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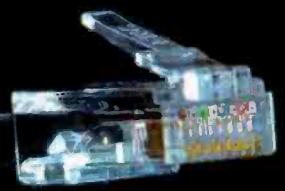

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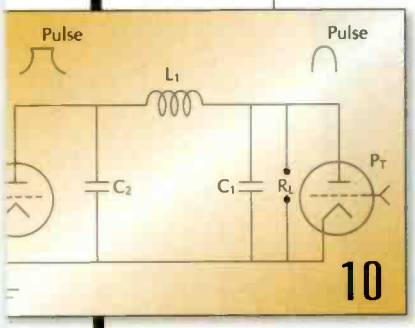
Features



Columns

Departments

ASBPE

Award-winning content

Radio magazine won a Regional Gold Award from the American Society of Business Publication Editors for the December 2004 article Surround Takes to the Airwaves. *The article, written by Mike Pappas, detailed KUVO's experience with airing the first, live surround-sound broadcast for HD Radio.*

ON THE COVER:
Dr. Joy Browne broadcasts her daily show from the new studios of WOR-AM, New York. Photo by Andrew Rosenberg, Creative Studio Solutions. Cover design by Michael J. Knust.

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Tieline G3 Vs Telos Xport...

You Decide.

Telos has recently published comparisons between their Xport POTS Codec and the Tieline Commander G1 Codec which has been obsolete since November 2004. Here is a comparison with the current Commander G3.

Tieline Commander G3 Vs Telos Xport

Feature	Tieline Commander G3	Telos Xport
POTS to POTS connection	Yes	No - POTS to ISDN only
POTS Audio Delay	100 Miliseconds	>600 Miliseconds
Maximum POTS Audio Quality	15kHz	15kHz
Low bit rate audio quality over POTS	7kHz as low as 9.6kbps	Telephone quality below 16kbps
15kHz Bi-Directional Audio over POTS	Yes	No - 15kHz 1 way only
POTS Compatibility	Yes Comrex/Musicam	No
Intelligent Gain Control	IGC + AGC	AGC
Warranty	2 Years	1 Year
Expansion Ports	2	1
12 Volt DC portable power options	Yes	No
Simultanous duplex Comms and Talkbalk*	Yes	No
Remote Control Talent's audio Inputs	Yes	No
Stereo 15kHz over POTS*	Yes	No
Dual Mono 15khz POTS*	Yes	No
Bonded POTS* Up to 48kbps mono	Yes	No
Audio Over IP Codec to Codec *	Yes	No
Weight	4 lbs	7 lbs
Dimensions	8.5x8.5x2.9 inches	9.25x12.75x3.5 inches
GSM 7.5kHz Wireless *	Yes	No
ISDN Options	Mono, Stereo, J-Stereo	Mono
ISDN Algorithms	Mpeg Layer 2, G.722, G.711, Tieline Music	AAC+, AAC LD, G.722
15kHz stereo/dual mono over 1 x 64K channel	Yes	No
User Remote Profiles	98	30
Configurable Macro Function Options	Hundreds	No
User configurable program/monitoring/comms	built in 11 x 6 cross point audio router*	No
Split Phones - Monitoring/Comms	Yes	No
List Price per pair **	**$5,750** (2x G3)	**$6,850** (Xport / Xstream)
Link Renegotiation	1 second	5-6 Seconds
Control Inputs and Outputs	2 in 2 out (Exp to 16 in/out)	3
Automatic Failover	Yes - to 15khz POTS 2	Yes - to analog

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** Refers to base MSRP without ISDN option for POTS Codecs and MSRP for Telos Xstream as of 4/1/2005. The Telos logo, Zephyr, Zephyr Xstream, Zephyr Xport are all registered trademarks of TLS Corporation, © 2004. aacPlus (TM) Coding Technologies. Comrex, Musicam and Telos and associated trademarks are property of their respective owners. Product specifications quoted from the manufacturer's manual listed on the website 5/11/2005 * Requires additional POTS, ISDN, GSM, IP modules for operation.

Currents Online

File Sharers Lose in Supreme Court

The Supreme Court says that Internet file-sharing services will be held responsible if their customers use the software primarily to swap songs and movies illegally.

Solid State Logic Gets New Owners

Musician and technologist Peter Gabriel and broadcaster David Engelke have acquired the assets of the company.

The Launch of Roadcasting

Roadcasting broadcasts to wireless-capable devices within a 50km range through a long-range, peer-to-peer 802.11g wireless network.

Moseley Acquires Assets of Proxim

For $21 million, Moseley will acquire most of the domestic and foreign operations of Proxim.

Media Monitors Increases Monitored Markets

100 new stations and one newspaper have been added to the company's roster of monitored markets.

Find the mic goes monthly!

Since 1998, *Radio* magazine has placed the mic icon on the cover of each issue. At the end of the year we have held a sweepstakes asking you to find all of them and enter to win prizes.

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Site Features

FM Radio Turns 70

By John Landry, CSRE, and Dave Saviet

On June 11, the 70th anniversary of the first FM radio broadcast was celebrated at the site of that broadcast, in Alpine, NJ. The facility, which still stands today, was built by the inventor of FM radio, Major Edwin Howard Armstrong. A special temporary authority was granted by the FCC for the operation of a wide-band FM station, WA2XMN on 42.8MHz, the original frequency used by Armstrong.

Photo by Dave Saviet

Armstrong was a true pioneer in the development of radio. Not only was he the inventor of the regenerative detector circuit and later the Superheterodyne circuit, which revolutionized radio reception and is still in general use today, but he also developed early over-the-horizon RADAR systems and multiplexed wireless audio links. At the time of his death he was involved in a patent dispute over his FM radio invention with RCA and other radio manufacturers. His widow, Marion McInnis Armstrong continued the patent fight in court after his death and ultimately claimed victory.

Read the entire story at beradio.com.

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Viewpoint

One step closer

Last month, the NRSC submitted its IBOC standard called NRSC-5 to the FCC. In short time, the FCC turned around and requested comments on the standard. Since the request was made, several comments have been supplied to the FCC. The deadline for the initial comments is a few days from this issue going to the printer. Reply comments are due next month. We encouraged readers to share their comments with us as well. Some of these have been posted to Reader Feedback online and used in our twice-monthly e-mail newsletter, IBOC Update.

Before the NRSC provided the data to the FCC, the information was posted on the NRSC website. Immediately people noticed that the standard did not include three items: a defined audio coding system, details on supplemental program services (multicast or Tomorrow Radio) and advanced data services.

E-mail lists and reader letters also noted that the standard did not address AM interference at night and the use of separate antennas. While these are worthy topics of discussion, these are not concerns of a transmission standard. NRSC-5 deals with the system that generates the IBOC signal.

Going back to the three missing items, should we be concerned that they are not covered in the standard? Not yet.

The lack of a codec specification protects the system from being completely proprietary. As it is, Ibiquity has stated that it will license the transmission technology without its HDC codec if it is asked. In theory, someone could create an IBOC system that uses another codec and then work with receiver manufacturers to include this alternate codec in the receivers. The development of smarter radios has been underway for some time, which makes this possible, although realistically impractical. Receiver manufacturers don't want to manufacture units with multiple codecs. It's been hard enough getting them to manufacture an IBOC receiver in the first place.

That aside, I was told that the NRSC deliberately omitted any codec specifications from the standard because legal restrictions prevent Ibiquity from divulging the actual specifications of HDC. The NRSC wanted to include it but because of the legal restrictions it was not possible.

As it is, coding technology will continue to improve, and IBOC is still in its early phases. The codec standard can be determined later.

Many have looked at supplemental program services (SPS) as a significant feature of IBOC. Commonly called multicast now, and previously called Tomorrow Radio when it was being developed by NPR and others, some see it as a way to provide new programming services to listeners. The belief is that these services could help terrestrial radio compete with the quantity of programming choices available from satellite or Internet radio.

I agree that SPS and surround sound are features that can help consumer acceptance of IBOC, but once again, we are at an early stage in IBOC. The first generation IBOC receivers are available. Kenwood, Radiosophy and some others are providing SPS-capable receivers, but they are not the norm. Not including SPS in NRSC-5 is not a problem, but it is something that needs to be addressed soon.

A long-standing promise of IBOC has been the ability to transmit additional data to listeners. Obviously displaying stock tickers and scores are information that many consumers want; These are available on Internet messaging services and cell phones. Advanced data services can offer more, but the receivers must be able to display this data. In addition, allowing the listener the ability to pick and choose data—a function of the receiver—will help drive acceptance of this.

Once again, the timing is important. Let NRSC-5 determine the basic operation of the system, which it has done. The added features and enhancements are needed, but they can wait until the next standards-setting announcement.

All I ask is that the NRSC and the receiver manufacturers not wait too long. The momentum has started. Don't let it slip away.

Chriss Scherer, editor
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The Doherty linear amplifier

By John Battison, technical editor, RF

The first kind of transmission used a spark transmitter for Morse code. This was followed by the Poulson arc transmitter where the radiation from the sustained arc provided the continuous wave (CW) transmission. Then came CW transmission using the 30kc Alexanderson rotary alternator, and later a microphone was placed in the antenna lead to modulate the carrier.

Finally, the vacuum tube opened the gateway to relatively simple and easy RF carrier generation and concurrently adequate audio amplification. This brought with it the requirements for efficient methods of modulating the carrier wave to enable speech transmission. There developed a number of different modulating circuits. Most of these required large power tubes and corresponding large magnetics (chokes, transformers and other devices that tend to create magnetic fields) to handle high-power modulation.

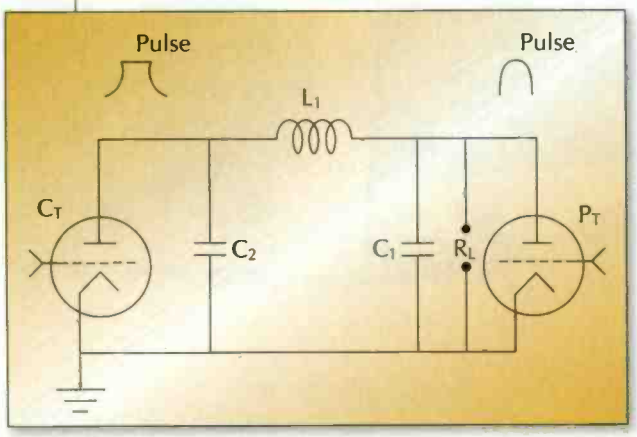

Figure 1. The basic Doherty amplifier circuit.

The original attempts to transmit audio using modulated oscillators quickly proved inadequate because only relatively low power could be handled. Modulating the oscillator also led to other problems. Class A linear modulation with 30 percent efficiency was soon superseded the by class B amplifier, which in turn led to many modified class N systems in the effort to avoid the use of high-power modulating stages with expensive high-voltage power supplies, transformers and power tubes.

Natural evolution

Throughout the years, a surprisingly large number of modulating systems were developed. Among these was a modified class C amplifier, which is cut off during the negative half cycle and its partial pulses added to another amplifier. The idea was excellent and ingenious, but proved to be difficult to operate in practice. This was partially due to the constantly changing operating load impedance problem. In 1936 a well-known engineer named William Doherty* devised an efficient operating system using this principle. This effectively made the Doherty linear amplifier a commercial proposition. In the following two or three years several other well known engineers such as Fred Terman, J. Woodyard and consulting engineer Jim Weldon of high-power AM transmitter and Continental Electronics fame postulated modifications that greatly improved circuit performance. Weldon took it a step further and developed a grounded grid circuit that considerably increased its efficiency.

When first developed, the Doherty amplifier gained a reputation for difficulty in adjustment and consistent operation. This was not so much the fault of the circuit but lack of knowledge of the principles and power flow by the operators. One of the major problems was a lack of understanding of the operating characteristics of the load and difficulty in obtaining a purely resistive output load.

Triode tubes were originally envisioned for the system, but as new tubes were developed the circuit was adapted to use the new tube types. The general theory of operation of the Doherty amplifier is shown in Figures 1 and 2.

Figure 1 shows a basic triode Doherty amplifier circuit. One tube is the carrier tube and the other is the peak tube. R_L is the load across which the final RF power output is developed. This load is probably the cause of much of the misunderstanding and problems encountered in the Doherty amplifier. The problem occurs because two tubes feed power into a single load. Each source develops a voltage across the load, and when both sources feed power simultaneously the impedance will change depending on the relative powers.

Figure 2 shows the modulation generation process. Figure 2A shows the input signal. The carrier tube is biased to operate in class B and is driven to saturation

** Described in the Proceedings of the I.R.E., September 1936*

Shrinking Revenues?

dMarc's new revenue solution gains momentum

RevenueSuite's Online Control Console keeps you informed.

The chase for new revenues has exasperated radio execs for what seems like years, yet some are now starting to see light at the end of the tunnel. RevenueSuite, a newly launched revenue-on-demand program from dMarc is finding revenue streams where none existed before.

Offered exclusively to Scott Studios and Maestro customers, RevenueSuite has been on the market only a few months, yet it is already syndicated into more than 250 stations. That makes it the fastest growing new revenue solution in the industry. An additional several hundred radio stations are in various stages of review and/or pre-installation, according to dMarc management.

One of the early adopters is Nassau Broadcasting Partners, headquartered in Princeton, NJ, and serving multiple markets in the Northeastern U.S. Nassau recently committed all 55 of its market-leading stations to the RevenueSuite program.

"We give RevenueSuite a resounding thumbs up," said Nassau's Senior Vice President of Engineer Tony Gervasi. "It's performing exactly as dMarc said it would. The best part about it is that we literally set it up, turned it on, and it operated seamlessly with our Scott Studios (SS32) systems, generating revenue. Prior to installing it group-wide, we put it through numerous performance tests. We found that RevenueSuite was easy to install, highly intuitive, hands-free and reliable. Now it's up and running, generating revenues across our network of stations."

Other managers report liking the fact that, once RevenueSuite is installed, it requires virtually no traffic management or operational maintenance. "After you close the logs for the day," said dMarc President Ryan Steelberg, "the RevenueSuite program begins to fill unsold and designated avails automatically without the need for station overhead or local trafficking. You can turn it on, and the system will run autonomously while providing real-time revenue reports and local control through a simple-to-use web-based interface. The RevenueSuite program is made available to any Scott Studios or Maestro enabled station." ■

For more information on RevenueSuite, check out the company's online site at www.dmarc.net.

www.beradio.com

at carrier level as shown in Figure 2B. In this manner all the output ranging from peak negative modulation up to saturation level is produced. At the same time the peak tube is biased to operate in class C, and its drive is adjusted to produce absolute minimum plate current at carrier level. This results in the production of positive modulation peak pulses as shown in figure 2C.

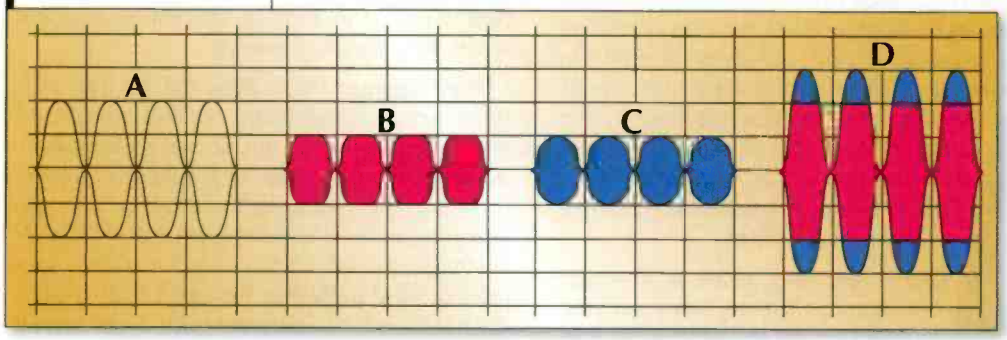

Figure 2. The various waveforms created by the Doherty amplifier to yield an output. A is the input signal, B is the signal in saturation, C is the peak pulse and D is the resulting output.

Now we come to Figure 2D. Note that the waveform is shown as being composed of two pulses (2B with 2C added together). Also note that it is larger in amplitude than Figure 2A. In fact, when the amplifier is properly adjusted it yields four times the power of Figure 2A. Although the average plate current of the peak tube is considerably lower than that of the carrier tube it is essential that its cathode emission be as great as the peak tube's. This is because under conditions of maximum power both tubes contribute the same amount of power; for this reason it is common to use the same tube type for each stage.

This is where many people have difficulty understanding the Doherty system. We mentioned earlier that a pi network was used. This has the valuable property of inverting the load and termination impedances. It also delays the signal by 90°, which is not as useful in this instance. This calls for a phase-advancing network in a transmitter. This 90° phase shift is not a basic part of a Doherty amplifier but is merely an undesired by-product of the essential 90° network.

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Maintaining balance

When two power sources feed a single load, complications result affecting the ultimate impedance value. This is where the phase shifting property of a network allows the Doherty amplifier to work. It is common to use the phase shifting property of a network to accomplish an impedance balance. If we merely paralleled the plate circuits of the peak and carrier tubes across the load the system would work only as long as the grid drive voltage on the carrier tube stayed between zero and carrier level (the peak tube is biased almost to cut-off).

When excitation goes above carrier level on the positive half cycle the output of the peak tube rises. This will cause the apparent load impedance to increase and the carrier tube output would decrease as the peak tube output increased. This would not provide a four-fold increase in carrier power.

This is where the pi network formed by the inductance L_1 and capacitances C_1 and C_2 are used to invert the impedances seen by the peak and carrier tubes to produce the required varying load impedance value. Remember that a 90° network has the characteristic that an increase in the load impedance is matched by a reduction in the input impedance of the network. This operates in both directions so that a change in load impedance caused by the operation of one tube into the network will affect the output of the other tube.

"...the Doherty amplifier is a little different from the familiar amplifiers."

But what about the 90° phase difference between the two voltages? The pulses won't match.

In an operational broadcast transmitter correction of the 90° phase shift lag is taken care of by means of a simple 90° phase advancing network and the peak tube input is synchronized with the carrier tube. This advancing network adds nothing to the performance of the Doherty amplifier, although without it the amplifier could not operate.

It is obvious from this rather brief description that the Doherty amplifier is a little different from the familiar amplifiers. Two networks are involved, one is a 90° lagging and the other a 90° leading. It is easy to see how a small adjustment of either of these networks will have considerable effect on the efficiency and operation of the amplifier. In normal use there should be no need to adjust the impedance of the load once tuned, except perhaps when installing new tubes. The Doherty amplifier is probably still to be found in use in a number of stations, although I can't help wondering how it would work with IBOC today.

E-mail Battison at batcom@bright.net.

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FCC Update

New radio market definitions tested

By Harry Martin

No big surprise: the FCC finally gets a new local market definition rule in place and in roll petitions seeking to test the "bright lines" established by the new rule. For the moment, however, the new rule's bright lines remain clear, for the FCC has recently rejected requests to use alternative market definitions in making station counts under the radio multiple ownership rule.

One case involved stations in Ithaca, NY, an Arbitron-rated market where BIA reported nine radio stations "home" to the market. A four-station group was proposed to be sold intact. Under the FCC's local radio multiple ownership rule, in a market with 14 or fewer stations, an entity may not own more than half the stations. Thus, if there were nine stations in the market, the proposed sale would have been permitted. Petitioners opposing the application argued that, because of terrain obstructions that allegedly prevented reception of two of the nine in-market stations listed by BIA, the market should be deemed to consist of only seven stations, which would have precluded the proposed sale. The FCC rejected these technically based arguments.

The Commission said the Arbitron-based market definition is presumptively to be used, and there is a heavy burden on a petitioner to show that an alternative definition is appropriate. The FCC's staff reviewed the market in question and concluded that seven stations provide city-grade or better coverage and two other stations provide city-grade coverage to most of the market. As a result, the FCC found that the petitioner's argument regarding terrain obstructions failed to show that reliance on the Arbitron market definition was inappropriate. Thus, the FCC found that acquisition of a four-station group complied with the multiple ownership rules.

Another attempt

In a second recent case, the complaining petitioner tried a different tack. The four stations proposed to be sold were located in Pullman, WA, and Colfax, WA, neither of which is in an Arbitron-defined market. That didn't bother the petitioner, who argued that the Commission should define a new "Moscow [Idaho]-Pullman-Colfax" market to consist of stations licensed only to those three communities. Because there were only nine stations that would be considered local under this formulation, and because the proposed buyer already owned two of them, the proposed assignment would have left six of those nine stations under common control.

The Commission rejected this approach, observing that in unrated markets it has adopted an interim market-definition method using a contour overlap standard similarly modeled after the old rule. The proposed assignments easily conformed with those rules and were granted.

We can expect to see more new and novel challenges to the radio market definitions. Nevertheless, the Commission is reluctant to go beyond the confines of any new rule, especially one like the radio market definition, which was adopted only after years of debate and court challenges.

Previously, the FCC's guidelines used in reviewing merger cases were murky. The agency flagged cases where informal market concentration benchmarks were exceeded, but ended up granting most of these. The new rule, by making the market definition tighter and more rational, swept away the flagging procedure and otherwise short-circuited FCC consideration of competition issues. This does not mean, however, that the FCC won't be persuaded in rare cases that the new market definitions shouldn't apply, and the door certainly remains open to such challenges. But, the burden of convincing the Commission to look beyond the new market definition will be high given the new rule's history and agency's lack of a jurisdictional basis to deal with competition issues case-by-case.

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.

Dateline:

On Aug. 1 radio stations and FM translator stations in California must file their 2005 renewal applications. Radio stations also must file biennial ownership reports and EEO program reports by Aug. 1. California radio stations must broadcast their renewal post-filing announcements on Aug. 1 and 16, Sept. 1 and 16 and Oct. 1 and 16.

Aug. 1 also is the deadline for radio stations in Alaska, Hawaii, Oregon, Washington and the Pacific Islands to begin their renewal pre-filing announcements in anticipation of filing their renewal applications on or before Oct. 1.


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Clear Transmission

By Doug Irwin

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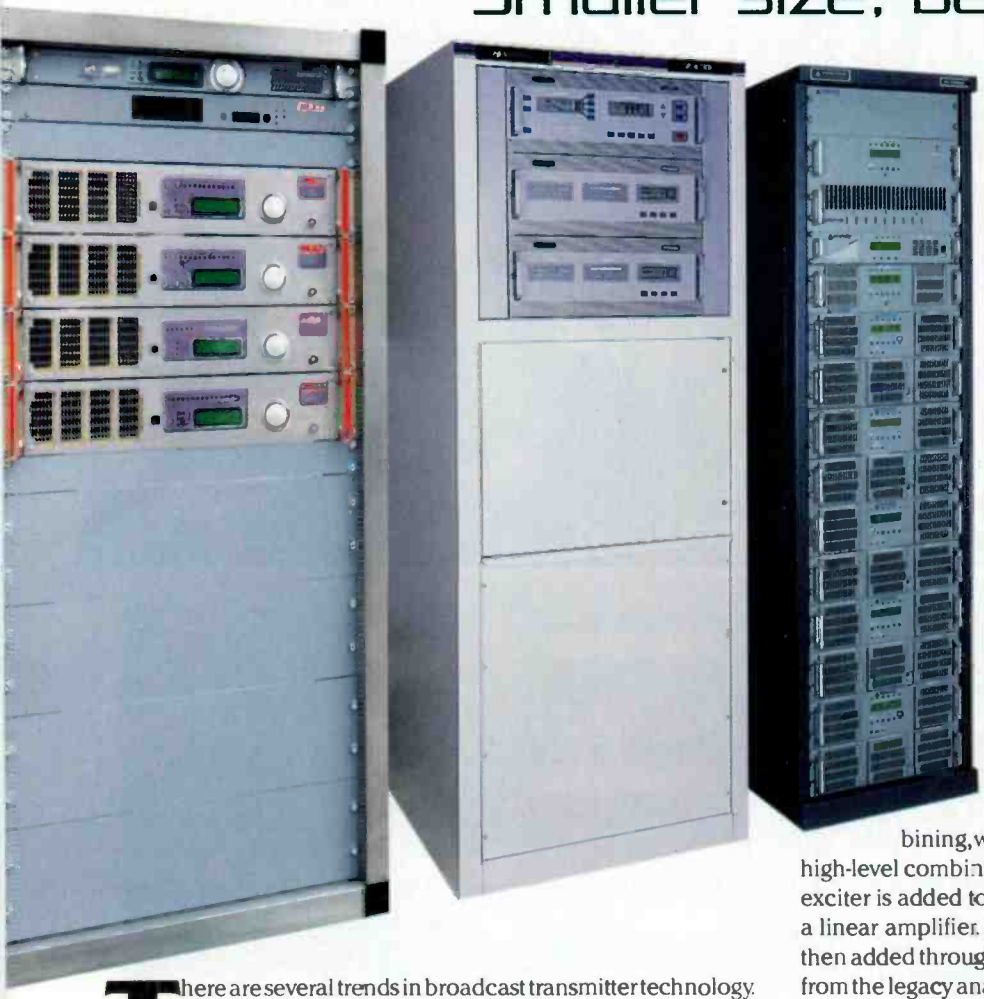

There are several trends in broadcast transmitter technology. The most easily recognizable one is the simplification of HD Radio transmission by the introduction of more linear amplifiers (thus allowing the transmission of the analog FM signal plus the IBOC signal through the same path). A second trend is the reduction in size of standard analog solid-state transmitters, along with more use of embedded bi-directional communications links, frequency-agility, and built-in stereo generation and even audio processing.

When I first wrote about IBOC transmission in *Radio* magazine in August 2002, the three methods of IBOC transmission were discussed, although only one (high-level combining) was practical at that point. Although I don't have numbers to back it up, I believe it is likely that the majority of the early adopters of HD Radio used this method.

Two things have happened in the meantime. First, the FCC has given its blessing on the use of a separate antenna for IBOC transmission (as long as certain parameters are met); and second, high-power amplifiers that can generate high TPO levels with the analog FM carrier and the IBOC carriers are now (almost) commonplace.

Let's take for example an FM station that has a six-bay (full-wave spaced) antenna and an ERP of 50kW. Neglecting transmission line losses, this station would need about 16.7kW of power reaching the input of the antenna. In the early days of IBOC transmission, this station could have converted to IBOC transmission by installing a high-level combiner—adding 10 percent to the TPO (to make up for losses through the analog path in the -10dB combiner)—and installing an IBOC transmitter capable of putting out 1,670W to the "digital" input of the -10dB coupler (once again neglecting transmission line losses for simplification). This is not an inexpensive proposition by any means, and potentially could have necessitated the installation of a new, larger analog transmitter, a larger power feed, extra air-conditioning and more floor space.

Within the last year, Harris developed an IBOC technology that it calls split-level combining, which is a more efficient variation on the original high-level combining method. A sample of the RF from the analog exciter is added to the IBOC signals and thereafter amplified with a linear amplifier. The output of this IBOC + analog transmitter is then added through a selectable ratio combiner with the analog RF from the legacy analog transmitter. A phasing adjustment allows the user to match the phase of the carrier from the linear transmitter with that of the legacy transmitter. This method actually reduces the amount of RF needed from the analog transmitter, and couples more of the IBOC signal in to the antenna and not a waste load.

More options

While the high-level or split-level methods work for the station used in this example, the FCC has now made it easier to implement IBOC by use of a separate antenna. If this same station located another antenna on the same tower (at more than 70 percent of the HAAT) or perhaps already had a backup antenna in place, then the implementation of IBOC could be as simple as this: divide the station's analog ERP by the second antenna's gain; divide that by 100 (because the sum total of the upper and lower sideband groups is -20dB below the analog carrier level) and then size the IBOC transmitter accordingly. In this example the station would need 167W of IBOC power reaching the antenna input (antenna gain = 3). If

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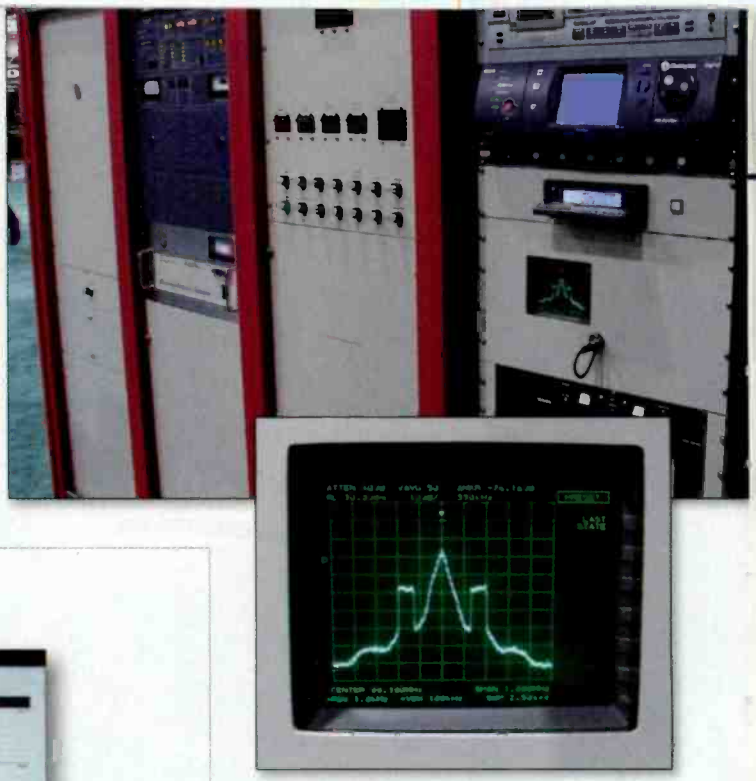
an auxiliary antenna already existed, then the amount of capital needed to implement the project is reduced substantially.

If the station in this example used any sort of a combined antenna, then another possibility exists. The IBOC signals (for multiple stations) could be introduced into the antenna system by way of back-feeding the combiner, and thereafter routing the combined IBOC signals into the antenna by means of new ports built in to the hybrids at the antenna bay inputs. This also greatly reduces the TPO necessary from the IBOC transmitter.

ERI, Shively and Jampro provide interleaved antenna systems that have ports added for the introduction of the IBOC power. This is yet another way to get around the original high-level combining method.



What's old is new. Other tube transmitters have been used to pass the IBOC signal, but Continental has released the 816HD as a regular line product.

But wait: there's more. Continental Electronics has modified its legacy designs (class-C vacuum tube) to linearize them so that they can amplify a low-level IBOC plus analog FM signal, and bring it up to the TPO necessary to feed the correct amount of RF to the same antenna that the station has always used. (Continental states that the upper power limit of this technology is 20kW of analog plus IBOC.) It essentially amounts to a new product line. It also provides a practical transition path for owners of existing 816R transmitters.

Armstrong single-tube transmitters have supported HD Radio for some time. Harris is investigating the possibility of retrofitting older tube transmitters similarly, so that they can transmit the IBOC plus analog signals. Broadcast Electronics will not pursue this methodology.

The station used in my example would be limited to the options already discussed: high-level, or split-level combining; use of a separate antenna, or a combined or interleaved antenna; or use of a large vacuum-tube (linear) amp. At this point in the development of the technology the upper limit of solid-state common amplification is 14kW. Below that power level, there are many options available.

What about AM IBOC? Things haven't

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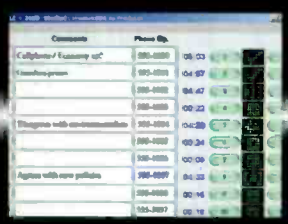

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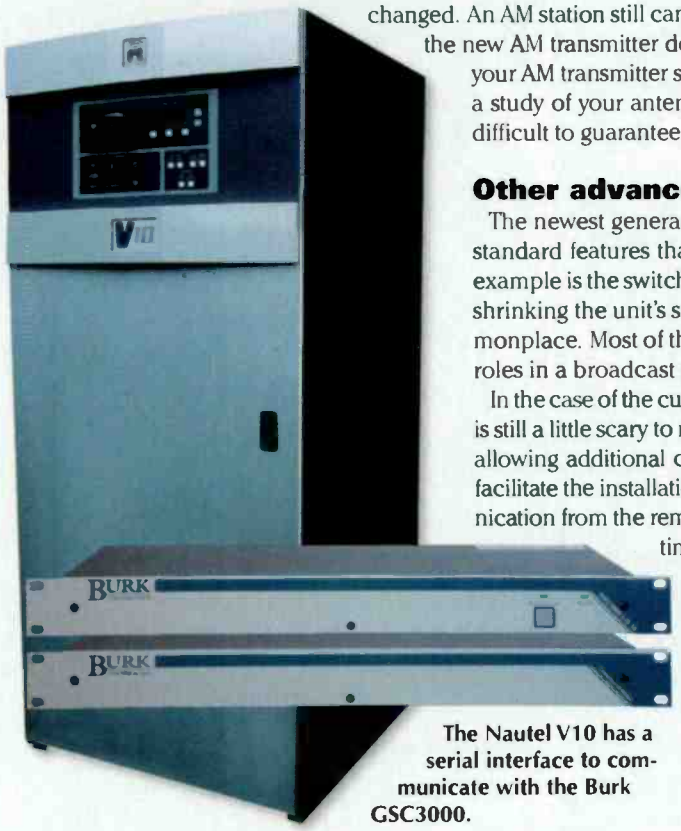
changed. An AM station still cannot broadcast IBOC signals at night—it's daytime only. The majority of the new AM transmitter designs are ready to transmit the IBOC signals; if you intend to upgrade your AM transmitter soon with an eye towards IBOC, be sure to budget for (at the very least) a study of your antenna's bandwidth characteristics. Antenna performance is much more difficult to guarantee for an MW (especially a directional) antenna system.

Other advances

The newest generation of FM exciters and lower-power solid-state amplifiers come with standard features that would have seemed overly complicated just a few years ago. One example is the switch-mode power supply, which eliminates a large power transformer, thus shrinking the unit's size and weight. Another example is the LCD user-interface, now commonplace. Most of these exciters are frequency-agile, so they can potentially play multiple roles in a broadcast group.

In the case of the current generation of IBOC exciters, a computer controls the functions. This is still a little scary to most of us. These same IBOC exciters have Ethernet connections as well, allowing additional communication options. (The second generation of IBOC systems will facilitate the installation of computers at the studio location.) Another trend is direct communication from the remote control unit to a transmitter itself via serial data. Remember the last time you had to wire all of your control and command functions from a new transmitter over to the remote control? Nautel's V-10 can communicate with a Burk GSC3000 directly via a serial connection; all telemetry and control move over this path. This simplifies the installation process and makes it neater too.

The increasing interest in HD Radio among broadcasters has prompted radio transmitter manufacturers to invest heavily in the development of new products. It's an exciting time to work in broadcast engineering, and it's a great time to learn something new.



The Nautel V10 has a serial interface to communicate with the Burk GSC3000.

Irwin is director of engineering for Clear Channel Radio Seattle.

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Redefining a heritage

By Matt Sheahan

Heritage: (her-i-tij) n. **1.** Something passed down from preceding generations; tradition. [ME < OFr. < heriter, to inherit < LLat. hereditare < Lat. heres, heir.]

WOR in New York City is a heritage radio station. Signing on Feb. 21, 1922, it was one of the first stations in the United States. Since that time, WOR has broadcast programming to New Yorkers and to national audiences via its syndicated network programming. It is a legacy that its owner, Buckley Broadcasting, takes seriously.

Since 1926 WOR had been broadcasting from its 23rd floor Times Square location. It was a premium office space with premium lease prices (not to mention the ever-present traffic issues in that intensely congested part of midtown New York City). A complete studio rebuild was impossible to achieve at the old location. To take one studio or master control off line for weeks at a time would have compromised both local broadcasting and WOR's two national radio networks. After 79 years, it was time to move the operations.

Tom Ray, Buckley Broadcasting corporate director of engineering, and his team began the search for a new broadcast location in May 2004. After numerous site visits, Ray settled on a location less than two blocks from Ground Zero at the World Trade Center. The site was chosen because, as Ray explains, "that part of town is really starting to awaken with new businesses and housing. It's a much nicer part of the city, and it met our broadcast and financial requirements. It's really a perfect location for our new facility."

The new location was not without challenges. The building, called the Trinity Place building, is a city landmark. It was one of the first multistory business buildings in Manhattan. While historically interesting, any changes to the infrastructure had to meet exceptionally strict standards. What might be a simple process, such as putting a generator on the roof, became more complex because of the building's landmark designation.

Give and take

To remain on the air throughout the move, Ray constructed an STL relay link at the Times Square location because the new location does not have a clear sightline to the transmitter. In addition, Ray decided to continue to use WOR's existing Enco digital audio system. The entire system would have to be relocated to the new facility while broadcast operations continued without interruption.

The routing switcher gets a new twist.

(About five twists per inch, actually.)

Everybody needs to share audio. Sometimes just a few signals — sometimes a few hundred. Across the hall, between floors, now and then across campus. Routing switchers are a convenient way to manage and share your audio, but will your GM really let you buy a router that costs more than his dream car? Unlikely.

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An expensive proprietary router isn't practical for smaller facilities. In fact, it doesn't scale all that well for larger ones. Here's where an expandable network really shines. Connect eight Axia 8x8 Audio Nodes using Cat-6 cable and an Ethernet switch, and you've got a 64x64 routing switcher. And you can easily add more I/O whenever and wherever you need it. Build a 128x128 system... or 1024x1024... use a Gigabit fiber backbone and the sky's the limit.

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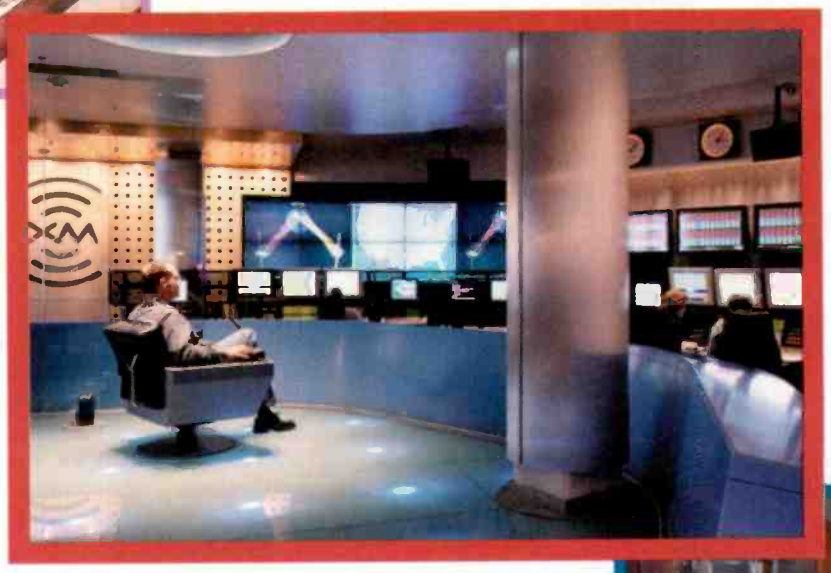

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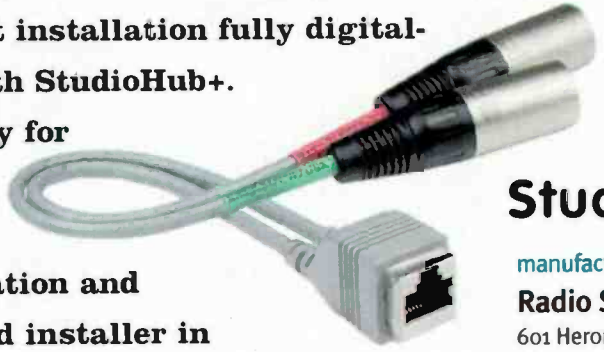

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Dr. Joy Browne (left) originates her show from one of the three talk studios in the new WOR facility.

With the location chosen, Ray then had to begin designing and engineering a facility that would meet the requirements of WOR's local and network programming. There were several basic needs established for the new studios. The facility needed to stand up to the rigorous uses of the station and provide a durability that would stand the test of time. Because broadcast technology is constantly evolving, the new studios had to allow for change in the future. This included the ability to route data in addition to audio, because WOR sends cues to the satellite uplink for network feeds. The facility needed redundant backup systems that would prevent any single point of failure. Finally, the console and routing system would need to be tightly integrated.

It was obvious that state-of-the-art technology was essential. With these criteria in place, it was time to make decisions.

Each on-air studio/control room combination had to be identical. Each studio has the same equipment complement, the same number of microphones and the same capabilities. In this way, no one talent can own a studio, as was the case at the previous location.

To handle the systems integration, WOR chose Creative Studio Solutions of Colorado. Ray was familiar with CSS' work for major broadcast organizations around the country and wanted a team with the experience and technical acumen required for this significant transition.

WOR already had an existing new technology infrastructure in place. The station has transmitted an HD Radio signal since 2002, and added AM stereo at the beginning of 2004. The station streams its programming online.

According to Ray, the most significant new technology that was integrated into the new studios was the Axia Smartsurface and Livewire System. This was the first large-scale implementation of the new system. At WOR's old facility, the router controls were located

The facility is built around the Axia audio network. This is one of the conrol rooms.

outside the studios. Now, routing functions are not only within the studio, but within the console surface.

"With the ability for a user to load his own settings into the consoles, and with each studio being identical, there is no problem moving a show into a different room," said Ray.

The Axia system uses standard Ethernet switches to connect the control surfaces and utility products.

Design decisions

WOR's new facility, while in a nice part of New York, is located near a high school. The studios face an alley frequented by teenagers going to and from school. Because of the noise emanating from the alley below, additional sound isolation was needed so that Dr. Joy Browne's program would not include a detailed background discussion of how bad today's school lunch was. Ray says the station took a page right out of the Lucas Sound THX manual. The building's historical status prevented any exterior work to be done to the existing single-pane windows. Instead of replacing the windows, a duplicate window frame was made and then installed on the inside. This preserved the historical look and added a second pane of glass. While Ray concedes that the technology isn't cutting edge, "it

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is a system that works very well."

WOR chose Studio Technology for studio furniture. Studio Technology worked with the station to create a custom studio furniture design that provided each studio with the needed functional and aesthetic requirements of the facility.

The new studios went live On May 4 without a hitch. Dr. Joy Browne was on the air giving advice across the country, WOR delivered news and weather, commercials were played and the production studios were in use. It was by all standards an extremely successful move.

photo by Tom Ray

The technical operations center and master control room is the central point of the studio installation.

Added benefits

The result has been better than Ray had hoped.

"The cleanliness of the audio makes the IBOC signal sound fantastic," said Ray. There is no more IM distortion and audio coloration or masked ground loop hums to deal with. Plus, with the ability to route data, we should be able to start taking advantage of Program Associated Data in the near future."

The heritage of excellence continues at WOR. With 83 years of broadcast history and counting, Tom Ray is aware of that history. While moving the station forward to the future, the station was mindful of the past. With its long history with New York, the station wanted to do its history proud. Ray notes, "I think that we have done that."

Sheahan is communictions manager with Creative Studio Solutions, Wheat Ridge, CO.

Photos by Andrew Rosenberg unless indicated.

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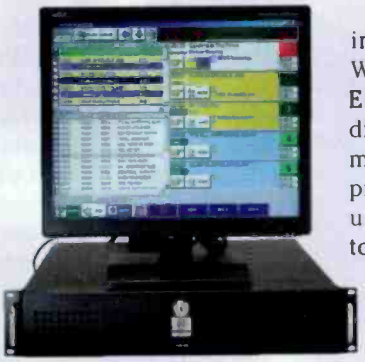

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Since 1979, BGS has supplied broadcast equipment to radio stations, ranging from the smallest facilities to legendary stations like WOR. BGS was the primary dealer on the WOR rebuild project, supplying nearly all the new equipment ranging from the entire Axia networked audio system to the rack screws. According to Tom Ray "if you need it, BGS has it, and the antibiotics to deal with it." With offices around the country, there's always a knowledgeable broadcast professional ready to help you, whether it's a complete studio rebuild or a handful of connectors. BGS takes care of everything from the big stuff to the little stuff.

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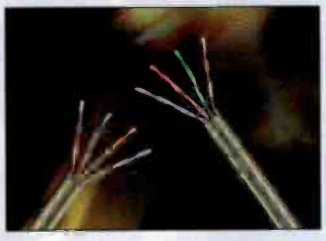

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Neumann BCM 705

By Doug Irwin

I've always considered Neumann microphones to be the "gold standard," but I've had little experience with them (save the U87). Georg Neumann founded the company in Berlin in 1928, and over the years developed and introduced 90 microphone models. Sennheiser took over the company in 1991 and has taken excellent care in maintaining the Neumann brand; Sennheiser has also facilitated a marked increase in the ability of Neumann to produce enough units to lower the price point and to likewise build up Neumann's market share. The TLM-103, the KMS-105 and the newly introduced BCM 104 come to mind; but unlike those three, the BCM 705 is a dynamic microphone—the first ever built with the Neumann name.

The transducer element itself in the BCM 705 is a variation of the Sennheiser MD431; the capsule has been redesigned to reduce tolerances in frequency response and sensitivity. The microphone is designed for "speech reproduction at close range" according to the user manual. The capsule and the microphone itself are elastically suspended so that structure-born noise pickup is minimized; and, of course, the microphone is designed to be used with standard mic booms.

The hypercardioid pattern is obviously important in a studio environment because of the typical physical arrangement; you want to hear the announcer while not hearing much "slapback" from windows, the console and computer monitors. Figure 1 shows the patterns vs. frequency. My experience in a physically small studio was that pickup off of the backside of the mic was not a problem. As you can see from Figure 2, the free-field response of the mic has a substantial low frequency roll-off. This compensates for the proximity effect and gives the mic a fairly flat low-frequency response in the near field.

We tested this mic against a ubiquitous dynamic mic and against a Neumann BCM 104 (condenser). As a dynamic it is not as sensitive as the condenser but had about the same output level as the other dynamic mic. (When you use a dynamic mic you will need to build up a bit more gain in your mic preamp, which will be noticeable in the output as a higher noise floor.)

Installation

As you can see in the picture of the mic, it is meant to hang vertically from the mic mount. The headgrill can be unscrewed from the remainder of the body of the mic with a few clockwise turns, and can then be easily cleaned with mild soap and water. Neumann sells the headgrills as accessory parts, so each jock could have his own. According to the user manual, the pop filter, which is inside the headgrill, can also be removed and cleaned with care—not something jocks are going to do of course.

Performance at a glance

- Hypercardioid pickup pattern
- Bass response designed to compensate for proximity effect
- Good sensitivity (1.7mV/Pa = -55.4 dB; ±1dB)
- Integrated pop screen
- Removeable headgrill for easy cleaning

We tested the BCM 705 in a typical broadcasting environment—a small studio otherwise known as Edit 2 at Sports Radio 950 in Seattle. This room is about 7'×7'. The other two mics used in the comparisons were the Neumann BCM 104 (which has the same physical characteristics as the BCM 705) and the ever-present Electro-Voice RE-20. All three mics were fed in a to a Mackie 1202 VLZ. Gains were trimmed to be identical from mic to mic by impressing each mic with a fixed sound-pressure level at a fixed distance, and setting gains to produce the same output level. The channel muting buttons were used to ensure that only one mic was heard at a time and that the gain settings would not be touched. The output of the Mackie was then routed through our normal mic processing into a small console, driving headphones.

The BCM 705 had a sound characteristic somewhere between that of the RE-20 and that of the condenser; there was not a pronounced low-frequency build-up and thus it sounds less rich on the low end than the RE-20 or

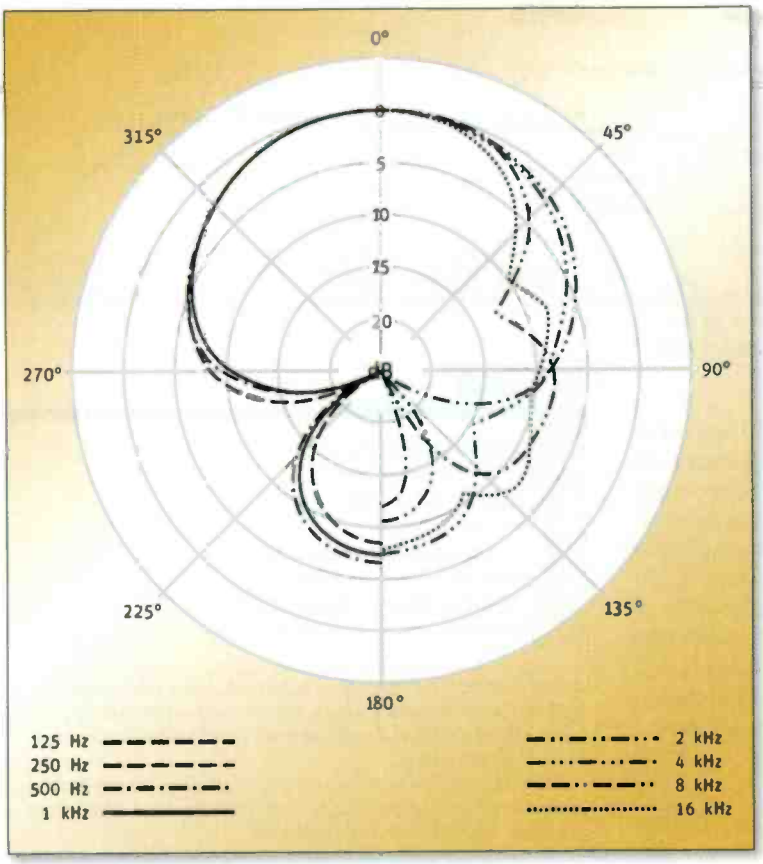

Figure 1. The mic's polar pattern at various frequencies.

the BCM 104. It had high frequency content much like the condenser, but noticeably better than that of the RE-20. In my opinion, it provides a realistic and pleasing reproduction of one's voice. We also tried it on a voice-tracked show on one of our FM stations using the same mic processor settings as the condenser mic we normally use (except for more overall gain) and over the air it acquitted itself well.

Most broadcast engineers have a favorite microphone and mic preamp and processing combination—many long established—but there have been changes and new

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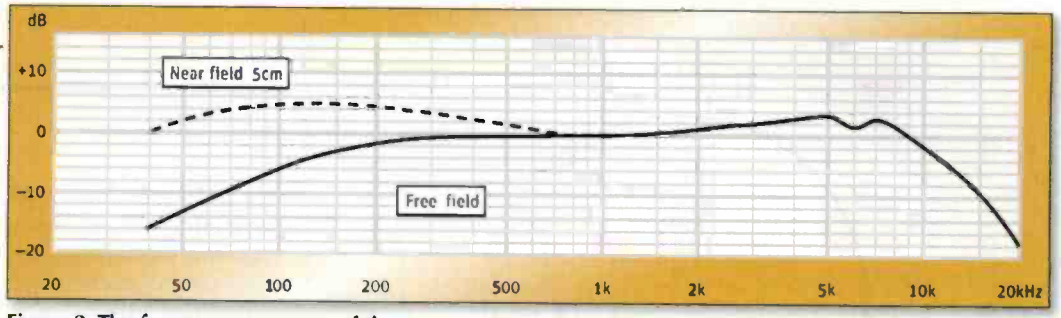

Figure 2. The frequency response of the mic in a free field (per IEC 60268-4 into 10kΩ).

trends in both during the last 10 years or so. Whether or not a mic sounds good or not is totally subjective; and what one person thinks sounds great may be anathema to the next person. In any case, if you are about to start auditioning microphones, then I recommend the BCM 705 for your list of candidates. It is a welcome addition to the Neumann product line. Broadcasters with reservations about the use of condenser mics in a broadcast environment should pay it special attention.

Irwin is director of engineering for Clear Channel Radio in Seattle.

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Great River Electronics MEQ-1NV

By John Landry

With the widespread acceptance and use of digital editing systems in radio production, the need for new stand-alone microphone preamps has grown. Most digital editing systems have a built-in mixing capability. In addition, many broadcast facilities are installing signal routing systems that can mix. Without a conventional broadcast console to provide one, the need for a stand-alone microphone preamplifier has grown.

Great River Electronics has been making high-quality preamps for a long time, to much acclaim in many recording studios and production houses. In addition, the company has designed custom analog electronics, and among its customers are the CBS Radio Network and Minnesota Public Radio. The MEQ-1NV is a stand-alone preamp and a separate equalizer in a 1RU package.

The MEQ-1NV comes in basic black. Right away the bright blue power-on LED on the mic preamp is a sign that this is no ordinary black box. The preamp features a large gain selector knob, calibrated in 10dB steps from -70 to +20 with a smaller gain pot next to it that sets the gain within that 10dB range. On the bench we set the range to 40, as the instructions indicated, and all tests were conducted here. There are switches on the front panel to select phantom power, input impedance and output termination.

Because the microphone preamp plays a critical role as the first step in any recording or broadcasting system, it follows that its specs should be as close to ideal as possible with regard to noise and frequency response. Most amplifiers are not ideal and much has been written about how different amplifiers have a different sound. For this article we tested the MEQ-1NV on the bench, and then made some qualitative tests using speech with a few varied microphones. These tests were recorded on a DAT tape and later played through a few different sets of monitors.

Performance at a glance

- Four-band parametric EQ
- 1/4" TRS send and receive jacks
- XLR inputs and outputs
- Transformer-balanced I/O
- Rackmount ears and rubber feet supplied
- Continuously adjustable gain from 70dB to 0dB
- Zero to 20dB attenuation
- 18dB per octave low frequency roll-off
- Built-in power supply
- Discrete semiconductor circuit design

Great expectations

The frequency response was as expected. With the termination turned on, we measured less than 0.2dB change in the output from 20Hz to 20kHz. It was only off 1.25dB at 40kHz. The distortion measured was 0.014 percent at 1kHz. With the termination turned off, the response changed slightly, with almost 1dB lost below 100Hz and 2.05dB gained at 45kHz. The weighted noise floor at 120Hz measured at -104dB terminated. The published noise spec is equivalent input noise of -128dB or better. This figure includes the amplifier's gain as well as the measured noise floor level. Our test results are considerably better than that.

Next we fed it with a 1kHz square wave and turned on

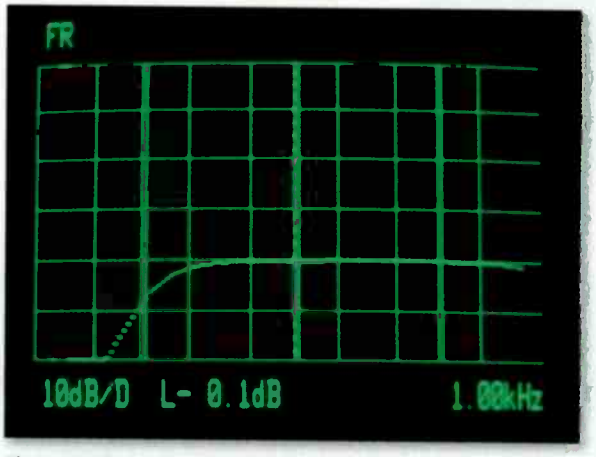

Figure 1. The response with all the bands disabled and the low frequency roll-off filter set to 150Hz.

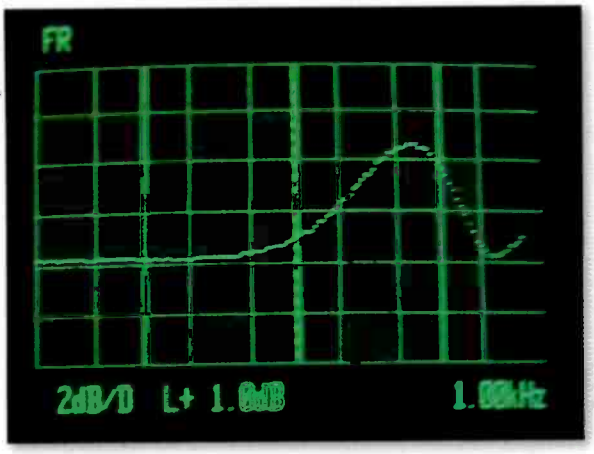

Figure 2. The response with only the midrange band in use with the broad bandwidth selected and a slight 4dB increase.

the termination. Some tilt was observed at 100Hz and there was some rounding at 20kHz, but the results are good for a transformer-balanced circuit. The square wave performance without the termination on was not pretty.

The four-band equalizer is every bit as good as other legendary units. One advantage the MEQ has is that each band can be disabled individually. Our frequency sweeps were made using a Sound Technology 1510A analyzer. With all other bands disabled, the low frequency roll-off filter was set to 150Hz, and the results are in Figure 1. This setting would tame the wildest morning zoo jock. Figure 2 shows just the midrange band in use with the broad bandwidth selected and a slight 4dB increase. Figure 3 shows just the high equalizer in use, with the shelving mode on and the gain set for a 12dB cut.

In the end we recorded speech with three microphones: an EV RE-20, an AKG C-1000 and an AKG Solitube to check the preamp's sound coloration. With the big gain knob set for 40dB, the results with all three mics showed little coloration. The instructions pointed out that the sound would be different depending on the settings of the two gain knobs, so we played. Indeed, the coloration as we heard it was noticeably different when using the low gain as it was for higher gain. And likewise, removing the termination produced a totally different sound, which was especially pronounced in the recordings done with the RE-20. We did not have a guitar handy to check the instrument input, but this amplifier would make an excellent direct box for recording.

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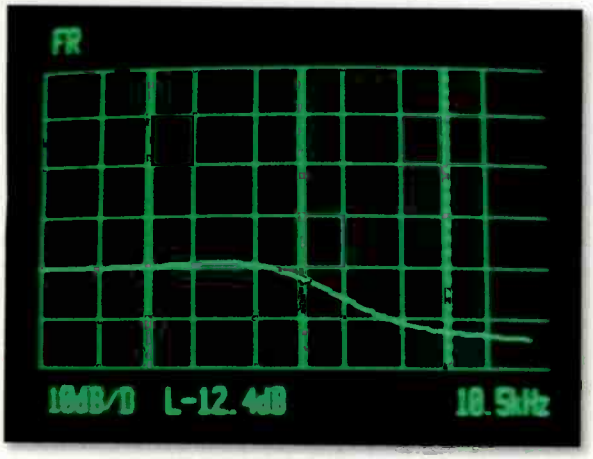

Figure 3. The response with only the high equalizer.

MEQ-1NV. The internal circuitry is discrete, using top-notch transistors such as MPS A10/A18, BC5508 and TIP41. Interstage coupling capacitors are high quality Panasonic HFS electrolytics. There is only one op-amp in the mic preamp, and it drives the unbalanced output. The equalizer uses tuned RC circuits and similar quality semiconductors, and has no op-amps. It is a must for critical recording, and would be excellent in the air studio for that major-market sound. Such quality comes at a price ($3,300), but it is worth every penny if you want an outstanding sound.

Landry is a maintenance technician at CBS Radio/Westwood One Technical Services, New York.

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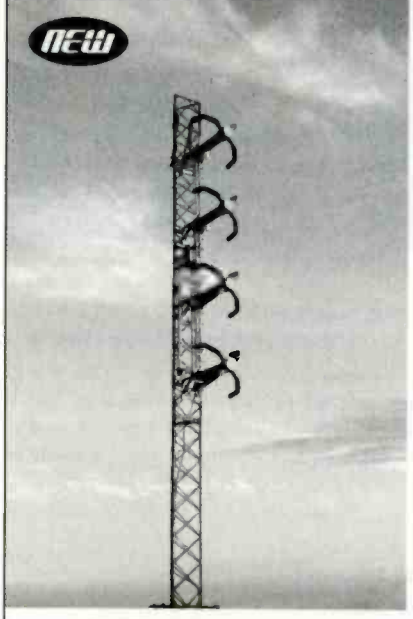

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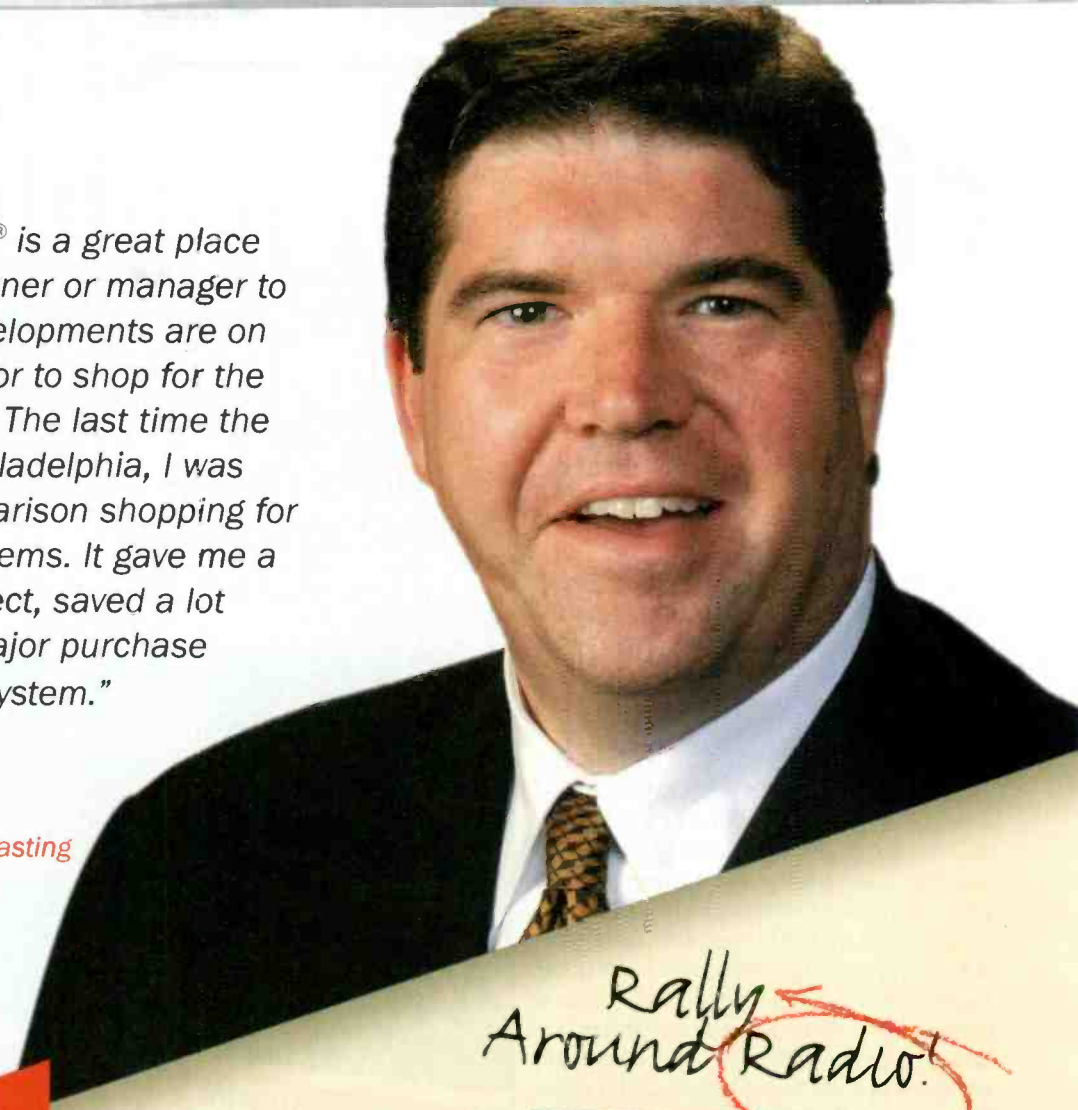

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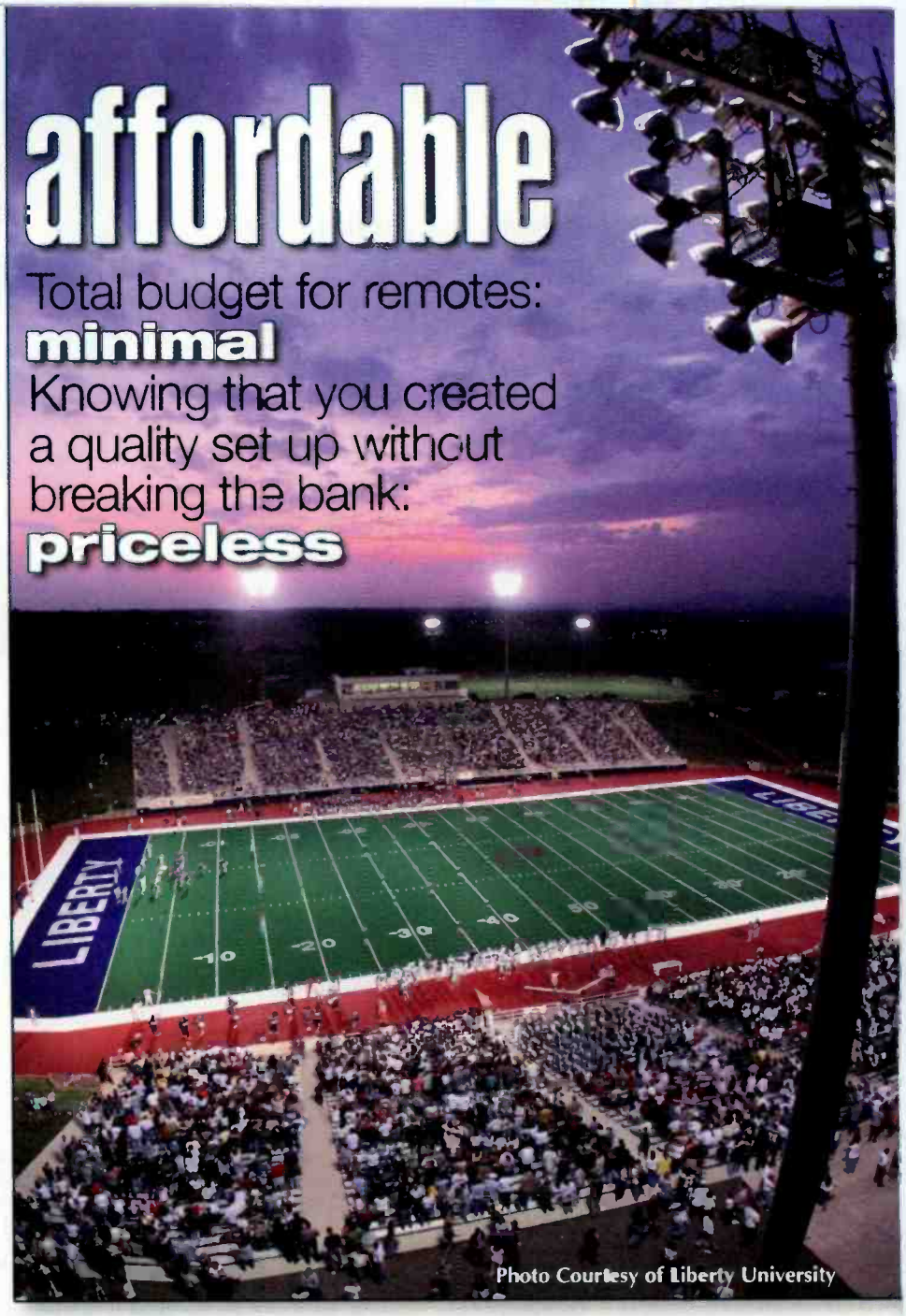


Photo Courtesy of Liberty University

By Chris Wygal

Non-commercial, medium market and small staff; These are the ingredients for a sports broadcast crew that must keep the bells and whistles to a minimum. And it's the case at WRVL, the 50,000W flagship station of the Flames Sports Network, a broadcast service of Liberty University. The voice of the Flames, Jerry Edwards, has taken his small broadcast crew across the country since 1981 with frequency extender and headsets in hand, making NCAA Division I football and basketball available to listeners in the Lynchburg and Roanoke, VA, markets.

In May 2002 I came to WRVL to take on studio engineering and programming. We wanted to improve the overall sound of the football broadcasts, so Edwards' trusty frequency extender was put away, and the need for new equipment reared its expensive head. My goals were to improve the home-crowd ambience, put a pre-game crew on the concourse of the stadium and make our sideline reports easy to hook up. I also wanted to get the game in stereo back to the station. But how do we do this with a budget that leaves little room for sports broadcasting? It comes by doing a lot with little, even if you have to make it yourself.

Right away I knew that we would need more mics. The Liberty University football team draws a home crowd of about 10,000 into A.L. Williams Stadium, and I wanted listeners to hear that ambience. At most large football venues, you'll find microphones placed on the sidelines, in front of the crowd and on TV cameras to create an effects mix. With this in mind, I picked up two Audio-Technica AT815b shotgun mics and positioned them together on top of the press box, pointing them at each 20-yard line. Not using the typical X-Y miking pattern isn't a problem in this situation because of the distance of the source. Any potential errors in phase are minimal. At $300 for each AT815b, I've captured a great effects mix for only $600. Of course in the future, having a guy on the sidelines with a parabolic set-up is a must.

We use Beyer DT190 headsets for the play-by-play announcer, color commentator and statistician, and I use a set as well for talkback. These older units had always been in the arsenal, so I didn't have to purchase new headsets. They work extraordinarily well and when purchased they sold for about $300. Our color commentator is on the sidelines, and making sure he is clean and clear for the entire game is key. I decided to go wireless with the Sennheiser EM100 UHF receiver system and a SKP100 UHF wireless plug-on transmitter. The transmitter easily snaps onto a headset mic cable. We sometimes set up in stadiums where the booth is a good distance from the sidelines, so I picked up the Sennheiser directional yagi antennas to go along with the wireless rig. Wireless audio is an all-or-nothing case as far as quality is concerned, and a good solid system that can handle long distances is vital. The complete wireless system cost about $660.

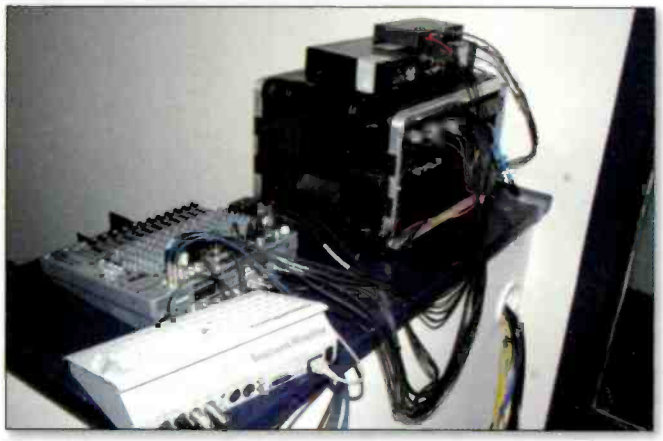
The three headsets and the pre-game feed are processed on two Behringer MDX1400 Autocom Pro units that provide great level control and good full sound on four channels, and for only $138. Two other Autocom Pro units are used in the signal chain back to the station, but I'll talk about that later.

Each member of the broadcast team hears a different mix in his headset. This is accomplished through a Behringer HA4600 headphone amp. It has four separate amps, sending a program feed and an aux mix to either ear in the headsets. With this feature, I can cue and talk to individuals, or everybody at once. The HA4600 offers tons of versatility and only costs $88.

The booth headsets connect through a homemade snake. I hated the idea of purchasing a pre-fab snake that would have had too many or too few of the features I needed. So I headed to the home improvement store and picked up a PVC electrical workbox on which I mounted the appropriate XLR and ¼" jacks. The jacks came

out of an old mixing console. From the box, I ran six-channel Gepco snake cable and fanned the other end with XLR and ¼" plugs. The colorful fanned end connects to a homemade panel that holds XLR and ¼" jacks on the back of the equipment rack. This facilitates locating the headphone amp separately from the mixing board. The headphones and their mics are split from the back of the panel, to the headphone amp and mixing board respectively. The cable was $40, the chassis mount jacks were free, the box was $7, and a wire connector was $2. This is a great 30-foot headset snake for just under $50 and it's as rugged as anything you'd get in a catalog. There's nothing wrong with being frugal, and becoming a friend of local electronics suppliers is a must in the frugality department. Getting parts and accessories at cost will obviously save dollars. Never throw away a console without first stripping it of valuable parts.

A Behringer UB2222FX mixing board is the heart of the setup. This board features eight mic inputs and four stereo line-level inputs. It provides three auxiliary outputs and two sub-outputs, allowing for separate headphone mixes and submixes to send to the PA system and the speaker system out on the concourse. It is also equipped with pre-fader listen on each channel, which gives us the opportunity to chat during breaks. Effects and processors can be inserted on channels one through eight. Because of this feature, I designed a talkback button using a small Radio Shack project box and switch. When I plug the switch into the insertion point on channel eight (my headset mic) I can leave the channel on, and simply push-to-talk when I need to speak to someone. The UB2222FX costs about $289.



The equipment set up and ready for the game.

On-site playback

For game elements playback, I use a Tascam MD-301mkII Minidisc deck, which sells for $375. For quick clips and instant replays, I use a 360 Systems Instant Replay unit, which costs $2,700. For off-air monitoring, I bring a Shurwood FM/AM receiver from home.

I work in the Flames Sports Network home radio booth behind the play-by-play announcer and statistician, and our pre-game and halftime crew works from a setup on the concourse in the stadium. This idea came about when we decided the broadcast needed some face-to-face exposure with the fans. The pre-game guys use a Mackie 1202-VLZ mixer that picks up an IFB feed from me for their headsets. They use Audio-Technica ATM31R hand-held mics (which has been replaced by the ATM31a), and basic Sennheiser headphones bought as a five-pack for $89. I set up two powered Behringer B300 loudspeakers so the nearby concourse crowd can hear the entire broadcast live. Both speakers and stands cost $778. The Mackie board goes for about $400. Comparable ATM31a mics cost about $140 each.

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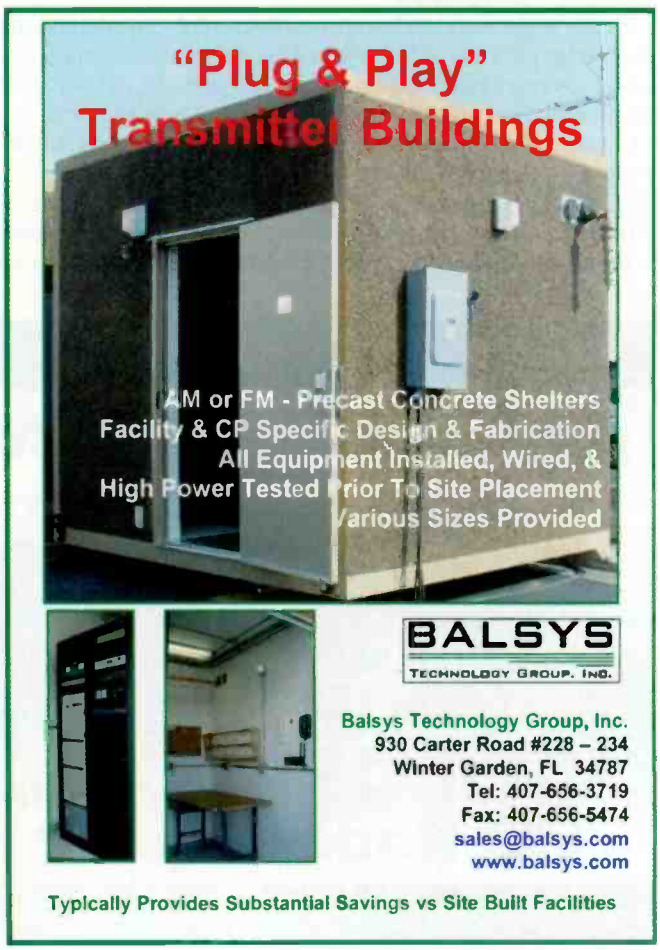
Portable affordable

The flying snake uses CAT-5 cable and a run of Belden 9451.

the concourse to the booth was a challenge when the idea was first conceived. The guys needed an IFB feed, the loudspeakers needed a complete broadcast mix and their program material needed to get to the booth. They also needed computer network drops for two laptops. I constructed a snake with three CAT-5 and one Belden 9451 run, attached it to some nylon rope, and flew it overhead from the press box to a light pole that is adjacent to the concourse pre-game setup. This prevents fans from tripping on or damaging the cables. It's truly an ugly combination of cabling, but it was an inexpensive route for data and audio. The IFB and loudspeaker feeds are sent through one CAT-5, using three pairs for unshielded, balanced audio. One pair is split and used for pin one in both feeds. I put six-pin XLRs on both ends of the CAT-5 and built adapters to fan out to the headsets and loudspeakers. I wanted a shield on the program material coming from the concourse, so I sent it through the Belden 9451. The other two CAT-5s carry the network links out to the laptops. The audio to and from the concourse across the flying snake is clean. I'm a firm believer that CAT-5 cable is a cheap and effective means for carrying analog audio.

The backhaul

So how do we get all of this home game material back to the studio in stereo? Through cooperation with the folks at the campus PBX, I secured two dry copper pairs from our press box to the control room back at the studios. We're lucky in that respect, in that the lines are free, and our studios are on the same campus as the stadium. However, the line-level audio runs across nearly two miles of unshielded copper wire. There's a lot of uncharted territory in sending audio over that much cable, and the complications are endless. My theory is that signals leak into the unshielded copper at countless points along the line, and ridding the inherent sizzle and hum is nearly impossible. However, to overcome the noise and buzz on the lines, I use the Behringer Autocom Pro MDX1400 on



The stereo shotgun mics are pointed at the 20-yard lines at each end of the field.

both ends. The stadium unit spits our program material out at nearly +20dB. The studio unit pulls the signal back down to a usable +0dB, and through some compression, gives us a punchy game sound, even before the station processing. Thus, I've worked the S/N ratio to our favor. This is somewhat an unconventional approach, but the line is clean and sounds great at game time.

All of the equipment is connected using standard microphone cables and other pre-fabricated cabling or self-built adapters. Because random cabling needs happen during every project, budgeting these accessories is difficult. When equipment purchases come along, I usually throw in some XLRs and other things on every requisition.

During a period of four years, The Flames Sports Network spent just under $10,000 to achieve a football broadcast sound that could have cost thousands more. By building my own cabling when possible and buying solid equipment, we have achieved a great on-air product. The more expensive, well-known equipment is always preferable, and if the funds exist, then by all means, get it. We've found however, that custom-built equipment and a little creativity go a long way, and can save the checkbook in the process.

Wygal is studio engineer and on-air programmer for WRVL at Liberty University, Lynchburg, VA.

The homemade snake uses a PVC electrical box.

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Spectrum analyzer
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FSH6: The internal preamplifier of this analyzer provides a frequency range from 100kHz to 6GHz. The unit offers an average noise level typically of -135dBm (RBW 100Hz). Other features of this product are a 0.5dB level accuracy up to 6GHz, resolution bandwidths of 100Hz to 1MHz and a wide range of detectors: sample, max/min peak, auto peak and RMS.

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Soundscape Editor 4.0: This graphical interface is user-configurable and is the working environment for all Soundscape 32 and Soundscape 16 DAW configurations. It runs on Windows 9x/ME/NT4/2000/XP. It relies on the DSP in the Soundscape 32 or Soundscape 16 hardware for all audio processing, mixing, DSP effects, and disk handling and synchronization. Parts can be recorded to any one of 256 virtual tracks. During tracking the system responds like a tape recorder, with the non-destructive punch in/out, loop recording of multiple takes. The transport buttons can be controlled from the on-screen transport bar, the computer keyboard or a hardware control surface. Audio tracks can be armed for recording from the Arrange window, the computer keyboard, the Mixer window or a hardware control surface.

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Cobranet interface
Audio Science

ASI2416: A modular 1RU Cobranet interface, this interface can be populated with four function specific modules, allowing as many as 32 channels of analog or AES/EBU I/O and 64 relay-based GPIO outputs and 64 opto-isolated inputs. Each module has an interchangeable connector portion that may be configured with a pluggable terminal block, Studiohub or a standard 50-pin Centronics connector interface compatible with Audio Science's sound cards. The base unit features 16 channels of Cobranet I/O and a Texas Instruments 32-bit floating point DSP that allows switching/mixing and broadcast specific features such as tone decoding. A graphic display on the unit's front panel displays peak meters and network status. This device may be operated in a tethered mode, whereby it is connected directly to an ASI6416 Cobranet sound card with an Ethernet crossover cable.

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Neutrik

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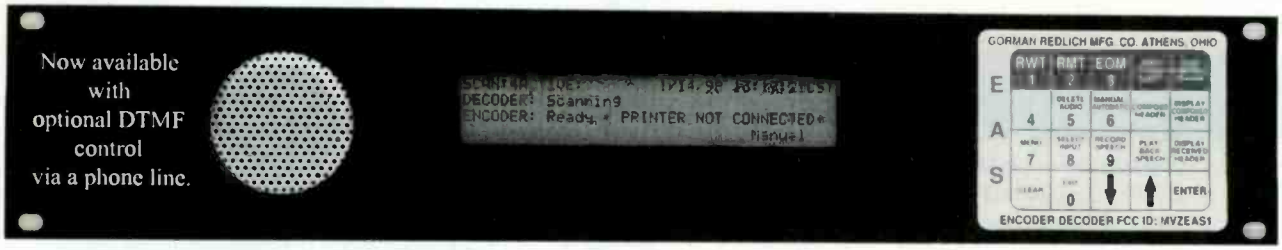

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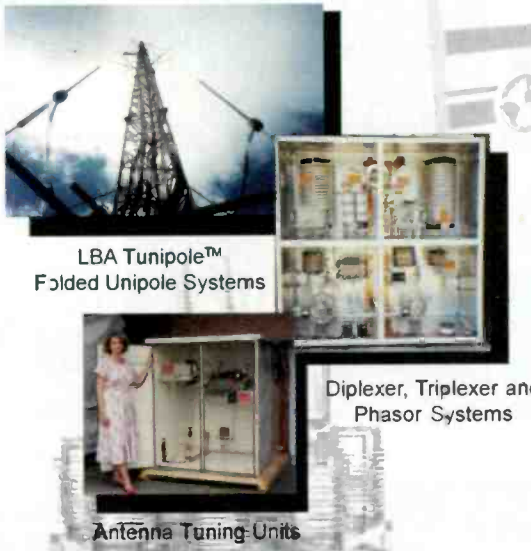

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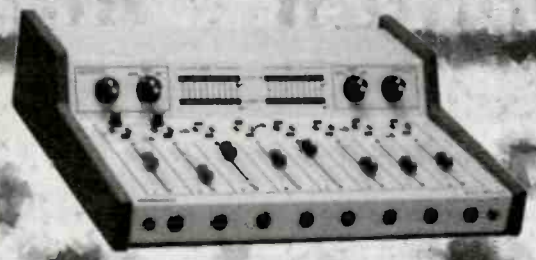

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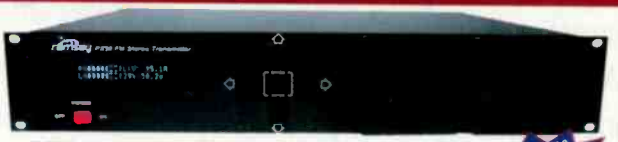

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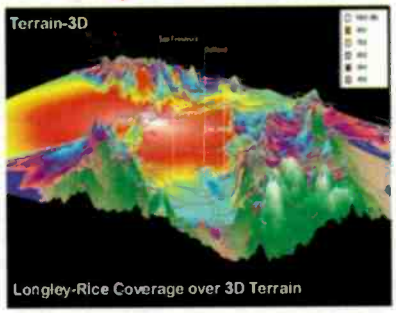

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Contributor Pro-file

Meet the professionals who write for Radio magazine.
This month: Portable Affordable, page 44

Chris Wygal
Studio Engineer
WRVL, Liberty University
Lynchburg, VA

Wygal began working at WRVL in 2002. In August 2002 he installed Imediatouch Oplog and updated the WRVL control room to facilitate the new automation platform. Wygal is currently preparing the control room for a complete makeover.

He also engineers and produces football broadcasts for the Flames Sports Network, the radio outlet for Liberty University athletics.

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Written for radio professionals

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Sign Off

By Kari Taylor, associate editor

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Sample and Hold

2004 Top 10 Radio Owner Revenues

Radio magazine Per-station Revenue Rank	Owner	2004 Est. Revenue ($000)	Owner # Stations Present	Owner # Markets	Avg Revenue per station in 2004 ($000)	2003 BIA Revenue Rank	2003 *Radio* magazine Rank
1	Emmis Communications	$311,175	25	8	$12,447	10	2
2	Infinity Broadcasting	$2,219,800	180	42	$12,332	2	1
3	ABC/Disney	$454,850	73	45	$6,231	5	9
4	Cox Radio	$485,600	79	19	$6,147	3	7
5	Radio One	$375,500	68	22	$5,522	7	11
6	Univision Communications	$338,675	70	22	$4,838	8	12
7	Entercom	$487,325	106	21	$4,597	NR	NR
8	Clear Channel Communications	$3,560,925	1,194	191	$2,982	1	15
9	Citadel Broadcasting	$412,982	225	51	$1,835	6	18
10	Cumulus Broadcasting	$323,625	303	59	$1,068	9	25

BIA ranks owners by total revenue. *Radio* magazine has taken this data and then divided it by the number of stations owned, to provide a ranking based on individual station average performance, which shows the revenue efficiency of each owner. For comparison, we have included the BIA ranking, the owner's 2003 *Radio* magazine ranking and the average revenue per station.

Source: BIA Financial Network, May 2005.

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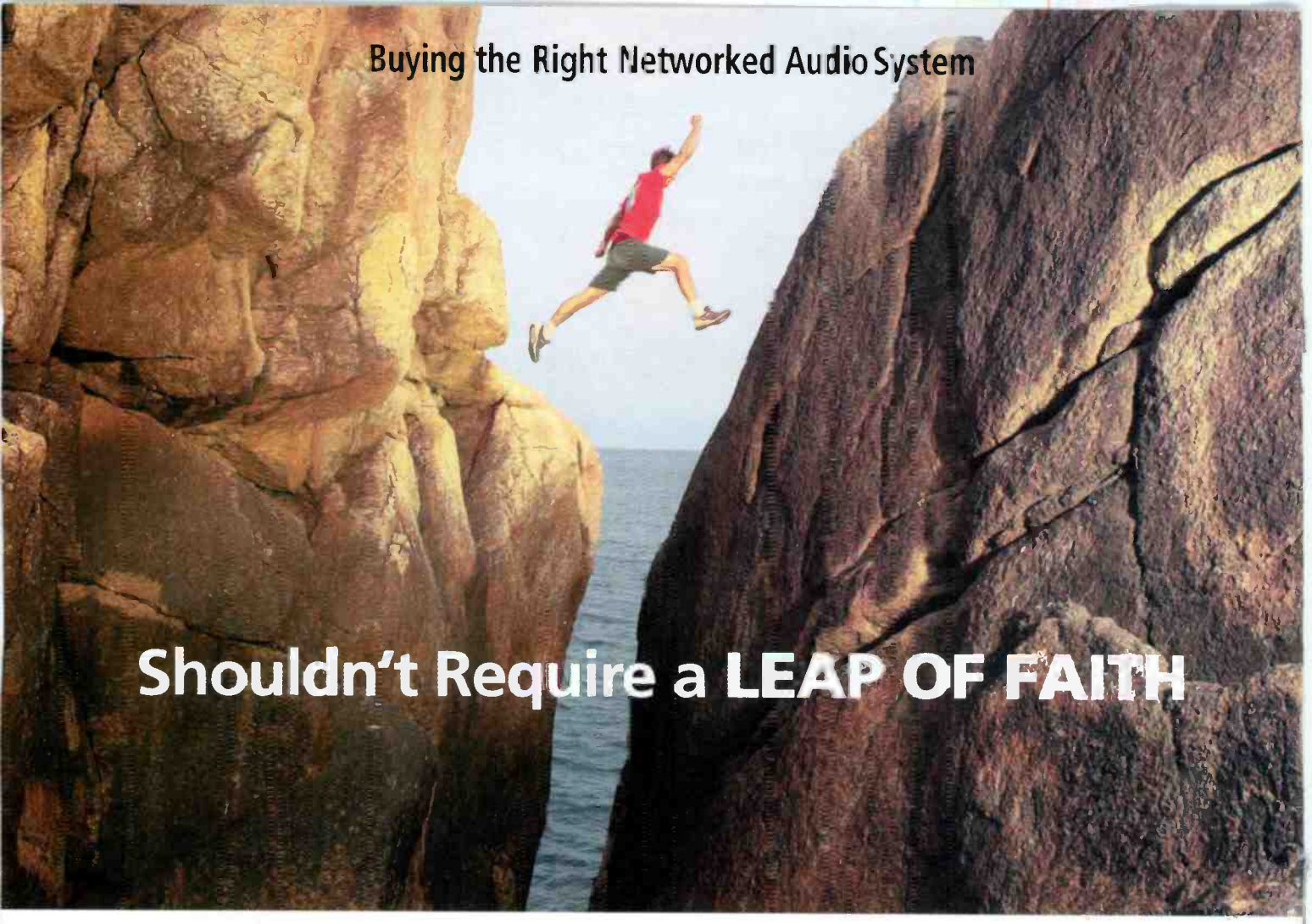

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