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November 2006
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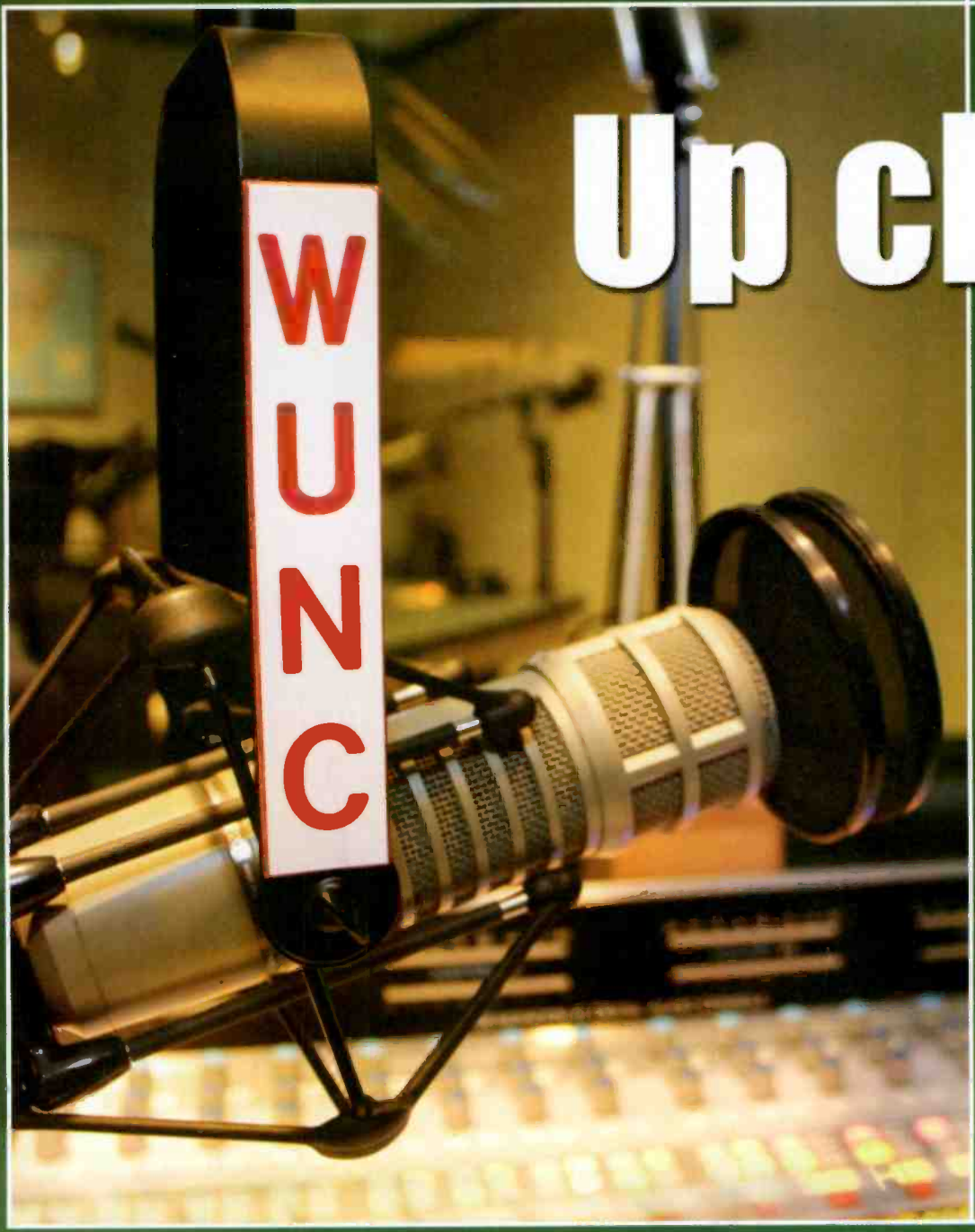

Up close with the community

HISTORY REMEMBERED

Preparing for radio's 100th anniversary

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Burk GSC3000
Inovonics 713

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Features

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ON THE COVER

WUNC, Chapel Hill, NC, has increased its public presence by building a satellite studio, which lets the station get closer to its listeners. Photo by Dave Horne. Cover design by Michael J. Knust.

Wireless Broadband Internet Remotes

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Clear Channel St. Louis

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CONTENTS ONLINE

Currents Online

Selected headlines from the past month.

FCC Seeks Nominations for WARN Committee

This committee is being established pursuant to the Warning, Alert and Response Network Act (WARN Act), which was enacted on Oct. 13, 2006.

MXL Ships MXL.006 USB Condenser Mic

The MXL.006 features a large, gold diaphragm, a three-way attenuation switch and a USB output.

Buckley Will Use PPM in NYC

Buckley Radio, a Top 50 radio broadcasting company, will begin using the PPM in a multi-year agreement with Arbitron.

MPEG Surround Technology Showcased at AES

MPEG Surround is a compression technique for multi-channel audio signals.

Shure Signs Licensing Agreement with APT

Shure selected Apt-x Live after a series of extensive listening and performance tests conducted over a period of several months.

Audio-Technica Launches 40 Series Online Demo

The website feature allows visitors access to technical specifications while auditioning A-T's line of 40 Series side-address condenser microphones.

Mississippi Stations Find New Way to Send Emergency Alert

Thirty Mississippi radio stations have installed Global Security Systems' First Alert System.

Site Features

Radio Glossary

With new technology comes new terminology. We have a list of the new language of radio broadcasting, and you can find it online.

Today in Radio History

The important dates that have shaped radio's history are included here.

2006 Product Source

The September issue included the annual *Radio* magazine Product Source. You can read the entire contents including the special sections and Pick Hits recap online.

Applications and Solutions

Looking for specific articles relating to a type of product? We provide easy links to technology through the Applications & Solutions section. Click on a product category to see articles relating to your interest.

The DAB Answer Series

The Insight to IBOC supplement in this issue covers a specific aspect of digital audio broadcasting. The complete content of each issue, including the one in this issue is available online.

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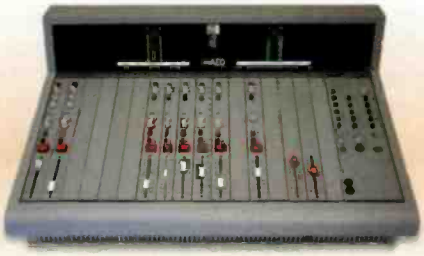
Analogue audio console with built-in telephone hybrid and power amplifier at incredibly low price.



BC 500
Cost effective analogue audio console with built-in digital telephone hybrid.

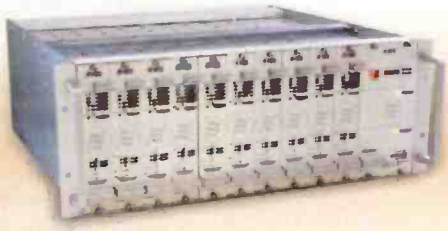
BC 2500
Top level analogue audio console.

EQUIPMENT FOR REMOTES

PAW 120
Palm-size digital recorder. New and improved design.

Swing
Portable codec, audio mixer and telephone hybrid.

Eagle
ISDN audiocodec with phone hybrid capabilities at a great value!



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Who was first?

A quiet celebration is brewing that marks a unique anniversary for radio broadcasting, although I don't expect that it will stay quiet for much longer. Radio recently marked a milestone as well. The two events are 100 years apart, but they're part of the ongoing evolution in radio broadcasting that we're all a part of. What are these two events? The anniversary will occur in December, while the milestone occurred in September. Let's start with the history.

In the June issue this year I offered a definition of radio: delivering an audio program of entertainment or information to an audience. Audio is the key for radio. But when did radio begin transmitting audio signals? Be careful. While many people are quick to credit Marconi as being the first to broadcast an audio signal, he only transmitted Morse code with a spark-gap transmitter in 1901. (And for now we won't argue the claim of him being first or that he actually received the signal; we'll save that for another time.)

The truth is that history is always sketchy at the moment something occurs, but the first audio broadcast is credited to Reginald Aubrey Fessenden, who provided a Christmas Eve broadcast in 1906. He actually transmitted an audio signal (his own voice) a few months earlier, but that was a point-to-point transmission. His Dec. 24 transmission was intended to provide a voice and music program to anyone who was listening. That's a radio broadcast to me.

This event may challenge the claim of who can be credited as being the father of radio. Debate it all you like, but the reality is that radio evolved and improved through the work of many people. It is not any one person who performed all the work. Marconi and Fessenden are important, but so are Fleming, Hertz, Tesla, de Forest, Armstrong and many others.

We like to answer the "who was first?" question for everything we do. The debate over the first broadcast station gravitates toward KDKA, but it's not hard to show that other early broadcast stations beat KDKA to it. This example leads us to define "first broadcast" and other aspects, which further clouds the issue.

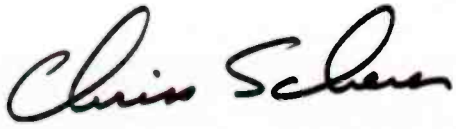
Simply asking "who was first?" doesn't always yield the correct answer. The truth is that KDKA and Marconi just marketed themselves better than the others. Many people have never heard of Fessenden. The upcoming anniversary will help change that, but even when claims are settled in patent suits or in a courtroom, history may continue to get it wrong for some time to come.

First or not, the 100th anniversary of Fessenden's voice broadcast will be recognized in December. Look for more news and stories about him in the coming weeks leading to the Christmas Eve anniversary. We have our own salute to the man in this issue on page 40, which is a lead-in to a special feature in next month's issue that reviews the top technologies that have shaped radio broadcasting.

While we remember the past 100 years, radio broadcasting continues to make strides forward. I mentioned another milestone that was recorded in September. On Sept. 18, the 1,000th station commenced HD Radio transmissions. WIYY, Baltimore, was bestowed the recognition by Ibiquity. Since then more than 20 additional stations have signed on with HD Radio.

Remember the 1,000th HD Radio station event today, by the way, because I'm sure that in 100 years there will be a heated debate contesting the WIYY distinction of achieving that mark.

Regardless of who gets the credit for being first, second, 1,000th or any other distinction, the evolution of radio broadcasting is the result of cumulative efforts from inside and outside broadcasting circles. The innovation and technical evolution continues and extends beyond the confines of the airwaves and includes many other forms of wired and wireless distribution. Even with the ongoing challenge of new forms of audio media, radio holds its ground and moves forward.



Internet remotes... there's been talk.

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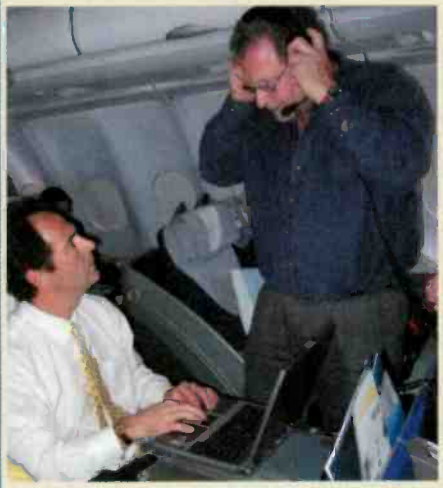

... successfully aired his three hour talk show from a commercial airplane [using ACCESS] at 37,000 feet on a regularly scheduled flight between Frankfurt, Germany and New York, US.

Peter Greenberg—Host of the syndicated radio program Travel Today

For the complete story visit
http://remotebroadcasts.blogspot.com

Radio Free Asia—Live from the Himalayas

"The results [with ACCESS] were especially reliable considering that Dharamsala has one of most "problematic" Internet infrastructures that we have come across."
—David Baden, Chief Technology Officer Radio Free Asia

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Ski Mountain Remote

This picture, really demonstrates what ACCESS is about. This product truly has the ability to cut the wires.

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JAMN 94.5—Walk for Hunger

"ACCESS was used on the air exclusively for JAMN945 at this one. It was all over EVDO with a tremendous amount of active cell phones in the area. The ACCESS was connected to the Verizon wireless Broadband...

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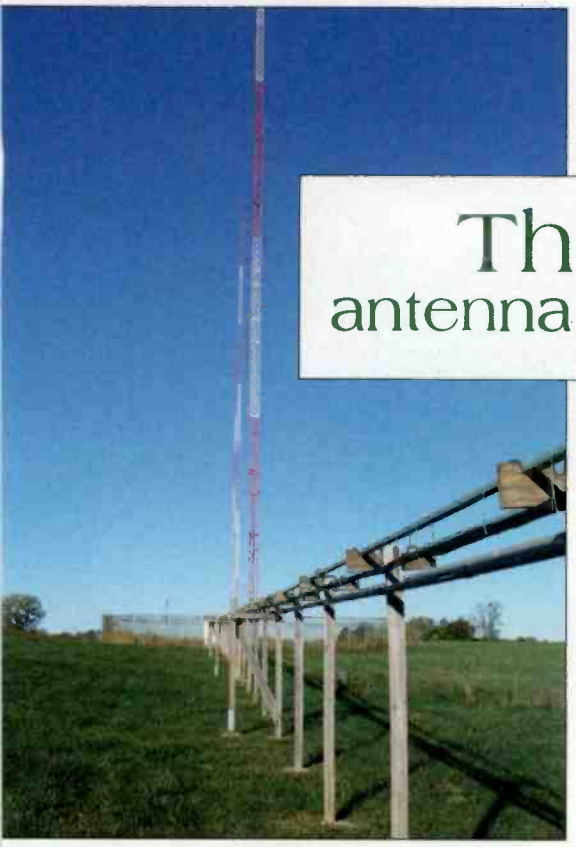

The road to antenna maintenance

By John Battison, P.E., technical editor, RF

It's important to know a station's licensed operating parameters before any meaningful system maintenance can be performed.

It is a true statement that AM antennas are usually forgotten until something goes wrong with the signal. Then, finally, some attention is paid to the pile of steel rusting by the transmitter building. In the case of a nondirectional station it generally takes serious deterioration to affect the signal greatly. In the case of a directional station many factors such as current, phase, self and mutual impedance, monitoring system and transmission lines can interact to ruin a pattern and affect a service area.

I'll speak more directly at directional array (DA) maintenance than to nondirectional because a DA's additional complexity requires greater attention to several numerical values than a simpler nondirectional antenna. Before any useful maintenance can be performed it is essential to know how one's system is supposed to operate and also know the licensed operating parameters.

A station chief engineer should have information on the operating parameters for the antenna system at the station including a copy of the latest proof of performance and the current license. If the station does not have this information, make it a priority to obtain them. Sometimes this takes a great deal of repetitious effort to find out the name of the consulting engineer or other person who performed the proof of performance and obtain a copy of the proof. At the same time the station files should be checked carefully to be sure that the license displayed is the correct current license.

These may sound like obvious steps to take. However, it is surprising how many times I have visited stations and had a great deal of difficulty in finding the current license and a copy of the latest proof of performance. Several times I have found that the engineer has several licenses in his file and is not quite sure which is the latest. This is not generally the engineer's fault. It is often the fault of management who has not passed on engineering papers to the proper department.

While searching for the proof of performance and license it is essential to ask if any special temporary authorizations have been issued and are currently in use. Also, check for any pending applications that may have been acted on without the knowledge of the chief engineer.

Worthwhile effort

The foregoing may sound like a lot of unnecessary work, but believe me it is not. Until you know that you have the current, correct operating parameters it is not possible to be sure that you are resetting the operation in accordance with licensed FCC authorizations. There is nothing more frustrating on completing a DA tune-up than to have the station engineer come along and say "I just found this—it was dated last week" and produce a new license.

While the chief engineer is gathering the above information examine the operating log. Also examine the maintenance log to look for obvious potential problems. A properly maintained maintenance log is a wonderful maintenance tool.

If you don't know what you're looking for and what the operating values are supposed to be you can't very well perform maintenance on a system. Once all the necessary information has been gathered and assimilated the engineer will know what he is trying to maintain. He will have all this information ready for the time when it's needed for maintenance work or an FCC inspection.

Maintenance procedures

The road to proper maintenance is the road to adequate record keeping when the actual licensed and anticipated operating parameters have been established The next step should be to write down

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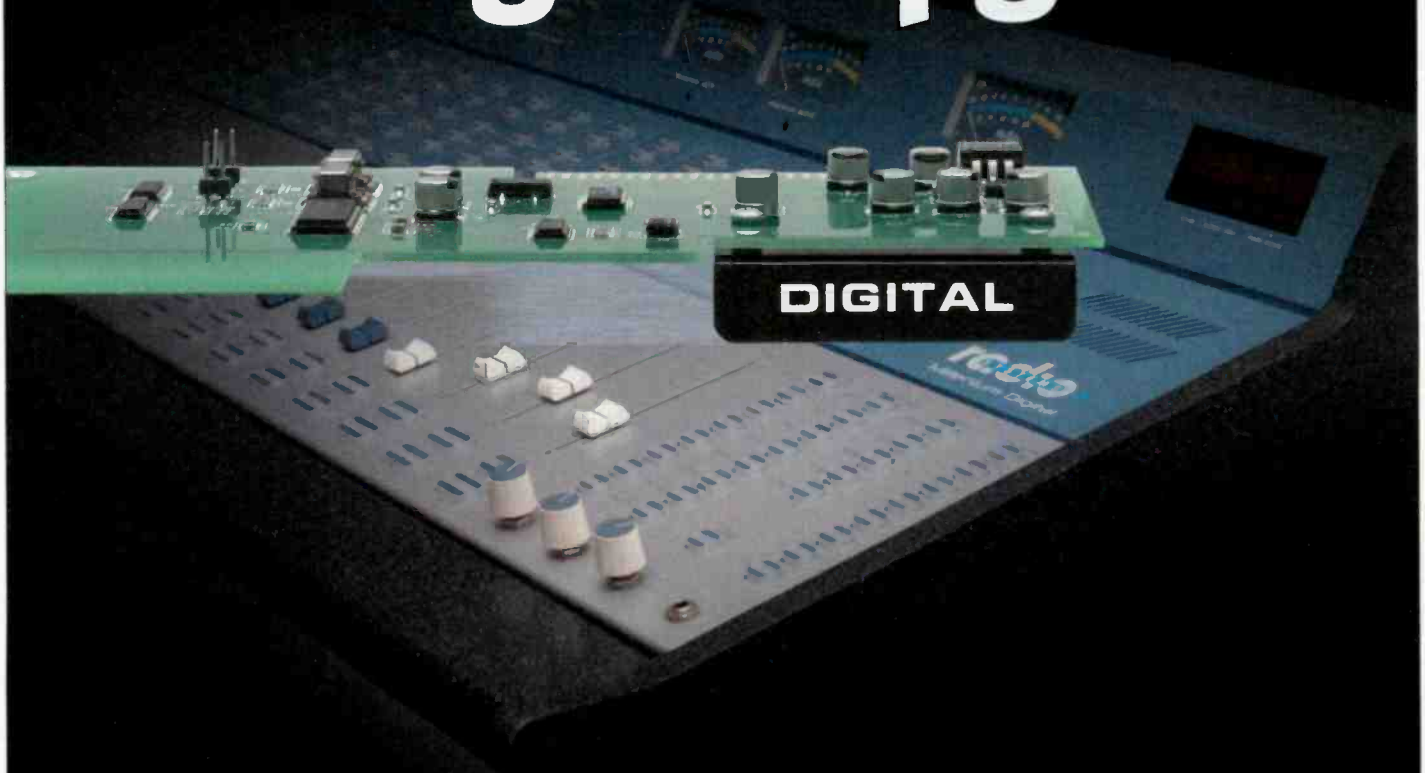

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all the dial settings on the phasor cabinet face (as well as in the maintenance log book) and all of the other indicating devices, including the antenna monitor. If, at this point, the antenna system happens to be properly adjusted according to the required operating parameters it will probably be a small miracle.

$I_{cp}^2 \times R_{cp}$ = RF power out

$I_p \times E_p$ = RF power out

Compare the power output according to the antenna with the output of the transmitter to verify operating efficiency.

The old FCC requirements of weekly inspections and equipment operating logs, in my opinion, made maintenance a great deal easier. The regular equipment inspection contributed greatly toward trouble-free operation. The old operating logs were often used as directional signs pointing toward potential problems.

Comparison of RF power out of the antenna based on I_{cp}^2 times R_{cp} against power consumed by the final stage I_p times E_p provides an excellent way of checking the efficiency of the final stage. Check this figure from time to time to be sure that RF power is not being lost in unexpected places. The efficiency figure thus obtained can be useful if the engineer needs to operate under conditions of indirect power measurement, which is based on the use of previously measured or the manufacturer's rated efficiency.

Regular maintenance must include the examination of all connections and connectors in all circuits, tower-mounted antenna monitor loops, or current transformers at the output of the tee-matching network in the ATU. Lighting circuits and photo-electric controls must be checked and tested as well as pattern change contactors and control circuits.

If maintenance occurs immediately following transmitter shutdown, capacitors should be checked for unusual heat, which may indicate potential failure or excessive current through a circuit. Inductors should also be examined for signs of overheating. This often occurs at anchoring point connections and is especially important when clipped leads are employed because their clamps frequently work loose or develop poor contacts. Inductor overheating is indicated by discoloration of the plating.

Check tube operating hours if meters are provided, and don't forget to record the date of putting tubes into service. It's also a good idea to include details on actual or suspected reasons for tube failure.


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Transmission lines and antenna monitoring lines normally have little to check provided that no visible damage has occurred and that there are no symptoms that would indicate transmission line problems. Unless there are erratic readings there is normally no need to make more than a thorough inspection of the visible portions of the lines and their connections.

Overheating of inductors often occurs at anchor points.

If any of the lines are gas pressurized, or use a dehydrator individual gas pressures and the amount left in the tank, and dehydrator conditions should be checked. Of course if any damage to the lines has been noticed the line should be checked with a time domain reflectometer (TDR).

Guy tension and anchors must be examined and verified. Check for rust and galvanic action at guy anchors. Use field glasses to check for cracked guy insulators and look for cracks in base insulators. Water can infiltrate them and complete disintegration can follow in winter.

Ground systems and associated copper strapping must be examined for breaks and poor hard soldered joints. Unless there has been heavy traffic the soft ground radials should be OK in the absence of indicated electrical problems.

The common point impedance and current must always be verified after the completion of tuning the antenna. If a built-in operating impedance bridge is provided in the phasor it should be used, otherwise insert an in-line operating bridge on the transmitter side of the common point ammeter.

FCC monitoring points should be checked after all maintenance is completed. Maintenance results and work performed on the system should be recorded in the maintenance record book together with all measured operating parameters including the FCC monitor point readings and antenna monitor readings.

If any tubes have been replaced or major items taken from spare stock, replacements should be ordered or obtained, and other maintenance supplies replenished as necessary. There is nothing worse than realizing at midnight that the only spare final tube was used last winter and never replaced.

E-mail Battison at batcom@bright.net.

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FCC uses terrain data in NCE-FM channel reservations

By Harry Martin

In November 2003, the Commission opened a window for noncommercial entities to reserve for noncommercial use vacant FM allotments that had previously been set aside for auction. Because newly allotted FM channels in the commercial band are subject to auction, and because noncommercial channels (and applicants) are not expected to be involved in auction proceedings, the Commission had to come up with a way by which commercial channels might, in some limited circumstances, be reserved for noncommercial use and thereby be removed from the auction process.

To that end, the Commission adopted standards by which parties could petition the FCC to convert commercial FM allotments for noncommercial use so long as certain threshold qualifications were met. Communities out of the reach of existing NCE stations were preferred.

Two petitioners submitted proposals that appeared to qualify under the reservation process. However, both proposals were dismissed by the Commission's staff because the petitioners used engineering studies showing the actual terrain within the proposed service areas to determine the population that would receive first and second local service. The use of actual terrain in determining population typically increases the population. However, historically the Commission has declined to rely on terrain data in its FM channel allotment process, in any context, because such data tend to be derived from a specific assumed transmitter site, and in most FM allotment proceedings the successful applicant does not have a final transmitter site in mind at the allotment stage.

On recent reconsideration, however, the staff reinstated the proposals. In so doing the staff created a limited exception applicable to noncommercial FM reservation petitions. Petitioners proposing to reserve FM allotments for noncommercial use will be able to use actual terrain data to show compliance with the first and second local service requirement, as long as they certify that they have reasonable assurance of the transmitter site specified in the petition, and they have received FAA approval for the proposed construction. Finally, the petitioner will need to submit an application that meets the requisite level of first and second local service.

The overall impact of this ruling is unclear. It is at least conceivable now that Longley-Rice or other terrain data models could be extended to commercial proposals as well, in which case parties seeking to add or modify channels could choose hypothetical sites to support an otherwise-defective allocation proposal.

Dateline

Dec. 1 is the deadline for radio stations in the following states to file their 2006 biennial ownership reports: Colorado, Minnesota, Montana, North Dakota and South Dakota.

Dec. 1 is the deadline for radio stations in the following states to place their 2006 EEO reports in their public files and post them on their websites: Alabama, Colorado, Connecticut, Georgia, Massachusetts, Maine, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.

Buy an FM translator now

AM daytime stations might want to consider purchasing an FM translator or translator CP in their markets now. The NAB-sponsored proposal to allow AM stations to use FM translators to serve their communities at night is likely to be adopted. However, even if new rules are adopted in a year or two, trying to apply for a new translator is likely to be frustrating. After an AM-friendly window is opened, thousands of new applications are likely to be filed, many of which will be mutually exclusive with each other. The Commission still hasn't processed any of the thousands of mutually exclusive translator applications filed in the March 2003 window. The prospect for speedy processing of thousands more are dim at best. But AM broadcasters willing to take a risk might want to locate and purchase an existing translator CP now. A constructed translator would be ready for use the day the new rules become effective. There would be no waiting for the FCC to process the application. During the wait for the new rules, the signal of a noncommercial station could be rebroadcast. If the rules never materialize, the facility would at least have some resale value.

Martin is a past president of the Federal Communications Bar Association and a member of Fletcher, Heald & Hildreth, Arlington, VA. E-mail martin@fhhlaw.com.

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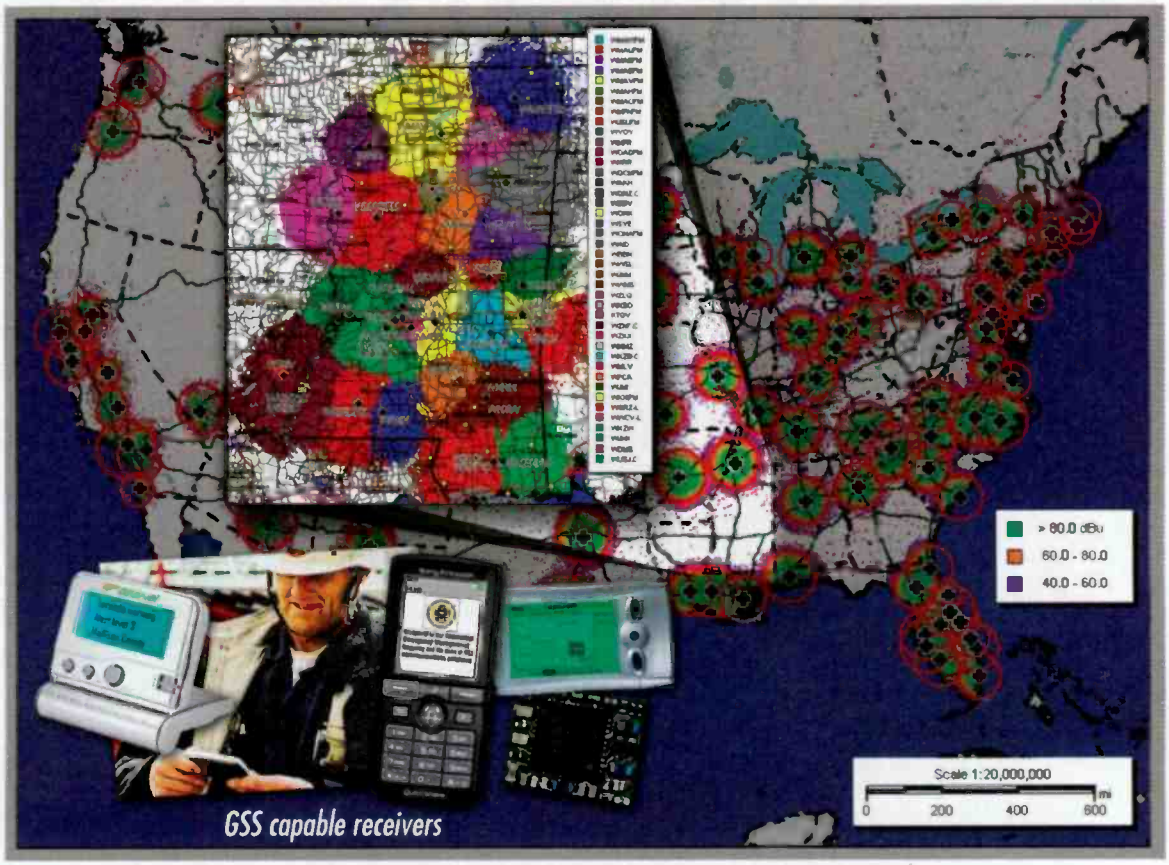

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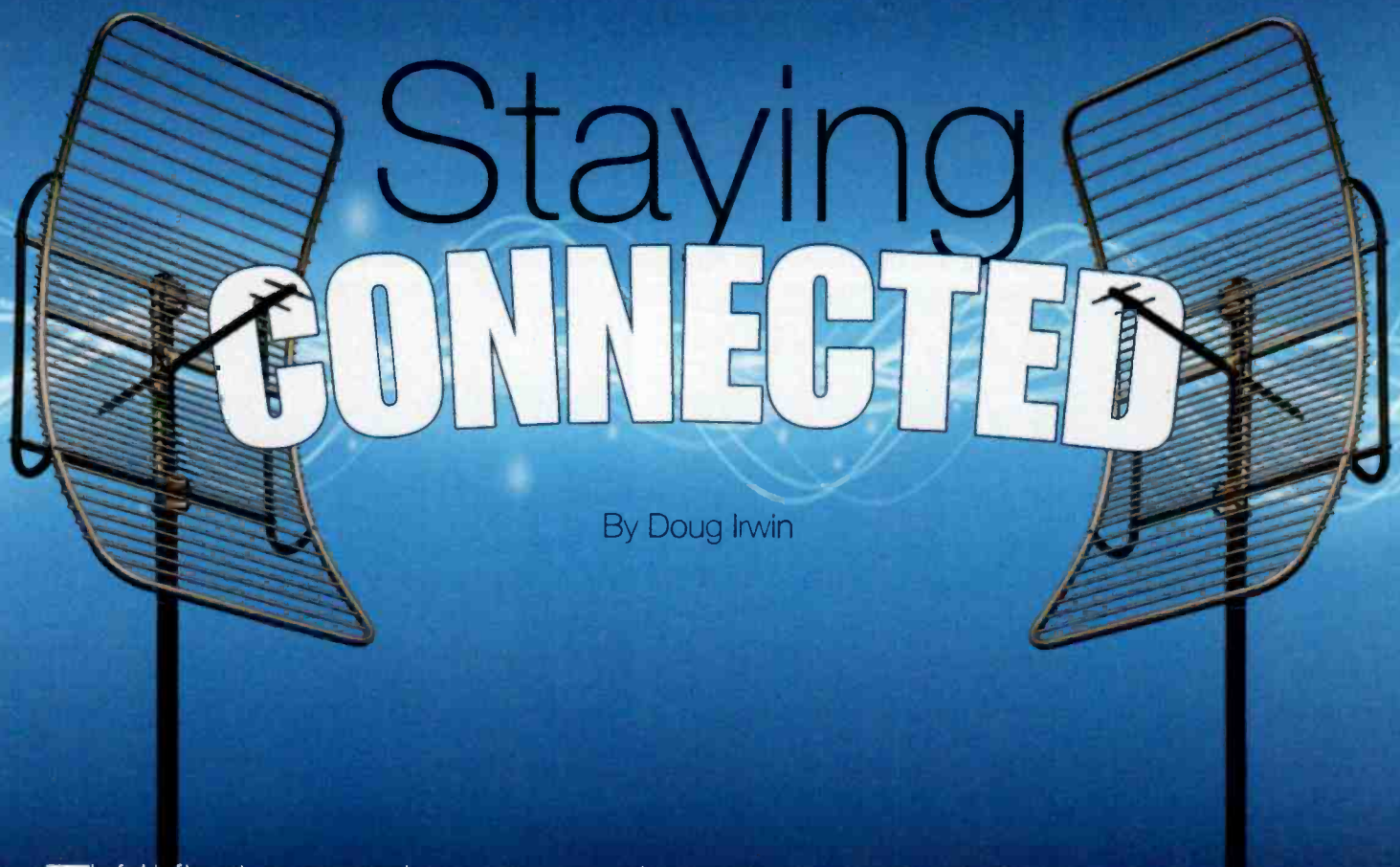

Staying CONNECTED

By Doug Irwin

The field of broadcast engineering keeps getting more complex. And though I sometimes pine for the days before computer automation, one thing I never miss is an old analog radio STL. While I still make use of one or two of the classic analog radios here and there, always in the back of my mind I remember that parts just aren't available any more. I have to keep hoping that they never break. The little parts drawers are nearly empty. Fortunately most of them are back-ups anyway.

With the trend toward digital audio transport, and lately data transport, a whole new generation of radio STL systems has been developed. Their inherent advantages completely outweigh the problems that they happen to share with their ancestors. For example, with an older style analog radio, co-channel interference could easily be noticed (at best) as some low-level audio chatter and (at worst) not-so-low level audio and a beat note to go along with it. My experience is that digital radios can operate more easily in a co-channel fashion, as long the desired-to-undesired ratio is great enough for the local demodulator to ignore the "noise" signal from the undesired transmitter. (If you opt to rely on this, by the way, be certain that your desired signal doesn't go through fades making it weaker, and that your undesired signal isn't in a fade when you measure your desired to undesired ratio. Changes in the desired-to-undesired ratio while you aren't looking may lead to great frustration later.)

The QAM modulation scheme of many of the digital radio systems seems to make them particularly susceptible to de-sense. Other transmitters keyed on and off (like paging transmitters) can make some of the digital demodulators lose lock, even with the receiver being far removed in frequency from the offending transmitter. That isn't typically a problem with analog radios because they use FM (unless you are unlucky enough to have an intermod show up on your STL frequency). The solution in a case like this is generally a sharp-skirted filter to keep other RF out of the front-end of your receiver. Getting a better antenna and using horizontal polarity (if possible) are other ways to reject signals from many other communications systems transmitting from mountaintops.

The current generation of digital radio STLs sound great, but like many other systems in radio, they aren't necessarily plug and play.

The primary advantage of any digital system vs. an analog system that operates within a limited dynamic range is the consistent quality of the sound. The dynamic range of audio encoded in a digital system is essentially fixed and is defined by the word length.

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So if you *are* looking to touch your listeners, you should be looking at the Aphex Model 230.

www.aphex.com

Genuine APHEX

Illustration By Jesse Cooper. Aural Exciter, Big Bottom, Easyrider, RPA, and Logic Assisted Gate are trademarks of Aphex Systems.

The dynamic range of an old analog system is defined by two things: the noise floor (in the case of an analog radio system or analog tape) and the limit of headroom (100 percent modulation in the case of an analog radio, the saturation point of tape).

Staying wired

Wireline STL systems have come a long way in the last 20 years. I never had the opportunity to use copper loops for an STL—although it was common everywhere in the old days. (You were indeed lucky if your studio and transmitter site shared the same central office) Getting a 15kHz pair was, in many instances,

Resource Guide

Manufacturers of STL equipment and accessories

Airlink Communications
510-781-9700
www.airlink.com

Armstrong Transmitter
315-673-1269
www.armstrongtx.com

APT
800-955-APTX
www.aptx.com

Bext
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www.bext.com

Bitrage
904-808-0656
www.bitrage.com

Broadcast Electronics
217-224-9600
www.bdcast.com

DB Elettronica Telecomunicazioni
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www.dbbroadcast.com

Digital Juke Box
740-282-SOFT
www.digitaljukebox.com

DMT
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www.dmtonline.us

Energy-Onix
888-324-6649
www.energy-onix.com

Harris
800-622-0022
www.broadcast.harris.com

Kathrein, Scala Division
541-779-6500
www.kathrein-scala.com

Lightpointe
866-376-5878
www.lightpointe.com

Marti Electronics
217-224-9600
www.martielectronics.com

Mayah Communications
+49 811 55 16 0
www.mayah.com

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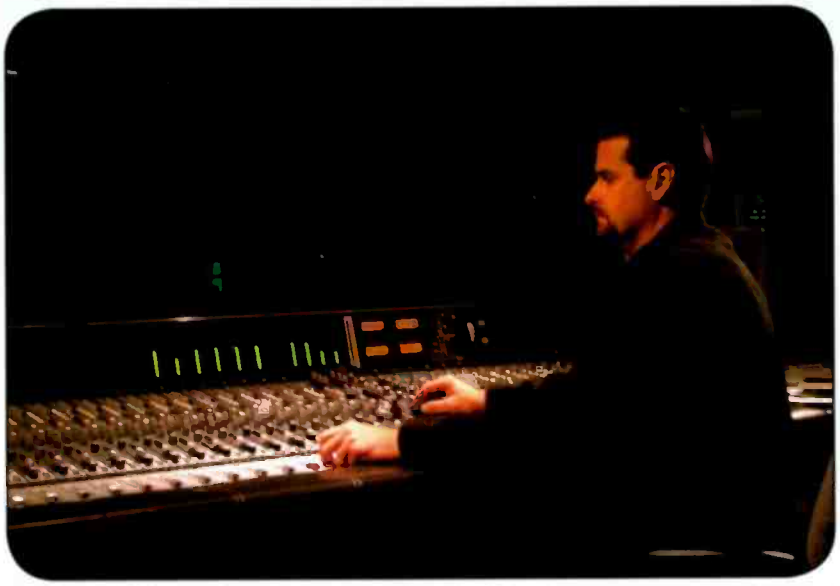
Insight to IBOC
November 2006 Part of the *Radio* magazine DAB Answer Series

Implementing Surround

Classical station WGUC makes the commitment to surround broadcasts

By Don Danko, CBRE CBNT

As one of the industry-leading classical radio stations in the country, it has been 90.9 WGUC's mission from day one to offer the highest quality musical experience to our highly discriminating listeners. So when WGUC initially made the transition to HD Radio in 2003 we were looking forward to the added benefits it would bring, such as the ability to broadcast 5.1 surround sound.



Don Danko, VP of engineering and operations for WGUC, prepares a surround recording for playback.

WGUC recording engineers began producing recordings of the world-renowned Cincinnati Symphony Orchestra and other notable ensembles in surround a number of years ago. These recordings provided the first programming for the station's surround-sound broadcasts. The next step would be to expand WGUC's surround-sound broadcasts to include commercially available recordings as well.

To do this, we evaluated many surround recording formats. There are unique characteristics to all of them, but for our use, we needed something that worked in our existing stereo infrastructure that would provide a rich surround experience.

The Neural Surround Downmix has the capability of transporting

HD Radio for a statewide network

By Chriss Scherer, editor

Every HD Radio installation is different because of the unique characteristics of the transmitter site, including the tower, the antenna and the available transmitter building space. As stations consider their options to install HD Radio equipment, it's not uncommon to change the design plan as additional information is discovered. In many cases, a station can examine another HD Radio operation and borrow ideas to apply to its own circumstances. For Wisconsin Public Radio (WPR), this was not quite the case.

Looking through the WERN antenna

Radio magazine has covered several HD Radio installations at commercial broadcast stations, so it was time to look at noncommercial side of radio to see how one radio network was making the change to HD Radio.

Wisconsin Public Radio has 27 radio stations in its statewide network. These stations carry

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Inside

A special supplement to
Radio
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WGUC

5.1 surround through our stereo infrastructure. The Neural process works because it is based on the principle that natural stereo and 5.1 content are two-dimensional (width and depth spatial attributes). The Neural Surround Downmix corrects overlaps of the signal sources in intensity, time, coherence, polarity and phase before the surround channels are combined and "watermarked" in the stereo downmix. In reverse, is the Neural Surround Upmix. The Neural Surround Upmix renders any two-channel audio source (stereo, matrix encoded stereo, Lt, Rt or Neural surround content) as surround sound. The Neural Upmix can simultaneously position individual elements within the surround field creating image stability by placing audio exactly where it would be heard.

For example, mono or pan-pot stereo will image in front of the listener, whereas stereo containing depth information will surround the listener. The Neural Surround Upmix allows the recording engineer to monitor stereo production and transport the 5.1 surround content encoded by the Neural Downmix.

The Neural Downmix (top) and Upmix were used to encode and monitor the surround material for stereo transmission.

Starting a project

When Neural Audio came to us with the proposition of actually researching the availability of 5.1 classical recordings and then encoding that content into a stereo stream for broadcast in analog and digital formats, we were certainly interested; especially because we had been testing the Neural Surround Mix/Edit System as well as other systems. We began researching not only the content and how it could be imported into our current infrastructure, but also the performance of the Neural Audio Neural Surround system as well. We came across several complications that had to be resolved.

The first issue was ensuring that the Neural Surround Downmix was of the highest quality. With the help of the Cincinnati Public Radio Audio Recording and Mastering Engineer Alex Kosiorek we had complete control of our created content. But we wanted to ensure content that originated elsewhere was at least of an equally high standard. After a collaborative effort focused on quality control, we were pleased that the Neural Surround Downmix was able to produce a stereo downmix that accurately represented the original content whether monitored in mono, stereo or Neural 5.1 Surround Sound. It is important to note that task was not easy in itself, and being able to accomplish it was quite remarkable.

WERN, WHRM

continued from page 1

one of two programming networks: NPR News and Classical Music (on 13 stations) or the primarily talk-formatted Ideas Network (on 14 stations). The public broadcaster is also developing a third programming network of all-classical music, which will be used to feed the HD2 channels of the network's HD Radio installations.

The network's goal is to convert all its stations for HD Radio. The current timeline accounts for all but two of the stations to be converted to HD Radio by August 2008, although the remaining two may be completed by that date as well. The network is currently converting WLSU in La Crosse, WHAD in Delafield and WPNE in Green Bay.

Late last year, two stations were converted to HD Radio: WERN, Madison, and WHRM, Wausau. These stations, licensed to the Educational Communications Board of Wisconsin, began the process of installing HD Radio equipment in the first quarter of 2004. The process began with applying for grants through the Corporation for Public Broadcasting. The grants were approved during the summer of 2005, and the work began shortly thereafter.

At KUWS-FM in Superior and WHA-AM in Madison, both licensed to the University of Wisconsin, converted to HD Radio.

The stations

The two stations have different antenna systems. WHRM uses a multistation, 10-bay ERI panel antenna that was designed to accept HD Radio signals on the second input. This community antenna installation has been adding HD Radio stations since it was installed in early 2004.

The antenna for WERN, a Jampro JAPD, was installed for the station's analog signal before HD Radio was being considered. Adding another antenna to the tower was not possible, so a separate antenna approach was not considered. Because the existing analog antenna had the power capability, the original plan was to install an HD Radio transmitter and high-level combine the analog and digital signals to feed the antenna. While awaiting the grant approvals, WERN Technical Services Manager Peter Ives continued to investigate HD Radio technology, and during the 2004 Broadcasters' Clinic in Madison, WI, he learned that Jampro was developing a retrofit upgrade for the JAPD to accept a second input.

The antenna-combined method appealed to Ives because it would require less room in the transmitter building and result is less wasted energy because of the high-level combiner. The alternate

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Image credits:
Page1 - Antenna image courtesy of Jampro.

The *DAB Answer Series* is an ongoing series of supplements that covers the technology of digital audio broadcasting.

Insight to IBOC - a supplement to Radio *magazine*, November 2006,

Open Mic
The HD Radio roll-out

The larger groups are regularly in the spotlight with news of their stations implementing HD Radio, but smaller groups are just as much a part of the transition. Lincoln Financial Media (LFM) owns 18 radio stations, and it is in the process of installing the technology across the group. We talked with Barry Thomas, vice president of engineering for Lincoln Financial Media, to hear about this group's philosophy on implementing HD Radio.

Radio: *How does LFM determine which stations will install HD Radio equipment?*

BT: The HD Radio roll-out is incorporated into our existing transmitter replacement plans for each station. This process is slated to be completed over the next few years, but more than one-third of our stations will be on the air with HD Radio by the end of 2006. The station roll-out is also on schedule with our agreement with Ibiquity to implement the technology at our stations.

Radio: *What is the current station roll-out plan?*

BT: In 2005: KKFM, Denver, and WLNK-FM, Charlotte, went on the air. In 2006, WSTR-FM, Atlanta, WLYF-FM, Miami, WMJX-FM, Miami, KCKK-AM, Denver, and KYGO-FM, Denver, went on the air. KSON-FM, San Diego is under construction. In 2007 we'll add more stations in Denver and possibly San Diego. The HD Radio roll-out should be complete by the end of 2008.

Radio: *How do you categorize LFM's plan to implement HD Radio?*

BT: LFM is not an early adopter, but we also do not want to be behind the curve. Call us a middle adopter.

We're not exactly sure how we're going to use the technology, but we know that there is potential. We are experimenting with ways to do it. We believe that the killer ap is multicast. We're exploring what we're going to do with the added channels in the end.

Radio: *So multicast is important to LFM?*

BT: Yes. We expect to run HD-2 on all our HD Radio FM stations.

Radio: *What are your stations doing with the multicast capability?*

BT: Consider that muticast today is like FM radio was in the 70s: the record changer in the back of the studio. We have a variety of formats on our HD-2 channels, and in time we'll focus on what will work best on these channels. In the meantime we have the platform to do it.

WGUC

The next step was obtaining the surround sound content and deploying it in our existing infrastructure, including importing the large audio files into our Enco Digital Audio Delivery (DAD) system. This is where Neural Audio swung into action. They contacted two classical labels, Telarc and Deutsche Grammophon, for permission to encode their available 5.1 content for stereo. After permission was secured, Neural took the 4.0 and 5.1 original content and captured that on DVD-A or SACD, and using software-based batch conversion watermarked the uncompressed WAV files for stereo. We also worked together to convert the ID tag information produced by the batch conversion software so that it imported accurately into our Enco System. Now all Neural Surround downmix files are stored as linear audio broadcast WAV files for playback on WGUC-FM. We were quite pleased that we were able to resolve many of the conversion and ID tag issues, a testament to Neural's customer service and commitment.

"The whole idea is to keep everything lossless to avoid codec artifacts while at the same time watermarking the files for stereo," said Neural Product Line Manager Dave Casey. "The 5.1 WAV files are quite large, 30MB per minute. But with the Neural Downmix, the files were reduced to a manageable size, which allowed us to easily place the watermarked content on to WGUC's Enco automation system so the files just slid into the musical lineup."

In looking back on the project, both Casey and I agreed that the longest part of the effort was the search for the 5.1 classical content because we had a fairly large universe from which to search, including international recordings.

We are extremely excited about 5.1 because it allows us to offer an all enveloping sound experience for our digital listeners, placing them front and center in the best seats in the concert house. But it also provides a richer stereo environment and pleasing surround sound experience for analog listeners as well. In partnership with Neural, we will continue our search for the best 5.1 classical content as we expand the surround library for our play list.

Danko is vice president of engineering and operations, Cincinnati Public Radio.

WERN, WHRM

continued from page 3

plan, however, meant that he would need to run an additional length of 1⅝" coax to the antenna. The tower owner had concerns about the added wind loading, but this was addressed by routing the new coax within an existing cable bundle. The resulting added wind resistance had a minimal effect on the tower. Ives modified his installation plan and began the work to modify the WERN antenna and install the additional transmission line. The WERN project included installing a combiner section on the tower near the antenna and replacing the feeder assembly to the antenna bays.

The radio upgrade for WERN and WHRM occurred at the same time as the construction of the Wisconsin Public TV/WPR digital Operations Center in Madison. The Operations Center delivers 12 TV networks to a dozen Wisconsin TV transmitters, six translators, two affiliates, numerous cable networks, Direct TV and educational content to schools. The ops center also distributes Wisconsin Public Radio networks program content and data to 27 stations.

The tower work on WERN began at the beginning of the summer of 2005, and the two radio stations completed their upgrades in August and September 2005. In October 2005, Jampro performed the final tuning of the installed system.

New transmitters were also installed as part of the upgrade. WERN installed a Broadcast Electronics FMI 73, and WHRM installed a Broadcast Electronics FMI 106. The digital transmitters were installed next to the existing analog transmitters.

The two stations are not yet transmitting a multicast signal, but there are plans to implement multicast in the coming months.

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Broadcast Profile
Wisconsin Public Radio
- **27 radio stations** *25 FM, 2 AM*
- **7 bureau locations** *Milwaukee, Madison, Green Bay, La Crosse, Eau Claire, Superior, Wausau*
- **2 programming formats**
- **4 stations on the air in HD Radio** *KUWS-FM, WERN-FM, WHA-AM, WHRM-FM*

WERN, WHRM

continued from page 5

Interconnected facilities

WERN and WHRM did not need to install new STL equipment for the upgrades because the stations within the Wisconsin Public Radio network are connected through an ATM network. The ATM network connects seven nodes around the state through DS3 circuits. These nodes are broadcasting bureaus, transmitter sites or the WPR headquarters. Transmitter sites that are not located at one of these nodes are connected to the network via T1 circuits and Intraplex or Moseley interface equipment. WHRM is one of these stations.

The test equipment setup that was used to sweep the antenna.

One of the goals of WPR is to provide a completely digital path to each transmitter whenever possible. For WHRM, this required an upgrade to its Intraplex system to connect the site to the bureau in Wausau, WI. Enhanced Apt-x cards were added to its system for additional capacity and to maintain a completely digital path.

All but two sites are connected via the ATM or T1 links. These remaining two sites rely on 950MHz STL links.

Unique challenges

Operating a state-wide network provides some challenges that most radio stations—particularly commercial stations—do not encounter. In most HD Radio installations, one studio facility feeds one transmitter site. In the case of WPR, several locations can feed several transmitter sites, so each transmitter site must be capable of remotely switching between multiple audio feeds, such as EAS, station ID, local underwriting, feeds from any of the state-wide bureaus and the programming network.

Commercially available programmable logic controllers are used to control a digital audio switcher. Some events are controlled by timer, others by RS-232 or Ethernet.

Overall, WPR and Peter Ives are pleased with the installations. Ives notes that there were some small changes to the WERN coverage after the antenna modifications were completed, but the differences are minor. The cause of the changes will be investigated later.

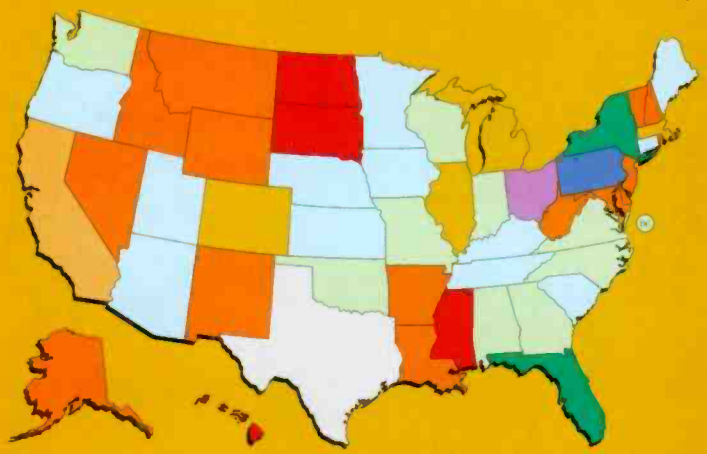
Sample and Hold

The digital adoption

by Chriss Scherer, editor

On Sept. 18, 2006, WIYY-FM, Baltimore, officially became the 1,000th station to commence HD Radio transmissions. The number of stations transmitting HD Radio signals has nearly doubled since September 2005, and Ibiquity hopes to see 1,200 stations on the air by the end of this year.

The surge in the HD Radio roll-out has followed the push from the HD Digital Radio Alliance to promote HD Radio to consumers. The alliance has also been working to coordinate multicast roll-outs across the top 100 markets as a way to further promote HD Radio.



The twice-monthly Digital Radio Update e-mail newsletter from *Radio* magazine includes an overview of the stations within each state that are transmitting an HD Radio signal. This data, supplied by Ibiquity, shows that the distribution of the roll-out varies widely by state. It's not surprising that California would have a high count. It stands at 109. Texas (74), New York (68) and Florida (63) are also HD Radio leaders.

There are no HD Radio stations in Hawaii yet, which may not be a surprise to some. However, Mississippi, North Dakota and South Dakota also have no HD Radio stations on the air. It's clear that the larger markets have the means and the drive to implement HD Radio.

Station count information was obtained from the Ibiquity website on Oct. 18, 2006.

Tools for installing and maintaining an HD Radio system

Ibiquity continues to develop the tools and resources available to stations adopting HD Radio technology. Likewise, the HD Radio Engineering Alliance, an engineering extension of the HD Digital Radio Alliance, has pooled its resources to provide more information to stations working with HD Radio.

Ibiquity recently released four white papers that cover networking assessments for HD Radio, which are posted to the Ibiquity website with many other documents that provide useful information to stations making the HD Radio transition.

HD Radio Data Network Requirements
Timothy Anderson, Ibiquity Digital

Minimizing network-induced dropouts is a prime consideration for the successful implementation of an HD Radio system. This document aids the station engineer in the integration and connection of networked components necessary for the HD Radio Advanced Application Services, specifically multicasting.

HD Radio Networking Implementation Recommendations
Kurt VanderSluis, MTM Technologies

Ibiquity Digital contracted MTM Technologies to provide specific recommendations for the construction and provisioning of HD Radio STL systems. This study covers the nature, resiliency and failure modes of the digital transmissions under adverse network conditions in a controlled lab setting and field surveys of several radio stations using Ibiquity technology in production settings with varying degrees of success.

HD Radio Networking Best Practices
Trieu Vu, MTM Technologies

MTM Technologies provided specific recommendations for the construction network required for the successful implementation of HD Radio technology. This paper defines network devices, their functions and their role in a network. It also contains recommendations on deployment, location and proper use of various networking components to ensure reliability.

SAFE: A Secure Blueprint for Enterprise Security
Sean Convery and Bernie Trudel, Cisco Systems

Cisco's secure blueprint for enterprise networks (SAFE) provides best practice information on designing and implementing secure networks.

Access the papers online at www.ibiquity.com/broadcasters/quality_implementation/iboc_white_papers/.

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a crap shoot; the performance depended on the skill of the telco techs that aligned the system. If you sent audio between central offices, then the audio had to be converted to digital (and truncated to 11 bits), sent over a T1, and then reconverted back to analog on the far end. If you could get 65dB of dynamic range you considered yourself lucky.

Trying to explain the frequency response vs. headroom trade-off to some telco techs was indeed something that could try your patience—and it used to be that if we got a good field tech, then we knew the lines would work. We always tried to get the same tech for the next time. (Now they're all retired.) Once again, advances in other communications technologies (like the cellular telephone) have had a positive benefit for broadcasters: with more users at typical transmitter sites, many telcos installed fiber, dramatically increasing the reliability of wireline STL systems.

Perhaps more significant though was when we were allowed to generate the data ourselves for subsequent transport over telco T1s. After that happened, the flood-gates opened. Intraplex began selling its channel banks directly to end users. It included the A/D, and at the far end, the D/A, that gve broadcasters more control over the sound of the radio station and many other handy features. Other manufacturers jumped at the same chance not long after.

We have actually come full circle with wireless connections now that Pulsecom and APT have partnered on the PCAU and HD PCAU. Both work with dedicated lines to provide digital links via copper.

The nature of data transport via digital data circuits (such as a T1) is that it is bi-directional—in fact full-duplex—and so signals can easily be brought back in the TSL direction. A common example would be the backhauling of air monitor or audio from an RPU receiver. Those are not functions that you are typically going to carry out with a radio system.

The ability to extend the station's LAN to a transmitter site has nearly become a necessity in the last couple of years. First, it was only because it was handy to have a computer at the transmitter site to retrieve e-mail or look at manuals online. Now there are many other reasons for it, not the least of which is HD Radio (although you only need the data going in one direction for that). Radio systems that can do that also are fairly easy to come by, but nearly all of them work in unlicensed ISM bands and as such, use low power, limiting their operational distance, and are ultimately subject to interference from other unlicensed users. That being said, I recently installed a 5.8GHz ISM band radio making use of a four-foot dish pointing right at downtown Seattle. Using a spectrum analyzer, I saw absolutely nothing else but the transmitter on the other end of the link.

Any digital STL acquired in this day and age should have the following capability, at minimum: the ability to send one AES data stream, embedded with left and right channels, sampled at 32kHz (44.1kHz if you want to be able to generate the HD MPS at the transmitter site) with 16-bit resolution; and full-duplex data connectivity for TCP/IP applications. Alternatively, if you intend to make use of the exgine architecture for an HD Radio application (and you don't need a LAN extension) then a simplex data connection will be adequate. The recommended minimum data rate is 300kb/s.

Current offerings

Moseley Associates has offered the SL9003Q Starlink for many years. A recently introduced configuration is the SL-9003Q-2SLAN that provides one AES data stream (44.1kHz sample rate stereo pair) with simplex data at 544kb/s rate. If the user wanted to build a full-duplex data system, he could opt to install a Moseley Lanlink as well, which (by way of duplexers, using the same path with the same antennas) inserts a data transceiver on both ends of the system, with Ethernet in and out. The Lanlink operates in the 900MHz ISM band, and it is an independent system that could be used with any 950MHz band STL. By the way, you could use it right along with your old analog STL.

T1 interfaces have found common use in STL applications.

And perhaps you have no need for high-speed data to your transmitter site; you just want a digital STL to take advantage of the sound quality. There are plenty of radios out there that will do just that. TFT offers Model 460, which can carry three AES data streams (stereo embedded, 32kHz sample rate, using 256 QAM) in an occupied bandwidth of less than 500kHz. Again, an advantage of a digital scheme: This radio is specified to have a 10E-6 BER for a -84dBm signal level. Obviously you can't do that with an analog radio.

Harris' digital radio STL is the CD link, which will transport one 16-bit AES data stream and two RS-232 data channels. An option is to replace the RS-232 data with

two 6kHz audio channels or a single 12kHz audio channel.

Armstrong recently introduced the Xlink. This is a microprocessor-controlled analog radio with the standard features—three SCA inputs, one composite and one mono input. It is frequency agile, making it handy as a spare for a station group. Armstrong can provide a two- or four-channel digital encoder/decoder pair that can be loaded in the Xlink, making a cost-effective upgrade to digital.

Broadcast Electronics offers the Big Pipe system—a mainframe chassis that uses plug-in interface modules for specific functions, such as audio transport or Ethernet. The link ends communicate via

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The 'Bridge' hardware ...

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unlicensed channels in the 5.3GHz ISM band. BE has also recently introduced Big Pipe LT, which is a single-rack unit version that allows for Ethernet connectivity up to a 45Mb/s data rate.

The copper loop has entered the digital age with the Pulsecom PCAU and HD PCAU.

My policy for many years has been to operate radio STLs as back-ups, making use of the reliability and flexibility of digital (wired) STLs for my mains. If you were to implement the same policy you'd have many choices from which to pick for equipment.

Harris/Intraplex is kind of the granddaddy in wireline STL equipment. The STL HD is a package of two 4RU frames that contain modules that transport the AES data stream (later transmitted over the analog transmitter) along with another set of modules that transport Ethernet. (This set would be used to carry the UDP data packet stream that carries the MPS and SPS should you opt to use the exgine architecture for HD Radio implementation).

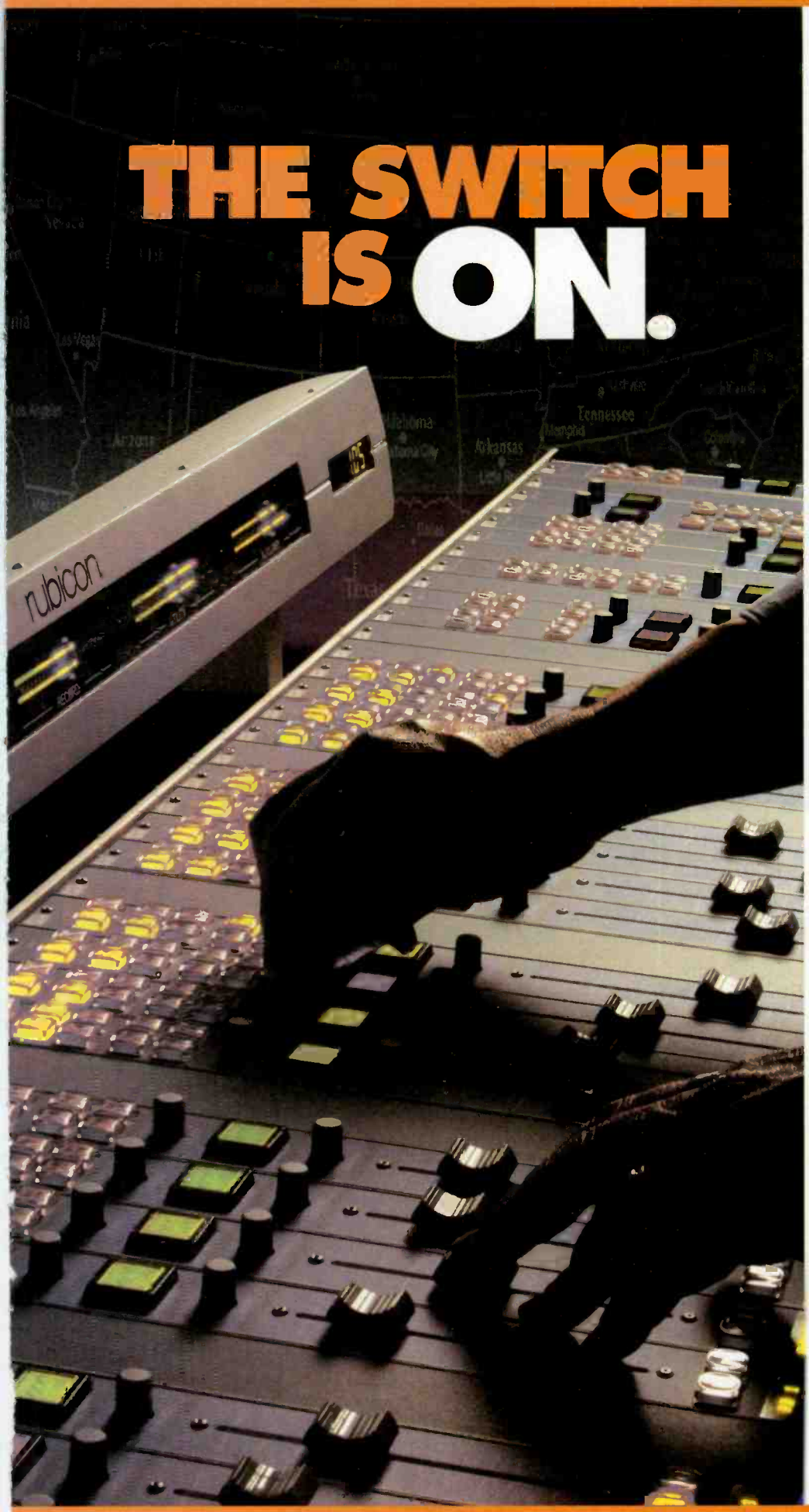
APT offers the Worldnet Oslo, a 3RU frame system that uses plug-in modules to transport as many as 14 stereo audio pairs. Options for the audio transport are non-compressed, linear; 48kHz sampling, 24-bit resolution Apt-x or Enhanced Apt-x. The system can operate over T1, E1 or IP networks. APT has also partnered with Pulsecom to distribute the PCAU and HD PCAU for wired digital loops.

Musicam USA has a product known as Team, which is a mainframe-based system that makes use of plug-in modules that carry out specific functions such as audio transport. The Superlink is another mainframe system made by Musicam. It too uses plug-in modules for specific functions like audio transport; in addition it can bond multiple ISDN circuits—as many as three—for a total of 384kb/s data throughput. Aside from ISDN, the Superlink can also communicate via Ethernet, ATM or T1.

Options abound for digital transport to your transmitter site. As the means by which entertainment content streams are distributed increases in number, it's wise to build an STL system that has not only great initial capability but also scalability as well. TCP/IP capability for your transmitter site is now nearly a must-have, and generally speaking, digital transport of program audio is just easier than the old analog methods and it sounds better anyway.

Irwin is a broadcast engineer in Seattle.

Kathrein-Scala PR-950 antenna image courtesy of Kathrein, Scala Division.



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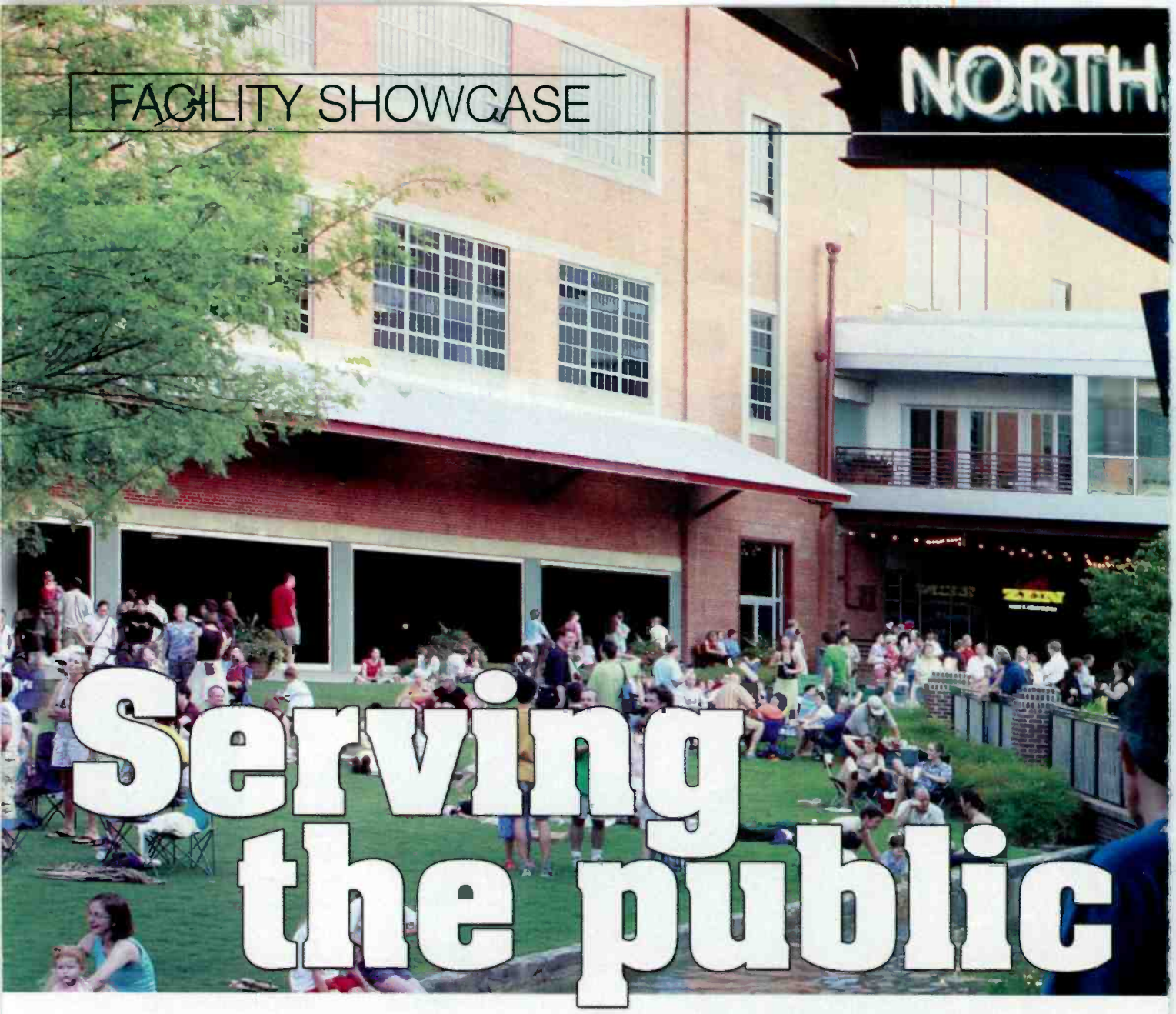

Serving the public

WUNC extends its ties to the community through a satellite studio.

by Chriss Scherer, editor

WUNC has enjoyed great success from its efforts to provide a quality service to the Raleigh-Durham-Chapel Hill area, and with this success came the need to expand its facilities. The attention first turned to possible expansions at the main studio in Chapel Hill at the University of North Carolina.

This proposition met resistance because the Chapel Hill site has real estate restrictions, including building a second floor over the existing building. Someone suggested looking at available business space in neighboring Durham, NC, which is about nine miles from the Chapel Hill location.

Jim Goodmon, CEO of Capital Broadcasting, had another idea. An advocate of unifying the triangle (Raleigh, Durham, Chapel Hill), Goodmon saw the opportunity to redevelop an aging factory site into a business and residential area. That site is the American Tobacco Company factory where Lucky Strike and other once-popular cigarettes were made. Tobacco manufacturing on this site ceased about 20 years ago. Since then the facility had been abandoned and it was falling apart.

Many of the old manufacturing and warehouse buildings in the American Tobacco Historic District, as it is now known, have been restored and converted into offices, retail shopping and some residential space as well.

Goodmon helped WUNC identify a space of 8,342 square feet that would be ideal for the radio station. This space was also more than twice as large as the potential space that could have been developed in Chapel Hill. To top it off, the location would also provide WUNC with a presence in Durham.

The work begins

The site was chosen in the late summer of 2004. The station immediately began the process of creating designs, pulling permits and arranging contractors. By April 2005, the preliminary steps were complete and the demolition and construction phase began.

On Oct. 17, 2005, the first program, *The State of Things*,

CAROLINA PUBLIC RADIO

aired live from noon to 1 p.m. from the historic location. The news department moved in Dec. 6, 2005, and by January 2006 afternoon newscasts, *All Things Considered* and *Market Place* were also originating programs from the new facility.

Now, every weekday the facility originates local newscasts at 1 p.m., 2 p.m. and 3 p.m., and live programming originates from 4 p.m. to 7 p.m.

Part of the appeal of the new facility was its warehouse feel. Lots of southern yellow pine trees were used in the original construction. When it came time to begin preparing the space for the studios, one pine post had to be removed to make way for Control Room 2. A steel beam was installed to support the building load when the post was removed, but the post was saved for reuse. Part of that post now supports the counter of the Control Room 1 furniture.

Another item that required a custom touch was the outside sign. The station wanted a large version of the CBT on-air light that is used inside to make a visual statement outside the studio. David Wright, WUNC associate director of radio, turned to a local fabricator to craft the

The back studios have layouts that are nearly identical to the showcase studios in the front. Top to bottom: Control 2, Studio 2 and Edit 2.

Serving the public

large on-air light as well as the neon lights with the call letters and North Carolina Public Radio name.

The facility features two studio areas; one in the front of the space and one in the back. The two areas are nearly identical. The front studios are the showcase studios and are visible from the pedestrian sidewalk. This side includes Control 1, Studio 1, Edit Booth 1, a news booth and a call screener booth. The back studios include Control 2, Studio 2 and Edit Booth 2. There is also a tech center with eight racks.

The News Booth looks into Studio 1 and Control 1.

Control 1 is the center of the showcase studio area.

The furniture layouts in the studios are similar, with the only noticeable difference being the Corian countertop in the front studios and the laminated surface countertops in the rear studios. Studio Technology provided the furniture. Control Room 1 also features a profanity delay and an additional ISDN codec.

The heart of the audio system is a Wheatstone Bridge router with Generation 6 control surfaces. The control rooms have 16-channel surfaces, the edit booths have 12-channel surfaces, and the news booth has an eight-channel surface.

Redundancy was important to the overall installation. The dual studio spaces provide obvious backup for studio use, and the flexibility of a routing system adds to that.

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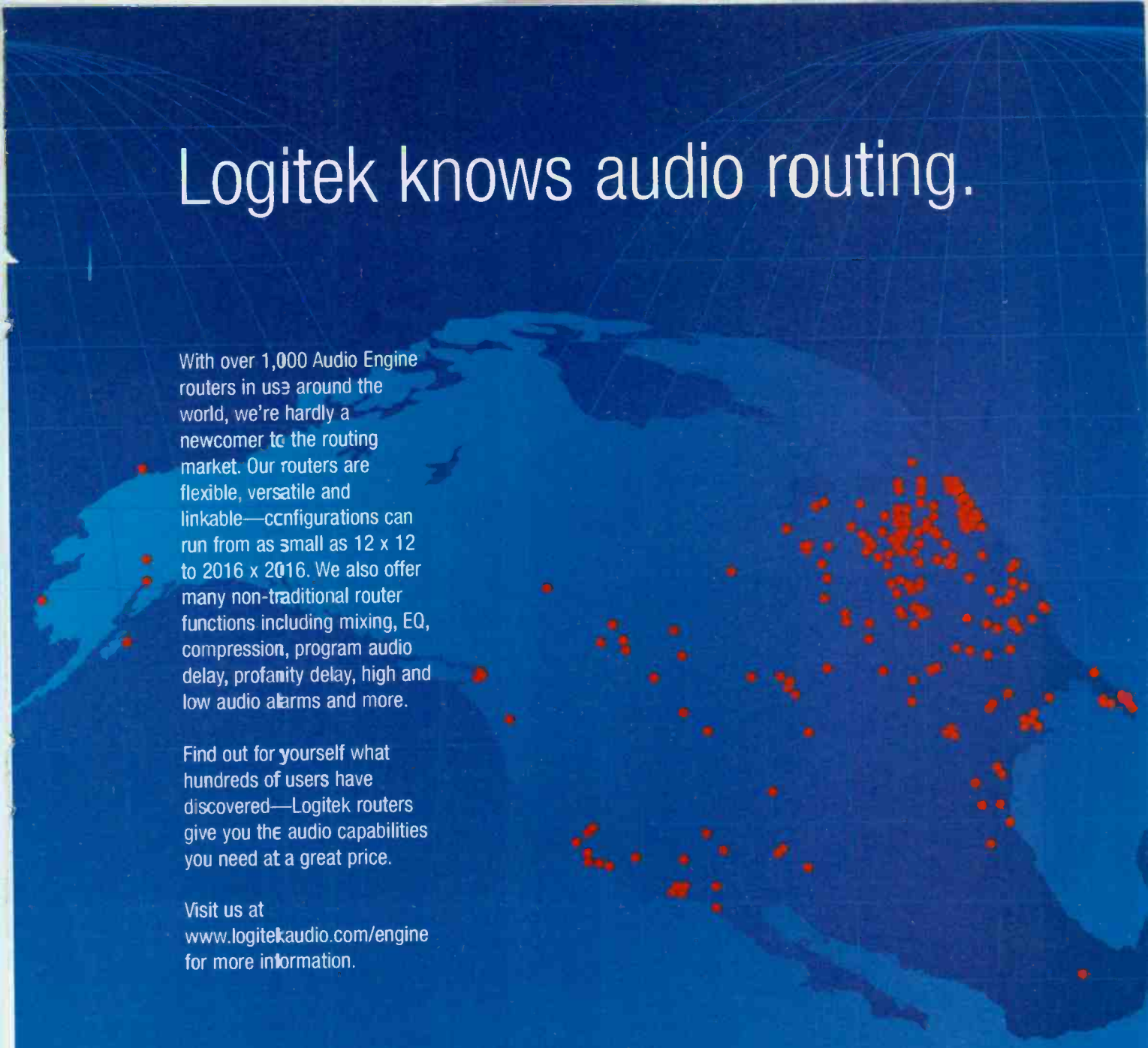

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Serving the public

The facility also has a 100kW natural gas generator and a 30kW three-phase UPS to support the facility.

WUNC is updating its audio storage and playback system with an Enco Dad. The Durham and Chapel Hill facilities have local servers tied together through a direct fiber connection provided by Level 3 Communications. This IT connection extends all the functions of the WUNC and University of North Carolina computer network to the Durham facility. The connection also makes it easier for the station to create and store off-site backups through the connection.

While the IT side is connected through the fiber link, the station wanted a dedicated link for the audio and control feeds. A Broadcast Electronics Big Pipe was installed to handle this. The two sites are connected via a DS3 circuit to provide the necessary bandwidth. There are plans to add an RF link to provide the desired redundancy the station wants. The Big Pipe provides a bi-directional path for 16 audio channels, several serial data streams and two video feeds. The video feeds aren't used yet, but the capacity is there if it is needed. The Big Pipe provides eight off-premise telephone feeds between Durham and Chapel Hill.

The Big Pipe also provides an Ethernet path that is dedicated to the Wheatstone IP control network. This was key because the Chapel Hill facility was concurrently upgraded with a Wheatstone Bridge Router. Durham can now exercise control over the main bridge router in Chapel Hill via a GP-16 control panel for emergency program overrides and inserts.

For the equipment integration, WUNC tapped the resources of Lightner Electronics. David Wright noted that using a system integrator not only reduced the burden of the station staff in installing the new facility, but it also lended the expertise of the installation crew to the project. System integrators are familiar with the needs of the users, and also know how to address the challenges of an installation.

Edit Booth 1 is used for the daily newscasts and *All Things Considered.*

Photos by Dave Horne

Equipment list

Aircorp Model 500
Broadcast Electronics Big Pipe
Broadcast Tools SRC-8 III
CBT Systems Classic and Dual-lens on air light
Crown D-75A
Denon DN-C680, DN-M991R, TU-1500RD
Electro-Voice RE-20
Enberg BA-12
Enco Dad
Ergotron monitor stands
Eventide BD600
Fostex 6301B
Genelec 8030
Henry Engineering Superelay
HHB CDR-850
Krone punch blocks
Neumann U87
O.C. White mic booms
Panasonic SV-3700
Rane HC4, HC6
Sony MDS-E11
Studio Technology furniture
Telos 2X12, Zephyr, Zephyr Exstream, One Delta
Torpey clocks and displays
Wheatstone Bridge, G-6

The team

WUNC: Joan Siefert Rose, GM; David Wright, associate director of radio; John Francioni, chief engineer; Nandini Sen, director of IT
Design Development Documentation: Balsys Systems
Integration: Lightner Electronics

More online

Lots of additional photos and a facility floorplan are available online at beradio.com.

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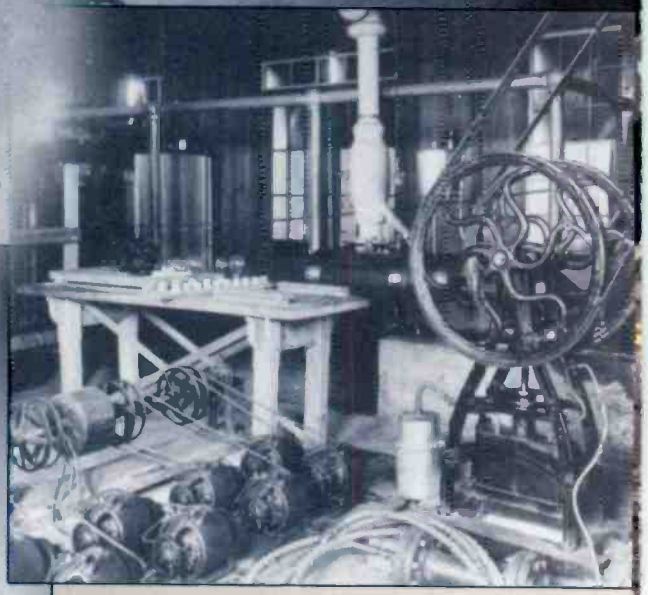
Night at
How Fessenden



While Guglielmo Marconi sent the first message by wireless in 1896, Canadian inventor Reginald Fessenden saw greater potential. Fessenden was Thomas Edison's chief chemist at Menlo Park just a few years before, and throughout the 1890s he independently researched the science of electromagnetism.

Fessenden studied the design of Marconi's method of transmitting wireless. While it unquestionably did the job, he noted its flaws. The

Brant Rock Influenced Radio

By Allen J. Singer

telegraph key and spark-gap transmitter sent a "whip-crack of the ether" on no specific frequency of the electromagnetic spectrum. The telegraph signals could be picked up by any receiver anywhere. This was fine for ships at sea, but not for military communication or anything else requiring privacy. Fessenden's idea was to send continuous waves of electrical signal across the ether that could carry sounds of voices and music.

Scientists proposed different theories of how wireless signals were transmitted on the ether. Fessenden's "gliding wave" theory stated that radio waves were "attached to and guided by the earth's surface." High frequency electrical waves, he explained, could propagate from a grounded transmission system and follow the curvature of the Earth. Both earth-based electric currents and magnetic and electrostatic fields in the air would carry the waves.

An early opportunity

The U.S. Weather Bureau hired Fessenden in 1900 to research and invent a wireless device to communicate with outlying stations tracking severe weather. He set up shop on Cobb Island on the Potomac River in Washington, DC, and developed an electrolyte-based detector he called the "barreter." This device consisted of a metal plate immersed in a liquid solution that could generate a continuous electrical wave when current was applied.

The tests in 1900 resulted in spoken words transmitted wirelessly and received one mile away. Fessenden's assistant pressed his earphones to his ears and underneath the roar of static, he heard faint words: "One, two, three, four. Is it snowing there, Mr. Thiessen?" the voice said. "If it is, telegraph me back." It worked. The Weather Bureau was impressed with his results and agreed to continue financing his experiments. He patented his method in 1901.

The barreter's biggest problem was that it was plagued by atmospheric distortion. Fessenden looked for ways to improve it and examined Nikola Tesla's research on electromagnetism and generation of high frequency waves using alternating current. He wanted to design his own system using a mechanical generator to transmit 100 kilocycle electrical waves through the air; in simpler terms, amplitude modulation. Later that year he moved his research base to Roanoke Island in North Carolina.

While there, he kept innovating. In 1902 he combined two signals to produce one with a new frequency. He named the circuit the "heterodyne," after "other force" in Greek. His primitive equipment, though, could not produce the precise frequencies the circuit required.

Two Pittsburgh investors approached Fessenden in 1902. They had big plans to turn the results from Fessenden's experiments into a commercial service, and to compete with Marconi for transatlantic operation. With their financing, he formed the National Electric Signaling Company. Engineers at General Electric were hired to design and build the required 100 kilocycle alternator. He erected a tower and installed the alternator at a station at Brant Rock near Boston in 1904.

The big night

General Electric's alternator worked but reception was nonexistent during daylight hours. After much fine-tuning, fishing boats started receiving his test signals in 1906. Inspired by the success, Fessenden scheduled a holiday radio program and asked phonograph companies to donate records. In his test broadcasts late that year, he announced the special Christmas Eve program to his several listeners.

While the stockings were hung by the chimneys with care on the mainland, shipboard wireless operators were surprised to hear violin music instead of the usual dots and dashes. When the music ended, the crackly voice of the world's first disc jockey floated prominently through the static. "If anyone hears this," it said, "please write to Mr. Fessenden at Brant Rock." Fessenden himself then played *O, Holy Night* on the violin—singing the last verse; read passages from the bible; and played Handel's *Largo* from the *Serse* opera on a phonograph record. He repeated the program on New Year's Eve. To him, at least, it was a success.

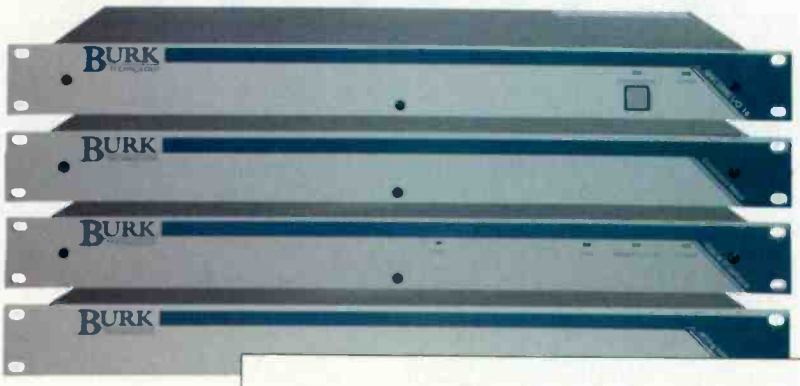
The general public never learned of it, though. Only a few fishermen, naval officers and wireless hobbyists were privy. His backers declared their interest in transatlantic telegraphy and walked out. Disappointed in the overall result, Fessenden decided radio would never serve as a form of entertainment.

Fessenden accomplished what he had set out to do: he proved voice and music could be carried by continuous wireless waves. Others, though, deserve credit as well. Thomas Edison invented the hot-cathode vacuum tube in 1884. Borrowing on the tube's "Edison effect," Ambrose Fleming created and patented the diode "valve" tube in 1904, which forced directional current flow. Lee de Forest added a third electrode to Fleming's diode in 1907 and called it the Audion tube. Later, Edwin Armstrong experimented with the Audion tube and designed the first audio amplifier, the regenerative circuit. Armstrong took the modified Audion tubes and wired a circuit that received and produced RF waves—Fessenden's mechanical alternator had just been made obsolete by the vacuum tube. Later in 1916, Armstrong combined the heterodyne with his regenerative circuit and created the "superheterodyne," a four-stage amplifier whose basic design is still used to this day.

Singer is a freelance writer and a former radio engineer in Cincinnati, www.allensedge.com.

Dec. 24, 2006, will mark the 100th anniversary of Fessenden's audio broadcast, and as the radio industry recognizes the contribution of this achievement next month, Radio magazine will recognize the top 100 technology achievements that helped shape radio broadcasting. Look for this special feature next month in Radio magazine.

Photos: Fessenden in his later years; Fessenden (seated at right) in the lab; the alternator generator at Brant Rock; the tower at Brant Rock. Photos courtesy of the State Archives of North Carolina.



Burk GSC3000

by Michael Kernen

The broadcast engineer is unique in that he can never truly be off the clock. We can all recount endless numbers of midnight phone calls, family vacations dotted with ringing cell phones and daily e-mails, and the occasional drive in to the station to reset something—or worse. Heck, I drove my family from Tampa to Detroit non-stop to fix an STL problem. The fact is, engineers know this is part of their gig and we grudgingly accept it. Of course, who among us would turn away from technology that would allow us to return to our normal lives sooner? The obvious answer: remote facility control.

Overview

Gentner designed and built the VRC-1000 touch-tone transmitter remote control system back in the late 1980s. Back then it was a welcome addition to the WRIF transmitter plant because it allowed the engineers to interact with the transmitter without the impediment of a baffled, disinclined or distracted disc jockey on the other end of the phone. Now engineers would be on the front line in the event of a failure or out of tolerance condition; the VRC-1000 would phone an engineer, instead of simply flickering the oft-ignored alarm lamp in the corner of the studio.

Gentner dutifully evolved the VRC-1000. Subsequent introductions of the VRC-2000 and the GSC3000 represented the company's efforts to remain parallel with advancements in technology and customer demand. In April 2001, Gentner sold its remote facilities management (RFM) products to Burk Technology. Burk's core business is RFM, so it was a good fit. Burk took the GSC3000 and VRC2500 under its wing and developed software and hardware for the platforms alongside its existing Arc-16 product and accessories.

Post Burk, the GSC3000 has seen the development of Lynx 5, a PC software tool with several enhancements, a handful of directly connected accessories known as G-Link, as well as upgraded internals.

For the unacquainted, the GSC3000 combines all aspects of remote facilities management. It's capable of monitoring, metering and status, issuing commands, collecting data via snapshots (Burk calls them captures) and running macros. The included Lynx software will run on a PC with minimal hardware requirements and provides the primary user interface. A typical site's hardware consists of a GSC3000 I/O unit connected via multi-pair cables to wiring interface panels for metering and status termination and command relay units. Phoenix connectors are provided for wiring ease. The optional voice interface connects to the G-Bus (RS-485) and a Web interface can be connected via RS-232.

The core of the system is the single rack space I/O unit. Available in eight and 16 channels, it has two nine-pin serial ports, two RS-485 (G-Bus) ports, and 37-pin D connectors for wiring interface panels and command relay connection. As many as 16 I/O units can be connected via the G-Bus, providing 256 channels of metering, status and command. The I/O unit can run macros, capture status/metering for logging, issue commands and issue alarms if conditions warrant. Scheduling of commands, captures and macros is also possible.

Command and control accessories

Also a single-rack unit, Wiring Interface Panels provide a convenient termination point via Phoenix connectors. They connect to the I/O via the 37-pin cable. The wiring interface is entirely passive. One is required for metering and another for status inputs.

The Command Relay Unit is an eight-channel unit that incorporates its own power supply for the 16 internal relays. Phoenix connectors and

Performance at a glance

- Multiple communication options
- Expandable to 128 channels
- Multiple alarm reporting options
- Logging capability via site captures
- Ability to store macros
- Lynx software configuration tool with custom screen creation application
- Available Web interface with e-mail and SMS alerting

a 37-pin connector occupy the rear panel. Each command channel has two relays so on/off or up/down commands can be implemented for any single function. Two of these are needed to complete an I/O 16.

Forced to live at the logical end of the G-Bus (unit ID #16), the Voice Interface reports alarms and answers incoming calls. It provides for touch-tone interrogation of the system responding with a decidedly robotic voice. A modem can be connected here for dial-up access using the Lynx software.

The Web interface allows the user to interact with I/O units at the site by way of a Web browser and Java, or by IP connection and the Lynx software. The Web interface also sends SMTP e-mail to report alarms. SMS text messaging is supported.

Lynx software, the PC software that provides a viewport and configuration tool, started life in the Gentner offices and received a complete revamping at the hands of Burk. Users can create and view custom screens, calibrate metering, create and execute macros, issue commands, and view metering and status. The software provides a means for connection to multiple sites using any of several connection methods. Custom screens can be created and edited using Burk's custom screen editor application. This allows you to choose which commands, meters and status channels to display. You can choose from several meters, buttons and lamp styles. Choose a background and display them in any layout.

Burk has recently introduced the ability to create virtual channels. These can make complex calculations based on input conditions and mathematical calculations providing "a way to link a single on-screen meter or status channel to several different conditions." Boolean expressions are also supported.

Burk Technology

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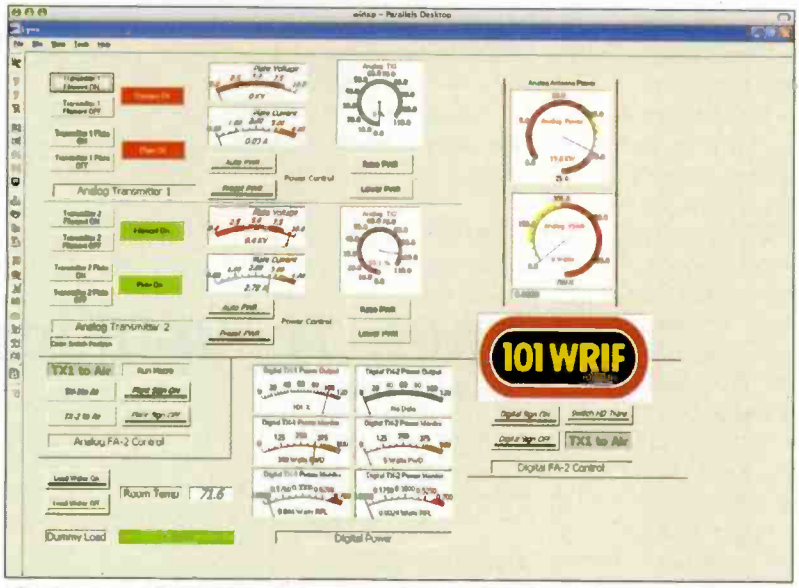
G-Link expansion series

Burk has recently expanded the capability of the GSC3000 by leveraging its G-Bus RS-485 communications network. Burk calls the expanded product line G-Link. It includes the GX-128 Interface for X10 automation, a pair of remote outlet



The Lynx software screens can be customized to control a GSC3000 system.

controllers, the GT-4 Remote Temperature Monitor and the One Connect system that provides a direct interface for Nautel V5 and V10 transmitters.

The Burk AC-8 and AC-4 bring the power cycle into the GSC3000 realm of capability. The AC-8 and AC-4 are operationally identical. The differences being that the AC-8 is an eight-outlet rack mounted unit matching the look and size of the GSC3000.. It features front panel outlet controls with status LEDs, while the AC-4 is much smaller. Having only four outlets, the AC-4 can be easily stowed in the bottom of a crowded equipment rack or wall mounted.

The One Connect is the first of its kind. Burk has found common ground with transmitter manufacturer Nautel allowing nearly direct integration with its V5 and V10 transmitters. Rather than using individual wires to connect to the transmitters metering samples, status indicators and command controls, Burk's One Connect receives info directly from the transmitters control CPU via a serial RS-232 connection. By taking advantage of a direct connection, Burk One Connect brings much more data to the GSC3000 than most engineers would ever dream of bringing to a conventional remote control.

The Burk GT-4 Remote Temperature Monitor is simple and straightforward. It allows four temperature probes to be connected and monitored via G-Bus by the GSC3000. Three types of temp sensors are available: indoor, stack and outdoor/general purpose. An outdoor/general purpose sensor is included.

The GX-128 brings monitoring and control of X10 compatible automation modules to the GSC3000 product. X10 is a specification for wireless consumer-oriented appliance, lighting and security equipment. Quoting X10.com, "X10 is regarded as the de facto standard in home automation." 128 X10 modules can be paired to the GX-128.

Plugged in

My facilities use seven of Burk's GSC3000 equipment, so I couldn't resist trying out a few AC-8s. Our tech ops room is strictly secure, so anyone needing to reboot an errant ISDN unit had better be on the engineering staff. Knowing that these things often catch a bug, I plugged them in to the AC-8's rear panel. I also plugged in the occasionally cranky POTS codecs as well as a few of the other usual suspects (PCs).

I've used the GCS3000 product since its introduction. Burk is interested in improving and further evolving the product, so I can't wait to see what they come up with next.

Kernen is chief engineer of Greater Media Detroit.

Editor's note: Field Reports are an exclusive *Radio* magazine feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company.

These reports are performed by the industry, for the industry. Manufacturer support is limited to providing loan equipment and to aiding the author if requested.

It is the responsibility of *Radio* magazine to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by *Radio* magazine.

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by Kari Taylor, senior associate editor

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Acoustic treatment
SE Electronics

Ghost Acoustics: The Ghost series comprises five products in a choice of two colors: charcoal gray and light gray. The central building block for the range is a 2'x2' absorber built around a steel inner frame. The construction is layers of highly compressed glass fiber with layers of aluminium foil that help break up lower frequency waveforms. These layers are covered with a fully fire retardant fabric and the whole structure is bound with a brushed aluminum frame. Each absorber ships with a metal frame that screws onto the wall.

408-873-8606; www.seelectronics.com
microphone@seelectronics.com

Audio software
Backbone Networks

Radio Pro V4.1: Broadcasters build their playlists from songs, commercials and program segments with clickable images and text for display within their Itunes player or Web browser. By clicking on images and text listeners can conduct e-commerce while continuing to listen to the programming. The software helps program directors decide what commercials to run at certain times of the day. Integrated real-time reporting tells the operator how many people listen to what programs or songs, at what time, for how long and from where based on potential geographical mapping of IP listener connections. Radio broadcasters can simultaneously webcast their streaming programs while commanding the software to create, annotate and post podcasts made from the program material, pulled from the station's audio content database. The software creates podcast chapters, inserts images and links to each chapter, playable on Photo or Video Ipods.

508-753-5665; www.backbone.com
info@backboneaudio.com

Talent receiver
Production Intercom

TR-1: On the top of the unit are inputs for 1/4" and 3.5mm plugs and a rotary volume control that can be turned down, but not all the way off. The rear panel features a green LED indicating that the unit is connected to the system and is receiving the required 18Vdc to 30Vdc from the power supply. A second red LED flashes when audio traffic is being received. An external recessed switch allows the user to choose single- or two-channel operation. Connection to the receiver is via a three-pin mini XLR.

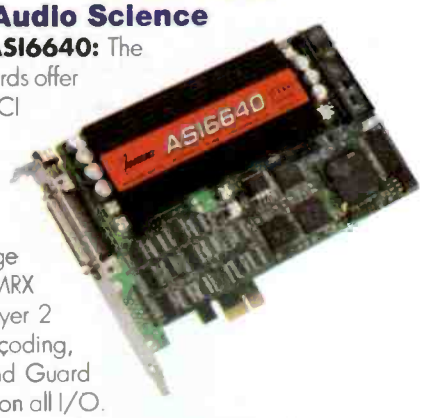
800-562-5872; www.beltpack.com
info@beltpack.com

Sub-audible detector
Broadcast Tools

DSD-2: The DSD-2 is a 25/35Hz subaudible detector with a single-channel, high-pass filter. The unit's detection algorithm virtually eliminates false triggering due to level variations. Features include twin SPDT relays, front-panel LEDs for each detected tone and a third for combination tone detection. Other features are balanced input and output termination via 1/4" TRS jacks and plug-in Euroblock terminals, RS-232 programming and tone detection port, front panel input audio presence and overload LEDs and ouput level trimmer. The unit is powered by a surge protected internal bi-polar 15Vdc power supply.

877-250-5575
www.broadcasttools.com
bti@broadcasttools.com

Sound cards
Audio Science



ASI6620, ASI6622, ASI6640: The ASI6600 series of sound cards offer a faster DSP, short-length PCI format, +24dBu analog levels, 96kHz sample rates and SSX multi-channel support. All the features of the ASI6000 range are also present, such as MRX multi-rate mixing, MPEG Layer 2 and 3 encoding and decoding, TSX time scaling and Sound Guard transient voltage protection on all I/O. The ASI6620 provides six stereo play streams mixed to two balanced stereo outputs and four stereo streams of record from two balanced stereo inputs. The ASI6622 adds two AES/EBU inputs and outputs with a dedicated AES/EBU sync input and word clock input. The ASI6640 provides 12 play streams mixed to four balanced stereo analog outputs and eight stereo record streams from four balanced stereo analog inputs. The series features driver support for Windows WAVE, Direct Sound and Linux ALSA.

302-324-5333; www.audioscience.com
sales@audioscience.com

Radio automation application
Mediatron

Radiocube On Air: This system supports multiple audio outputs. Multi-format and multi-sampling mixing of these audio formats is possible: MP3, WMA, WAV, MPEG 2 and BWF. Users drag and drop from Windows Explorer to the play list. Separate progress bars provide intro/ramp count up/down. The system offers a built-in pre-listen player with loop function. Features of this application include Direct X plug-in support; adjustable pitch for audio outputs (±50 percent); and a dedicated control panel.

+49 89-3715645-0
www.mediatron.com; info@mediatron.com

Subwoofer
Adam Professional Audio

Sub 8: The subwoofer is a compact speaker that extends the low end of any near field monitoring system. It houses a 8" woofer with a large 50mm voice coil and is driven by a 160W ICE power amp. The front baffle features two motorized knobs that allow the end user to tailor input levels and crossover frequency settings. These knobs can be controlled with a wireless remote control. The unit also provides an on-board 2.1 bass management system. The built-in amps are 160W/240W and the speaker's frequency response is ±3dB 28Hz to 150Hz. Input impedance is 10kΩ. The speaker's dimensions are 10.2"W x 16.1"H x 14.9"D.

49 30 86300970
www.adam-audio.de
info@adam-audio.de

Stereo audio processor
Orban

Optimod DAB-6300: This multipurpose stereo audio processor is for digital radio, netcasts, STL protection, audio production and digital mastering. With a 20kHz audio bandwidth and a 48kHz internal sample rate, the processor succeeds Orban's Optimod DAB-6200 audio processor while offering improved processing algorithms and more flexibility. The 6300 contains a stereo enhancer, AGC, equalizer, phase-linear multiband compressor/limiter with two or five bands, and two independent stereo look-ahead peak limiters. The processor incorporates Precode technology that preprocesses audio to minimize audible artifacts in low bit rate codecs.

510-351-3500
www.orban.com
custserv@orban.com

FM antenna
Jampro Antennas

JBCP-H-HD: The Optimizer JBCP-H-HD FM side-mount antenna is designed for digital broadcast applications that require insensitivity to icing conditions as well as high power handling. Each element is fabricated with thick wall brass and copper with a 3 1/8" outside diameter. On a single frequency, VSWR is 1.1:1 ±200KHz or better. Radomes are not normally needed because even with as much as 1/2" of radial ice, typical VSWR is still less than 1.4:1.

916-383-1177; www.jampro.com
jampro@jampro.com

IP-based satellite service
Orbital Data Net

Satellite Link: Designed to support the Comrex Access, this satellite link provides an IP connection across a satellite network. The link allows the Access to operate anywhere in the continental United States—even where broadband cable, DSL, POTS and ISDN circuits are unavailable. Satellite dishes are pre-positioned at locations the user commonly transmits from, allowing the user to move the bandwidth wherever it is needed without having to pay for leased terrestrial lines. Fly away systems and mobile automated satellite antennas can be installed on a vehicle or be included in the company's EGG Satcom trailer unit.

573-445-8101; www.orbitaldata.net
paultette@orbitaldata.net

UPGRADES and UPDATES

APT has launched Apt-x Live designed specifically for live performance situations. It has about half the latency of Apt-x. (www.aptx.com)... **Barix** introduced a new programmable software feature for its Instreamer and Exstreamer audio encoding and decoding products that allows users to develop custom applications in a network-, audio- or USB-flash environment. (www.barix.com)...**Broadcast Electronics** has added emergency-alert messagecasting to the Radio Experience Message Manager, the company's text application suite for RBDS, HD Radio and Web. (www.bdcast.com)...**Enco Systems** has released version 5.1d of its Digital Audio Delivery (DAD) system. The new system features a new user interface, metadata features and stronger music scheduling and traffic integration. (www.enco.com)

Tower-style table leg supports
RAM Broadcast Systems

TL Series: The TL series tower-style tabletop leg supports are available in two sizes. The TL-285 is 28 1/2" high for sit-down applications and the TL-365 is 36 1/2" high for stand-up applications. Both are made from 1" tubular steel with welded 1/4" cross member supports. They will support more than 2,000 lbs. The legs have adjustable feet with an adjustable range of 2" to ensure a level table on almost any floor. The legs are powder coated with three layers of black semi-gloss paint for a long-lasting durable finish.

800-779-7575
www.ramsyscom.com
sales@ramsyscom.com

Monitoring system
ATC

SCM12 Pro: This two-way passive monitoring system is designed for near-field applications and can be shelf- or stand-mounted. Each monitor features a hand-built driver composed of a 3" midrange soft dome coupled onto a 6" cone for bass and midrange frequencies, as well as a 1" soft-domed tweeter with a neodymium magnet for high-end response.

702-307-2700
www.lasvegasproaudio.com/atcstmo
sales@lasvegasproaudio.com

Acoustic panel
Golden Acoustics

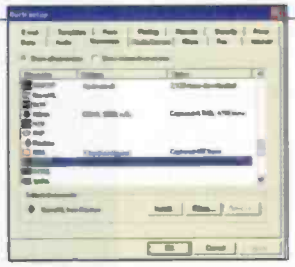
Equalizer 18: These panels may be applied to the ceiling or walls. They are 18" deep and designed to diffuse sonic energy in the high, middle and low ranges. Depending on the number of panels and the mounting arrangement, the panels can effectively diffuse sonic energy to below 30Hz.

248-548-8840
www.goldenacoustics.com

UPS
Superior Electric

Stabiline SLF: All SLF series UPSs are equipped with a front panel LCD status display. More than 20 UPS statuses and conditions can be displayed. The system produces a true sine wave output voltage waveform. All models are microprocessor controlled and feature a two-stage automatic voltage regulation capability. All models have surge suppression and EMI/RFI filtering circuitry. RF11 telephone jacks are provided on the UPS rear panel for fax and modem use. An RS-232 port is also provided. Other features include 120Vac, 50/60Hz operation, and 500VA, 700VA and 1kVA models.

800-787-3532; www.superiorelectric.com
info@superiorelectric.com



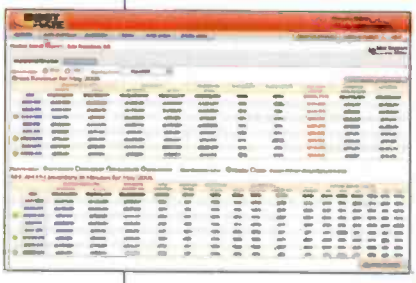
Radio newsroom system
Burli Software

News Data Ingest: Burli ingests and manages a range of data in traditional and emerging formats. More than 50 serial data wires are supported in a variety of formats, languages and character sets. The system provides automatic ingest from FTP sites as well as LAN or WAN locations. The system automatically records from multiple analog or digital audio sources. Clock, threshold, GPI recording triggers are available. Record and manage telephone recordings remotely with DTMF tones. It supports PCM, MP2, BWAV, Cart Chunk and MP3 formats in a variety of sample and bit rates. A built-in RSS reader treats RSS feeds like newswires.

604-684-3140; www.burli.com; info@burli.com

Traffic, billing software
LAN International

Viero Revenue Management: More than a traffic and billing system, this software uses a scheduling service known as the Booking Agent to maximize spot placement and revenue providing management with accurate reporting on inventory and revenue, past and future. E-PIF is the Electronic Public Inspection File that allows the user to oversee and manage public files from a central location, automate missing file notifications and provide the public with safe, streamlined access at each local site. Radio Fusion, for customer relationship management and sales force automation, allows users to create proposals and manage accounts. Best Rate, a rate and yield management tool, offers drill down capabilities that allow management to make critical course corrections in advance.



949-425-3300; www.lanint.com
ro.catalfo@lanint.com

Software tool
Bid4spots.com

Powerbidder: This new tool enables scalability so that general sales managers with multiple stations can enter their rates on one bidding screen and apply them to multiple stations. Advertisers create auctions early in the week for ads they would like to run the following week. Radio stations bid against each other to win an advertiser's spots. The more auctions in which stations compete, the better their chances of winning auctions and selling last-minute airtime. With Powerbidder, sales managers enter the total number of radio spots they wish to sell across any number of stations, along with gross dollars per spot for each daypart. The software automatically determines which ads the stations should bid for to sell the most inventory.

866-326-7788; www.bid4spots.com
customerservice@Bid4spots.com

Software package
Arctic Palm Technology

CS RDS: CS RDS captures play line data from your automation system, promotional material from the CS Scheduler module, captures your local weather forecast with the CS Weather module and sends that data to the RDS encoder, HD Radio system, website and Intranet simultaneously. It supports most automation systems sending text from multiple input sources to multiple output streams. Data captured from input sources may be sent to your RDS/RBDS encoder as well as your website, intranet or other system. Highlights of this system include cart triggered messages; station branding; automatic weather updates; normalized text formatting option; and play list history for Web or intranet.

800-268-4081; www.arcticpalm.com

Line multiplexer
APT

HD PCAU: APT and Pulsecom have created the HD PCAU, which assists broadcasters with their migration from analog to digital. This product offers an AES/EBU interface, as well as 20Hz to 20kHz bandwidth to transport HD Radio content and auxiliary data, allowing RBDS to be embedded in the audio stream.

800-955-APTX; www.aptx.com; info@aptx.com

Condenser mic
AKG

Perception 400: The new large diaphragm, multi-pattern condenser microphone encompasses selectable cardioid, omni and figure-eight pickup patterns with switchable 10dB pad, switchable bass cut filter, shock mount and metal case. The mic features two back-to-back, 1" diameter vibrating surface capsules with gold-sputtered foil diaphragms. The mic features a full 20Hz to 20kHz response and 145dB max SPL capability at less than 0.5 percent THD. The 400 boasts a precision-tooled zinc/aluminum alloy metal chassis with a stainless steel, dent-resistant grill screen to protect the capsules. The mic comes in a metal-framed "sound tools" carrying case with a screw-on, spider-type shock mount.

818-920-3212; www.akgusa.com
akgusa@harman.com

Play-out and production software
Airshift

Airshift Studio: Designed for radio stations that have one to five studios, the software is used for all production-related tasks. The workflow starts with planning process. The station defines their program schedule for each weekday. The template divides each hour of programming to a segment that has various attributes: start and end time, name, type and selected music clock. For daily planning, playlists are created for each program containing all the elements needed: music tracks, sounds and commercials. A third-party system, such as music scheduler or traffic system takes care of the scheduling of commercials. A producer finishes production of one item, then places it in the playlist. The publishing phase is where created content is published to the audience. After the program is published, the content is archived or purged.

+35 8 50 365 0577; www.airshift.tv
sales@airshift.tv

Phone flasher, door announcer
DM Engineering

Studio Hotline: Features of this product include microprocessor-based circuitry; multiple LEDs used for indicators; color visual indications and audible signals for phone and door; a three-position audible control switch; remotely mutable control for audible signals, contact closure or TTL low to mute; and dc output voltages for driving the solid state relay pack for turning on high wattage incandescent lamps for phone and door indication. A terminal block with screw connections can be used for external I/O control for ease of wiring. The unit's dimensions are 5.75 x 2.6 x 1.1.

805-987-7881; www.dmengineering.com
info@dmengineering.com

Neafield monitor
Klein + Hummel

O 300: A triamplified three-way nearfield studio reference monitor, the O 300 delivers is similar to the O 300 D minus the digital input and control hardware. By using a dense, low-resonance material called LRIM, the company has molded the waveguides required for dispersion directly into the baffle. The unit's 8" cone woofer is made of a special lightweight polypropylene material. The midrange is handled by a treated fabric dome with a 3" voice coil. The 1" high-frequency driver is equipped with a titanium/fabric dome that combines the transparency of a titanium dome with the low distortion of a fabric dome. All three drivers are magnetically shielded.

+49 711 45 89 30; www.klein-hummel.de; sales@klein-hummel.de

LAN extender/facility controller
Moseley Associates

Lanlink HS900D: Lanlink provides a 1Mb network connection at remote sites where no wires or cables exist. It operates in the free 900MHz band without licenses, leases or new antennas.

805-968-9621; www.moseleysb.com
info@moseleysb.com

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Contributor Profile

Meet the professionals who write for *Radio* magazine.
This month:
Field Report, page 46.

Randall Rocks
Technical Director
Yellowstone Public Radio
Billings, MT

Rocks has been in the radio technical engineering field since 1972.

He has worked in many capacities over the years at Yellowstone Public Radio and its extensive translator and sister station network. He started his own engineering company, Rocks Broadcast Engineering, in 1984. Rocks continues to consult with commercial radio broadcasters today.

Radio
THE RADIO TECHNOLOGY LEADER

Written by radio professionals
Written for radio professionals

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ADVERTISER INDEX

This index is a service to readers. Every effort is made to ensure accuracy, but Radio magazine cannot assume responsibility for errors or omissions.

by Kari Taylor, senior associate editor

Do you remember?

In 1961, Gates, a subsidiary of Harris-Intertype, manufactured and advertised the Studioette speech input console. The four channel, step-type mixer offered generous key switching facilities to accommodate four microphones into two preamplifiers, three turntables, two tape machines and three remote lines. Three utility keys were provided for individual needs.

The unit also included a high-gain program amplifier, 10W ultra linear monitoring amplifier, dual muting and warning light relays, a 4" illuminated VU meter, a self-contained power supply, complete cueing facilities for turntables, net, tapes and remotes and an output emergency key.

In its day, this level of switching was considered to provide a great deal of flexibility. Compare this to the modern routing and control surfaces available today, and the Studioette might not even have enough flexibility for a news booth or dubbing station.

Sample and Hold

Listener retention

Does radio lose a substantial portion of its audience during commercials breaks?

Radio industry perception is yes: 68 percent believe it does

Reality is no: 92 percent of audience actually stays

Source: Arbitron, Media Monitors, Coleman study, September 2006

That was then

In this 1950 photo, Frank Atwood, the host and producer of the *Connecticut Farm Forum*, interviews an unidentified area farmer on the subject of farm safety. The WTIC mobile unit was equipped to cut 16" aluminum-based disks in the field. Engineer Al Jackson manned the controls during the interview.

Photo courtesy of WTIC.

This Little Unit

Can Do BIG Things!

Our new AP-3 is the perfect HD Processor:

SETTING UP FOR HD RADIO?

The Vorsis AP-3 digital processor is the ideal tool to shape your sound exactly the way you want it —cleanly and efficiently.

Built around a multi-band compressor with complementary AGC, the AP-3 replaces a whole *rack* of dedicated units. VORSIS pre-conditions your signal (HPF, LPF, notch filter, de-esser, expander), then let's you apply 3-band AGC/compression *and* 4-band parametric EQ (signal chain reversible) before going through a final stage zero-overshoot peak limiter.

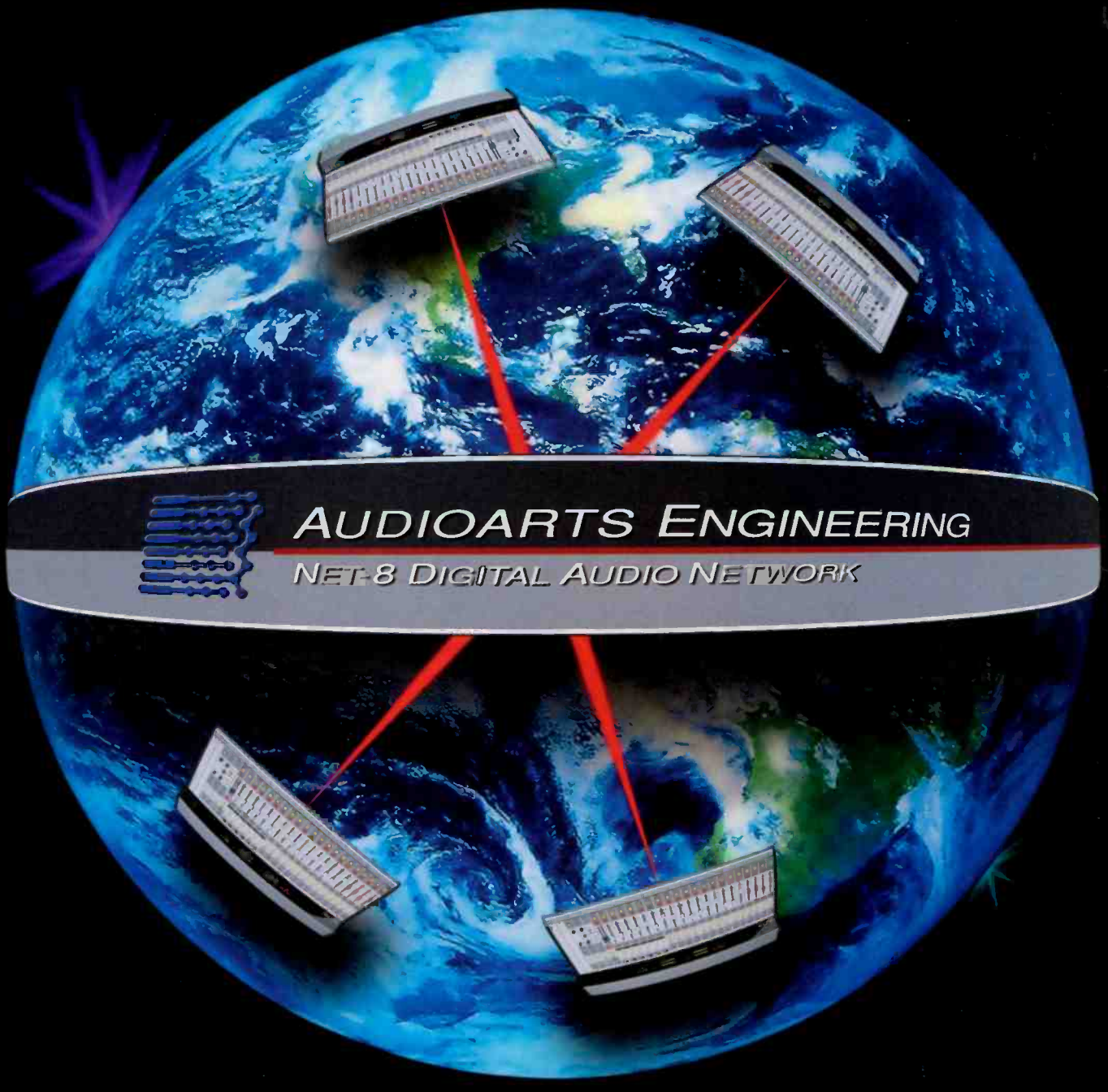
With real-time spectrum density readouts and full metering, our included PC graphic interface software makes operation of the AP-3 direct and easy, offering complete control of all audio parameters, presets, monitor functions, system settings and security—all through a single RJ-45 ethernet connection that lets you control one or many AP-3 units.

TAILOR THAT SOUND

VORSIS™

tel 252-638-7000 / sales@vorsis.com / www.vorsis.com

It's a Whole New WORLD!



AUDIOARTS NET ***is the EASY way to interface your D-75N digital consoles! And because D-75Ns are also standalone designs each studio can operate INDEPENDENTLY, relying on the network only to share resources. And by EASY interface we MEAN it—you don't have to be a software guru or IT professional to get up and running—and STAY running! And because it's AUDIOARTS, you can rest assured it'll be reliable and preserve your budget.*** ***TAKE ADVANTAGE of WHEATSTONE's extensive expertise in DIGITAL TECHNOLOGY!***

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