230 kHz with a power of 1 kW, antenna height of 90 degrees, and soil conductivity of 8 mS/m, then that contour has a radius of nearly 122 miles! Therefore, under Tell City, for a run-of-the-mill class C station, a relocation of one hundred miles or more would not be out of the realm of possibility.

Now let us go to the other end of the scale and consider a class A AM station. One class A station in Chicago, for example, on a particular azimuth, has a 0.025 mV/m contour radius of some 370 miles. Under the Tell City metric, a relocation of a translator from Minneapolis/St. Paul or Cleveland to the suburbs of Chicago would theoretically be permitted.

Additionally, Tell City also sought to make a substantial change in the channel of operation. The translator was licensed on channel 218, 91.5 MHz. The proposed channel of operation was 279, or 103.7 MHz. This was a difference of 61 channels, while the minor change rules permit changes up to three channels either side of the licensed channel, or changes of 53 or 54 channels to the intermediate frequency split. If critically considered, it can be realized

that limiting changes to those channels, keeps the possibility of mutual exclusivity alive, and Ashbacker with it.

Follwing the Media Bureau's action on Tell City, Commissioner Pai issued a statement expressing his disappointment with the denial of the waiver. While there is likely some disappointment that the waiver was denied, AM broadcasters should continue to take heart that they are in fact being noticed, and have a substantial ally in Commissioner Pai.

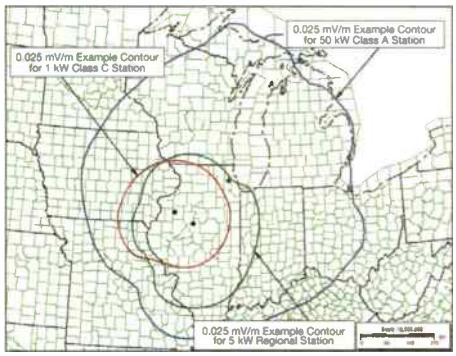

Figure 3: Tell city waiver AM interference contour example

The statement of Pai alluded to the opening of an AM translator window. Indeed that topic was brought up during an interview with Commissioner Pai at the NAB/RAB Radio Show in Indianapolis earlier this autumn. Although the Commissioner could not provide definitive details at the time, he alluded to the potential opening of a window in 2015. Clearly, pending LPFM issues would need to be addressed prior to any translator window due to spectrum availability. This is especially true considering the fact that major amendments to mutually exclusive pending LPFM applications are permissible under the various ongoing settlement windows.

Any such translator window is expected to be limited to participation by AM facility licensees as of a particular date. Additionally, an authorization granted under this window is expected to be tied to the AM facility for which it was submitted in perpetuity. This makes sense. If the goal is to aid the AM service, then the translators granted under such a window should be reserved for their use. Due to the expected tie in to a particular AM facility, it is expected that a cancellation of the AM station license would similarly result in a cancellation of the associated translator license.

Lest we ignore them, other similar waiver requests have been proposed before the Commission. One such request proposed a simultaneous channel displacement with Mattoon. Although the ultimate goal will be achieved through the submission of two sequential applications, a single application would have been more efficient for both the Staff and application, but could pose Ashbacker issues. There is a technical hurdle there too, as any time a scenario like that is proposed in sequential applications, the final channel has to work in both locations.

Although Tell City would have further aided AM broadcasters, Mattoon remains a vital tool. It is definitely one that can be used now. Alternately, if your time horizon is a little more distant, start thinking about a translator in the expected upcoming window. Demand will likely be robust. Due to the spectrum constraints, that may be the last such window for a long time, so get with your consultant, and don't miss the opportunity!

Ruck is the principal engineer of Jeremy Ruck and Associates, Canton, IL.

88Nine, Radio Milwaukee

by Shane Toven, Editor

The Midwest has a rich history of broadcast stations that have made their unique mark on the industry—both commercial and non-commercial alike. This month we visit Milwaukee, Wisconsin.

Milwaukee is the largest city in the state of Wisconsin, and the 31st largest city in the United States. The city is perhaps best known for its many breweries, and of course the baseball team named for those breweries, but it is also a home to a very diverse population, as well as a thriving music and cultural scene. Genres covered in the local musical landscape range everywhere from Jazz and Classical to Rock, Metal, Punk, Hip Hop, and everything in between. The city has also hosted a number of well known club DJs. Nationally known bands that have come from the Milwaukee music scene include the Violent Femmes, the BoDeans, and many others.

88Nine Radio Milwaukee serves the city with a unique outlet for new music from local bands, playing at least two tracks from local bands each hour. Many of these bands would likely not

"Studio Milwaukee" main performance area

receive airtime anywhere else. The station aims to serve as a common gathering place for the community, both on the air and physically at the station. Their mission is to be "a catalyst for creating a better, more inclusive and engaged Milwaukee" and "reach a new generation of radio listeners with an entertaining and adventurous selection of music and public affairs programming."

HISTORY

88.9 WYMS has been on the air in Milwaukee since 1973 and is licensed to Milwaukee Public Schools. The station for many years had broadcast Jazz music with a mix of ethnic programming (particularly polka music) on the weekends. In 2002, the station's operations were handed over to the University of Wisconsin-Milwaukee

for a period of time after the school district suffered a budget shortfall.

RADIO FOR MILWAUKEE

In 2003, the school district sought proposals for a nonprofit group to run the station under LMA. A nonprofit startup known as Radio For Milwaukee had a distinct vision to hyper-serve the community with locally focused programming completely different from what was available through existing commercial and non-commercial outlets. By 2004, they had an agreement with the school district in place and

A large collection of Jazz LPs gives a nod to the station's history.

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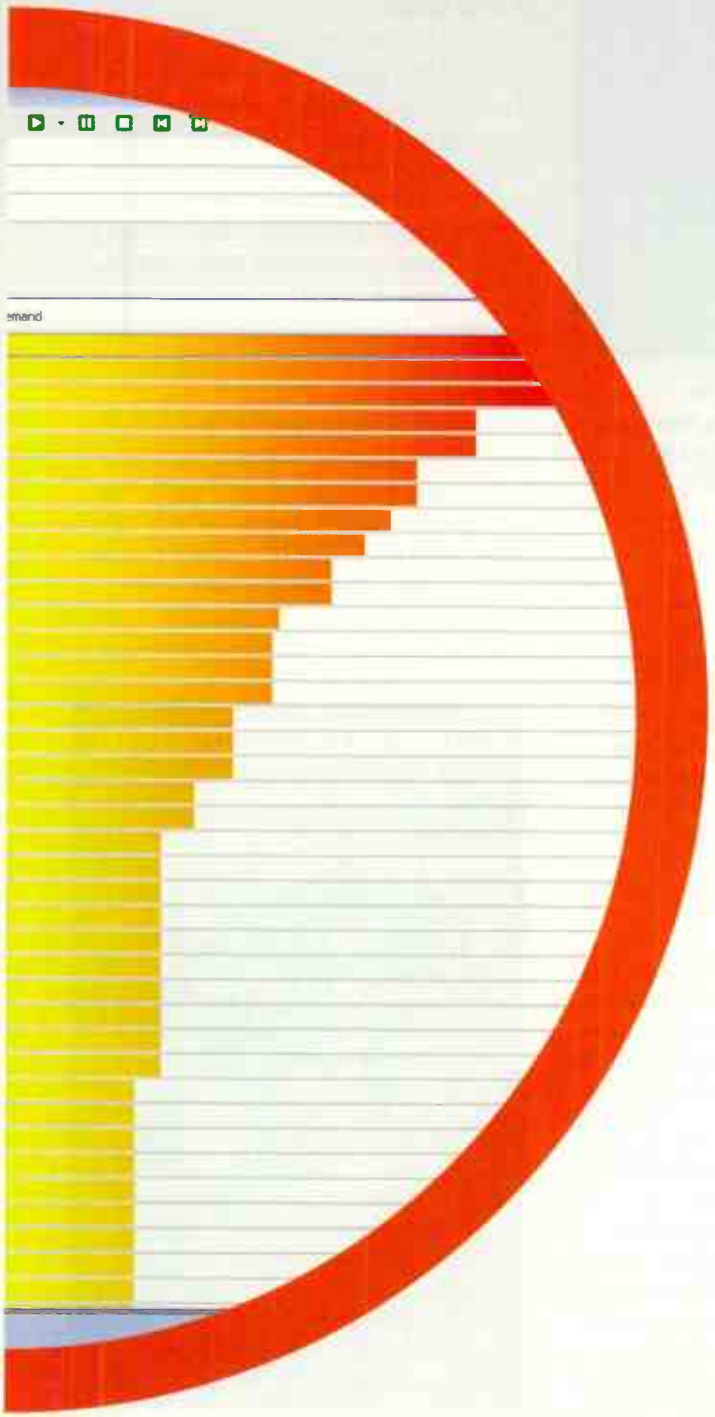

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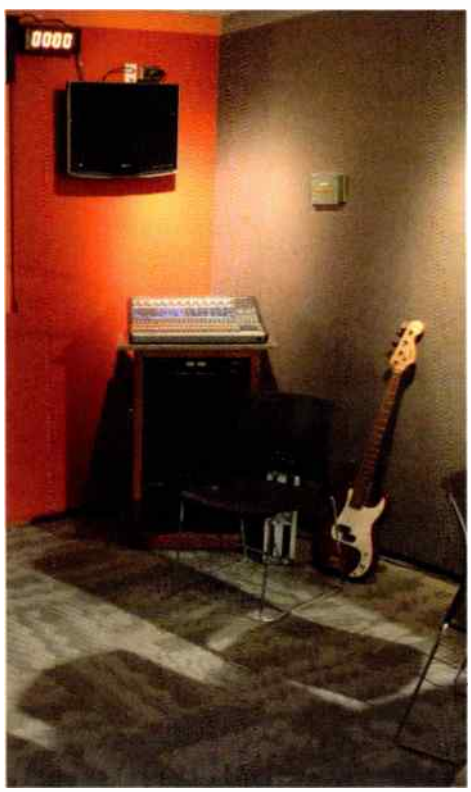


The main control room and small performance space, including a separate mixer for live bands, which feeds into the Axia network for broadcast.

began to execute their vision.

After several years spent figuring out exactly what the "sound" of Milwaukee is (no small task due to the diverse musical genres represented in the town) and how best to serve the community, 88Nine Radio Milwaukee made its long-awaited debut on WYMS in 2007 from the existing studios located at the Milwaukee Public Schools administration building.

"MILWAUKEE PROUD" PROGRAMMING

With 21 employees, six of whom are in the programming department, 88Nine Radio Milwaukee produces all but a small portion of its program schedule locally. Their goal is to bring the "best of the best" to their audience. The lineup includes programs such as "Discover New Music" focused (as the name suggests) on new music; "414 Music Live" which brings local artists into the spotlight (414 is Milwaukee's area code); "AMKE" which is Radio Milwaukee's morning show including music, interviews and community affairs; "The Rhythm Lab" with a distinctly urban sound; "The Saturday Session" inviting local DJs into the studio for interviews and music sets; and "Sound Travels" bringing world music to the Milwaukee airwaves.

According to Radio Milwaukee Program Director Sean Demery, "We're not looking for everyone to listen, but we're looking for enough like-minded listeners and partners to accomplish the mission and serve the community."

A NEW HOME

In 2013, Radio For Milwaukee accomplished the next milestone in their vision to become a gathering place for the community by constructing new studios in the historic Walker's Point neighborhood of Milwaukee. While the studios at Milwaukee Public Schools continue to be used to air weekly school board meetings, the new facility gives 88Nine Radio Milwaukee a very tangible physical presence in the community.

WALKER'S POINT

The Walker's Point neighborhood is south of Milwaukee's Third Ward and has historically been an industrial neighborhood for the most part, home to tech companies such as Rockwell Automation and PKWARE. Recent years have seen a revival of this neighborhood as new housing; retail and office development replaces long shuttered factories and other previously

PARTIAL EQUIPMENT LIST

- ENCO Systems Automation
- Axia AES and Analog Nodes
- Axia Element control surfaces (Main Control Room)
- Axia Radius systems (Production Rooms)
- Telos Nx12 Phone Systems
- Telos Z/IP One Audio Codec
- Telos Zephyr Xstream
- Telos ProStream
- Presonus StudioLive Console for live bands
- QSC KLA Arrays with KW subwoofers in live performance venue
- Electro-Voice RE27 Microphones
- DBX Microphone Preamplifiers
- Rolls Headphone Amplifiers
- Genelec Studio Monitors
- Eventide BD961 Audio Delay
- Denon DN-C635 CD Players
- TrippLite UPS units

A "green" roof doubles as another performance and event space.

industrial space. The neighborhood is also becoming a new cultural center, with a number of community nonprofit organizations as well as a variety of nightclubs and other venues.

THE STUDIOS

On the broadcast side of things, the facility features one main control room with a self-contained space for live performance, four small production studios, and a tech center to house support equipment common to all studios in the facility. Audio routing and distribution is via Axia Livewire with content primarily played from the ENCO system or CDs by the hosts, and of course the live bands and DJs that frequently visit the facility.

UNIQUE SPACES

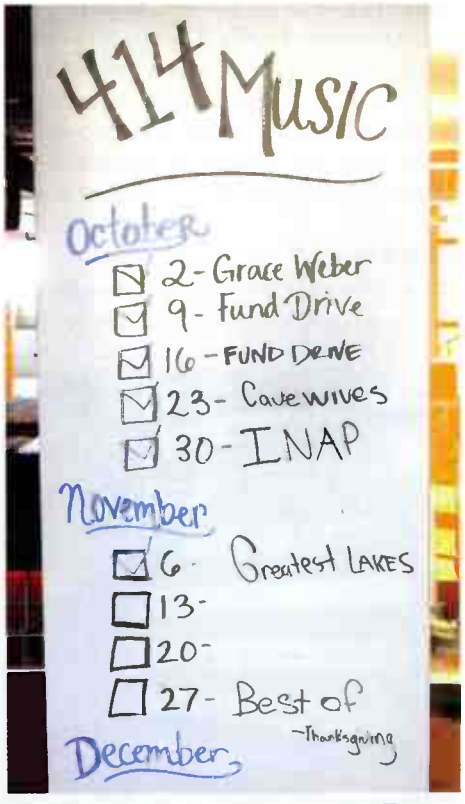
In addition to the broadcast studios, the facility features several other very unique spaces to help Radio Milwaukee accomplish their mission. As you enter

The technology center houses support equipment for the studios.

A recycled door doubles as a countertop.

CD Shelving made from recycled lumber

Kitchen and green room space



Walls also function as whiteboards—This particular one is the 414 Music lineup.

the facility, the first thing that you notice is that it is directly attached to a local coffee shop. This immediately creates a warm and inviting atmosphere to connect with the station and others in the community.

While there is a secure entrance into the broadcast facility itself, there is a large common area between the coffee shop and the station's main indoor performance space. Viewing areas are provided from the common area for both the main air studio and the performance space. This performance space can accommodate audiences of up to 100 people and regularly hosts live concerts for the public by local bands and nationally known artists. Large glass garage doors open up between the common area and the performance space to accommodate larger crowds.

"GREEN" CONSTRUCTION

Recycled materials are used throughout the facility. In the office spaces, one of the more interesting features is the use of old doors as countertops. Shelving for CDs and wall coverings are also constructed from reclaimed materials. This theme carries throughout the building all the way to the rooftop, where a "green" roof also doubles as yet another live performance and event space.

THE KITCHEN SINK...AND MORE

What radio station would be complete without a full kitchen? Not only does the new Radio Milwaukee facility have a full kitchen area, it also features something most radio stations don't have—a laundry room to allow visiting artists (or station staff) to wash their clothes after long hours on the road or working at the station. Artists and staff can also make use of the green room spaces to rest and relax when they aren't on the air. The entire facility is designed to make station staff and visitors feel very much at home.

MORE THAN JUST A BUILDING

In keeping with the Radio For Milwaukee mission, the goal was not only to create a new home for the broadcast studios, but a "hub" for the community. Now that the staff is getting used to the space, 2015 promises to bring even more opportunities to use the space to fulfill the mission. The new space truly does give 88Nine Radio Milwaukee a common gathering place to bring the community together both on the air and in person through music.

Another small studio equipped for audio editing and production

Axia Radius surfaces in smaller studios

FIELDREPORT

Yamaha MG10XU

by Chris Wygal

Generally speaking, engineers get to hide out in their office or rack room, work on a project or two and be ready for things to go awry. Sometimes however, a project pops up that requires him or her to come up with a quick and easy solution. When small jobs happen, having good tools that are easy to carry around can be an engineer's best friend. An acoustic set with guitars and vocals, a board room or maybe a fundraiser broadcast with some mics in the call center are prime examples of events that generate a "how do we do this" phone call to the engineer.

Yamaha is one of the biggest players as far as large and micro-format mixing surfaces go. The "MG" series has proven to be a top-quality small-format mixer, providing simple solutions for musicians and engineers. New to the MG family is the Yamaha MG10XU. It has four mic inputs, three stereo inputs and a host of nifty features for grab-and-go-and-sound-great projects.

COMPANY

Yamaha Pro Audio
www.yamahaproaudio.com

ON THE SURFACE

The MG10XU has layout features found on just about every small mixer. Rotary pots make for an economical use of space. It is just over nine inches wide and weighs less than 5 pounds. The four microphone inputs boast excellent preamp technology providing smooth and accurate response along with a low noise floor, features that have made Yamaha a favorite among audio engineers. Each mic input includes a 26 dB pad and 80 Hz high pass filter. The mic channel input stage provides as much as 64 dB of gain. Channels 1 and 2 have a compressor stage that adds threshold, ratio and output compensation to the channel. The ratio is adjusted up to 4:1 with a 25 msec attack time and a 300 msec release. Low, mid and high EQ adjustments allow for basic tonal crafting of the response on all four mic channels. 48V phantom power is available on each mic channel. The unbalanced stereo inputs each have two-band (high and low) equalization. Channels 5/6 and 7/8 have ¼" TS and RCA jacks. Channel 9/10 comes with ¼" TS jacks, and is switchable to the USB interface. All the channels include effects send, pan and rotary fader.

NUTS AND BOLTS

Small format mixers all-too-often only include ¼" output jacks. When these small mixers are put into "big boy" environments, adapters are needed to convert to the professional XLR ins and outs. The MG10XU has both XLR and ¼" mains outputs. As simple as it may seem, the is one of the most attractive features on the MG10XU. It also includes a headphone jack with separate level control, master output level control and a seven-segment stereo LED master meter. It also contains "monitor out" jacks for use in the studio. As mentioned before, the MG10XU comes with a USB jack for slick interfacing with a PC or Mac. When the driver is installed, the mixer effectively becomes a soundcard. This is great for minimal cabling, low noise floor and low-latency recording and monitoring. The USB input to the computer is the main output from the mixer.

The MG10XU boasts the SPX Digital Multi Effects Processor. It's a bank of 24 reverb and acoustic effects with a separate effects return channel that automatically routes to the mains output. These digital effects contain everything from room ambiance, delays, plates, choruses, and flanges, plus several others. This is a great tool for conveniently mixing acoustic sets or very small bands. The built-in effects sound true and convincing and much better than lugging external equipment to small setups. And if that isn't cool enough, the MG10XU makes room for a microphone stand adapter. It's light enough to perform atop a mic stand!

As equipment becomes lighter, smaller and in some cases virtual, an all-in-one solution is an added bonus. The MG10XU provides lots of quality and features that are packed in small frame. A console like this is a critical component in the engineering toolbox for whatever project may come in the future!

Wygal is the programmer and engineer for Victory FM at Liberty University, Lynchburg, Va.

Each month, Radio magazine receives a number of e-mails and comments from our readers. From time to time we pick a few of those to share. October's editorial on the topic of AM radio brought these responses.

LOW POWER AND LOCAL

"Regarding the Disney stations that will be for sale, I would consider it likely that a religious broadcaster will purchase them. In my area within a range of about 30 miles, a particular religious broadcaster has one 3000 watt FM station, a 24 hour 500 watt AM station and four FM translators, all with identical content. Thank you, FCC! I believe that a digital only portion of the band would be a bad idea since locking onto an AM digital carrier is not always easy and could be a nightmare at night. How many car radios or home have such capabilities, anyway? Content is the key and if the FCC would consider it, low power 100 to 250 watt local stations would be a reasonable alternative to the scarce channels open to FM low power community or school sponsored stations. A lower power requirement would encourage the development of such stations. This would also diminish interference if higher power stations sell some stations to communities."

B. Hammond

***Editor's note:** Any current HD Radio model that is capable of receiving hybrid AM HD Radio signals is also capable of receiving all digital AM HD Radio signals. It has been reported, however, that overall performance and behavior if the signal is lost in all digital mode varies between receivers from different manufacturers.*

MORE POWER FOR AM

"One thing I think would help AM is something that was tried (once) and has been suggested a few times over the years. How about lifting the 50 KW power cap on AMs? Let those stations that are strong buy up and shut off those that are weak or marginal and let them go up in power to 500KW or perhaps 750 KW. That would help those strong stations overcome the noise and be able to move a little further away from their core service area (dealing with the encroachment issue) and still deliver a good signal. Fewer stations would mean less interference, and if enough went away, maybe the receiver manufacturers could widen up the bandwidth of the radios again to improve quality. You are correct in that those AM stations that have good content AND have a decent signal make a lot of money, even today. The list of the top 10 billing stations in the country usually includes a number of AMs. Rather than killing the AM band, doesn't it make more sense to let those stations that are strong get stronger and let them buy off the weak? It's not like the TV spectrum, where it has other uses. If AM goes away, what will we do with those frequencies? Probably nothing, so let's figure out a way to have fewer, stronger stations in that band rather than just letting it lay fallow."

Alan Parnau

PORTABLE AM RADIOS

"Sadly, any portable digital radios only have FM on them. When will we get portables with AM, too?"

Submitted via radiomagonline.com

FM IN SMARTPHONES

"I am a Broadcast Engineer who has been working in public radio for a number of years. The FM Chip Activation is a no brainer! Public safety (EAS), larger audience base for all stations and even a selling point for the carriers. What is the hold up?"

Steve Oneill

Send your feedback to radio@radiomagonline.com. We always appreciate hearing from you.

Transmitter Site Cleanup

by Doug Irwin
CPBE AMD DRB

Consider the following scenario: You are tasked with maintenance responsibility for a new (to you) radio station and its transmitter site. After the first couple of visits, you start to notice some things that appear to be…shall we say…out of place. Should you demolish certain things and throw the pieces in a dumpster, or perhaps restore some of these "mystery" systems to service? Let's take a look at some examples.

I have yet to visit a "new" transmitter site that doesn't have a cabinet filled up with old spare parts. Naturally when you first discover them your inclination may be to keep everything. However, some items will clearly be obsolete. One station I visited had lots of spares for an old vacuum tube transmitter—yet was currently running two solid-state rigs, each of which was at least 10 years old. Verdict: remove or otherwise dispose of the old parts.

Some transmitter sites that once housed tube transmitters may also have old blower motors lying around. Typically those can go. Keep in mind they often have some salvage value.

On the subject of blower motors, one thing you might see around such a transmitter site is this:

This is a fan puller tool used to remove a squirrel cage (or other fan blade) from the shaft of a motor. Keep this one!

Fan Puller

Another feature one often sees at some sites is an old exhaust blower either in the ceiling or right over the door. Does it work? What is it for? This may have been part of an "old-school" cooling system. Think about it…20 years ago before solid-state transmitters and computers made their appearance at the transmitter site, air conditioning wasn't as commonplace as it is today. There was not as much need to keep the transmitter space nice and cool. Many sites simply relied on exhaust blowers.

Can this system still be useful? At the very least, it could function a backup cooling system if the "new-fangled" air conditioning system should fail for some reason. Test the old system. Find the thermostat, run the setting to a lower temp, and see if the fan comes on. If not, see if you can make it work. If you have one of the fan blade pullers I described earlier, you'll be glad you kept it. It makes changing the blower motor much easier should that be necessary to make the system functional.

Most likely you have a temperature sensor of some sort connected to a remote control, right? You might want to consider adding an air switch or perhaps a current sensor to the exhaust fan system. Connect this sensor to the remote control. This way, if you get a call or message from the remote control indicating that the room temperature is high and the exhaust fan is on, you'll know your air conditioning may have malfunctioned.

Another item typically found at sites is one or more boxes of air filters. Did they go with the tube transmitter that made its exit 10 years earlier? If so, clearly they're garbage. Before you throw them out, however, look for any old and forgotten air inlets carved into the exterior walls. Sometimes desks, cabinets, or other boxes get pushed up against them. "Mystery" filters could have been used on these air inlets, hopefully on the north wall of the building.

Once an air conditioning system is installed, often old system remnants such as these are forgotten. These air inlets are part of the same system as the exhaust fan I mentioned. Remove any old, rotted filters and replace them. Move stuff away from the walls so that these air inlets aren't forgotten again.

Here's another familiar sight:

Alarm Sensor

Old transmitter sites often have components of abandoned alarm systems. If your transmitter site is shared in some fashion, clearly you'll want to know when someone other than you goes in and out. One option is to remove these abandoned components as part of site cleanup. On the other hand, you could connect these sensors to your current remote control and configure an alert that tells you when the door opens or closes.

These are just a few things that you could do to make a "new to you" site a bit cleaner and more reliable. Do you have any tips for making old sites new again? What is the strangest thing you have ever encountered at an inherited transmitter site and how did you deal with it? E-mail your stories to *radio@radiomagonline.com.*

Irwin is RF engineer/project manager for Clear Channel Los Angeles. Contact him at doug@dougirwin.net.

WE NEED YOUR TIPS

Tech tips may be suitable to earn SBE recertification credits. Send your tips to radio@RadioMagOnline.com.

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50 YEARS SBE. 1964-2014

This Month in SBE History

2014 Marks the 50th Year of the Society

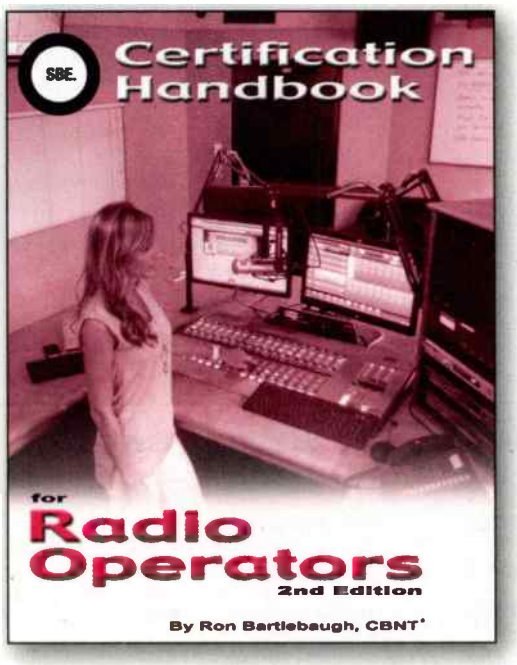
Operator Certification

by Chriss Scherer

Since its inception in the 1960s, the Society of Broadcast Engineers continued to grow and evolve in its purpose and the services it provided to members and the industry. As the 1980s approached, radio and TV broadcasting technology continued to advance, and the Federal Communications Commission began loosening many rules. This included individual operator licensing.

For many years, radio operators who were in control of the station (taking meter readings and changing power among other duties) were required to hold an FCC Third-Class License with the Broadcast Endorsement.

By December 1978, the FCC eliminated the licensing requirement. While this removed a perceived burden for operators and station owners, it meant there was no longer a standard means for a station to qualify its operators.



The Society of Broadcast Engineers had already established the Program of Certification in 1975, and with the void created by the FCC's action, the SBE stepped up in October 1980 to find a solution. Work began to develop a test and certification that could substitute for what the Third-Class License evaluated. This new level of certification was called the Certified Broadcast Technologist (now abbreviated CBT).


The Society of Broadcast Engineers

Washington, D. C.

The Board of Directors recognizes by the issuance of this Certificate that

Andrew R. Funk

is hereby recognized as a

BROADCAST TECHNOLOGIST

In testimony whereof witness the signatures of the President and Secretary under the seal of this society this 1st day of July, 1982

Secretary

President

No. 20000 Expires 7-1-87

Then and now, the CBT can be obtained in one of two ways. First, an applicant can take and pass a written exam, like the other levels of SBE certification. A local SBE chapter certification chairman or his designate can administer the 50-question multiple-choice exam. Examinees can also arrange for private proctoring when there is no local chapter or when the exam proctor and examinee have a personal or professional conflict of interest. The second method to obtain the CBT is to hold a valid FCC General Class Radio Telephone license, FCC Amateur Extra Class license or a Canadian Advanced amateur license with either two years of continuous satisfactory service in broadcast engineering or a related technology prior to the date of application, or a total of three out of the last five years of satisfactory service in broadcast engineering or a related technology.

In time, as the required technical proficiency of a radio operator lessened, the CBT came to be aligned as an engineering-level certification. Today it's part of the Core Four levels of SBE certification. In 1995 when the FCC eliminated all licensed operator requirements at radio stations, the SBE created the Certified Radio Operator (CRO) and Certified Television Operator (CTO) levels of certification. The SBE has revised the "SBE Certification Handbook for Radio Operators," which is the preparation guide to take the CRO exam. The second edition of the book is now available from the SBE.

Historical source: "The History of the Society of Broadcast Engineers, 1964 - 1981," by Bradley L. Dick, CPBE.

Scherer is a contract engineer and recording engineer in Kansas City, and former editor of Radio magazine.

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