

# BE Radio

October 1999

An INTERTEC/PRIMEDIA Publication

[www.beradio.com](http://www.beradio.com)

## TRANSMISSION

### SPECIAL REPORT:

**Folded Unipole  
FM Antennas  
Solid State**

**FACILITY  
SHOWCASE:  
Indianapolis**



# The Scoop Reporter II Redefines "CONSOLIDATION"



It's interesting how a single word like "consolidation" can have so many implications.

But, when it comes to the Scoop Reporter II, it means only one thing: Real Savings! That's because the Scoop Reporter II is the world's first codec to combine ISDN, POTS, auto-battery backup, 3 channel mixer, PC programmability, and lots more! As a result, "consolidation" means a cost effective, "all-in-one" solution that inspires confidence when you are out in the field.



Linking Innovation With Clarity

AETA AUDIO CORPORATION  
75 Fleetwood Dr. Suite 200 • Rockaway, New Jersey 07866  
Phone: (973) 659-0555 • Fax: (973) 659-9555

[www.aetausa.com](http://www.aetausa.com)

# **ENCO + Orban + Harris = DAD<sub>PRO32</sub>** **The Only Complete Digital Audio Delivery Solution**



ENCO and Orban have combined the best features and technology of their digital audio products, and Harris now exclusively represents the new and improved DAD<sub>PRO32</sub> Digital Audio Delivery System.

DAD<sub>PRO32</sub> offers all of the features and functionality demanded by today's progressive broadcast facilities. Utilizing standard off the shelf non-proprietary hardware, network architecture, and operating systems, DAD is the logical choice for both Automated and Live Assist-On-Air operations, Production, News, and Inventory Management. DAD supports Orban Sound Cube Technology, transparent links to the Orban Audicy Multitrack Editing System, sharing of data with other software applications for Wire Capture & Editing, Scheduling & Billing, and the Internet, as well as interface to other professional broadcast control and switching equipment. And DAD comes with free software upgrades for the first year, permitting immediate access to all of the latest features supported by rapidly emerging technology and evolving broadcast industry requirements.

Integrated LAN and WAN capabilities make DAD<sub>PRO32</sub> the logical choice for groupwide, nationwide, or worldwide sharing of Audio, remote VoiceTracking, News, Schedules, and other data.

Call Harris today to discuss how the DAD<sub>PRO32</sub> Digital Audio Delivery System will permit you to realize the operational efficiencies and cost savings available with the latest technology.

*next level solutions*

WIRELESS

BROADCAST

COMMUNICATIONS  
PRODUCTS

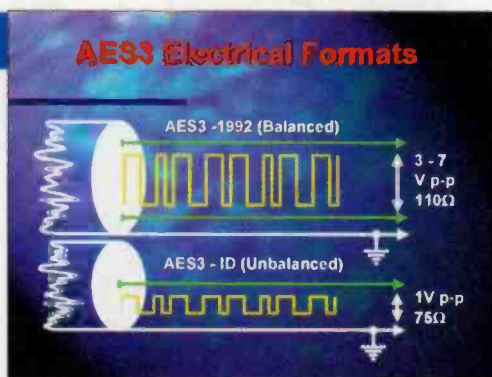
1-800-622-0022 • [www.harris.com/communications](http://www.harris.com/communications)

**HARRIS**  
Communications

Circle (104) on Free Info Card

## FEATURES

- 30 Special Report: Transmission**  
*by Sylvio M. Damiani/Robert D. Lambert Jr.*  
Two parts: A folded unipole variation and investigating RFR
- 42 Facility Showcase**  
*by Chriss Scherer*  
The new home of Emmis Communications, Indianapolis
- 52 Antennas**  
*by John Battison*  
Part eight of nine: A further discussion of FM signals



08

## DEPARTMENTS

- 06 Viewpoint**  
*by Chriss Scherer*  
DAB variations
- 08 Contract Engineering**  
*by Russ Mundschenk*  
The digital air chain
- 14 Managing Technology**  
*by Skip Pizzi*  
Advances in telephone hybrids
- 18 RF Engineering**  
*by John Battison*  
Maintaining solid-state transmitters
- 22 Next Wave**  
*by Chriss Scherer*  
Datacasting update
- 24 FCC Update**  
*by Harry C. Martin*  
\$60,000 in fines issued
- 66 New Products from NAB Radio**
- 78 Classifieds**
- 79 Advertiser Index**
- 80 The Last Byte**  
*by Skip Pizzi*  
Boombox browsers



42



18

## ONLINE AT WWW.BERADIO.COM



### Currents Online

Read the latest technology news every day online.

### Studio Spotlight

Cox stations in Birmingham, AL

### Online Survey

The evolution of radio



Online

**ON THE COVER:** Seacomm Erectors Inc. nears completion of the American Tower Corporation's West Tiger Mountain site in Washington. The twin 304' truss-Leg self-supporting towers and Cog Wheel Master FM Antenna were supplied by Electronics Research Inc. of Chandler, Indiana. Photo by Soundview Aerial Photography, Arlington, WA. Courtesy of Seacomm Erectors.

# Same Shift Different Day—



until now.

Give your on-air  
talent something to  
get excited about.

**The DH30.**

## This Revolutionary Digital Hybrid Features:

- AES/EBU and analog inputs and outputs
- Adjustable compressor and expander
- Adjustable 3-band digital EQ
- Adjustable caller control
- Selectable auto mix-minus
- Digital Echo Cancellation™
- Highest quality sound
- Bass boost
- LCD menu display
- Remarkable low price

Limited Time  
Special  
Pricing!



**Gentner**

[www.gentner.com](http://www.gentner.com) • 1.801.975.7200 • 1.800.967.9836

## DAB alternatives

Someone whose only involvement with radio broadcast is his car stereo recently asked me this question: "So, when can we expect to see IBOC DAB happen?" He wanted a specific date. I couldn't give him one because there isn't one to give. He then asked for an estimated timeline. Again, I had no specific answer.

The three IBOC proponents are all working on their systems. At the recent IBOC DAB panel at the NAB Radio Show, each company expressed that its system was either complete or nearing completion. That's the easy part. Taking IBOC to the next step is a little more difficult.

Depending on how matters are handled by other parties, including the FCC, the NRSC and the proponents themselves, the process may be swift and efficient or long and drawn out. I'll bank on the latter.

Now, there is a new item in the works to allow consumers to receive digital media. CEMA, the Consumer Electronics Manufacturers Association, filed comments with the FCC in July concerning the creation of a new broadcast service.

MMBS, Mobile Multimedia Broadcast Service, is a proposal that outlines a new application for some of

the soon to be abandoned TV spectrum. With the channel reallocations for DTV, some spectrum in the upper TV band will be available for new use. The frequency range covered by the comments is from 746MHz to 764MHz and 776MHz to 794MHz. This spectrum is currently occupied by TV channel 60 to 62 and 65 to 67. The total available spectrum covers 36MHz. The spectrum will not be fully available until 2006, when all of the TV stations have completed their channel transitions.

CEMA proposes that MMBS provide free, high-quality multichannel digital audio, information and high-capacity data services for a new broadcast service to mobile receivers. One of the goals of the new service is to provide a service that is at least as good as CD quality. IBOC proponents share this wonderful goal.

It has appeared that CEMA has never fully supported IBOC. This new service proposal furthers this assessment. It seems strange that the organization that represents manufacturers of consumer radios does not want to promote the sale of new radios for IBOC but is interested in promoting new radios for MMBS.

There's even more alternate DAB activity.

UK-based Virgin Radio and Ericsson are testing technology for wireless Internet terminals. These wireless termi-

nals — basically enhanced cell phones — will use the wireless communications network originally built for telephone calls. This mobile medium has a head start, with existing technology moving into its next generation and an established user base behind it. Currently, no timeline has been established on when this new service will be available.

You are also aware that CD Radio and XM Satellite Radio are preparing to launch their multichannel services near the end of next year. Both plan to offer at least 100 channels of programming, primarily for mobile audiences, but there are also plans in place for terrestrial repeaters.

One point of concern with IBOC is that the FCC will not take a firm stance on a system. In some ways, we will be presented with a situation similar to the AM stereo decision. To turn this around, what if one system is chosen as a standard? Will the other two proponents simply walk away, consoling each other on their own nice-try efforts? I doubt it. The resulting legal action could further detain IBOC from becoming a reality. (By the way, the FCC is due to issue a rulemaking on digital radio on October 21.)

Before these newer technologies have a chance to upset the IBOC work being done so far, it may be a good time for the three proponents to begin working together and form a grand alliance. Each has something to offer to create a complete, final system. Between RF transmission, audio coding, data subcarriers and data transmission, each camp can still walk away with a significant piece of the pie.

The original work on IBOC began more than 10 years ago and is ongoing. We are seeing real-world demonstrations and tests on the systems. We are getting closer. However, the recent flourish of activity doesn't answer the original question: When will IBOC be ready in the U.S.?

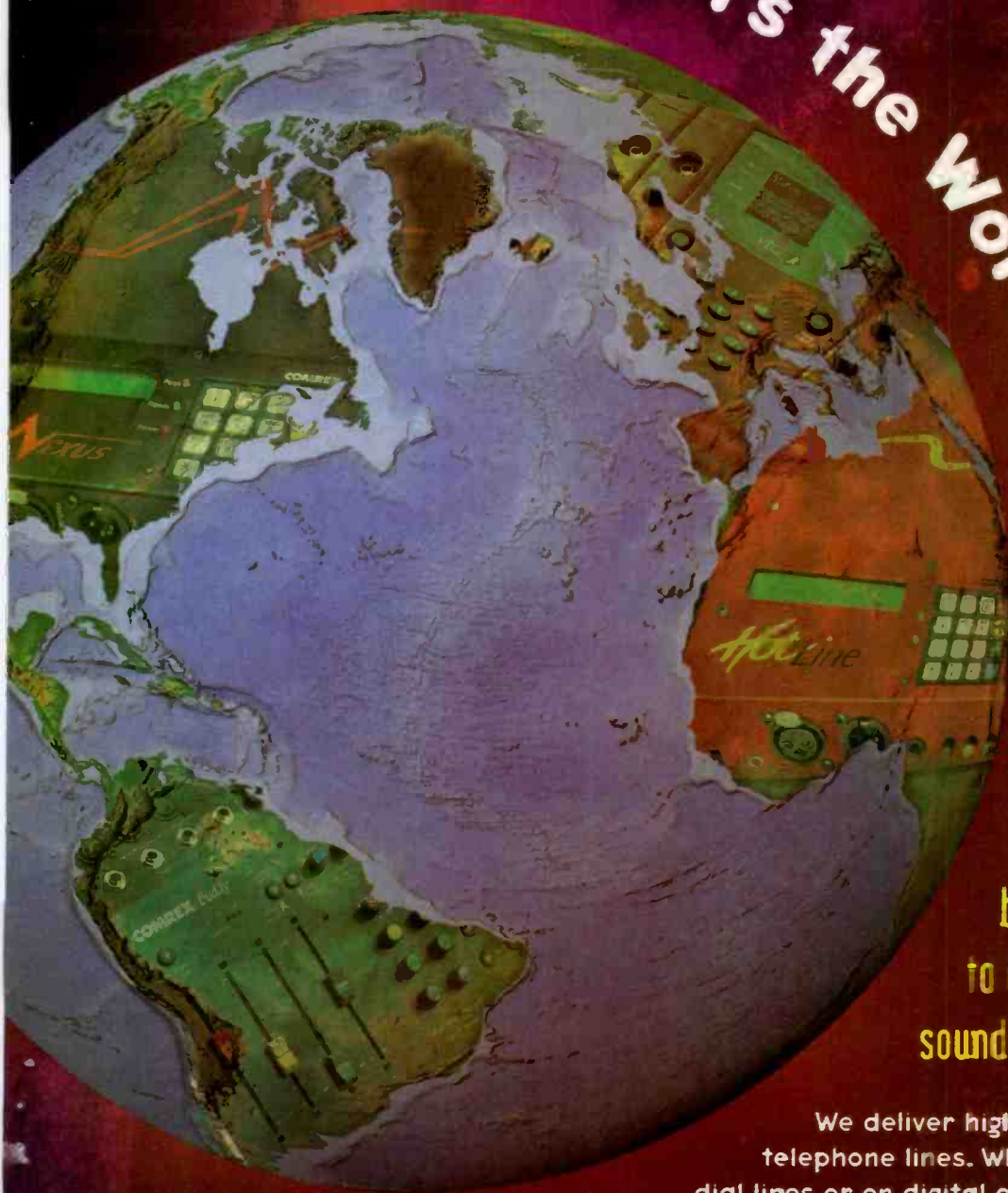


*Chris Scherer*

Chriss Scherer, editor



# Comrex Covers the World



With products in use on at least 6 continents\*, Comrex is the name broadcasters trust to deliver great sounding remotes.

We deliver high quality audio over telephone lines. Whether on standard dial lines or on digital circuits, Comrex has a solution. No matter what your remote broadcast need, let Comrex help you cover it.

Contact us today to find out how we can help!

**(800) 237-1776**

Comrex Corporation, 65 Nonset Path, Acton, MA 01720  
Fax: (978) 635-0401 Fax-on-demand: (978) 264-9973  
Email: [info@comrex.com](mailto:info@comrex.com)

\* We're not sure about Antarctica.



**COMREX**  
[www.comrex.com](http://www.comrex.com)

## The digital air chain

By Russ Mundschenk

Interconnecting the digital components of a broadcast air chain is easier than you might think. After a slow start, manufacturers are finally providing equipment that is not only easily installed but also enables a digitally recorded source to remain so all the way to the transmitter. The caveat is that digital audio resembles RF or video more closely than does its analog counterpart.

The AES/EBU digital transmission format surrounds each right and left sample of audio with synchronization and status information. These *packets*, or *frames*, of data are sent as a serial bitstream similar to RS-232. The bit value is

similarly to video. The AES3-ID standard sends 1V peak-to-peak square waves over unbalanced 75Ω coaxial cable. This method is handy because it allows the use of video hardware, such as patch bays, distribution amps and switchers. If necessary, a balun can convert AES3-ID to AES3-1992.

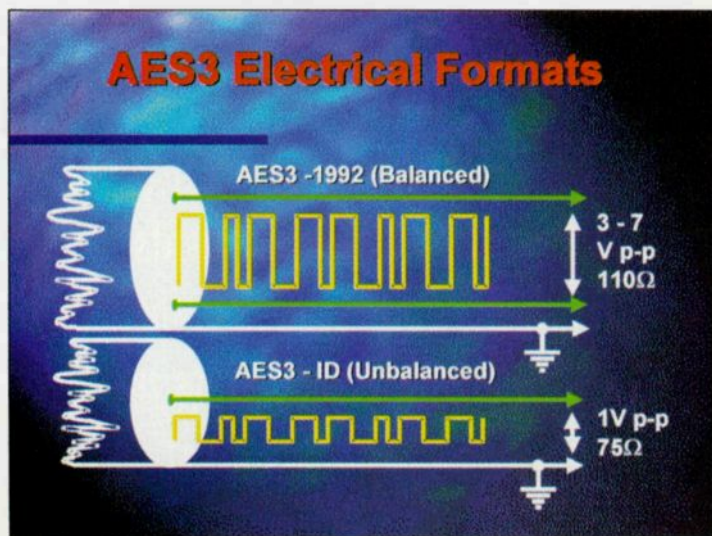
### The digital steps

Usually, the first link in a digital air chain is analog, unless your facility uses all-digital sources. Set your microphone's gain structure carefully. The wonderful device that converts sound pressure to alternating current has a terrific dynamic range — in excess of 120dB. For years, good mic pre-amplifiers have been designed with large amounts of headroom, and announcers take advantage of it. Uncontrolled live audio must be given its freedom — and an analog-to-digital converter can easily run out of numbers to assign to a waveform. Unless you introduce some type of analog limiting, you must allow a full 30dB of headroom at the input to the analog to digital converter. Unfortunately, this causes a level mismatch with the rest of the sources, which have been recorded with only 15dB or 20dB of headroom. The solution is to use digital limiting and subsequent make-up gain to increase the overall level and limit the peaks of your live sources. Some digital consoles include onboard compressor/limiters that can be used for this purpose.

Other analog sources such as reel to reel and cassette decks are self-amplitude limiting because of tape saturation. Leaving 20dB of headroom should suffice.

Digital sources such as CDs, DAT tapes and some hard-drive storage systems provide digital audio feeds to the console. If no digital gain change is performed within the console, the source should come out with about the same numbers it went in with. Be wary of any digital equalization or expansion — a boost of a few decibels at the wrong frequency can cause clipping.

If it is not provided internally, a synchronization input is required for digital consoles. If all of the devices in a broadcast facility can be synchronized to one stable AES3 generator, then the audio frames and subframes can be easily mixed. Otherwise, the console will have to rate convert the incoming signal to keep step with the rest of the inputs. Rate conversion and synchronization always involve some interpolation and low-pass filtering, and they should be avoided whenever possible. Unfortunately, a lot of playback gear lacks synchronization inputs, but many record/playback devices automatically synchro-

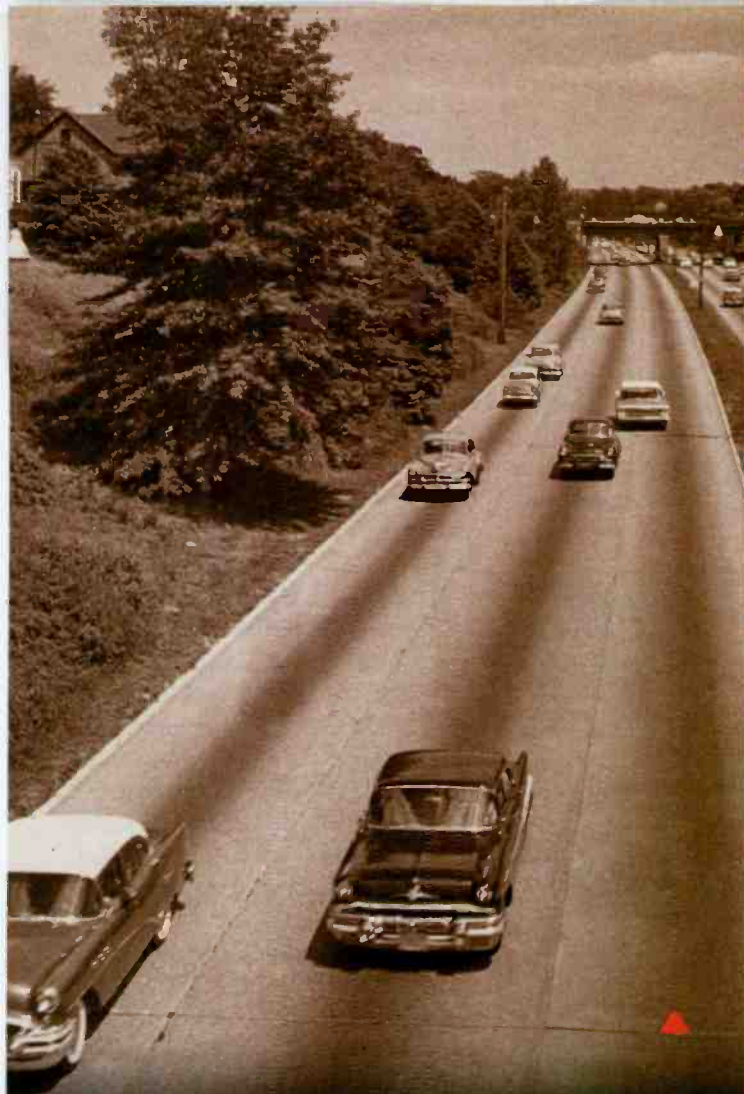


A comparison of the two versions of the AES3 signal.

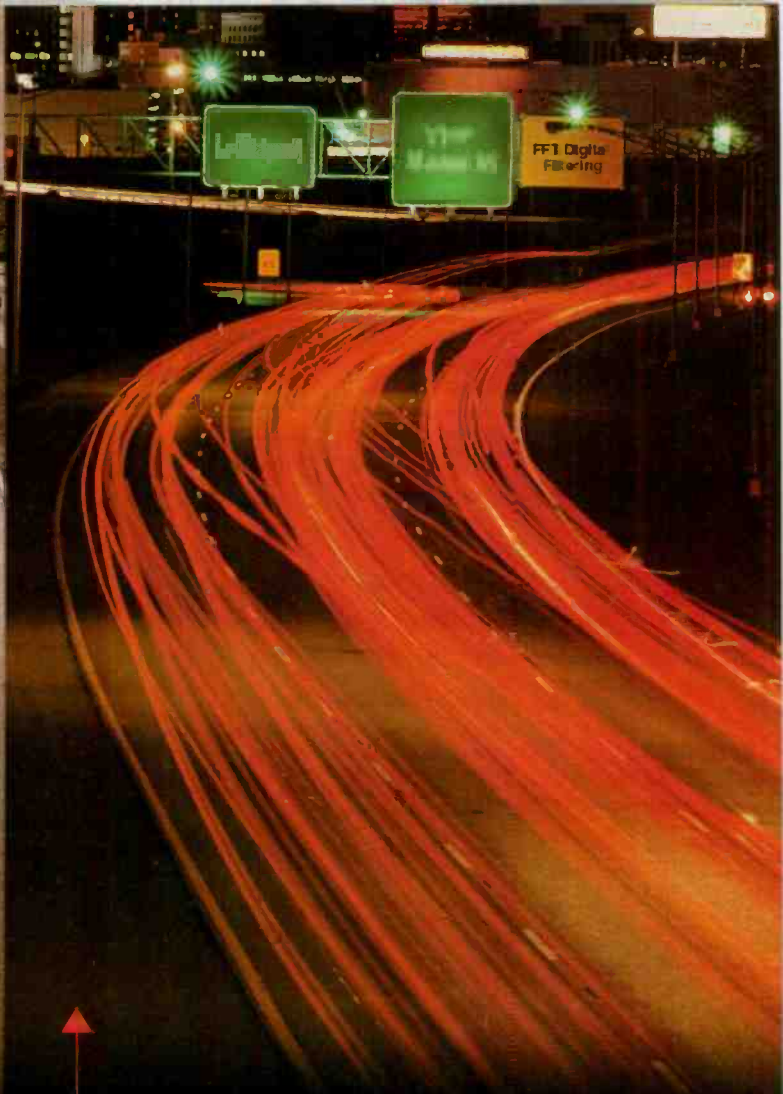
determined not by amplitude but by timing, and a waveform of all digital "ones" has twice as many zero crossings as a waveform of all "zeros." Since AES3 digital audio can carry data at bit rates in excess of 6MHz, it is imperative that cable and interconnections maintain the system impedance. If they don't, reflections and capacitive roll-off can reduce a sharp square wave to unrecognizable noise.

There are two AES3 transmission formats that differ electrically. The first and most common is the 110Ω standard, called AES3-1992. This standard specifies balanced transmission lines and peak-to-peak square wave voltages of from 3V to 7V. This format uses special 110Ω ( $\pm 20$  percent), low capacitance cable. Some manufacturers are advocating the use of standard category-5 LAN cable for balanced digital audio. CAT-5 cable has an impedance of 100Ω. The advocates claim good performance, despite the small impedance mismatch. The second AES3 format takes advantage of the bitstream's

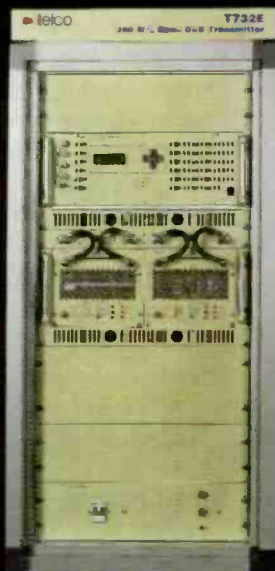




*Drive Time.*



*Digital Drive Time.*



Drive time takes on a whole new meaning with the crystal clear quality of digital audio broadcasting (DAB) and Itelco's digital transmission solutions.

Itelco transmitters have been selected for DAB operations just about everywhere you find DAB. And it's no wonder. Only Itelco DAB transmitters combine modulator and exciter components in a single compact unit for maximum reliability in a minimal space. Upgrades are unbelievably easy too, with our software-based DSP approach to transmitter design. And with all-FFT digital filtering, there's absolutely nothing to adjust.

L-Band and Band III DAB transmitters are just part of Itelco's complete offering of digital transmission solutions for radio and television broadcasters.

To learn more about our DAB transmitters and DTV transmitters and translators call us at (303) 464-8000 or visit our web site at [www.itelco-usa.com/ber](http://www.itelco-usa.com/ber)

 **itelco**®

Circle (107) on Free Info Card

# Contract Engineering

nize to their inputs. Some devices provide a bridging input for the synchronization signal. The sync signal sent to these units may be daisy-chained as long as it is properly terminated at the end. As with any type of bridging configuration, there is no isolation between inputs. Further, disconnection of a device's internal looping input will result in loss of sync to all downstream equipment.

## Routing flexibility

You may want to run all of the interconnections to the console through some sort of physical patch bay. Unfortunately, no one has come up with a standard for patching the 110Ω balanced format. Currently, the best option is to use high-quality TRS audio patch bays. The bays should be wired to terminate an output when its normalised input is patched. Loss of load causes a peak-to-peak volt-

age rise that can damage some system components, especially those originally designed for video. Half-normalising of outputs is not acceptable, since there are no high-impedance inputs for them to feed. Design your facility to reduce the number of interconnect points. Standard 66-type connection blocks are not designed to carry 6MHz square waves. An alternative is to use CAT-5 rated blocks or those specifically designed for AES3-1992. A typical video patch bay (especially the self-terminating type) works well with the AES3-ID 75Ω format, but care should be taken in patching so as to not unterminate a source.

Splitting the AES3 signal is easily done with a distribution amplifier. Resistive splits should be avoided because of the inherent attenuation. The 110Ω AES3-1992 format requires a specially designed balanced digital DA. The 75Ω format can use either AES3-ID or video DAs.

Mixing AES signals requires a great deal of number crunching. This process requires a digital mixing console or a stand-alone microprocessor-based mixer. These devices calculate the instantaneous products of each mixed sample.

Switching AES3 signals may be done with specialized AES3-1992 110Ω balanced switchers — the unbalanced AES3-ID format can use both AES and video switchers — as long as they are nonclamping. AES switchers are synchronous and change assignments at the beginning of a frame to remove pops and clicks. This also relieves any downstream equipment from having to resynchronize to the new selection.

Studio-transmitter links (for nonintegral facilities) can degrade the signal, especially those that use digital compression. Production of spurious artifacts and delay increases dramatically as different compression schemes are daisy-chained.

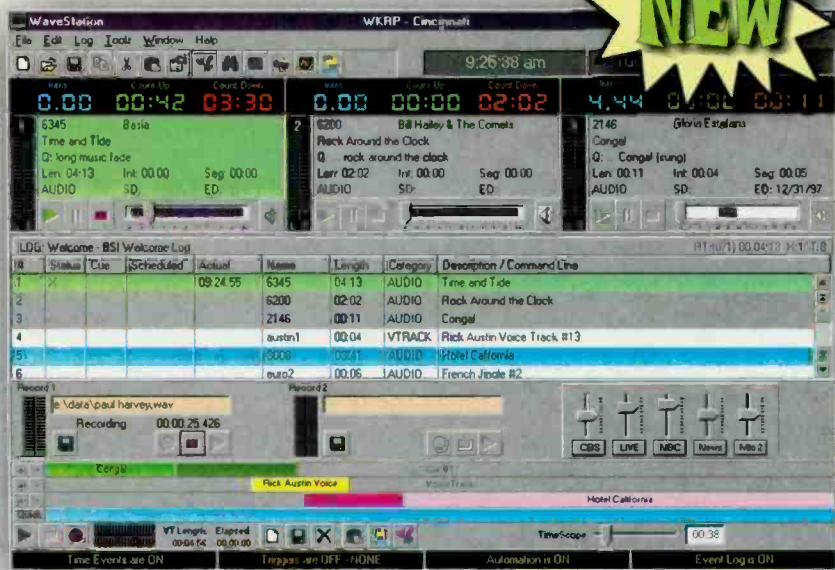
## On to processing

After having been gain changed, mixed, split and switched, the signal enters the digital audio processor. There are only a handful of digital processors available (see

# Affordable Digital Automation

24 HOUR  
FREE  
TECH SUPPORT

NEW



Our new WaveStation 3.0 has all the features of the \$50,000 automation systems, but is priced reasonably like software, not gold-plated broadcast hardware. We often hear, "It can't be true!" More than 1000 satisfied users worldwide prove the contrary. WaveStation includes a powerful digital audio editor and uses standard or compressed audio files, including MP3. On-screen Voice-Track editing, time-shift recording, serial port control. WebCast ready. Full automation, satellite, voice track and live assist. No recurring fees, Free upgrades. Microsoft Windows 95, 98 or NT.

888-BSIUSA1

Try Before You Buy

Download the Actual Software!

www.bsiusa.com

Only

\$999

BSI

Circle (108) on Free Info Card

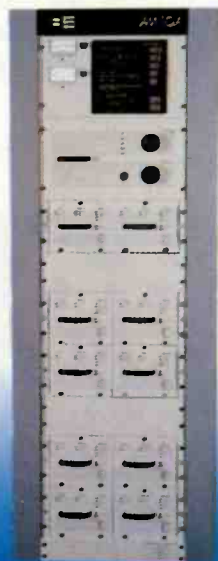
Since 1991, BE has introduced more new AM and FM transmitters, with more advanced ideas and useful technology, than any other company in the world. At the same time we were bringing prices down. No other company can touch Broadcast Electronics for value.

**BROADCAST ELECTRONICS  
IS THE ONLY MAJOR  
MANUFACTURER DEVOTED  
EXCLUSIVELY TO  
ENGINEERING BETTER RADIO.  
CALL 888-232-3268 NOW.**

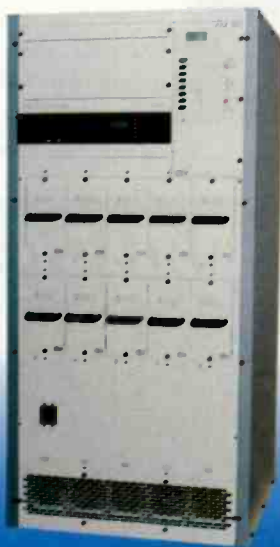
# GET MORE THAN YOU PAY FOR

## FEATURES:

- Digital or analog exciters that deliver CD-quality sound for under \$5400. Broadcast Electronics exciter technology is unsurpassed.
- Transmitters with redundant PAs and power supplies that plug in from the front panel.
- AM transmitters with switching power supplies; they sound great at .1% or 100% output power.
- Transmitters with no plate blocking capacitors or sliding contacts to fail.
- Transmitters you can buy for under \$6000.
- All with 24-hour support.



**AM-10A**



**FM-5C**



**FM-35T**

**Need Solutions?**

***www.bdcast.com***

**OR (888) 232-3268**

BER999 ©1998 Broadcast Electronics, Inc. The BE emblem is a registered trademark of Broadcast Electronics, Inc.



***Solutions for  
Tomorrow's Radio***

Circle (109) on Free Info Card

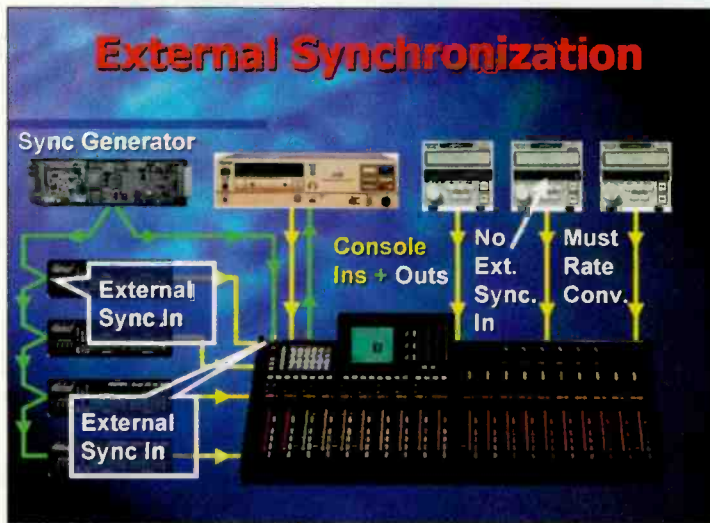
## Contract Engineering

"Digital on-air processors" September 1999, p. 38), and they all are capable of receiving and sending AES3 digital audio. Most modern analog and digital processors provide an analog composite output, but there is no digital composite standard. AES/EBU is designed to carry two-channel audio with a bandwidth equal to half the sampling frequency or Nyquist frequency, which certainly is not an efficient high-bandwidth single-channel composite transmission format. If AES/EBU is used to interface the digital audio processor to a digital exciter, the exciter must accept a processed discrete left and right input. It is then necessary to use the exciter's internal stereo generator. Even if the sampling rates of the processor and exciter are the same (in round numbers), the exciter will still have to rate

convert to synchronize the units. This causes modulation overshoots and added propagation delay.

Determine what additional processing functions the digital stereo generator in the exciter may add to the signal. These can take the form of added low-pass filters, a look-ahead limiter or a composite limiter. Each exciter manufacturer offers different functions. These added functions may affect the sonic and modulation performance. To date, there is no digital equivalent of the analog composite input to a digital exciter, where the stereo-encoded signal from the audio processor is tightly coupled to the modulator stage. It might be wise to make an analog connection between the processor and exciter, at least until a digital composite standard is adopted.

Compression algorithms, audio processing and even the acquisition of the AES signal introduce delay. The compound group delay of an entire transmission system can cause unacceptable psychoacoustic effects in the air talent's headphones. A small amount of delay (<10ms) manifests itself as a perceived loss of high frequencies. The mixing of spoken audio as conducted through the bones in the announcer's head and the delayed headphone audio acts as a low-pass comb filter. More delay means more disorientation. One solution is to use your backup analog air chain to feed the headphones. The air signal should still feed the speaker monitors to detect any transmission problems. It is possible to use the microphone tally to switch headphone monitor feeds so that a low-delay signal is heard when the mics are on and an off-the-air signal is heard when the mics are off.



Sources and feeds can be synchronized or unsynchronized.

Russ Mundschenk is chief engineer of WBEB, Philadelphia.

# DIGITAL RADIO AUTOMATION

# \$699

(this is not a misprint)

## QuicPix Radio Studio

MediaTouch™, America's Digital Automation Original since 1984, shatters the price barrier with QuicPix®, the software that makes digital audio and automation truly affordable. The QuicPix Radio Studio® software consists of:

- \* 4 Programs in 1: Audio Player, Cartwall, Audio Production and CD Ripping utility software
- \* Live Assist On Screen Buttons that are mouse and/or touchscreen friendly
- \* 7 Deck Audio player that also provides a 27 button hot play cartwall
- \* Overlapped MPEG-2 broadcast quality stereo audio on any sound card
- \* Wave audio editor, file import and quick audition feature
- \* Windows™ 95 / 98 using peer, NT™ or Novell™ networking
- \* 24/7 support, training and upgrading included
- \* Fully upward-compatible to a MediaTouch OpLOG Enterprise System

**Try Before You Buy at [www.quicpix.com](http://www.quicpix.com)**

Ask: Windows 95, 98 and NT are trademarks of Microsoft. Novell is a trademark of Novell Corporation.



**MediaTouch**

[www.quicpix.com](http://www.quicpix.com)

[omt@omt.net](mailto:omt@omt.net)

888 665 0501

Circle (110) on Free Info Card

# WAKE UP TO THE #1 MORNING TEAM IN EVERY MAJOR MARKET.



Morning radio should be fresh, alive and spontaneous. And 360 Systems' Morning Team works with you to make it happen.

Wake up your audience and grab them with Instant Replay. All of your best bits are there when you need them — like having 50 cart machines pre-loaded and ready to fire.



## Instant Replay®

*24 hours of your best audio clips, quips and sound effects, right at your fingertips.*



## Short/cut™ Editor

*Everything you need to get your hottest phone calls edited and on-air in record time.*

With the Short/cut Editor, you won't drop a beat when you're editing calls, interviews and promos. It's the fastest, easiest two-track audio editor a jock ever rocked a scrub-wheel on. No tape, no computer hassle and no "learning curve" — anyone can use it, and everyone will.

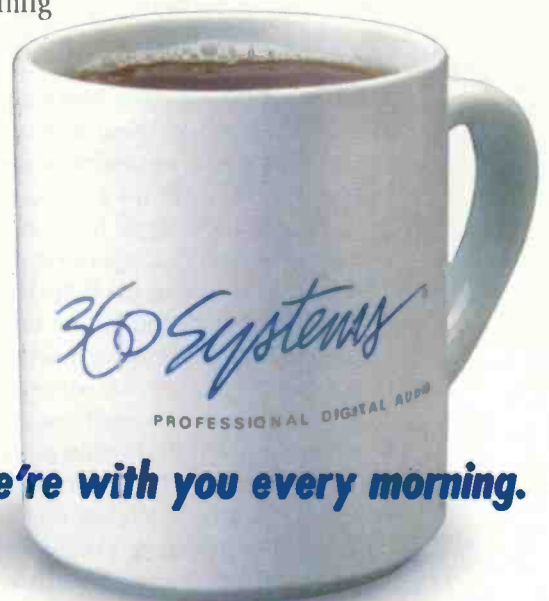
Timing is everything in live radio and this team helps keep the show moving.

Sound good to you?

Save your sanity and let your on-air personalities go crazy.

Morning radio was meant to be fun, and the 360 Systems Morning Team will help you keep it that way.

*Thousands of 360 Systems Instant Replay and Short/cut teams are hard at work every day. To find out what that means for you, call (818) 991-0360 or visit our website at [www.360systems.com](http://www.360systems.com).*



**We're with you every morning.**

For more information call (818) 991-0360 / Fax (818) 991-1360 / e-mail: [info@360systems.com](mailto:info@360systems.com) / Website: [www.360systems.com](http://www.360systems.com)

© 1999 - 360 Systems. Instant Replay, Short/cut and the 360 Systems logo are trademarks of 360 Systems.

Circle (111) on Free Info Card

## Polishing your POTS

By Skip Pizzi, Executive Editor

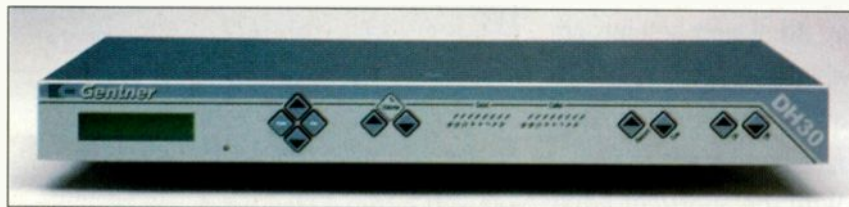
The analog dial-up telephone system, affectionately known as POTS (“plain old telephone service”), simply won’t go away. Radio broadcasters continue to deal with POTS audio as a common component of their on-air sound, and this isn’t likely to change for some time. POTS is a constant reminder of legacy audio from the earliest days of aural transmission. In today’s sonic environment, if the range of audio quality that we’re exposed to were equated to fine art, POTS would be Elvis on black velvet.

To be fair, POTS is a communications system. “Voice-grade” quality is really all that’s necessary, and it keeps the channel’s costs down. Radio broadcasting itself didn’t sound much better in its early years, but audio technol-

ogy has vastly improved in intervening years, and radio has come along. POTS alone remains back nearly where it was in the bad old days. Nevertheless, incremental improvements continue.

adapt itself to the conditions of the current phone call, thus optimizing the studio-to-telephone interface each time the hybrid was used. But the audio quality of the caller wasn’t greatly improved by these devices. The digital telephone hybrid primarily improved isolation between the studio and the telephone, which generally made the *studio* voice sound better, and kept it more independent of the audio processes and gain applied to the caller side.

Many frequent POTS-audio users learned that a little audio equalization and compression can go a long way in improving POTS audio quality downstream of the interface. Therefore some POTS hybrids incorporated such audio processing into their DSP functionality, making both the caller and the studio host/reporter sound better. Nevertheless, these devices were still limited by the delivered quality of the audio from the POTS network.



The Gentner DH30 is a 1RU digital POTS hybrid that includes a unique built-in speaker with front-panel volume control, AES3 I/O and highly adjustable operation.

ogy has vastly improved in intervening years, and radio has come along. POTS alone remains back nearly where it was in the bad old days. Nevertheless, incremental improvements continue.

### Digital hybrids

One of the biggest difficulties with putting POTS on the air has been the physical interfacing of the two-way phone system into an otherwise one-way audio system. In other words, while most audio uses a pair of wires to send a single audio signal from point A to point B, POTS can put a bidirectional signal on that same pair.

Technically speaking, the POTS scheme is called a “two-wire” system, while the rest of audio uses a “four-wire” approach. This terminology refers to the fact that most audio systems require two separate circuits (each occupying a pair of wires) to establish a bi-directional communications path, but POTS does it on a single pair. To put it in familiar ms, POTS is a two-lane highway, while the rest of audio uses a divided, four-lane system.

Advances in this space during the early 1990s applied digital signal processing (DSP) to the telephone interface, resulting in substantial improvement over previous analog hybrid technology. The most notable change came from the ability of the “digital hybrid” to intrinsically

### The latest trends

That’s how things stood until the last year or so. Now POTS hybrids are finally starting to reach out and touch something in the quality of the network itself. Because many radio stations are now equipped with digital connections to their local telco central offices (COs), the latest crop of POTS interfaces accommodate a direct digital connection on the telco side. This includes ISDN-BRI, ISDN-PRI or T-1 services, which can be directly interfaced to the (single or multi-line) POTS hybrid.

Advantages of this “digital-to-the-CO” approach include lower noise, reduced distortion and even better isolation, all due to the fact that now the four-lane highway has been extended to the caller’s neighborhood. The only analog, two-wire section of the circuit is between the caller’s phone and his/her CO, which is typically a small part of the overall path.

For larger stations that use multiple phone lines fairly frequently, the dedicated, multi-line capability of a T-1

**NewsReady32**  
The LAN/WAN/WEB Newsroom System  
Now Connecting Jacor Coast to Coast

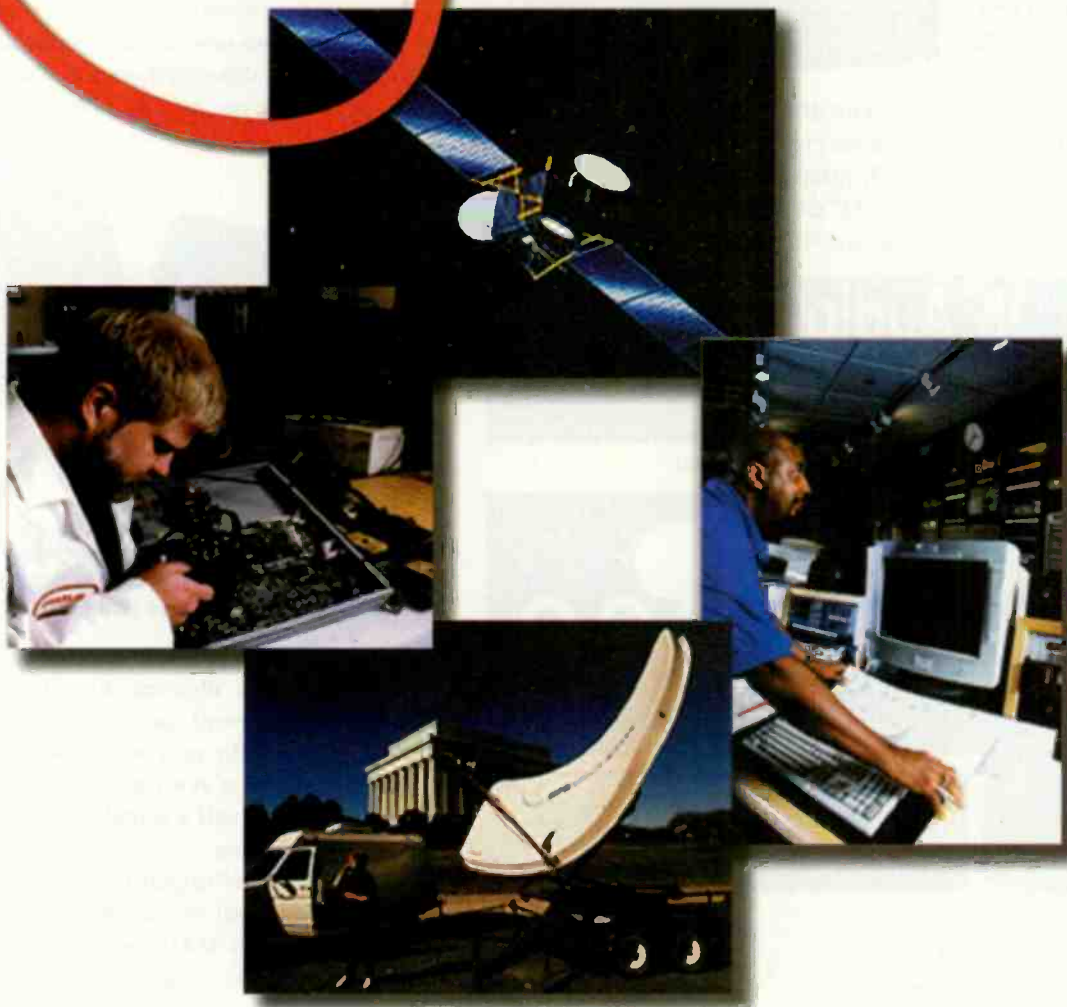
**WR** 800-833-4459  
www.WireReady.com

**WireReady**

Circle (300) on Free Info Card

# NPR SATELLITE SERVICES®

**WE KNOW RADIO,  
WE KNOW SATELLITES!**



## LINK UP WITH US®

Telephone: 202 • 414 • 2626  
[www.nprss.org](http://www.nprss.org)

HOLLYWOOD

Simply Grab that Caller  
and put 'em On-the-Air

### innkeeper 1 Digital Hybrid

Desktop List  
Price \$780.00



- The perfect hybrid for analog telephone lines.
- True separation of send and receive audio.
- DSP automatically adapts to line conditions.
- 19" rack mount or 11" desktop version.
- Optional desktop keypad.

**JK Audio** Remote  
Broadcast Gear

800-JK Audio (815) 786-2929 [www.jkaudio.com](http://www.jkaudio.com)  
800-552-8346 Fax: (815) 786-8502

Circle (119) on Free Info Card

**LOUD  
and CLEAR**



This magic box  
is making radio stations  
**louder and clearer**  
in all the major markets.

**it may be why your competitor is louder.**

The DCP-1A gives you  
increased loudness  
and SCA protection.

To get more information or arrange a free demo,  
call us today.



**SOLID ELECTRONICS LABS**

630 Greene Countrie Dr. Newtown Square, PA 19073 (610)353-9449

Circle (120) on Free Info Card

## Managing Technology

connection to the CO may make more sense than the (switched) ISDN approach. Multi-line installation is also far simpler, requiring only a couple of cables to a central point rather than dozens of discrete pairs to each studio.

Some new hybrids also include AES3 digital audio outputs, so the telephone audio can remain in the digital domain as it passes into the mixing console and perhaps beyond. In some cases, backfeed inputs to callers also accept AES3. Some multi-line units also allow internal conferencing of multiple callers, thereby freeing up the console from some of its mix-minus busing duties.

### Control freaks rule

Another new area involves advanced control capabilities. For example, some new digital hybrids include a TCP/IP control interface, allowing them to be managed remotely via an intranet or the Internet. This provides substantial



The Telos Desktop Director is a multi-line hybrid controller with a range of identifying icons that can be placed next to each line's select button. It can also serve as a control room telephone.

flexibility, particularly for live remotes with call-ins.

Other remote- or reporter- friendly features include auto-answer, password protection and acoustic echo cancellation, whereby auto mixminus can be extended to include the decay or reverberation time of a call that's being pumped through a sound-reinforcement system at a large remote venue.

Control can be performed from a PC (direct or via a network connection) or on dedicated multi-line telephone devices with LCD displays. These new systems also allow flexibility in allocating telco-line resources. The same set of lines can be controlled from any one of several different locations throughout the facility or remotely. This means a consolidated site can maximize the use of multiple incoming phone lines across several stations' programs and studios, with duplicate (or portable) control terminals and audio I/O in two or more studios of the facility.

Since POTS seems here to stay, stations that put a lot of telephone audio on the air are wise to consider this new class of devices, for both qualitative and quantitative reasons.

For more information  
Circle (201) on Free Info Card





## Voice Over America

With today's ISDN linkups, you can easily produce voice-overs from anywhere in the world – even from the comfort of your own home studio. Think about it...the spot you cut this afternoon could be uplinked by satellite this evening for global broadcast. Now that you know who's listening, shouldn't you insist on a microphone that will let you sound as good as you are?

The Neumann TLM 103. The new world standard vocal mic, at a price within any budget.



**Neumann|USA**

*The Choice of Those Who Can Hear The Difference*

Tel: 860.434.5220 • FAX: 860.434.3148 • World Wide Web: <http://www.neumannusa.com>

Circle (121) on Free Info Card

## Care of solid-state transmitters

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

**S**olid-state transmitters require careful attention to proper operation and maintenance procedures. Dirt and excessive heat are their greatest enemies; poorly regulated and contaminated primary power supplies come in a close second.

### Heating and cooling

Many transmitters are located in remote places, often in less than pristine, even ramshackle, buildings that are neither heatproof nor dust-proof. Concrete-block buildings with properly installed doors and cable entryways are usually easier to keep relatively clear of dust and dirt as well



Fan blades and cooling fins must be kept clean and clear of dust and dirt. (Courtesy of Continental.)

as small animals and insects. Nevertheless, these pests usually manage to find their way inside.

In the few instances of co-located studios and transmitters, sufficient air conditioning is usually included in the building plans. Yet, in cases where a plant has grown beyond the original size and capability of the A/C system, supplementary

A/C is often needed in transmitter rooms. Treatment can be the same as at remote locations, taking precautions that any hot vent air does not feed back into the system.

Block buildings can absorb and retain heat for quite a long period, with the temperature inside increasing all the time. For this reason, A/C is not a luxury; it is a necessity. When planning a new transmitter building, it is essential to be guided by the builder's recommendations regarding wall heat transfer, available insulation and equipment heat load.

To reduce dust, paint and seal all walls and floors. It seems that concrete usually manages to rub off and produce a little dust that collects in hot spots and settles in vents and blowers.

Do not forget the many small black boxes that seem to end up inside a transmitter building in addition to the transmitter

itself. They all add small doses of heat, 50W or more at a time. In some cases, in cooler regions, merely exhausting the heat may suffice. But it is a dangerous condition to enter into deliberately when a little foresight can prevent loss of airtime caused by heat buildup. Unexpected periods of high heat must also be allowed for.

Check the operating temperature range of the intended transmitter and plan enough A/C capacity to cover it with an adequate safe load. Include this load in your plans for a backup generator.

Arrange air vents so that rain cannot enter. One transmitter I worked on was beautifully installed. It had a direct vent to the outside air located directly over the final, vertical hot-air vent on top of the transmitter. When it rained, the rainwater entered the final cavity, cracked the glass of the tube and made an unholy mess of the inside of the transmitter. This was not a solid-state transmitter, and water doesn't usually crack hot transistor housings, but the principle is sound: Any air vents close to the transmitter must be designed so that rain cannot enter from any direction.

### Maintenance

Small ducts are attractive places for small animals and birds to nest. For this reason, it is better to use large-area filtered air vents. Although wire guards can be fitted over such vents, a nest built on the outside can stop as much airflow as one built inside! In short, be careful to ensure that the cool air supply that you planned actually operates as planned.

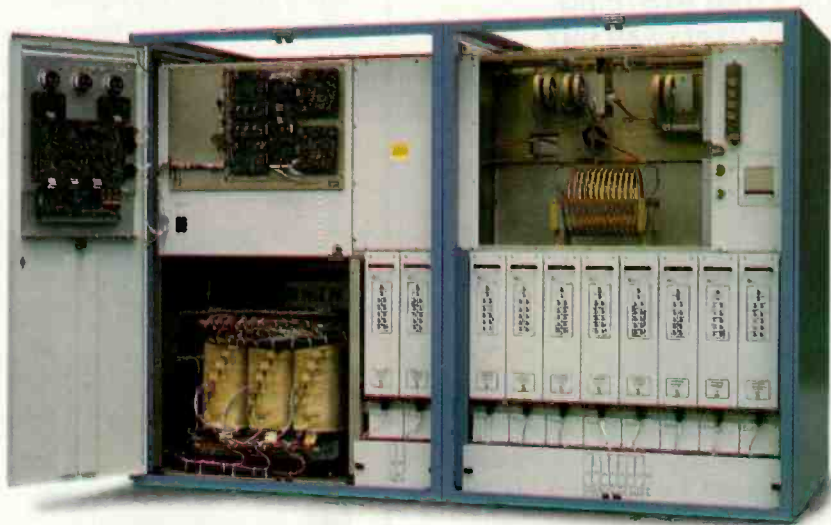
Where heat conduction by means of close, face-to-face contact is used, it is important to use the heat-sealing compound recommended by the transistor manufacturer. Small imperfections often occur on supposedly flat faces and detract from heat transference due to heat sinks. Be sure to clean old paste before reinstalling.

Fans have the habit of failing without being noticed. In many cases, muffin fans are used for spot or local cooling. Some fans operate quietly, and their presence may not be noticed — until they fail.

Sometimes engineers may have noticed hot spots and installed an unspecified fan without noting it on the station records or schematics. Subsequent engineers who didn't know about this fan might experience overheating troubles if this fan fails. It's always wise to take time to go over a new transmitter with a fine-toothed comb to look for little additions that made life easier for someone else.

Solid-state equipment can be sensitive to the temperature of its environment. It is necessary to move more air to

# Knowledge



## is power.

You know the best is elegantly simple.  
You know the best is efficient and reliable.  
You know the best is digital-ready.

The Nautel XL series of AM transmitters are built to provide the reliability you've always wanted, and the capabilities you'll need in years to come. Every XL model is 20% more powerful than competing transmitters. That's enough reserve power to accommodate simultaneous IBOC digital transmission while maintaining full AM performance.

With this reserve power, an XL transmitter virtually has a spare module built in. They're hot-pluggable, which means you



benefit from unsurpassed system reliability and can maintain full operation even in the unlikely event that a power module requires service. Full duplication of critical low-level circuits further contributes to system reliability.

The XL series is available in power outputs from 12-60 kW. If you're considering a new transmitter, take a close look at Nautel. You'll find elegant design, rugged engineering, digital capability and, literally, power to spare.

For more information about our full line of AM and FM transmitters, visit us on the Web at [www.nautel.com](http://www.nautel.com).



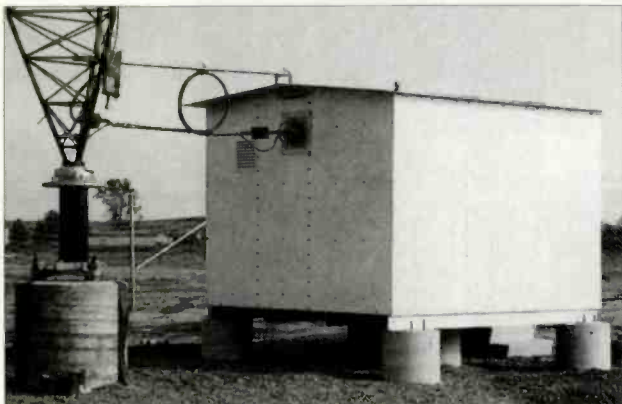
Hackett's Cove, RR #1, Tantallon, Nova Scotia, Canada BOJ 3J0  
Phone: (902) 823-2233 Fax: (902) 823-3183  
Nautel Maine Inc., 201 Target Industrial Circle, Bangor, Maine  
USA 04401 Phone: (207) 947 8200 Fax: (207) 947-3693

Circle (122) on Free Info Card

Email: [info@nautel.com](mailto:info@nautel.com)

**KINTRONIC**  **LABS INC.**

**FOR AN EXPANDED BAND or  
IBOC / DAB SYSTEMS  
FOR THE 21st CENTURY**



Prefabricated, Climate-Controlled, Fully-Equipped ATU Building  
PreTuned and Ready to Install. -WWJ, Detroit, MI

**KINTRONIC LABORATORIES INC.**

P.O. Box 845, Bristol, Tennessee 37621-0845  
Phone: (423) 878-3141 • Fax: (423) 878-4224  
Email: [kti@kintronic.com](mailto:kti@kintronic.com)  
Web Site: [www.kintronic.com](http://www.kintronic.com)



Circle (123) on Free Info Card

**The "Soundcard Solution"**



**Matchbox II converts unbalanced computer soundcards to professional audio!**

Eliminate the hum, buzz, noise, and distortion caused by mismatched levels and Impedances. Matchbox II's direct-coupled circuitry will make your digital editor sound its best! It's also idea for use with DAT, CD recorders, and tape decks. Over 30,000 units in use worldwide.

**HENRY ENGINEERING**

503 Key Vista Drive  
Sierra Madre, CA 91024 USA  
TEL (626) 355-3656 FAX (626) 355-0077  
FAX-on-Demand Doc #120 (626) 355-4210  
<http://www.henryeng.com>



We Build Solutions.

Circle (124) on Free Info Card

**RF Engineering**

cool a solid-state transmitter than a tube transmitter of similar power. High power in solid state is necessarily achieved by use of multiple RF modules, and often by individual power supplies. Thus, more components and a higher power-supply capability are required for a solid-state transmitter than for a tube transmitter of similar power.

Because of the increased sensitivity of solid-state equipment to temperature boundaries, errors can be made by allowing the RF power level label to govern the anticipated cooling requirements. This can result in an inadequate

volume of air and consequent overheating. As improvements are made in *Mosfet* design and construction, and possibly new high-power solid-state devices, cooling requirements could drop below equivalent tube transmitters.



**Proper ventilation is still important for solid-state transmitters.**

**Power quality**

Attention should be given to power-supply quality. Transient suppression in power supplies is extremely important. Lightning transients are a reality

in broadcasting, and much has been accomplished to control their effects. Proper power-line input treatment and surge protection are a necessity. Sometimes the nature of switched power supplies for large solid-state transmitters can reflect badly into the primary source and affect the power factor. Most power companies expect users to achieve a power fact as close to 1.0 as possible. High harmonic content that is allowed to develop across the power line can produce interference to other circuits and degrade the power factor.

This article has emphasized temperature control because disregarding it can lead to trouble in solid state. Although solid-state devices usually operate with low voltages, the power supplies are usually very low impedance and are capable of storing a tremendous amount of energy. From the viewpoint of high voltage, there appears to be little to fear; however, this is not necessarily the case.

The amount of power that can be stored in a non-discharged circuit can easily raise a metallic short almost to incandescence and can result in serious burns to personnel in contact with the shorting material. It behooves engineers to use as much care with low-voltage solid-state transmitters as with high-voltage tube transmitters.

E-mail John at: [batcom@bright.net](mailto:batcom@bright.net).

**For more information  
Circle (202) on Free Info Card**

*Omnia.fm's new HOT software cranks it up!*

## IT GOES TO ELEVEN

For some of you, being the loudest on the dial just isn't enough. You want to peel paint, break glass and blow the doors off your competition. And now, with the Omnia.fm's new HOT software module, you can push it to the max and keep on cranking. For the first time ever, you can go to eleven and still deliver all the clarity, punch and definition that's put the Omnia in so many racks, all over the world.

Developed in partnership with Paul Sanchez of HOT97 in New York City and Michael Guidotti of Star 104.5 in Philadelphia, the HOT software sets a new standard in the loudness wars. The Omnia's unique architecture

means you have amazingly clean sound with absolutely *no digital*



*grunge*. And of course, the Omnia's design platform protects your investment by allowing you to upgrade the system software at any time—so you're always on top of tomorrow's technologies and changing formats.

Create the smashing sound that holds button-happy listeners. Call your Omnia dealer for a risk-free demo and hear what HOT sounds like—before your competition does.

**Omnia**

CUTTING EDGE 2101 SUPERIOR AVENUE CLEVELAND, OH 44114  
TEL: +1 (216) 241-3343 FAX: +1 (216) 241-4103  
E-MAIL: INFO@NOGRUNGE.COM WWW.NOGRUNGE.COM

A Telos Company

- Audio Broadcast Group 3685 Roger B. Chaffee Blvd. Grand Rapids, MI 49548 Tel: +1 (800) 999-9281 Fax: +1 (616) 452-1652 e-mail: support@abg.com
- Bradley Broadcast Sales 7313G Grove Road Frederick, MD 21704 Tel: +1 (800) 732-7665 Fax: +1 (301) 682-8377 e-mail: info@bradleybroadcast.com
- Broadcasters General Store 2480 SE 52nd Street Ocala, FL 34480 Tel: +1 (352) 622-7700 Fax: +1 (352) 629-7000 e-mail: bgs@mercury.net
- Broadcast Supply Worldwide 7012 27th Street West Tacoma, WA 98466 Tel: +1 (800) 426-8434 Fax: +1 (800) 231-7055 e-mail: info@bswusa.com
- Crouse-Kimzey Company 1320 Post & Paddock Road, Suite 200 Grand Prairie, TX 75050 Tel: +1 (800) 433-2105 Fax: +1 (972) 623-2800 e-mail: sales@proaudio.com
- Broadcast Richmond 1821 W. Main Street Richmond, IN 47375 Tel: +1 (765) 966-6468 Fax: +1 (765) 966-5505 e-mail: info@bfocom.com

Circle (125) on Free Info Card

## Datacasting update

By Chriss Scherer, editor

**F**M stations have long used subcarriers as a means of supplemental income. Though the technology itself is not new, there has been recent work on setting some standards for data applications.

So far, data subcarriers have lacked standards for their use or protocols, except for RBDS (Radio Broadcast Data System), introduced in 1993. The new standards allow manufacturers to create products that are compatible with the specific technology.

The Consumer Electronics Manufacturers Association (CEMA) Mobile Electronics Technology Standards Setting Committee recently met and approved two new standards on two different data subcarrier formats. The two systems covered are called *Data Radio Channel (DARC)* and *Subcarrier Traffic Information Channel (STIC)*.

Service	Subcarrier Frequency (kHz)	Data Rate (kb/s)
RBDS	57	1.187
STIC	72.2 87.4	18.05 21.85
DARC	76	16

**Table 1. The frequencies and data capacities of various subcarrier services.**

### In the DARC

The standard for DARC has been approved as EIA-794. The system has already been deployed outside the U.S. and is extensively used in Japan, since it was developed by the NHK. A similar standard was already

passed in Europe in 1997. The CEMA standard is almost identical and serves mostly as a formality.

DARC is similar in function to RBDS. The signal is transmitted on a 76kHz carrier and a 16kb/s data rate. The modulation is a *Level Minimum Frequency Shift Keying (LMSK)*. The bandwidth of the subcarrier is 35kHz, which yields an occupied spectrum of 60kHz to 95kHz. Compare this range with the RBDS standard of 57kHz and a data rate of just less than 1.2kb/s (see Table 1). According to data posted online from the ITU and the DARC Forum, measurements have shown that the DARC subcarrier is fully compatible with the RBDS subcarrier.

### On the STIC

The October 1998 issue of *BE Radio* (Next Wave, p. 26) examined the Minnesota Department of Transportation tests on a system being developed for the Intelligent Transportation System (ITS). This system was being considered for a mobile traffic-management system to better inform motorists of traffic conditions. MITRE

Corporation developed STIC, and so far it has only been used in tests and pilot programs. The system is now ready for primetime and commercial deployment.

The adopted CEMA subcommittee standard for STIC is shown in the table. The Federal Highway Administration (FHWA) is supporting STIC for their efforts.

Both technologies offer increased data capacities compared with the RBDS standard. Even when the RBDS standard was introduced, it was felt that further enhancements would be needed, since consumers would have access to more data information services at higher data rates.

### Future of datacasting

The National Radio Systems Committee (NRSC), a joint effort between the NAB and CEMA, has a High Speed FM Subcarrier Committee (HSSC) that had its actions suspended in 1998 when agreement on a single standard could not be reached. At that time, the HSSC was evaluating three different systems: DARC, STIC and a third system, the High Speed Data System from Seiko. The testing for these systems was continued and has led to the established standards from the ITU. Where the joint CEMA/NAB subcommittee could not agree, the CEMA-only subcommittee has reached a decision. Their standard furthers the effort for DARC and STIC by establishing guidelines for their application in the U.S.

With IBOC on the horizon, there is some skepticism about further evolution of datacasting. Currently, the IBOC testing being done is for main channel performance. By occupying more of the available spectrum (and pushing subcarriers out of the way), a more robust IBOC signal can be delivered. Another possibility is to encode additional data into the main channel data stream. There is also the obvious apathy from consumers and broadcasters toward RBDS, which may be assuaged with higher data rates and capabilities.

*Some information was obtained from the August 2, 1999 issue of Radio TechCheck, published by the NAB.*

**NewsReady32**  
The LAN/WAN/WEB Newsroom System  
Now Connecting Jacor Coast to Coast

**WR** 800-833-4459  
www.WireReady.com

**WireReady**

Circle (112) on Free Info Card

If time is money, what  
could you get for an extra  
radio commercial every  
ten minutes?

If you're in the radio business to  
make money (and who isn't?)  
you need

## "Cash"™

Through an exclusive time-  
shifting process, Cash creates  
additional broadcast time to  
sell. It does it in real time, right  
on the air. It does it without  
reducing program content. It  
does it without affecting pitch  
or creating a "chipmunk effect."  
It does it in stereo or mono. It  
does it in variable amounts,  
adding from zero to five  
minutes, within two minutes to  
two hours.

Cash, from Prime Image - you  
don't need one unless you want  
to make some.



**Prime  
image**

The Digital Video People

662 Giguere Court #C, San Jose, CA 95133 • Tel (408)867-6519 Fax (408) 926-7294 Service (408)926-5177  
Primeimagein@earthlink.net • www.primeimageinc.com

Circle (113) on Free Info Card

## FCC issues heavy fines

By Harry Martin

In August, the FCC issued several notices to radio broadcasters that assessed fines, in the aggregate, of more than \$60,000. Broadcasters should be aware that FCC inspectors still make unannounced visits to studios, and audience and competitor complaints can lead to FCC forfeiture proceedings. The following fines were imposed:

**\$35,000 indecent broadcast.** An AM licensee was fined for comments radio personalities made during a week of broadcasts on a midday show. A listener's complaint, accompanied by recordings of the show, initiated the investigation. Indecent material continued to be broadcast, even during the investigation. In issuing the fine, the FCC reiterated that it has a statutory duty to prosecute licensees that broadcast obscene, indecent or profane language. The FCC's standard for determining indecency is "offensive language or material that depicts or describes sexual or excretory activities or organs."

**\$14,500 unauthorized operations and main studio location.** The FCC fined an FM licensee \$7,500 for constructing and operating its station on the wrong channel. In addition, the operator was fined \$7,000 for locating its main studio outside the station's city-grade contour. Although the FCC has recently relaxed restrictions on main studio locations, violations are not mooted by a subsequent change in the rules.

**\$7,000 main studio staffing.** While noting that noncommercial educational stations may seek a waiver of the main studio rule, the FCC fined a noncommercial station for failure to comply with the rule absent such a waiver. FCC agents attempted to enter the main studio of the station on three different occasions. Each time, they found a locked building with two contact telephone numbers posted on the door. During its investigation, the FCC determined that the station occasionally employed one person or was staffed by volunteers. The FCC's rule for main studio staffing requires, at a minimum, that a managerial or a full-time staff person be present during normal business hours. Part-time and volunteer staff do not satisfy this rule.

**\$4,000 broadcast of telephone conversation.** Based upon a complaint from a listener, the FCC fined an FM licensee \$4,000 for broadcasting a telephone conversation simultaneous with its occurrence but without the consent of the other party to the call. On-air personalities should take great care to ensure that they comply with the FCC's rule requiring advance consent to the broadcast (or recording for later broadcast) of telephone conversations.

### Broadcast ownership attribution

The FCC has revised its broadcast ownership "attribution" rules. The attribution rules define what constitutes a cognizable interest for purposes of applying the ownership rules. Essential elements of the FCC's order include the following:

- Adoption of a new "equity/debt plus" standard, which will function in addition to the current attribution rules. Under the new rule, a holder of a financial interest, whether equity or debt or both, in excess of 33 percent of a licensee's total assets will have an attributable interest in that licensee if it is either a major program supplier to that licensee (supplying more than 15 percent of the total weekly broadcast programming hours) or if it is a same-market media entity (including broadcasters, cable operators and newspapers). All stock, both common and preferred, both voting and nonvoting, will be counted toward the 33-percent threshold.
- Retention of the 5-percent voting stock benchmark, while raising the voting stock benchmark for passive investors from 10 percent to 20 percent.
- Elimination of current aspects of the cross-interest policy (*i.e.*, key employee relationships, nonattributable equity interests, joint venture agreements).
- No change in treatment of joint sales agreements (JSAs).
- No change in treatment of limited partnership interests as distinct from corporate voting equity interests.
- Application of limited partnership insulation criteria to determine attribution of limited liability companies (LLCs).
- Application of revised broadcast attribution criteria to broadcast/cable cross-ownership rules.

Except for television LMAs, any interests acquired on or after November 7, 1996, the date of FCC adoption of the Attribution Further Notice of Proposed Rulemaking, are subject to the new rules. If the interest was acquired before that date, it is grandfathered.

Harry Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Arlington, VA. E-mail [martin@fhh-telcomlaw.com](mailto:martin@fhh-telcomlaw.com).

### Dateline

Radio stations in the following states must file their biennial ownership reports on new Form 323, or Form 323-E for NCE stations, on or before December 1: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.



# Digital Done Right



The Logitek Numix is a full featured digital console, with up to 42 faders, from the new leader in digital broadcast console technology.

Each modular input wedge features a huge display screen above six P&G faders. Input routing, bus assign, stereo mode, pan and EQ settings are clearly shown for each channel. We even provide a separate timer for each input and space for automation systems to write song titles.

These consoles have four mix busses, talkback, mix-minus, pan, mute, snapshot automation and an amazingly flexible remote control system. Optional features include motorized faders, EQ, dynamics and talk show delay. Of course both analog and digital ins and outs are handled with ease.

Would you like to know more? Just call your favorite dealer or one of our sales engineers.

Would you like to know more?  
Just call us at (800) 231-5870 or e-mail [info@logitekaudio.com](mailto:info@logitekaudio.com)



## Logitek digital with a better difference!

5622 Edgemoor Houston, TX, 77081  
e-mail [info@logitekaudio.com](mailto:info@logitekaudio.com) Phone: 800.231.5870

Visit our home page at [www.logitekaudio.com](http://www.logitekaudio.com) for more information

Circle (114) on Free Info Card

# *Full service solutions at pit stop speed.*



1-800-622-0022 ■ [www.harris.com/communications](http://www.harris.com/communications)



Lead, follow, or get out of the way is not only the motto in racing, but is quickly becoming the norm in radio broadcast. If you're not, the pace car, you're somewhere in the pack.

Harris is in this race to provide you with the tools that it takes to cross the finish line first. The Broadcast Systems Division has the highest point standing in the industry when it comes to providing customers with complete systems at the velocity they need.

Whether you just need some lug nuts, more fuel to keep going, or a complete tire change for your

operation, Harris has the most experienced pit crew in broadcast.

Keep on track and win the ratings championship with an operation that runs without caution flags, start your engine with Harris equipment. We're here to make sure you get the checkered flag.

So, put on your driver suit and helmet, drive fast and turn left to your phone to make sure Harris is on your speed dial list for the times you need a next level radio solution.

*next level solutions*

WIRELESS

BROADCAST

COMMUNICATIONS  
PRODUCTS

**HARRIS**  
Communications

Circle (115) on Free Info Card

# THE Self-Resonant Folded Unipole Antenna

By Sylvio M. Damiani, P.E.



*A new variation on the folded unipole*

The view from tower's base. The metal ring is part of the ground system.

**T**he limiting presence of a strong reactance component in an antenna input impedance has caused problems for the broadcast antenna design engineer. This problem can occur even when engineers opt for models that theoretically rid themselves of this inconvenient  $\pm j$  component by attempting to determine, at the design level, a resonant height for the tower.

We refer, of course, to MW broadcasting in which the field and/or consulting engineer has to develop the mechanics of the antenna (or antennas) of a radiating system. Years of work in the field have resulted in the development of a new type of antenna in which a self-resonant condition is reached by the easy and continuous tuning of a lumped reactive component installed at the antenna itself.

## The regular folded unipole

The commonly used folded unipole (or monopole) antenna for MW broadcast basically comprises a grounded support tower and a set of skirt fold-wires that run vertically and parallel to the tower, making electrical contact at the top and usually at a movable point determined empirically. The fold-wires are uniformly distributed around the support towers to maintain an omnidirectional radiation characteristic when standing alone. The feed point of this antenna is a copper tube formed into an O-ring installed concentrically around the tower, near the ground, connecting all the fold-wires together. A large amount of mechanical hardware is involved (e.g., compensating springs, anchors and insulated spacing bars) to keep

the fold-wires stressed enough to avoid touching the steel structure of the support tower, even when buffeted by strong winds.

Electrically, this antenna presents a higher input impedance when compared with that of a simple tower of the same height isolated at its base. When properly designed, one can arrive at more than  $100\Omega$  input resistance, associated with a moderate reactance value, which turns the antenna into a relatively low-Q radiating device. Its relatively good bandwidth also makes it suitable for broadcasting music.

This technique has also been employed with directional antenna arrays. Its highly desirable, inherent high-input impedance will certainly be loaded down by the influence of other towers composing the array.

**Engineers Agree....to Receive Best Signal  
the Radio Industry should use a  
3.8 Meter Antenna**

**Patriot**

**Quality**

**Made  
in the USA**

**Made  
in the USA**

*Invest in a Quality*

## **Patriot 3.8 Meter Antenna**

**PATRIOT**

### **Quality Features:**

Stock Orders Ship in 48 Hours

Easy Two-Person Installation

125 mph Wind Loading

2° FCC Compliant

**Complete Line  
of Auxiliary Components  
In-Stock**

Circle (116) on Free Info Card



## **Satellite Export & Engineering, Inc.**

Sales Office

1007 Industrial Avenue

Albion, MI 49224

Visit Our Website:

[www.sepatriot.com](http://www.sepatriot.com)

E-mail - [sepatriot@voyager.net](mailto:sepatriot@voyager.net)

Phone: 517-629-5990

Fax: 517-629-6690

Toll Free: 800-470-3510

# Folded Unipole Antenna

Even so, the  $I^2R$  losses drop to a lower value because of the relatively low RF currents circulating in the antennas and their associated radial wires.

## Self-resonant folded unipole

From the basis of the folded unipole, we can make a few modifications and

*tance* component in series with the C-ring, between two adjacent fold-wires, its position and value having been correctly established.

This process is time-consuming, calling for several iterations to calculate the reactance value and its location on the C-ring. When running the RF design program EZNEC2 (a calculation program that uses the Numerical Electromagnetic Code 2, also called NEC2) without the self-resonant load, the input impedance will have a  $\pm j$  reactive component. The corrective self-resonance lumped reactance will have an opposite sign.

ipole is not so simple. Actually, I discovered this antenna when dealing with a similar problem and running the calculation program EZNEC2. At that time, under certain initial conditions, the input impedance of a regular folded unipole seemed to present a very low reactance. This in turn was an interesting feature, since it would provide, at least theoretically, for excellent bandwidth and very good audio quality in AM broadcasting.

Further calculations confirmed the conditions required for self-resonance for this specific antenna. As many readers may know, the *Code Technique* is based on modeling the an-



The base detail. Each fold-wire has a tension spring, two porcelain insulators and the horizontal C-ring.

add a few items to acquire a self-resonance capability. These include the following:

1. Substitute the base O-ring, mentioned earlier, with a C-ring, or, to better describe it, with an open polygon that interconnects all the fold-wires at the antenna base at the same height from ground (as shown in the photo above left). For example, for a three fold-wire antenna, the open polygon is a two-sided triangle, or a V-form device. For a six fold-wire folded unipole, an open hexagon (or a hexagon minus one side) is applied. For a nine fold-wire antenna, an open eight-sided polygon is installed at the electric closure of the fold-wires at the antenna base. Regardless of the total number of fold-wires, all must be interconnected through a *conductive open polygon*, generically referred to as a C-ring.

2. Install a *corrective lumped reac-*



A view from above. The blue arms are insulating spacers.

## Tuning to self-resonance

The corrective reactance is tuned to its expected value. In practice, at the transmission site, the reactance is tuned while the antenna input impedance is simultaneously checked through an operating impedance bridge. Remember to place the bridge's *X dial* to the zero position. Once this simple field operation is done, one has an antenna with a purely resistive input impedance. Obtaining a self-resonant folded unipole antenna is that simple, almost.

Unfortunately, the calculation of the self-resonance of the folded un-

tenna and metal structures near it with wires. The model has to be carefully prepared, obeying all the criteria the EZNEC2 manual recommends, to obtain the correct antenna characteristics and its resulting radiated E-field.

Once the required circuit conditions are known and modeled by the NEC2 engine, the subsequent tasks are determining the specific point at which to feed the antenna on the C-ring, deciding where to install the reactive load in series with the C-ring (i.e., between which adjacent fold-wires), and determining the proper



**digibid.com**  
Auction Network

**GET ON AND GET OFF.**

YOU WON'T FIND ART DECO COCKTAIL SHAKERS OR BEANIE BABIES ON DIGIBID. YOU WILL FIND THE VIDEO, AUDIO, MUSICAL GEAR YOU'RE AFTER.

DIGIBID IS THE AUCTION ARENA WHERE THE DEDICATED FEO CAN FIND EVERYTHING FROM ALESIS TO ZILDJIAN—AT RIGHT PRICES. AND THE BEST GEAR DEALS ON THE PLANET ARE THE MOST FUN, ESPECIALLY WHEN THEY'RE ALL 100% GUARANTEED.

**GET ON AND GET OFF. [WWW.DIGIBID.COM](http://WWW.DIGIBID.COM)**

Circle (126) on Free Info Card

## DPA Microphones On Line!

Log on for the  
latest details  
on  
Micing  
Techniques  
and  
Comprehensive  
Educational  
Forums

DPA 4000 Series  
Microphones

DPA Compact  
Microphones

DPA Miniature  
Microphones

Check out the new  
DPA 3541 Vocalist  
& Instrumental  
Microphone Kit!



**DPA**   
MICROPHONES

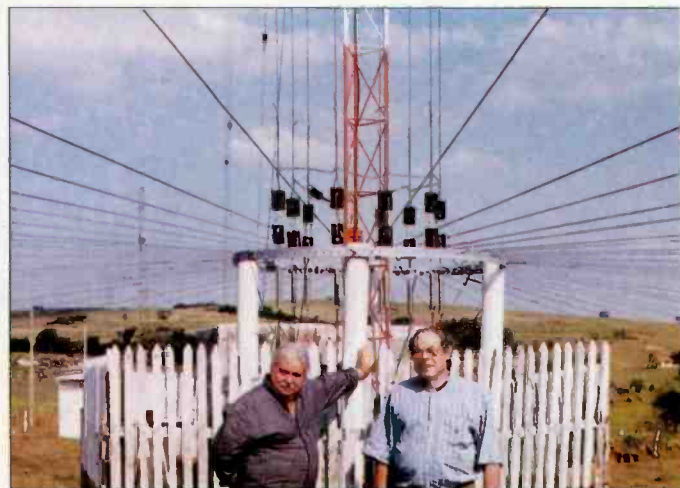
DPA Microphones /  
TGI North America Inc.  
300 Gage Ave., Suite #1  
Kitchener, ON Canada N2M 2C8  
Tel: (519) 745-1158  
Fax: (519) 745-2364  
Toll Free Dealer Fax Order Line:  
(800)525-7081

www.dpamicrophones.com

## Folded Unipole Antenna

reactance value in ohms at the operating frequency. All of this is related to the specific antenna under study. It is not within the scope of this article because it is part of a pending U.S. patent.

The reactance load changes the forward RF current phase into the fold-wires that are located after it. This opposes the direction of the source or feed point as well in respect to the remaining wires in such a manner as to produce zero reactance at the input point. That is why it is necessary to connect all fold-wires to the C-ring or open polygon in order to allow this phase difference between currents on the fold-wires, which in turn are the wires responsible for the radiation phenomena. Another characteristic observed at the end of the calculation is the current phase at the top of the tower area, which is also the point where the fold-wires are connected to the tower. There are no abrupt phase differences between currents flowing into the fold-wires and the current flowing in the tower top itself when the resonance occurs at the antenna input point.



ZYK-767 station owner Camillo C. Perez (L) and the author standing in front of the self-resonant unipole.

### Main characteristics

Figure 1 shows an SWR plot of one self-resonant model that was installed recently and has been in operation since December 1998. Observing the SWR throughout the frequency band under analysis, this antenna appears to approach a theoretically ideal antenna. It has a wide bandwidth never seen before for an AM-type transmission. At  $\pm 16\text{kHz}$ , referenced to the center (carrier) frequency it presents an SWR of 1.12:1. At  $\pm 12\text{kHz}$ , the SWR is less than 1.1:1.

Careful observation of its symmetry shows that the plot is symmetrical when viewed from the carrier frequency. Both of these characteristics are essential for an optimized AM transmission, which certainly will result in good music quality with very low harmonic distortion, and no locally generated intermodulation between sideband tones. If the audio frequency response were not purposely limited to some low value as it is

Circle (127) on Free Info Card





«A Smart Broadcast Solution?»

**NEW**



The new 3.0 version of the Studer On-Air 2000 Digital Mixing Console offers additional possibilities in the continuity suite. Up to six Cleanfeeds (n-1) ease the task when listeners or reporters call in. Any of the up to 24 faders can be assigned to be the master fader for the record or program bus. Mike signalling is possible even

with remote mic preamps. The interface to the Studer DigiMedia CAB System allows even fader control from the automation settings. And all that with an intuitive user interface with clearly arranged controls, accessible on touch-screen panels. Want to hear more? Please do not hesitate to contact us.

**STUDER**  
professional audio equipment

H A Harman International Company

Studer Professional Audio AG, Althardstrasse 30, CH-8105 Regensdorf-Zurich Switzerland, Tel. +41 1 870 75 11, Fax: +41 1 840 47 37  
Direct-Subsidiaries: Austria: +43 1 865 16 76 0, France: +33 1 45 14 47 80, Germany: +49 621 7 77 08-0, U.K.: +44 181 953 67 19  
Canada: +1 416 510 13 47, Japan: +81 3 34 65 22 11, Singapore: +65 225 51 15, USA: +1 510 297 27 11  
<http://www.studer.ch>

Circle (128) on Free Info Card

# Folded Unipole Antenna

commonly done, this antenna would provide a detected audio response comparable to a mono FM station — and at least up to the definitions of the AM IBOC DAB systems currently under development.

## Practical results and comments

There are two self-resonant antennas in regular operation in Brazil. The first, ZYK-767 Radio Cidade in Boituva, in operation since mid-December 1998, is a nine fold-wire model at 1490kHz, running 1.0kW of power. The SWR plot in Figure 2 is the calculated characteristic for this antenna. In practice, its transmission seems limited only by studio-related audio-quality problems. Even so, it presents superb music quality and excellent area coverage.

The second, ZYK-563, at Radio Ciube de Birigui in São Paulo, is a three fold-wire model installed in mid-February 1999, at 850kHz and 1.0kW of output power. This installation presents a much better set of

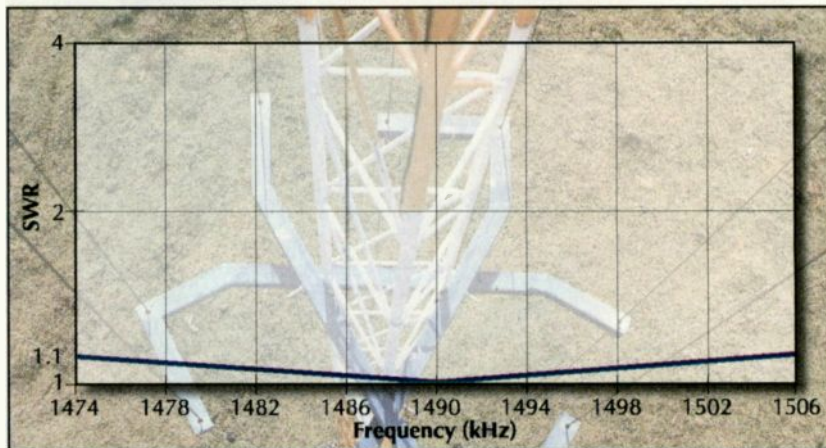


Figure 1. The SWR plot of a working self-resonant folded unipole antenna operating at 149kHz. Total bandwidth shown is 32kHz.

on-air characteristics than the first installation. It is also transmitting in C-Quam stereo.

*Note: The method described here has been filed with the U.S. Patent Office and has a patent pending.*

*Sylvio M. Damiani, P.E., is a consulting electronics engineer and coauthor of the Brazilian National Plan for MW Radio Stations. He is based in São Paulo, Brazil.*

For more information on folded unipole antennas, see John Mullaney's article on our website:

[www.beradio.com/  
features/tech/tech.cfm](http://www.beradio.com/features/tech/tech.cfm)

## One Dealer, One Focus, One Call

# Trust **ABG**

*Call us, and put our people to work for you.*



### MAIN/MIDWEST OFFICE

Grand Rapids, Michigan  
Voice: **800-999-9281**  
Fax: 616-452-1652  
E-mail: [support@abg.com](mailto:support@abg.com)

### NORTH CENTRAL OFFICE

Duluth, Minnesota  
Voice: **800-788-8759**  
Fax: 218-525-0455  
E-mail: [cgrace@abg.com](mailto:cgrace@abg.com)

### SOUTHEAST OFFICES

Mountain Home, North Carolina  
Voice: **800-369-7623**  
Fax: 828-697-2691  
E-mail: [cindy\\_edwards@abg.com](mailto:cindy_edwards@abg.com)

Lexington, South Carolina  
Voice: **800-951-7443**  
Fax: 803-951-3123  
E-mail: [jgeorge@abg.com](mailto:jgeorge@abg.com)

### SOUTHWEST OFFICE

Palmdale, California  
Voice: **800-858-9008**  
Fax: 805-273-3321  
E-mail: [tmezey@abg.com](mailto:tmezey@abg.com)

[www.abg.com](http://www.abg.com)

Circle (131) on Free Info Card

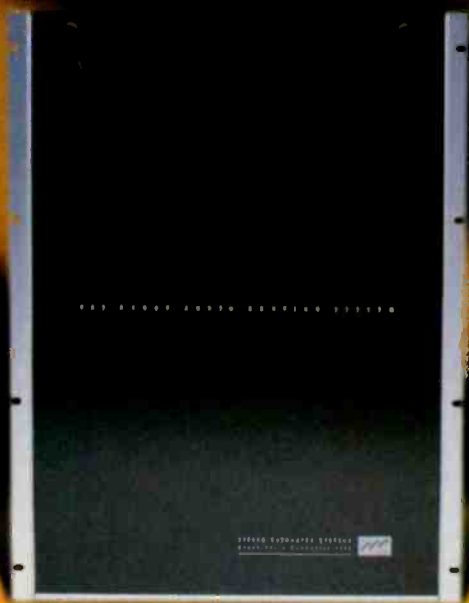
## SAS64000 AUDIO ROUTING SYSTEM

Elegant  
Analog

Instant  
Digital



256 X 256 LARGE • MONO/STEREO • WIDE VARIETY OF CONTROL PANELS • 118dB ANALOG DYNAMIC RANGE • DISTRIBUTED MULTI-PROCESSOR ARCHITECTURE



If the migration to digital is in your future, then this is the route to take. Introducing the large size, big performance analog router that also speaks fluent digital. A true hybrid that allows you to scale the number of analog and digital ports as needed, now and in the future. And even better, the SAS64000 creates a forward path to AES/EBU digital audio without creating analog obsolescence.

This means you can mix your analog and digital I/O in the same router frame. Go direct analog to analog, or digital to digital. Or mix it up with 24 bit conversion analog to digital and vice versa. Either way, this unique architecture sports flawless signal integrity and non-blocking flexibility.

And it's wonderfully simple, just plug in our new digital port expander and that's it. Welcome to digital! Co-existing richly with analog in the same framework.

There's lots more to tell. Call us: 818 840 6749. Fax us: 818 840 6751. E-mail us: [sales@sasaudio.com](mailto:sales@sasaudio.com) Check the Web site: [sasaudio.com](http://sasaudio.com) And of course, snail mail: 2112 North Glenoaks Blvd. Burbank, California 91504 USA.

Circle (130) on Free Info Card



SIERRA AUTOMATED SYSTEMS  
BROADCAST & COMMUNICATIONS

# Unexpected RFR

By Robert D. Lambert, Jr., P.E.

*Isocouplers are often installed and then forgotten — until they're the source of trouble.*

**M**uch attention has been given to the problem of RF exposure and radiation around tower bases. Monitors are now available for checking RF levels. With one of the monitors, an unexpected source of *radio frequency radiation (RFR)* was discovered: an isocoupler.

In the 1940s, there was considerable interest from AM licensees interested in getting CPs in the new 88MHz to 108MHz band. One of the first questions regarded the use of a series-fed AM tower to support the FM antenna. Western Electric and RCA solved the matter of getting the FM signal to the FM antenna without shorting the AM signal to ground.

Western Electric presented its cylindrical 730-A Filter and RCA its boxlike FM-AM Isolation Unit, later given the number BAF-14-A. In listing the desired characteristics, Western Electric stated, "The ideal bridging element would look like a low-loss 1:1 transformer at the FM frequency. It would present an infinite impedance to the AM frequency. It would be weatherproof and gas-tight. It would be nonradiating." The company further stated that "the coaxial construction employed prevents radiation which might assume troublesome proportions if other arrangements were used." Both manufacturers also pointed out other means for AM/FM isolation,

such as the cylindrical and boxlike isocouplers (as we now call them), introduced by each company and now in common use.

## Diagnosing trouble

Many isocouplers function properly, but some have been found to radiate FM strongly. Because they are usually installed near the tower base, this could pose an unexpected hazard to station personnel. It is recommended that every station check its isocoupler for such radiation. This should be done when the AM transmitter is off, and preferably at night if a visual indicator like a neon bulb on an insulated stick with a short pickup wire attached is used. A fluorescent tube can also be used but will require a minimum voltage to fire and therefore may not be sensitive enough in some cases.

Be careful. You may be surprised by the amount of RF present. At one station, vicious bright blue 1/2-inch to 3/4-inch arcs could be drawn from the isocoupler housing with an insulated screwdriver. A fluorescent tube was brilliantly lit when brought in proximity. In this instance, the TPO was 20kW and the isocoupler had a maximum FM insertion loss of 0.2dB, for a total loss of 900W. Therefore, its power loss through radiation could be estimated as half of the total, or 450W.

Once a station finds that its isocoupler is hot, the next step is to correct the problem. After all, it is neither easy nor inexpensive to replace a unit handling 20kW FM and the same or more AM power. Also, there may still be some doubt as to the source of the RF. It could be suggested that the RF on the isocoupler is due to the strong downward radiation from the stacked in-phase FM antennas overhead.

## The FM Series

SWR's FM antennas are customized to meet broadcaster's needs, ranging from educational series to multi-station antenna arrays (from 500w to 35kw per bay).

### Options:

- Circular, horizontal, or vertical polarization
- Pressurized or non-pressurized

### Low-High Power Antennas:

- FM1
- FME
- FM3
- FM10
- FMU



Antennas and Transmission Line Systems

Systems With Reliability, Inc.  
P.O. Box 856, Elizabethtown, PA 17033  
1-814-472-5436 FAX 1-814-472-5552  
Sales: 800-762-7743  
E-Mail: dswr@thirdwave.com  
www.swr-rf.com

SWR offers technical support before and after the sale.

Our Priority is Your Satisfaction

Circle (129) on Free Info Card

# 100% Orban engineering.

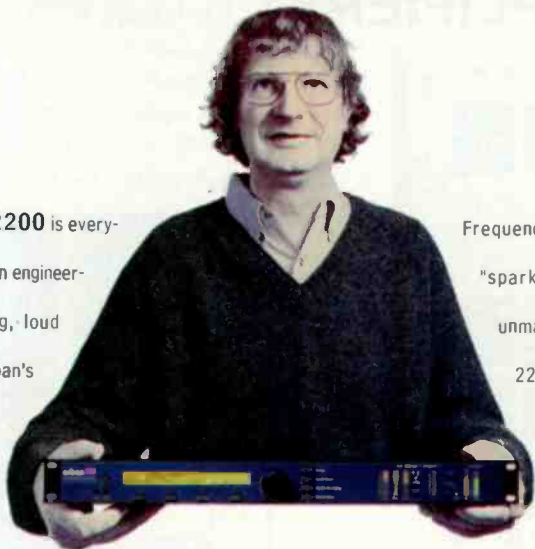
**THE OPTIMOD-FM 2200** is everything you'd expect from Orban engineering: superior design, a big, loud OPTIMOD sound, plus Bob Orban's proven processing know-how. In fact, about the only thing unexpected is the price.

Around half what you'd expect to pay for 100% Orban performance.

In one slim package, you get features usually reserved for high-end processors. Including built-in digital stereo encoding, eight factory presets (each with 19 LESS/MORE variations) and eight user presets. No other processor in this price range delivers a louder, brighter, or cleaner sound—with more bass punch. That's because the 2200 is a direct descendant of the best-selling digital processor in the world, pioneered by one of the most competitive engineers in radio.

## THE FAMILY RESEMBLANCE IS CLEAR.

The 2200's two key processing structures come directly from Bob's evolutionary work on the OPTIMOD-FM 8200. In the Two-Band structure, Bass EQ lets you selectively add punch, while a High



At  
about  
half  
the  
price.

Frequency enhancer automatically adds "sparkle." Protection mode maintains unmatched transparency and makes the 2200 an ideal upgrade for stations using Orban's classic 8000A. Both structures tightly limit peaks while providing superb baseband spectrum control. This guarantees highest loudness by protecting the stereo pilot tone and preventing overshoots in any uncompressed digital STL.

The result is the ability to create a big, loud, signature sound for all kinds of formats: pop music, talk, classical or jazz. All at a price that has competitive written all over it. Just like the engineering.

## THE SCIENCE BEHIND THE SOUND

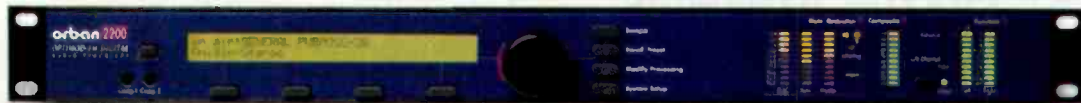
More and more broadcasting chains demand digital consistency. That's why the 2200's built-in encoder generates the stereo composite signal digitally. Digital encoding is ultra-stable; no periodic tweaking is required. The OPTIMOD-FM 2200D version also includes AES/EBU digital inputs and outputs in addition to standard analog. So you get loud, clear digital sound across the entire spectrum—and you can keep your signal in pure digital form all the way to the transmitter.

The OPTIMOD - FM 2200

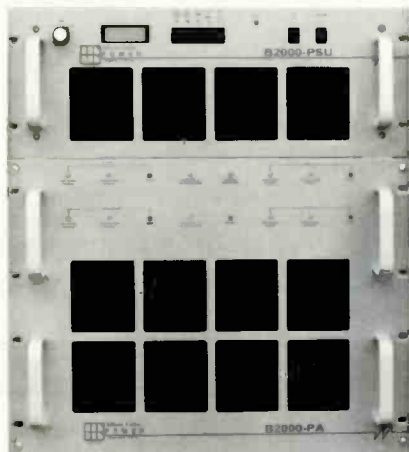


**orban**

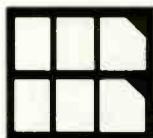
A Harman International Company



## SOLID STATE, FM BROADCAST POWER AMPLIFIERS



FM AMPLIFIERS FROM 150W TO 3KW,  
MODULES FROM 10W TO 700W



*Silicon Valley*  
**POWER**  
AMPLIFIERS

The RF People

Call 408-986-9700

Fax 408-986-1438

Circle (133) on Free Info Card

### Coaxial Dynamics'

NEW Line of  
Liquid/Air  
Terminations  
are quickly becoming  
the choice of  
"Chief Engineers"  
for testing, adjusting  
and alignment of  
R.F. Transmitters.

The NEW design  
of the Coaxial  
Liquid/Air Cooled Loads  
gives you the capability  
to handle requirements  
from 1 Kw to 10 KW.



**COAXIAL DYNAMICS**

SPECIALISTS IN RF TEST EQUIPMENT & COMPONENTS

15210 Industrial Parkway, Cleveland, OH 44135  
216-267-2233 800-COAXIAL FAX: 216-267-3142  
E-Mail: coaxial@apk.net  
Web Site: <http://www.coaxial.com>



Circle (134) on Free Info Card

## Unexpected RFR

After studying the matter for some time, circumstances arose that caused the station discussed above to take its AM station off the air and replace the isocoupler with a suitable length of coaxial line. Upon resuming FM operation, it was found that all the stray RF was gone. A replacement isocoupler of a different design was then installed so that AM operation could resume. The new isocoupler ran cool and could be touched without fear.



Isocouplers like the one shown here are commonly used to mount grounded antennas on hot towers. This isocoupler is operating properly.

A similar situation was found at a Class A FM station, where the TPO was slightly less than 5kW. The isocoupler was about 4 feet above ground level and was not far from the entrance to the transmitter building. EM leakage was found on the outer surface of the isocoupler, though much less than in the previous example. Nevertheless, a standard fluorescent tube would glow brightly when brought near the isocoupler. As before, a replacement isocoupler cleared up the problem completely. In this instance, the station owner declared that his station's coverage improved after the change.

### Verifying performance

Several experiments were conducted with the Class A station's original isocoupler. Using a 25W exciter, measurements were made of the insertion loss using two wattmeters and a 50Ω dummy load. The input impedance was measured with the isocoupler terminated in the 50Ω load using a Hewlett-Packard Vector Impedance Meter. This figure was used to determine the VSWR. The operation of this isocoupler was essentially within the listed specifications, which did not specify the permitted maximum level of radiation.

Anyone purchasing an isocoupler should obtain a statement from the manufacturer of the maximum permitted level of radiation from the unit.

*Note: The exact reasons for the isocoupler failures were never fully determined. Possibilities include lightning, an over-power condition, or even excessive harmonics from spurious emissions.*

Thanks to M. Fayne Anderson and Milton Holladay Jr. for their help with this project.

Robert D. Lambert is a consulting engineer in Columbia, SC.

# Citadel Selects Scott Studios as "the Best" Digital System



Larry Wilson (at right), CEO of Citadel Communications Corp., shakes hands with Dave Scott as Citadel standardizes on Scott Systems for its 124 stations and future acquisitions.

Citadel Communications Corp., one of America's top 10 radio groups in 1998 revenues, selects Scott Studios Corp. as its sole supplier of on-air digital audio delivery systems for its 124 radio stations and future acquisitions.

"We thoroughly investigated all of the competitive digital air studio systems and decided upon the best one," says Larry Wilson, CEO of Citadel Communications. "Our regional Presidents and Vice Presidents of engineering and programming spent nearly a year analyzing different options. While no system or manufacturer is 100% flawless, it became obvious to us that Scott Studios is the very best. Their long history of excellent service commitment, the quality of their digital studio products and competitive pricing were our primary reasons for selecting Scott Studios."

Dave Scott, CEO of Scott Studios Corp. says, "It's an honor to be Citadel's sole digital audio vendor and take their other brands as trade-ins on our new equipment. Our systems are designed by announcers, for announcers."

"Of Scott's 61 employees, 43 are former jocks and PDs with 700 years collective radio experience. Competitors work more from the engineer's perspective, although we have 20 former chief engineers on staff also. Scott Studios' digital fits DJs like a glove."

After adding five Oklahoma City stations and other pending transactions, Citadel will own or operate 124 radio stations in 23 mid-sized markets such as Providence, Salt Lake City and Albuquerque.

Citadel is well known across the country for attaining topnotch competitive programming success, and the addition of Scott Studios announcer friendly technology will help Citadel announcers deliver superior information, entertainment and service to their 8,000,000+ weekly listeners.

Citadel's stations are not the only ones who choose Scott: More U.S. radio stations use Scott Studios' than any other digital system, with 5,046 Scott digital workstations in 2,202 U.S. stations. Nine of the ten top-billing groups have Scott Systems.

Scott Systems are the easiest to use! They're intuitive, straightforward, simple, yet the most powerful!

Scott Studios is famous for our uncompressed digital systems at a compressed price, (but we work equally well in MPEG and MP3). Scott Studios' audio quality is the very best and plays on laptops or PCs with ordinary sound cards. We pre-dub your startup music library free. Your PD can auto-transfer songs digitally in seconds with a CD-ROM deck in his or her office.

Scott gives you industrial quality 19" rack computers, but nothing is proprietary: functional equivalents are available at computer stores. You also get 24 hour toll-free tech support! Scott also lets you choose your operating system: Linux, Novell, NT, Windows, DOS or any combination. You also choose from three systems: Good, Better, Best. One's right for you!

The Scott System 32 (pictured at the upper right) is radio's most powerful digital system. Your log is on the left side of the LCD touch screen. Instant access Hot Keys or spur-of-the-moment "Cart Walls" are on the right with lightning-quick access to any recording. Phone calls record automatically and can be edited to air quickly. You can also record and edit spots or voice tracks in the air studio or go on the air from production.

Options include seamless redundancy, self-healing fail-safes, newsrooms, 16-track editors, time and temperature announce, and auto-transfer of spots and voicers to distant stations over WAN or Internet. Check our web site and call us toll-free.

The screenshot shows a digital interface with a grid of song titles and artists. The grid is organized into columns and rows. At the top left, there is a time display '8:15 38A' and a 'Start 3' indicator. Below the grid, there are several circular buttons labeled 'Stack', 'Artists', 'Time', 'Year', 'Cat', 'Auto', 'Back', 'Forward', and 'Preview'. A large ':04' display is visible on the right side of the interface. At the bottom, there is a row of letters 'A B C D E F G H I J K L M N O P Q R S T U V W X Y Z'.

The Scott System is radio's most user-friendly. You get instant airplay or audition of any song simply by spelling a few letters of its title or artist. You see when songs played last and when they'll play next. You also get voice tracking while listening to music in context, hot keys, automatic recording of phone calls and graphic waveform editing, all in one computer!

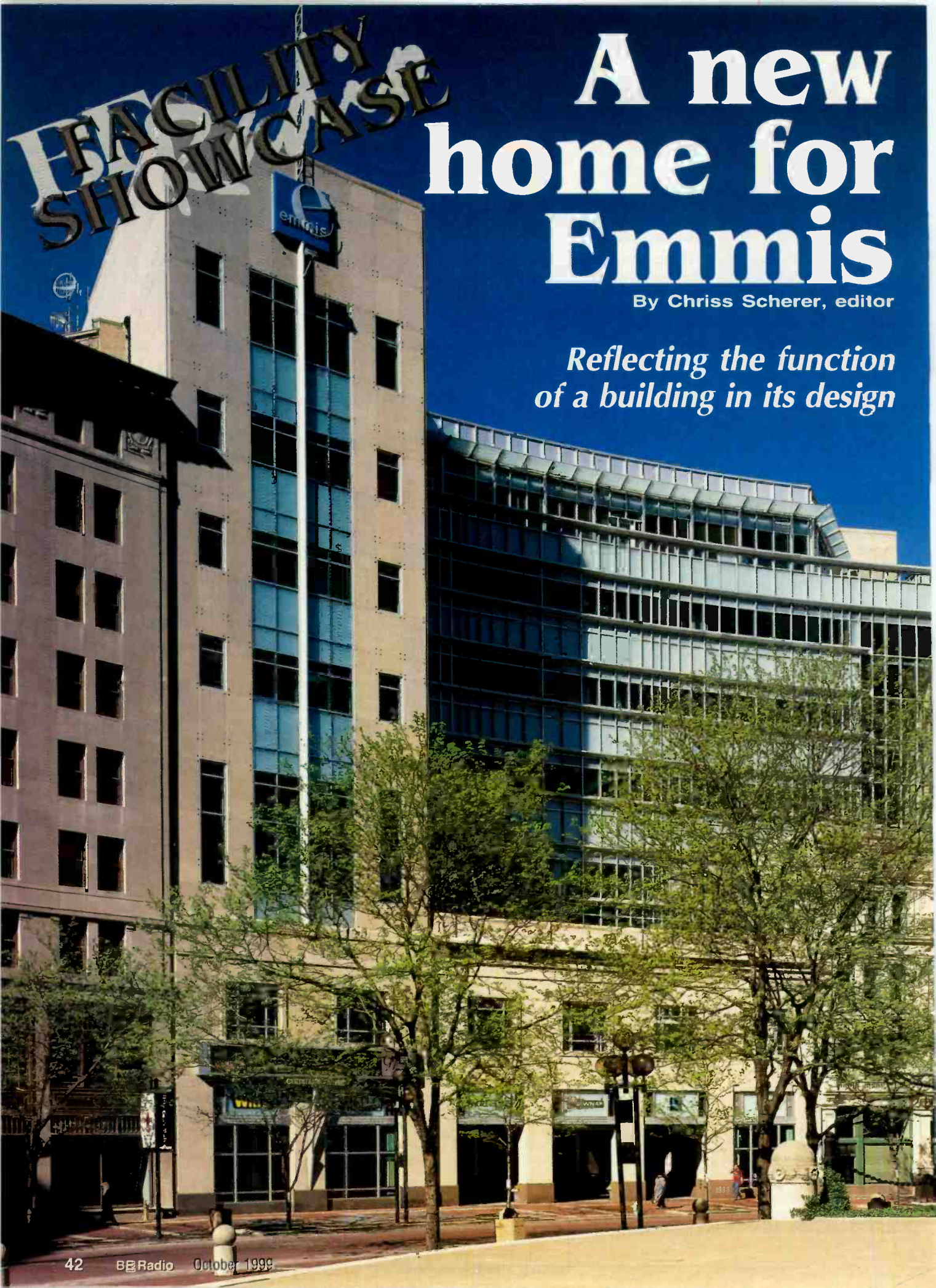
**Scott Studios**  
 13375 Stemmons Freeway, Suite 400  
 Dallas, Texas 75234 USA  
 Internet: [www.scottstudios.com](http://www.scottstudios.com)  
 (972) 620-2211 FAX: (972) 620-8811  
 8 0 0 7 2 6 8 8 7 7  
**(800) SCOTT-77**

FACILITY  
SHOWCASE

# A new home for Emmis

By Chriss Scherer, editor

*Reflecting the function  
of a building in its design*





In the September 1998 issue of *BE Radio* (p. 48), we gave you a sneak preview of the Emmis facility when it was under construction. The facility, located in the center of downtown Indianapolis on Monument Circle, was recently completed. The stations have moved in and begun operations.

See the September 1998 article to get a feel for the complete transformation of the building in just under one year.

The new 142,000 square-foot facility houses the corporate offices of Emmis Communications, radio stations WIBC-AM, WENS-FM, WNAP-FM, WTLC-AM and WTLC-FM, the Network Indiana and AgriAmerica networks and the offices for *Indianapolis Monthly* magazine. The radio stations previously occupied three separate locations around town.

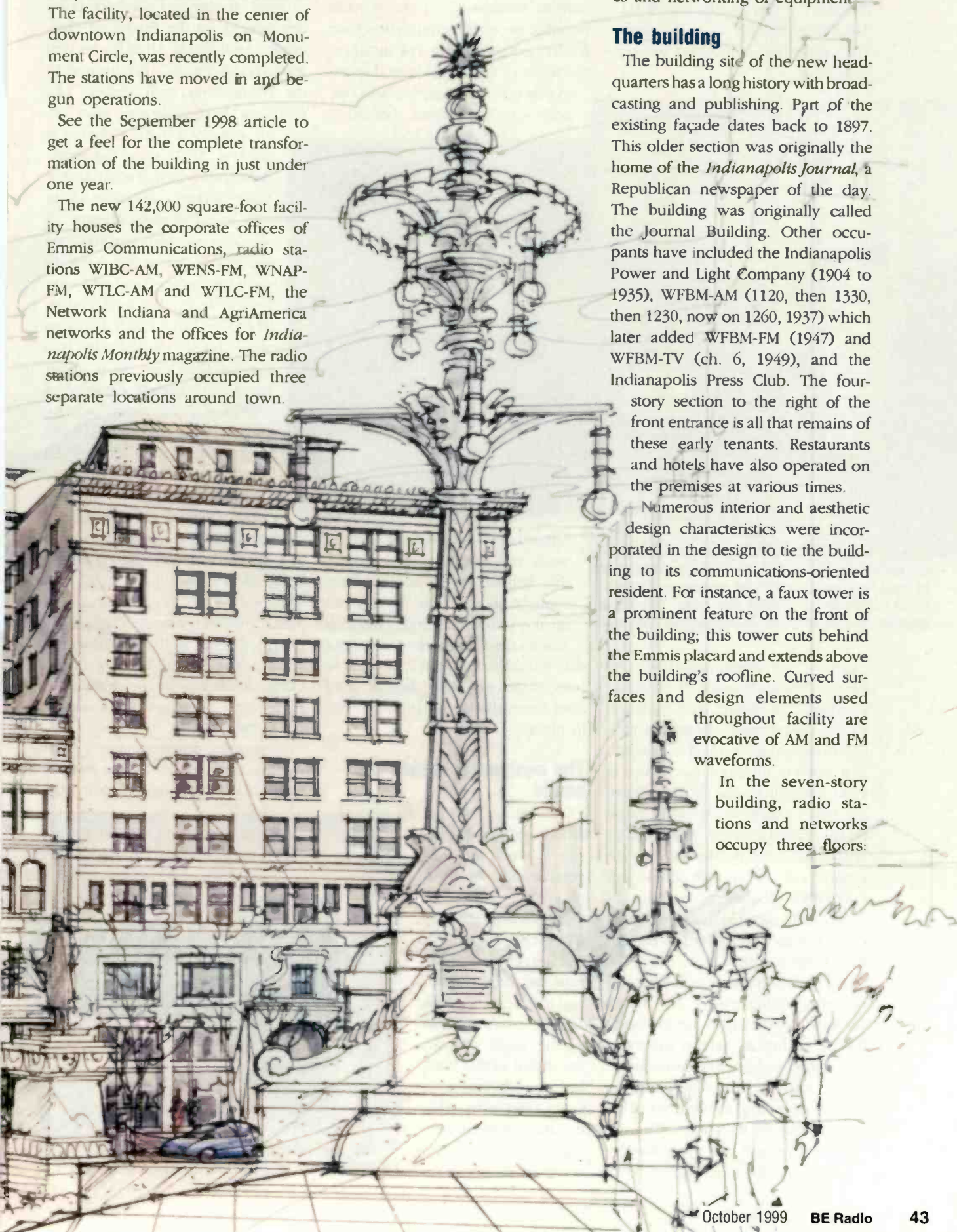
Moving these discrete operations into a single facility presented some advantages as far as sharing of resources and networking of equipment.

### The building

The building site of the new headquarters has a long history with broadcasting and publishing. Part of the existing façade dates back to 1897. This older section was originally the home of the *Indianapolis Journal*, a Republican newspaper of the day. The building was originally called the Journal Building. Other occupants have included the Indianapolis Power and Light Company (1904 to 1935), WFBM-AM (1120, then 1330, then 1230, now on 1260, 1937) which later added WFBM-FM (1947) and WFBM-TV (ch. 6, 1949), and the Indianapolis Press Club. The four-story section to the right of the front entrance is all that remains of these early tenants. Restaurants and hotels have also operated on the premises at various times.

Numerous interior and aesthetic design characteristics were incorporated in the design to tie the building to its communications-oriented resident. For instance, a faux tower is a prominent feature on the front of the building; this tower cuts behind the Emmis placard and extends above the building's roofline. Curved surfaces and design elements used throughout facility are evocative of AM and FM waveforms.

In the seven-story building, radio stations and networks occupy three floors:



# FACILITY SHOWCASE

WENS-FM and WNAP-FM on the third; WIBC-AM, Network Indiana and Agri-America on the fourth; and WTLC-AM/FM on the fifth floor. The corporate offices are located on the seventh floor.



The main lobby spans more than three stories and can be used for special events and receptions. (Shown R under construction). Photos this page: Jon Miller, courtesy Hedrich Blessing Photographers, Chicago.

One of the design goals was to keep as many common elements as possible. The studios and, to some extent, the technical operations/rack rooms are similar in their design, and much of the same equipment is used throughout the facility. There are two basic room layouts, based on the station's format: news/talk or music. Although no two studios are clones, certain considerations are common to all of them, regardless of format. The pictures included in this piece will give you a general feel for the facility's design.

Any facility relocation project is a time-consuming effort. For many stations, the demands are too great for the technical staff to supervise the entire design and installation project and keep the stations on the air and operating at the peak. This facility was no exception. Though the entire project was controlled by the station staff, much of the work

was outsourced. This not only helped the station's staff maintain a realistic workload, but also it made possible an earlier completion time for the entire project. For instance, the miles of cable and wire that are in place were prepared, and one end was terminated, before it



arrived in Indianapolis. When the walls and conduits were placed, the half-prepared cables were brought in, run and terminated on the unfinished end. This step alone saved several weeks of time that would have been lost if cable runs could not have begun until after the wall and cable trays were in place.

## The equipment behind the sound

Each studio is built around an Integrity console (20 total throughout the facility) and furniture from PR&E. All the twisted-pair wiring is AES3-compliant Belden cable. Cable runs between studios and tech centers are on 12-pair cables. Not all of the audio sources are digital at this time, but one advantage to using AES3 cable is that it makes excellent analog cable as well because of its lower ca-

pacitance and tighter manufacturing specification.

On-air storage and playback is accomplished via the Broadcast Electronics AudioVault. All of the servers and workstation PCs are housed in the fourth-floor tech center. The monitors, keyboards and mice are all extended with Cybex extenders. All PCs are industrial-duty and consist of eight AudioVault servers, one Net delay server and 25 workstations. All the servers and workstations are monitored by AutoView so each can be accessed and controlled from the tech center. There are three 23GB drives on six of the servers; the other two servers have six 18GB drives for a total storage capacity of 630GB for the entire system. There are more than 18,000 audio files on the system. All drives are mirrored for complete redundancy.

The original plan for audio storage called for 6.4:1 compression at a 32kHz sampling rate on all the audio files. Later, all the music was switched to 3.2:1 compression at 32kHz for better quality. Though this provided better quality, the programming personnel still did not find it quite satisfactory, so the music sampling rate was changed to 44.1kHz at 3.2:1 compression.

None of the stations shares a common transmitter site. All the stations have dual T1 circuits in place from



Looking into the studio of WENS from the hallway.

# THE FUTURE OF AUDIO PROCESSING



Only two controls

Operate the system skillfully in minutes

100% Digital Signal Processing Analog to Digital sample rate adaptive

Straight forward touch-screen programming

Your choice of excellent factory sound presets

Power User Controls to create your own custom settings

Create you own unique sound identity

Non-volatile memory to store your settings

## features

	MILLENNIUM®	OPTIMOD® 8200	OMNIA® FM HOT
Touch Screen Control	yes	nc	no
32 bit Floating Point Processor	yes	nc	no
AES/EBU Rate Adaptive Digital Interface included	yes	no \$1,550 extra	yes
Hardware & Software upgrades included at no charge	1 year	no	no
Final Limiter Sample Rate	256 kHz	128 kHz	48 kHz (virtual 192 kHz)
# of Audio Processing Bands	5	5	4
Available in colors	yes	no	nc
Warranty (parts & labor)	3 years	1 year	2 years
Base Price	\$10,950	\$10,400	\$10,700
Price with extras	\$10,950	\$11,200	\$10,700

Millennium is a registered trademark of CRL, Inc.  
Optimod is a registered trademark of Urban, Inc.  
Omnia is a registered trademark of TLS Corporation.



# millennium

## Clear... & Real Loud

Call for information on free upgrades and trade-ins.

Circuit Research Labs, Inc.  
2522 West Geneva Drive  
Tempe, Arizona 85282-3192 U.S.A.  
(800) 535-7648  
(602) 438-0888  
Fax (602) 438-8227  
E-mail: [crl@crlsystems.com](mailto:crl@crlsystems.com)  
Internet: [www.crlsystems.com](http://www.crlsystems.com)

# FACILITY SHOWCASE



The control room for WIBC has room for five guests and a co-host. The newsroom doors are on the right. Photos this page: Jon Miller, courtesy Hedrich Blessing Photographers, Chicago

the studios to the transmitters for telemetry and STLs. All the tower sites except WTLC-FM can be seen from the roof. These stations use a microwave STL as their primary and T1 as a backup. Only WTLC-FM uses the T1 for its primary STL. The roof

also has two Ku-band up-links for the networks, RPU antennas and a diesel generator.

A 200kVA UPS in the pent-house covers critical systems during the switchover

to and from the generator.

The production rooms can serve as back-up air studios and have similar layouts to them, with the addition of a SADiE DAW. Currently, the editors are not networked together.



The WIBC production studio.

## Lookouts

There are two showcase studios on the ground floor that look out to Monument Circle. The studios are accessible by any of the stations or networks. All of the operational functions, including access to call-in telephone lines, complete control of the on-air playback system, EAS, audio routing and monitoring, can be switched to either showcase studio. One studio is slightly larger than the other. Both can be used for any format, but one is tailored for a music format and the other for a talk format.

A video-quality electronic variable message board, located above one of the showcase studios, provides news and information about special events to passersby on the street. There is also a camera that can display images of pedestrians walking by the headquarters on the message board. The

## BROADCAST TECHNOLOGY COMPANY



The UM-2000 is a self contained split band stereo FM processor, with AGC and an **-ultra transparent-** digital stereo generator. Designed to give you concert quality, at a price you will like.

Contact us for details and dealer information.

**Just \$1,895.00**

*affordable  
audio  
processing*

**BROADCAST TECHNOLOGY  
COMPANY**

P.O. Box 751 • Lamar, CO 81052  
(719) 336-3902

<http://www.broadcasttech.com>



The news workstations are compact but still flexible. Notice the auxiliary audio jacks on the clock/timer panel.

Circle (136) on Free Info Card

# ***Rich, vibrant sound*** ***Symetrix 628 voice processor***



If sound were color, wouldn't it be great if it were rich and vibrant like the colors of a tropical bird straight from paradise. With the Symetrix 628 Voice Processor, vocalists and voice talent can achieve such brilliant, resonant sound.

Over a decade ago, Symetrix introduced the voice processor that became a standard to the audio industry. Now with the 628 Digital Voice Processor, Symetrix goes further. By combining proven digital signal

processing and an easy to use analog-like interface with factory and user programmable presets, Symetrix has created one of the most versatile yet reliable pieces of processing equipment on the market today.

Voices are as different as the colors of the feather. So each voice needs a unique palette of functions to make it sound its best. With its powerful processing, programmable presets and digital output, the Symetrix 628 is the complete palette.



***next level solutions***

WIRELESS

BROADCAST

COMMUNICATIONS  
PRODUCTS

1-800-622-0022 ■ [www.harris.com/communications](http://www.harris.com/communications)

**HARRIS**  
Communications

Circle (137) on Free Info Card

# FACILITY SHOWCASE



Above: A view of the larger showcase studio on the first floor. Right: Outside the same showcase studio standing in the forecourt entry looking out to Monument Circle. Photos: Jon Miller, courtesy Hedrich Blessing Photographers, Chicago

showcase studios use double-paned, bulletproof glass for soundproofing and safety. These studios are also equipped with a flexible, two-way video-monitoring system. The showcase studios will enable greater inter-

action between the on-air personalities and the community.

Sound quality and characteristics have been standardized across the stations with Symetrix 528E microphone processors, ElectroVoice 807 microphones for the news/talk stations, and Shure SM-7 and ElectroVoice RE-27 microphones for the music-format stations. JBL 400-series monitors are used throughout.

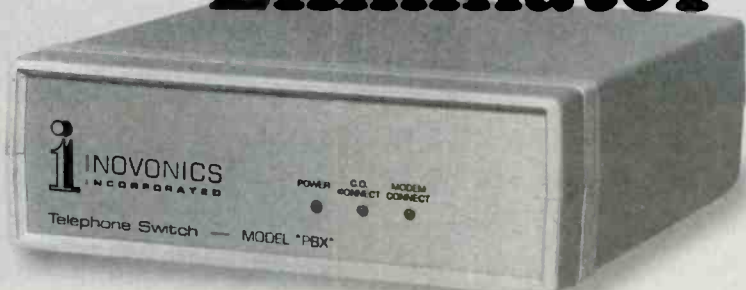
## Behind the scenes

Three technical centers, using 32 Stantron racks, provide transmission equipment (including satellite, ISDN and T1 transmission facilities) and technical support. Facilities are spread between the three technical centers, which are stacked on three separate floors. The fourth floor supports WIBC-AM, Network Indiana, AgriAmerica and the SAS64000 dual



frame 2563256 stereo router. The fifth-floor tech center provides support for WTLC-FM, WTLC-AM and the AudioVAULT storage unit. The sixth-floor tech center supports WNAP-FM and WENS-FM, the Emmis flagship station. Intraplex T1 primary and Moseley Aural backup STLs round out the systems. Inter-room wiring connections consist of

## Telephone Line "Eliminator"



### 7 DIAL-UP DEVICES CAN SHARE ONE CENTRAL-OFFICE LINE

Inovonics' PBX is a cost-saving alternative to the multiple telephone lines otherwise needed for modems, alarms and other dial-up apparatus installed at remote equipment sites. The PBX allows as many as seven devices to share a single central-office line, for outgoing calls and with selective incoming access as well.

The PBX finds immediate application with the expanding use of unattended remote equipment:

- Broadcast Transmitters/Translators
- Cellular/2-Way Radio Facilities
- Microwave Relays
- Geophysical Monitors
- Pumping Stations
- Security Systems

**PBX  
\$420**

## Inovonics, Inc.

1305 Fair Ave., Santa Cruz, CA 95060 USA  
TEL: (408) 458-0552 • FAX: (408) 458-0554

www.inovon.com  
Circle (138) on Free Info Card



## Project-at-a-glance

**Facility:** Emmis Communications

**Location:** Indianapolis, IN

**Stations/networks:** Five stations, two networks

**Number of studios:** 25

**Architect/project manager:**

Ratio Architects, Indianapolis

**Equipment installer:** Pacific Research and Engineering, Carlsbad, CA

**Acoustician:** Northeastern Communications Concepts, New York

**General contractor:**

Shiel Sexton, Indianapolis

**Design approved:** July 1996

**Construction start date:**

Jan. 1997

**Move-in date:** December 1998

# What they hear will determine your destiny

Made the old fashioned way,

Master craftsmen and tech-

the AKG legendary sound

your success, it's an invest-

SOLIDTUBE. Made with

detail that has earned



one-at-a-time in Austria.

nicians who understand

is not just assurance for

ment in your future. The

the same commitment to

us our legendary status.

## SOLIDTUBE

*a hand-crafted masterpiece*



# FACILITY SHOWCASE

approximately 12,000 feet of Belden 1806A AES3 multipair cabling.

Time throughout the facility is kept in sync with an ESE 185 GPS-based clock. The time signal from the ESE feeds the Integrity consoles, ESE analog wall clocks and PR&E digital clocks in every studio. Sine Systems LED message boards and controllers in each on-air studio are triggered by a variety of conditions to indicate alerts and open mics.

An eight-station news workroom provides eight workstations for WENS-FM, Network Indiana and AgriAmerica news support. Two lighter workstations provide local traffic/road condition services for all of the stations.

WTLC-AM, WTLC-FM and WIBC-AM also stream audio over the Internet. The Web servers for the Real Audio streams are kept in the tech center.

## Preparing for digital

The digital consoles were installed in preparation for the ongoing upgrade to a completely digital studio. Only WENS and WNAP are fully

running digital paths from the console out to the transmitter input at this time. The system delay from console input to an off-the-air receiver is not significant, and operators are able to monitor directly off the air. A few announcers are aware of the slight delay, but it is not significant enough to be a problem for them.

Though only a limited amount of digital audio is being routed through the facility, the wire and cable used will support the future changes.

This article focuses on the technical side of the operation, but there is much more in the building that also warrants

considerable attention, such as the general office area, several atriums, and the individual station reception areas. The Emmis headquarters is more than just showcase studios — the entire facility is a showcase.

*Thanks to Anita Gambill of Ratio Architects, Bob Hawkins, chief engineer of WENS and WNAP, Jeff Dinsmore, chief engineer of WIBC-AM, Network Indiana and AgriAmerica, and Dave Hood, chief engineer of WTLC-AM/FM and AudioVault administrator for their help in preparing this article.*

## FOR MORE INFORMATION

Circle (205) on Free Info Card

## Equipment lists

### Air studios

PR&E Integrity consoles  
Panasonic SV-3800 and SV-3700 DATs  
JBL 4412A monitors  
Electro-Voice RE-27 or Shure SM7 mics  
Shure SM7  
AKG K141 headphones  
Hafler P1000 and P3000 power amps  
Audiometrics CD-70 CD players  
Tascam 122 MKIII cassette  
Telos 1A2 telephone interface and  
Delta 100 hybrids  
AKG K141 headphones  
360 Systems Instant Replay  
360 Systems ShortCut  
Sony MiniDisc recorder/player

### Production

PR&E Integrity consoles  
SADiE DAWs  
JBL 4412A monitors  
Auratone Soundcube monitors  
Marantz CD recorder deck  
Audiometrics CD-70 CD players  
Electro-Voice RE-27 or Shure SM7 mics  
Hafler P1000 and P3000 power amps

### Tech center

AudioVault servers and workstations  
TFT and Sage EAS units  
Intraplex TDM-160 T1 multiplexer  
SAS 64000 256x256 stereo router  
WireReady servers  
Moseley 6010 and 606 STLs  
Telos Zephyr and ZephyrExpress  
ISDN codecs  
Comrex Vector and Hotline POTS  
codecs  
Marti RPUs  
CircuitWerkes TeleRadio  
Belar modulation monitors  
Dorrough audio test sets  
Cisco hubs

### News Workstations

Electro-Voice RE-27 mic  
AKG K141 headphones  
SAS IFB and router controller  
Tascam 122MKIII cassette  
Sony MiniDisc recorder/player  
Telos 1A2 interface module  
Symatrix 528E mic processor  
Fostex 6301B powered monitors

*the Only  
Complete  
Solution....*

**for state of the art  
Expandable Transmitter  
Control Systems.**

*as many as 8 transmitter sites  
can be controlled in Real-Time*

**NEW!**

**DATALINE™**

*with modem and voice support*



**ELECTRONIC  
ASSOCIATES  
INC.**

(915)595-3103

web: [www.elecassoc.com](http://www.elecassoc.com)

Circle (147) on Free Info Card



LISTEN.



**VECTOR**

**POTS CODEC**

**15 KHZ TWO-WAY AUDIO**

**ON ONE STANDARD PHONE LINE.**

**BGS IS NOW ACCEPTING ORDERS.**



Est. 1979

[www.bgsfl.com](http://www.bgsfl.com)

Circle (146) on Free Info Card

**BROADCASTERS GENERAL STORE**

2480 S.E. 52nd Street, Ocala, Florida 34480-7500

Phone: **352-622-7700** Fax: 352-629-7000 Email: [bgs@mercury.net](mailto:bgs@mercury.net)

**COMREX**

# FM Antenna Concepts

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

## A further explanation of the operational characteristics of FM

This is part eight of a nine-part series on broadcast antennas.

The inventor of our FM system, Major Armstrong, used simple dipole antennas in his original experimental laboratory work. These antennas bear little resemblance to the FM antennas used today. As Armstrong's invention worked its way into commercial use, antennas became more complex with the need for increased power.



Figure 1. Additional bays focus more of the radiated signal to the horizon and add gain to the system.

Today's FM antennas are based on that same basic dipole but differ widely in application and shape. The building block is the single dipole unit, or bay. Every manufacturer has developed a unique dipole design ranging from simple, flat, horizontally polarized, low-power models to 12-bay, circularly polarized monsters with a modified helix design and panel arrays.

### Antenna gain

To increase antenna power gain, more bays are added. Each additional bay narrows the transmitted beam vertically and increases the antenna's horizontal radiation. In the absence of tower-induced distortion, this radiation will typically be omnidirectional. It is easy to see how the compression of the vertical beam increases the horizontal power.

In *horizontally polarized antennas (HPOL)*, the power gain for a single bay is a little less than 1.0.

Adding a second bay



increases it to almost 2.0. Conversion to 50:50 *circular polarization (CPOL)* distributes half of the input power to horizontal radiation and the other half to vertical radiation.

Because half of the power is radiated in each polarization, the loss of power in each plane must be recovered in one of two ways. Either twice the input power from a larger transmitter is required to obtain the same coverage originally used or doubling the number of antenna

bays, for example, from three HPOL bays to six CPOL bays, is necessary.

There is considerable argument among engineers concerning the pros and cons of high-gain antennas with lower-power transmitters versus low-gain antennas and higher-power transmitters. The pros say that the narrow antenna beam tends to pass over the receivers closer to the transmitter and perhaps illuminates distant areas where there are no listeners. The cons maintain that, by virtue of the lower-gain antenna's broader vertical beam, close-in listeners will be properly served. It seems that, out to about four miles or so, signal strength is better. Past this point, however, there is usually no difference. Probably the best method of determining which way to go is to balance the initial costs of a high-gain antenna and perhaps a stronger tower against the long-term cost of electric power.

As public concern about the possible danger posed by non-ionizing radiation has grown, attention has increasingly been paid to end and downward radiation. In general, 180 to 225 vertical degree spacing between antenna bays controls downward radiation. Half-wave spacing (180 degrees) seems to be most effective. As the spacing is increased toward a full-wavelength antenna, gain tends to diminish as null fill changes.

# All Digital. All Radio. All Here.

- Voice Tracking
- Copy Management
- Digital Audio
- Live Assist
- WAN Support
- Automation
- News Room Integration
- Digital Switching
- Multi-Track Editing
- Satellite

**Computer Concepts  
Corporation**

Toll Free 1-800-255-6350  
[www.ComputerConceptsCorp.com](http://www.ComputerConceptsCorp.com)

**Maestro • NewsRoom • ReeLogger • LogMerge • VoiceTracker**

# Renaissance In Broadcast

## The Age of Enlightenment



### Ultra Tracker II

- High Gain Version of Ultra Tracker Single-Lobe Antenna System.
- Power Ratings From 3 to 60 kw With Inputs From 1-5/8" To 6-1/8" EIA Flange.



### Double Dipole

- High Gain Linear Polarization.
- Broadband with Single Input.
- Custom Directional Patterns Available To Meet The Most Demanding Protection Requirements.



### Ultra Tracker

- Single-Lobe Elevation Means Audibly Less Multipath.
- Dramatically Reduces Downward Radiation.
- Fiberglass "Clamshell" Design Radomes Available.



**ANTENNA CONCEPTS INC.**

6601C Merchandise Way • Diamond Springs, CA 95619  
(530) 621-2015 • Fax: (530) 622-3274  
e-mail: sales@antennaconcepts.com • www.antennaconcepts.com

Circle (149) on Free Info Card

# ANTENNAS

With FM's rise in popularity, HPOL antennas were often mounted on poles on the top or side of existing AM radiators and fed via quarter-wave isolating stubs, isocouplers or isolating transformers. The



**Figure 2. Electrical beam tilt can be used to direct the signal at a population center.**

additional tower height produced by the addition of a vertically mounted FM antenna increased the AM radiation

and could result in interference, requiring a modification of the AM license. To save this re-engineering cost, FM antennas were often side-mounted on AM transmitters.

### Tilt and fill

As FM antennas rose higher and antenna power gain increased to take care of line losses, it became necessary to take *beam-tilt*

into account. As the radiated signal's vertical beam-width narrowed, areas near the transmitter lost service, and more of the radiated signal was wasted in the upper air. Therefore, the beam has to be tilted either electrically or mechanically to return the signal to its proper place.

Mechanical tilting is comparatively easy. The antenna can be mounted at slightly less than 90 degrees to the horizontal plane so that the tilted beam illuminates the desired area. However, 180 degrees in the opposite direction from the now-served area, the signal is pointed toward the sky, thus less signal serves the listeners on the ground on that side. For this reason, mechanical tilting only works in unusual cases.

If a station is on the edge of a lake or seashore where signal on the backside is not needed, tilting the antenna works well. However, if the signal needs to be "bent" downward all around the transmitter, the electrical method must be used. Associated with beam tilt is *null fill*, which is often required because vertical nulls develop as additional bays are added.

About half a degree of beam tilt is usually sufficient to take care of overshoot. This amount of beam tilt is easily produced by advancing the current phase in the upper bays and delaying it in the lower bays. During design stages, the antenna engineer determines the required degree of phase control.

When deciding on a new antenna, examining the vertical and horizontal pattern is essential. Determine

# Finally...

## A Portable MiniDisc Recorder As Professional As You Are.



### FEATURES INCLUDE:

#### Flexible Recording System

- Recording Modes: Mono, Dual Mono (L = 0dB, R = -15dB), Stereo, Combined Stereo (L+R on 1 track)
- Record Level Settings: Manual, Manual with Limiter, and Automatic
- One Touch Recording with Separate Record-Pause Button
- Automated Level Sync Recording (LSR) System with Programmable Parameters
- Two Position Ambient Noise Cancel (ANC) Filter: High Pass, Band Pass
- Control of SCMS: On, Off
- Time/Date Stamp

#### Vital Security Features

- Pre-UTOC Writing at Track Start to Secure Recordings in Case of Power Loss
- 40 second (20 sec. 2-Track) Audio Buffer for Shock Resistance
- Pre-Record Audio Cache (up to 2 sec.) to Protect Against Missed Starts
- Low Battery Alarm

#### MiniDisc Standards

- Supports Recording and Playback in 1-Track Mono (148min) or 2-Track Stereo (74min)
- Complete Onboard Editing System
- Full Text Display and Editing

#### Full Compliment of Professional I/Os

- Stereo XLR Mic/Line Inputs with 48V Phantom Power
- Ultra-Quiet Mic Pre-Amps with Variable Attenuator: 0dB, -15dB, -30dB
- Stereo RCA Analog Line Outputs
- RCA Digital Input (SPDIF) with Sample Rate Converter
- XLR Digital Output (SPDIF)
- Headphone Jack with Level Control
- Built-In Microphone & Speaker



2480 S.E. 52nd Street  
Ocala, Florida 34480-7500  
Tel: 1-352-622-7700  
Fax: 1-352-629-7000

Circle (150) on Free Info Card

**SUPERSCOPE**

WWW.SUPERSCOPE-MARANTZPRO.COM

**marantz**  
**PROFESSIONAL**

# ANTENNAS

where nulls will fall, and have the manufacturer modify the antenna to take care of the problem. Many times, when a new antenna is installed, poorer reception results in some important areas because the vertical pattern was not checked.

## Going directional

Directional FM antenna development and design are quite different from that for AM. The former has stemmed

from the experiences of broadcasters. The first FM stations probably put their antennas on a tower or on top of a building, let the signal flow and awaited the results. It appears that not a great deal of thought was given to the effect of the antenna support until about 20 years ago. Early FM broadcasters knew that side-mounting sometimes provided good general coverage with a few areas of spotty or poor reception. When circular polarization became popular, broadcasters began to pay attention to the polar plots of vertical and horizontal radiation. Vertical and antenna plots were examined, and the often tremendous differences between the strongest signal in each polarization on the same azimuth were noticed.

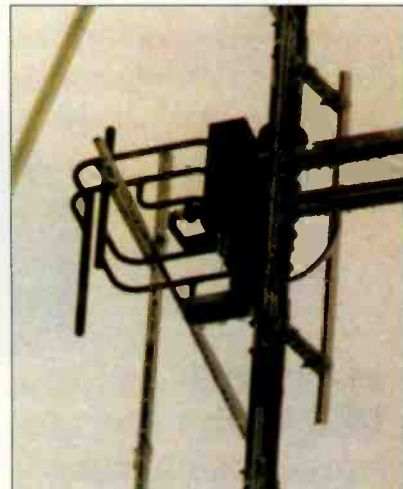
Savvy engineers took advantage of the directional effect of the tower

on an omnidirectional antenna. They were able to produce an FCC-acceptable nondirectional signal in a favorable direction through judicious antenna positioning. As FM close-spacing developed, directional antennas became a necessity. In FM, an antenna's planned directivity is developed by taking the tower into account and adding vertical and/or horizontal parasitic radiators to produce the desired pattern. The exact number of parasitic rods depends on the individual case.

Vertical tower sections have a strong effect on *vertical polarization (VPOL)* when the antenna is side-mounted and close-in. Similarly, horizontal sections can affect the *HPOL*. After a directional FM antenna is designed by the manufacturer, it is tested with either a full-scale model on the actual tower section or a scaled-down VHF or MW version.

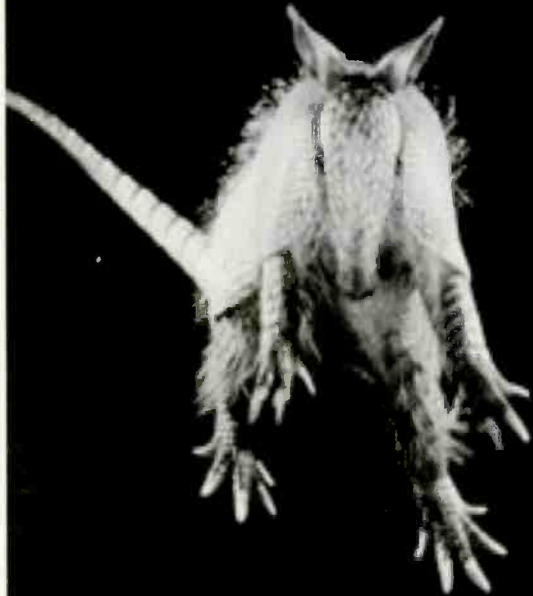
Directional FM antennas are not usually proofed in the same manner as AM directional antennas. Only in exceptional circumstances are field strength surveys made. Aircraft, usually helicopters, are being used more frequently because they can provide extremely good coverage information. The consulting engineer either uses the antenna plot supplied by the antenna manufacturer or a plot modified to suit the engineer's requirements. If the manufacturer can meet these specs, an application for construction permit is filed.

After the CP is granted, the manufacturer designs, builds and tests the directional FM antenna. The company then ships the antenna, which is installed and put on the air. The test results that the manufacturer supplied are filed



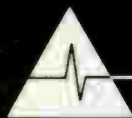
Parasitic elements can be added to an antenna to give it directional qualities. Photo courtesy of Shively Labs.

## JUMP FOR JOY!



Now you can own a high performance solid-state AM transmitter for a lot less!

Call today for details.



**ARMSTRONG**  
TRANSMITTER CORPORATION  
**Total RF Systems Solutions**

4835 North Street, Marcellus, NY 13108  
Tel 315-673-1269 Fax 315-673-9972  
e-mail:sales@armstrongtx.com

Circle (151) on Free Info Card



# PROtalk 4

On-Air Telephone Controller

## Just One Look...

..is all it takes. Introducing the PROtalk 4. An on-air telephone system at just the right size and price. Its unique, simple design is the basis for an ideal 4 line on-air solution.

The large, icon-based buttons are easy to read and make assessing the status of your phone board a "one look" process. The buttons are backlit, giving color highlight to the elegant work surface and ensuring accuracy at a glance. Your on-air talent will dedicate their time and energy to the program, not the equipment.

The PROtalk 4 delivers ease of use, robust work surface with rack-mount hybrid technology and attractive introductory pricing. We're sure just "one look" will make the PROtalk 4 your next on-air phone system.



For more information,  
or to purchase the  
PROtalk 4, visit our  
website, or call  
1-888-890-7424

## Broadcast Telephone Systems

22 - 100 Kal Lake Road

Vernon, BC V1T 9G1

phone: 1-888-890-7424

fax: 1-250-260-2871



<http://www.broadcast-telephones.com>

Circle (139) on Free Info Card

# ANTENNAS

with the application for license in the same manner as an AM DA application is filed.

## Cable considerations

It is important to pressurize coaxial cable; doing so will keep moisture out. Moisture can cause corrosion of the internal bullets that connect the center-line sections and can lead to arcing and the development of hot spots in the cable.

*Skin effect* can also take a toll on air dielectric cable that has developed a dirty, oxidized coating. VHF-FM experiences skin-effect conditions of travel along the surface of, rather than through, the copper center conductor. It has been estimated that as much as 40 percent of the signal can be lost in upper-band, UHF-TV frequencies from old, dirty, oxidized, unpressurized line. Even at lower-frequency FM, the skin effect can be noticeable.

Apart from preventing downtime caused by coaxial line damage, it is important to remember that unpressurized air dielectric line *could* account for unexplainable drops in coverage or signal strength.

## Deicing

An important consideration for the FM engineer is deicing. Deicing can be accomplished by means of heating the elements or by using a plastic *radome*. The radome prevents ice from collecting on radiators and producing an increased VSWR that is often sufficient to knock a transmitter off the air and cause line damage.

Antenna heaters are expensive to install and run. In some FM antennas,

the radiating element itself is used as a heat radiator. The heating current actually runs through it and thus heats it. Other antennas have a heater element inside the radiators.



**Metal guy wires should be kept clear of FM antennas so as to not interfere with their radiation.**

In most cases, it seems that radomes provide the best answer. There is no initial installation expense or continuing expense for power. If the proper material is used for the radome and it is sufficiently far from the radiator so that ice buildup cannot change the VSWR, there is no loss of

signal and no expense for heating. Unfortunately, wind loading increases, which has to be considered when planning the installation.

## Broadband antennas

FM antenna design has progressed from simple dipoles to today's highly efficient broadband antennas. We have seen the development of triangular loops, square loops, simple rings, ring antennas with capacity plates on the ends of the elements, various shapes of twisted and skewed antennas, helix, cylindrical and the increasingly popular panel-type antennas.

Depending on the tower shape and size, the panel antenna closely approximates a circular pattern. It also lends itself well to the multiplexing of several transmitters into a single antenna and provides good directional antenna control.

When using guyed towers for FM antenna support, ensuring that metallic guys do not pass in front of the antenna aperture is crucial. Any metallic objects close to the radiator will produce gross pattern distortion and many operating problems.

If guys have to pass in front of the antenna because of antenna mounting requirements, Phillystran or another type of nonmetallic guy must be used. It can be expensive in terms of insulators and labor to break up metal guys into the extremely short sections that will not affect the radiated signal.

## Innovative solutions...



Your new digital transmitting equipment sounds great! There's no arguing about that. But your jocks can't stand the delay they hear in the monitor when they go live. And let's face it, you're getting pretty tired of hearing the complaints. The CAS-1 Con/Air Switcher can solve both of these problems.

**Got digital gear? You need a Con/Air Switcher**

 **Sine Systems, inc.**  
innovative solutions

615 • 228 • 3500 (vox)  
615 • 227 • 2367 (fax)  
615 • 227 • 2393 (f.o.d)  
[www.sinesystems.com](http://www.sinesystems.com)

*This is the eighth in a series of nine articles on basic broadcast antennas. Upcoming installments will appear monthly in BE Radio throughout 1999. Once all the installments have been published, the series will be available for purchase as a single document. For more information regarding bulk orders of this series in quantities of 500 or more, contact Jenny Eisele at 913-967-1966.*

E-mail John at: [batcom@bright.net](mailto:batcom@bright.net).

**FOR MORE INFORMATION**  
Circle (206) on Free Info Card

Circle (140) on Free Info Card



# Announcing the *Prima* <sup>LT</sup>™

Another *Breakthrough* Codec from MUSICAM USA!



The Prima LT is the newest addition to our line of superb digital audio codecs. It is stereo, bi-directional, and comes with MUSICAM-enhanced MPEG Layer 2, MPEG Layer 3 and G.722 algorithms for maximum compatibility. Prima LT accepts one digital interface module for direct connections to ISDN, V.35, X.21 or RS422.

#### Highest Audio Quality

- ▲ 24-bit A/D and D/A Converters
- ▲ MUSICAM-enhanced MPEG Layer 2
- ▲ Dynamic Range better than 92 dB
- ▲ Ultra low distortion at less than 0.01%
- ▲ Data rates to 384 kb/s
- ▲ AES/EBU/SPDIF optional

#### Easiest to Use

- ▲ "One Touch" auto dialing
- ▲ Simple, intuitive menu navigation
- ▲ Connects to any MPEG or G.722 codec
- ▲ Software upgrades via Internet
- ▲ Removable rack mounts for desktop operation

**Unmatched value at \$3,495 ISDN Ready.  
Call now for more details.**

670 North Beers Street Bldg. 4  
Holmdel, NJ 07733 USA  
Tel.: 732-739-5600  
Fax: 732-739-1818



**MUSICAM USA**

<http://www.musicamusa.com>  
E-Mail: [sales@musicamusa.com](mailto:sales@musicamusa.com)

MUSICAM USA is the d/b/a of Corporate Computer Systems, Inc., Holmdel, NJ, USA

Circle (141) on Free Info Card

Home  
Free Info  
News  
Currents  
News • Business  
People

# Don't wait two weeks for your radio news!

Check out the latest  
news and business  
developments everyday

[www.beradio.com](http://www.beradio.com)

the online arm  
of radio's leading  
technology magazine.



Classifieds

## Also online:

Contact Us  
**Studio Spotlight, Tech Tips, Article Archives, Field Reports**

## For Online Product Information

For you, the Internet is a tool, not a toy. You don't have time to fill out cards, send it out via snail mail and then wait and wait and wait. But what else can you do?

Now get your inquiries answered faster with BE Radio's NEW online reader service "cards." Your request is automatically e-mailed to the companies who have the product, or you can link directly to Web sites for the service information you need.

Log on

To [www.beradio.com](http://www.beradio.com)

# Windows to the Web



[www.contelec.com](http://www.contelec.com)

**Continental Electronics:** Things to find on the [www.contelec.com](http://www.contelec.com) Website are: District Sales Manager's contact data; Factory Marketing & Sales personnel contact data; E-Slide - FREE engineering software; Product Line Descriptions and Specifications; Links from Broadcast Supply Division to vendor Web sites.



[www.omt.net](http://www.omt.net)

**OMT Technologies:** MediaTouch by OMT Technologies provides radio stations with state of the art digital audio systems for live assist or full automation use. With over 14 years of broadcast experience, MediaTouch has innovative software solutions starting as low as \$995. Surf to MediaTouch, see our exciting new products, and find out how our clients sound better and save money with our unsurpassed quality, reliability, and support.



[www.beradio.com/studio.cfm](http://www.beradio.com/studio.cfm)

**The Studio Spotlight:** BE Radio brings you into some of the newest radio on air and production facilities in the country. This website feature shows you the studios and tells you what was done to make it the showcase facility that it is. All the previous installments are available in the Spotlight Index. Show the world what your facility looks like. If you would like your studio featured in the Studio Spotlight, send a message to [beradio@intertec.com](mailto:beradio@intertec.com) and tell us about your facility.



[www.neutrikusa.com](http://www.neutrikusa.com)

**NEUTRIK USA, Inc.:** The NEUTRIK USA, Inc. website features direct links to various sites including Authorized Distributors, Sales Representatives, NEUTRIK USA, Inc. offices and our parent company's website for on-line access to spec drawings through WHIP files. Viewing includes a What's New section for new product introductions and a Trade Show section so that you can come see our products in person!



[www.beradio.com](http://www.beradio.com)

**BE Radio magazine:** BE Radio gives radio station managers and engineers the information they need to make critical equipment purchase decisions. The magazine is published 10 times a year and distributed to over 14,000 qualified subscribers in North America. Look online for the Studio Spotlight - an exclusive Website feature showcasing some of the newest radio facilities in North America.



[www.dataworld.com](http://www.dataworld.com)

**Dataworld:** Dataworld is an industry-leading information services company founded in 1971. Twenty-eight years of software development and data processing experience allows Dataworld to set trends in information services and solutions. Click on Dataworld's home page for exciting information on our Flag Service, the production of DataXpert and our new line of digital television services.

# New Products



## Portable recorder Sonifex

◀ **Courier ISDN:** Version 2.5 software for brings the unit up to the level of a portable ISDN codec to provide live audio as well as powerful recording and cut-and-paste editing features. Uses MPEG Layer II compression to send mono 11kHz bandwidth audio using an ISDN line. Compatible with Telos, CCS,

Dialog 4 and Prodys codec equipment. Uses a PCMCIA hard disk or card as its recording media to record MPEG, BWF or .WAV audio data files. Has scrub-wheel graphical editing facilities and built-in communications software. The PCMCIA card can be slotted into a PC for instant editing. Compatibility with Enco DADPro32 and Apple AIFF systems has been announced.

+44 1933 650700; fax +44(0)1933 650726;  
www.sonifex.com.uk  
Circle (256) on Free Info Card

## Broadcast Receiver Crown Broadcast

**Professional Single/Dual Broadcast Receiver:** Performs off-air monitoring, logging, automation control and calibration as well as providing an MPX signal for translators. Has a frequency range of 87.5MHz to 108MHz and is designed for multiple uses. S/N of better than 75dB and total harmonic distortion of less than 0.2 percent. Balanced audio outputs (0db to 8db left and right) on XLR connectors minimize noise and hum. Stereo separation is greater than 65dB and adjacent-channel rejection is greater than 40dB. Carrier and audio alarm relay contacts allow the unit to be used as an off-air automated monitoring system for switching ancillary equipment due to loss of audio or carrier signals.

800-294-8050; fax 219-294-8222;  
www.crownbroadcast.com  
Circle (254) on Free Info Card

## Digital on-air processor Circuit Research Labs

**Millenium:** One-hundred percent digital signal processing. 32-bit floating-point processing array. Analog and digital interface standard. Multiple dimensional/parallel architecture. Maintains the familiar look of a graphical user interface. Two RS232 serial ports for complete PC and modem connectivity. Remote-controlled operation via CRL Systems remote-control software. Includes fast standard menus and comprehensive Power User Menus.

800-535-7648; fax 602-438-8227;  
www.crlsystems.com  
Circle (251) on Free Info Card



## Hot button cartwall MediaTouch Systems

◀ **QuicPix:** Cuts can be played one at a time or loaded in the seven-event cut player. Touch the button you want to start and touch it again to stop the cut. Touch fade fades out all playing items. Talent can drag and drop segue makers and reposition cuts on the cut player. Twenty-four hot buttons in radio mode; 40 in sports mode. Up to four overlapping audio streams for beds and effects (two audio cards equals four audio play). Touchscreen or mouse compatible. Sorts by cut ID, title, artist, length and intro time or category. Color-coding alerts talent that a cut has been aired recently.

888-665-0501; fax 204-783-5805;  
www.omt.net/media.html  
Circle (252) on Free Info Card

## New active "Hub" components Radio Systems

**StudioHub components:** The first is a 2x12 out distribution amplifier and the second is a mixer amp for automation systems. These active components are powered by the StudioHub integral DC-Link system.

609-467-8000; fax 609-467-3044;  
www.radiosystems.com  
Circle (262) on Free Info Card

## Digital audio software Prophet Systems

**CD/Extractor:** The program allows you to record a 3 1/2min CD track in 30sec with no distortion. Built-in levelers and tones assure maintenance of the song's integrity. Available as a stand-alone product or as an integrated component to run on a dedicated NexGen Digital Broadcast system. Capable of importing multiple CD tracks while passing data to NexGen Digital. Can automatically gather Internet information on the album or song. Uses .WAV and compression technology.

800-658-4403; fax 308-284-4181;  
www.prophetsys.com  
Circle (257) on Free Info Card

## NewsReady32

The LAN/WAN/WEB Newsroom System  
Now Connecting Jacor Coast to Coast

**WR** 800-833-4459  
www.WireReady.com  
**WireReady**

Circle (300) on Free Info Card

# 1 SHOWCASE. 2 NETWORKS. 5 STATIONS. 25 STUDIOS. 300 USERS.

**At EMMIS,  
It Adds Up to  
AudioVAULT.**

EMMIS Communications' \$25 million headquarters in Indianapolis did the math and built the most notable radio installation in the U.S. with AudioVAULT as its digital audio delivery system.

Why AudioVAULT? Just Listen to Chief Engineer, Dave Hood...

*"I made a career decision to go with AudioVAULT. This system had everything I was looking for - scalable, flexible, user friendly, reliable and is backed by the great service from Broadcast Electronics."*

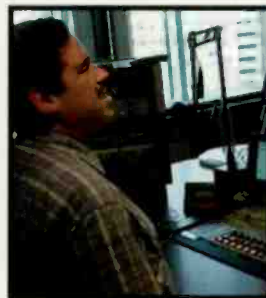
Do the math yourself. From single station operations to mega-opolies, there's an AudioVAULT system customized to your needs. Get a lock on today's digital studio ... lock on to AudioVAULT.

**Thanks, EMMIS, for  
putting your trust in  
Broadcast Electronics  
and AudioVAULT.**

**Audio  
VAULT®**

**www.bdcast.com  
or (888) 232-3268**

e m m i s



### **Visually Impaired DJ Rocks On.**

When EMMIS Communications chose AudioVAULT, DJ Bernie Eagan didn't want to be left behind. Bernie is blind and one of EMMIS's best on-air talents. To accommodate, BE installed a special Braille console, free. The interface with AudioVAULT was seamless and Bernie keeps rockin' on.



**Solutions for  
Tomorrow's Radio**

Circle (142) on Free Info Card

BER 1099 ©1999 Broadcast Electronics, Inc. BE emblem is a registered trademark of Broadcast Electronics, Inc.

## New Products

### M/S and stereo pre-amp

#### AETA Audio Corp

**PSP 3:** An M/S codec that converts consumer portable recorder into a professional level input device. Weighs less than 1.4 lbs. Mounts to your belt or attaches directly to your portable recorder. Adjustable M/S sound field. Master level and balanced controls. Adjustable mic sensitivity. XLR balanced I/Os. Phantom power (48V or 12V). Battery and external DC power.

973-659-0555; fax 973-659-9555;  
www.aetausa.com  
Circle (259) on Free Info Card

### Solid-state AM transmitter

#### Armstrong Transmitter

**AM 1000S:** Capable of 150-percent positive modulation. Designed to accept the digital IBOC signal. Three power levels. Totally remote controllable. Four 300W RF modules for extra reliability and headroom. Two independent high efficiency switching power supplies for redundancy.

315-673-1269; fax 315-673-9972;  
www.armstrongtx.com  
Circle (258) on Free Info Card

### Digital audio codec

#### Musicam USA

**Prima LT:** Sports many of the features users value in the CD Prima 120 codec. This fully bidirectional codec accepts one ISDN, V.35 or X.21/RS422 interface module. Comes with 24-bit A/D and D/A converters and provides Musicam-enhanced MPEG Layer II, MPEG Layer III and G.722 coding. Front panel includes a large LCD display, large-dial keypad and a simplified menu tree. Comes with a speed directory capable of storing more than 250 addresses.



732-739-5600; fax 732-739-1818;  
www.musicamusa.com  
Circle (250) on Free Info Card

### Digital audio cable

#### Gepco International

**552604GFC:** The latest addition to the 5526GFC digital audio multipair series.

Designed for transmission of 110-ohm AES/EBU digital audio. Features 26-gauge conductors insulated with a precision, low-loss dielectric, and shielded by 100-percent foil Mylar (with drain wire). Integrates a nonconductive polyethylene rod that is twisted together with the insulated conductors. Construction provides structural support and maintains the characteristic 110-ohm impedance of the pairs.

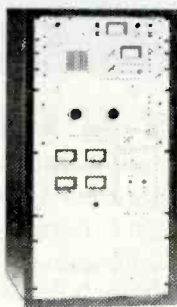


800-966-0069; fax 847-795-8770;  
www.gepco.com  
Circle (260) on Free Info Card

# Superior Broadcast Products

Quality Products at Reasonable Prices

## FM Transmitters



High Performance Solid State Exciter  
Solid State IPA Amplifier  
One Year Limited Warranty  
Factory Service

On site check out by factory personal available

1,000 watt .....	\$5,990.00
2,500 watt .....	\$11,990.00
5,000 watt .....	\$18,990.00
10,000 watt .....	\$24,990.00
15,000 watt .....	\$34,990.00
20,000 watt .....	\$37,990.00

20 Watt Solid State Exciter - \$995.00

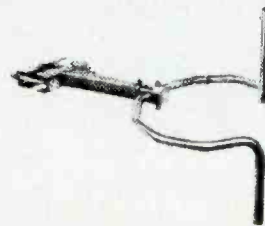
Solid State FM Transmitters with Digital Exciter

120 watt .....	\$2,800.00	2,000 watt .....	\$12,900.00
300 watt .....	\$3,500.00	3,000 watt .....	\$19,990.00
1,000 watt .....	\$7,990.00	5,000 watt .....	\$29,990.00

## FM Antennas

All Power Levels 500 watts to 20,000 watts per bay

As low as.....\$395.00 per bay



\* RF Coaxial Patch Panels  
\* FM Combiners

### FM AMPLIFIERS

100 watt.....	\$995.00
300 watt.....	\$1,790.00
500 watt.....	\$2,990.00

FM STL  
Both Transmitter  
and Receiver  
**\$3,500.00**

FREQUENCY AGILE  
FM TRANSLATOR  
**\$2,500.00**

Contact Jimmie Joynt 17194 Preston Road, Suite 123-297 • Dallas, Texas 75248

Ph: 972/473-2577 • 800/279-3326 • Fax 972/473-2578 • 800/644-5958

Circle (143) on Free Info Card

# Easycorder

The portable digital recorder



**MAYCOM**  
AUDIO SYSTEMS BV

Address: Dorpsstraat 29  
6661 EG Elst

The Netherlands

Tel.: +31 (0) 481 - 377 740

Fax: +31 (0) 481 - 377 380

Email: [sales@maycom.nl](mailto:sales@maycom.nl)

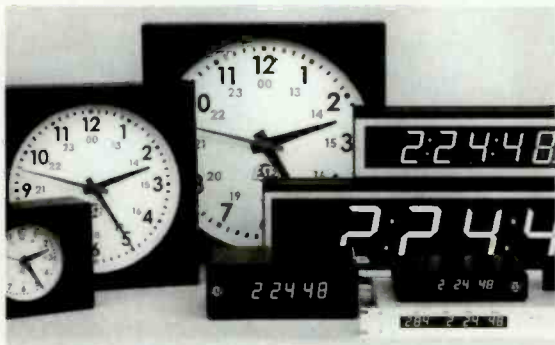
Http: [www.maycom.nl](http://www.maycom.nl)

Circle (152) on Free Info Card

- Over 6 hours non-stop operating
- Over 15 hours standby
- Internal solid state storage
- MPEG/Linear
- PC-Card interface
- Graphical non-destructive editing
- Transmission
- No moving parts
- Patent pending

"Remember that time is money."  
 - Benjamin Franklin

# When you must, must have precision timing



**W**hen you require the best, most accurate in precision timing look only to ESE. Designed for "Precision Timing", ESE Master Clocks & Accessories have been the industry standard for over 27 years.

Whether using GPS, WWV, Modem, Crystal or line frequency accuracy - all ESE Master Clocks can drive digital or analog slave clocks, as well as interface with video and/or computer based systems. Call for more details.



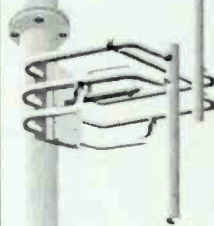
142 Sierra Street • El Segundo, CA 90245 USA  
 Phone: (310) 322-2136 • Fax: 310.322.8127  
[www.ese-web.com](http://www.ese-web.com)

Circle (156) on Free Info Card

## Shively Labs

Reach for Ratings!

Shively Antennas Deliver Coverage!



- Superior Engineering
- Multistation Solutions
- Filters & Combiners
- Translators
- Reliable Pattern Studies
- Coax

FM & TV Antennas  
 and Related RF Equipment

because ... it pays to be heard!

P.O. Box 389, Bridgton, ME 04009 USA  
 Tel.: (207) 647-3327 FAX: (207) 647-8273  
 1-888-SHIVELY e-mail: [sales@shively.com](mailto:sales@shively.com)  
 Web: [www.shively.com](http://www.shively.com)  
 - An Employee-Owned Company -

Circle (159) on Free Info Card

## TRANSCOM CORP.

Serving the Broadcast Industry Since 1978

FOR INFORMATION & THE LATEST PRICES,

VISIT OUR WEBSITE-[www.trcorp.com](http://www.trcorp.com)

SEND YOUR E-MAIL REQUESTS TO: [transcom@trcorp.com](mailto:transcom@trcorp.com)

Fine Used AM & FM Transmitters. Authorized Representatives for all major equipment manufactures. Let us send you a customized quote!

AM TRANS-MITTERS	FM TRANS-MITTERS
1 KW AM 1979	100 W FM 1985
5 KW AM 1980	100 W FM 1985
10 KW AM 1982	2.5 KW FM 1974
50 KW AM 1978	2.5 KW FM 1984
50 KW AM 1982	2.5 KW FM 1976
50 KW AM 1981	3 KW FM 1975
	3.5 KW FM 1986
	5 KW FM 1988
	5 KW FM 1983
	5 KW FM 1980
	5 KW FM 1982
	5 KW FM 1967
	10 KW FM 1967
	10 KW FM 1962
	25 KW FM 1981
	25 KW FM 1981
Harris MW1A	Harris FM 100K
CSI T-5-A	Harris FM 100K
Harris MW 10A	Harris FM 2.5H3
Continental 317C-1	Continental 814R1
Harris MW-50B	Collins 831 D
Harris MW-50B	CSI FM 3000E
	Harris 3.5K
	Harris FM 5K1
	Harris FM 5K
	Harris FM 5K
	Continental 816R1
	Collins 830E
	Collins 830F1
	RCA BTF 10D
	Harris FM 25K
	Harris FM 25K

P.O. Box 26744, Elkins Park, PA 19027  
 800-441-8454 • 215-938-7304 • FAX No. 215-938-7361

Circle (165) on Free Info Card



# Sound Experience Sound Partners

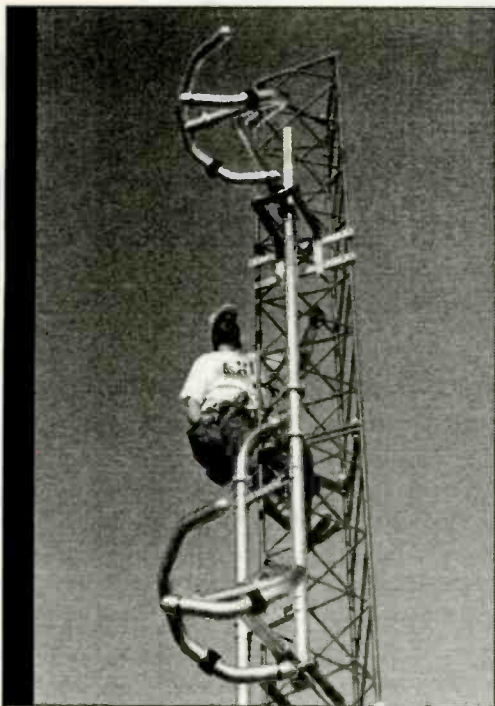
**D**ielectric Communications has installed 3/4 of all the digital antennas in the USA. As a radio broadcaster, you're planning that 21st century digital transition for your audiences also. Let's work together to develop a system with clearer signals now and digital capabilities later. From digital ready combiner systems, transmission lines, and antennas, to complete engineered RF systems, Dielectric is your FM resource today and DAB partner tomorrow.

Dielectric Communications • 22 Tower Road • Raymond, Maine 04071  
1-800-341-9678 • Email: [dcsales@dielectric.com](mailto:dcsales@dielectric.com) • [www.dielectric.com](http://www.dielectric.com)



**Dielectric**  
COMMUNICATIONS

*Engineering Excellence Since 1942*



ERI, SHPX series FM Antenna and  $\lambda$  Mounting System

**ERI**<sup>®</sup>

your single source for:

- FM Antennas and Filters
- $\lambda$  Mounting System
- Towers & Poles
- Structural Analysis
- Lightning Protection
- Grounding Systems
- Installation & Service

Call for special package price

**ERI** ELECTRONICS RESEARCH, INC.  
812-925-6000

Circle (160) on Free Info Card

**Switcher tools**

Designed by broadcast engineers for broadcasters, our audio and digital audio switchers offer excellent sonic quality, removable I/O connections, contact closures and serial remote control capabilities and flexible mounting accessories.



**SS 12-4**

Active crosspoint switching/routing with 12 stereo inputs and 4 stereo outputs.



**8X2D**

Active crosspoint switcher with 8 stereo inputs, 2 stereo and 2 mono outputs



**SS 3.1**

Passive switching/routing with 3 stereo inputs and one stereo output or vice-versa.



**10X1**

Passive switching/routing with 10 stereo inputs and one stereo output or vice-versa.



**6X1G**

Passive switching/routing with 6 stereo inputs and one stereo output, or vice-versa.



**SS 2.1/BNC**

Passive switching/routing with 2 composite audio, video, or AES/EBU inputs to 2 composite audio, video, or AES/EBU outputs, or vice-versa.



**SS 8.2**

Active crosspoint switching with 8 stereo inputs, 2 stereo plus 2 mono outputs.



**3X2B**

Active crosspoint switcher with 3 stereo inputs and 2 stereo outputs.



**SS 2.1/TERM**

Passive switching/routing with two stereo inputs to one stereo output or vice-versa.



**8x1 DAS**

Routes any one of eight AES/EBU digital inputs to split outputs.

*Check out our web site for product information, list pricing and a list of distributors!*

Internet: [www.broadcasttools.com](http://www.broadcasttools.com) E-mail: [bti@broadcasttools.com](mailto:bti@broadcasttools.com)

Voice: 360 . 428 . 6099  
Fax: 360 . 428 . 6719

**BROADCAST**  
**tools** inc.

Circle (161) on Free Info Card

# **PACEMAKER**

by **AUTOGRAM**



## **TWO CABINET SIZES**

**Model PM218**  
Up to 18 Modules

**Model PM228**  
Up to 28 Modules

## ***SHOWCASING THE FOLLOWING***

- New Modern Styling and Color with Wood End Bells
- **EXCLUSIVE BI-MODULAR CONCEPT**
- All DC control – easy replacement of front panel modules with no clicks or pops
- Same **AUTOGRAM** dependable screw-type plug-in connectors
- Easy installation with convenient changes post-installation
- **INCREDIBLE NUMBER OF INPUTS !!!**  
PM228 – up to 56 stereo inputs, PM 218 up to 40 stereo inputs
- Start with as few modules as needed – expand later!
- Uses similar switches and the same Penny & Giles pots as original Pacemaker
- No incandescent lamps on switches – **ALL LED ILLUMINATION!**
- New State Of The Art external power supply!
- Self-resetting “Poly-Fuses” protect individual circuit boards
- **AUTOGRAM** Autoclock standard in all units!
- Lighted meters !! 6 on PM228, 4 on PM218!
- Built-in Cue Speaker

***BUILT WITHIN THE AUTOGRAM TRADITION OF VALUE & QUALITY***

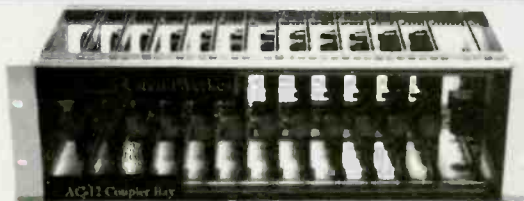
# **AUTOGRAM CORPORATION**

972-424-8585  
FAX 972-423-6334  
800-327-6901

1500 Capital Ave.  
Plano, Texas  
75074

email: [info@autogramcorp.com](mailto:info@autogramcorp.com) • [www.autogramcorp.com](http://www.autogramcorp.com)

## The CircuitWerkes AC-12 Telephone Autocoupler Bay



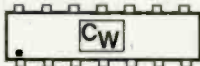
Get up to 12 couplers in a neat, compact chassis

- Auto answer & disconnect.
- 2 audio busses for mass feeds.
- Individually card selectable buss or auxilliary audio I/O.
- The aux. audio jack is ideal for multiple IFB feeds, etc.
- Ring counter answers on user set ring number.
- Momentary or latching dry contact outputs at pickup.
- Remove & install cards without affecting the rest.
- LED indicators for ring, clipping, power & online.
- Check out our Internet web site for more info and technical manuals.

The AC-12 rack-mounted coupler bay is the best way to eliminate a wall or cabinet full of yesterday's couplers. Our unique dual audio busses eliminate the tedious and messy wiring associated with mass feeds. Each card can also individually either send or receive telco audio, making it perfect for IFBs, etc. Best of all, a loaded AC-12 lists for about \$200 per coupler.

### CircuitWerkes

3716 SW 3<sup>rd</sup> Place  
Gainesville, Florida 32607  
(352) 335-6555 / fax 380-0230  
<http://www.circuitwerkes.com>



Circle (162) on Free Info Card



## FM BROADCAST ANTENNA

### FMR Series



- Circular polarization
- Series fed element
- Internal feed
- Brass/Copper construction
- Excellent bandwidth

## PROPAGATION SYSTEMS, INC.

719 Pensacola Road  
Ebensburg, PA 15931 USA  
814-472-5540 • FAX 814-472-5676  
E-mail: [psiba@surfshop.net](mailto:psiba@surfshop.net)

Circle (163) on Free Info Card

Buy simplicity,  
reliability and service.

# EAS

Price \$1750.00

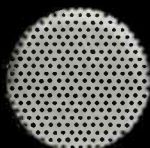
Equipment in-stock  
for immediate delivery.

Phone 740-593-3150

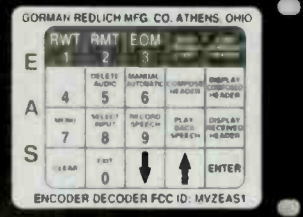
**GORMAN-REDLICH MFG. CO.**  
257 W. Union St. Athens, Ohio 45701

FAX 740-592-3898

Now available  
with  
optional DTMF  
control  
via a phone line.



SPONS: 40711E11 1 14798 1317121051  
DECODER: Scanning  
ENCODER: Ready \* PRINTER NOT CONNECTED \*  
Manual



- 5 two-way RS-232 inputs/outputs for computer, remote signboard & character generator
- 6 audio inputs on standard models. All audio inputs & outputs are transformer isolated from encoder-decoder board
- Automatic interruption of program audio for unattended operation
- 4 line 40 character LCD display with LED backlighting
- 20 key keypad to program unit, set modulation level, set input levels

- Will handshake with automation equipment
- 2 year warranty
- 2 minutes of digital audio storage
- 25 pin parallel printer port for external printer
- 52 terminals on the rear to interface with other equipment by removable plugs
- BNC fitting with 600 OHM balanced audio out for second transmitter

Web Site: [www.gorman-redlich.com](http://www.gorman-redlich.com) • E-mail: [jimg@gorman-redlich.com](mailto:jimg@gorman-redlich.com)

• Also available: weather radios, antennas for weather radios, crystal controlled synthesized FM digitally tuned radios, remote signboards, cables for interconnection, Character generators.

Circle (164) on Free Info Card

# Confiability with Life Time Warranty

## EDUCATIONAL CIRCULAR SERIES

Model	Bays	Power	Gain	Price
MP-1	1	600W	-3.3	\$250
MP-2	2	800W	0	\$680
MP-3	3	800W	1.4	\$980
MP-4	4	800W	3.3	\$1,280
MP-2-4	4	2,000W	3.3	\$1,820
MP-3-5	5	3,000W	4.1	\$2,270
MP-3-6	6	3,000W	5.2	\$2,740

## LOW POWER CIRCULAR SERIES

Model	Bays	Power	Gain	Price
GP-1	1	2,000W	-3.1	\$350
GP-2	2	4,000W	0	\$1,350
GP-3	3	6,000W	1.5	\$1,900
GP-4	4	6,000W	3.4	\$2,600
GP-5	5	6,000W	4.3	\$3,150
GP-6	6	6,000W	5.5	\$3,700

## MEDIUM POWER CIRCULAR SERIES

Model	Bays	Power	Gain	Price
SGP-1	1	4,000W	-3.3	\$690
SGP-2	2	8,000W	0	\$2,690
SGP-3	3	10,000W	1.4	\$3,595
SGP-4	4	10,000W	3.3	\$4,500
SGP-5	5	10,000W	4.1	\$5,300
SGP-6	6	10,000W	5.2	\$6,100

The antenna gain may vary with the frequency. For powers up to 20 KW please, make the request to provide the specific configuration.

OMB also Manufactures:

FM transmitters

TV transmitters

FM and TV Links

TV antennas

Medium power FM antennas

Connectors

Circle 155 on Free Info Card



OMB America

3100 NW 72 Ave #112

Miami, Florida 33122

Phone: 305-477 0974

Fax: 305-4770611

Toll free: 888-OMB4USA

# ENGINEER'S BEST FRIEND!

- Eliminate flanging (hollow room) effect
- Eliminate bad room acoustics
- Hold absolute levels
- Correct voice symmetry
- Front panel input level select +4 to -50 dB
- Three section variable boost and cut equalization
- Compressor/Expander cross coupled for maximum punch
- Built-in earphone jack

**AIRcorp 500PH  
Microphone Processor**



- DE-ESSER designed to protect pre-emphasis curves
- Simultaneous mic level and line level outputs
- Internal 48 Vdc Phantom Supply

**AIR corp**

Call your dealer...  
or call 972-304-0455 FAX: 972-304-0550

Circle (157) on Free Info Card

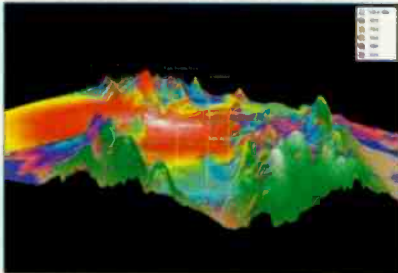
**Your #1 Source  
For Quality  
Used Radio  
Broadcast  
Equipment.**

View our latest list of equipment on-line at:  
<http://www.baycountry.com>  
or call and we will fax it to you.  
All equipment sold with a 15 day return guarantee.

7117 Olivia Rd. • Baltimore, MD 21220 • Ph: 410-335-3136 • Fax: 786-513-0812  
<http://www.baycountry.com> • e-mail: [baycountry@pcbanc.net](mailto:baycountry@pcbanc.net)

Circle (158) on Free Info Card

## BROADCAST ENGINEERING CONSULTING SOFTWARE



Longley-Rice over 3-D Terrain

Professional software packages for preparing FCC applications & plotting coverage. For Windows & NT.

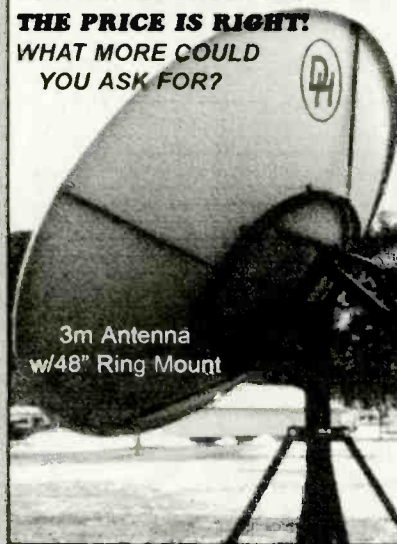
- Create "real-world" coverage maps & interference studies with Longley-Rice, TIREM, PTP, FCC & other models using polygon map features.
- Search for AM, FM, TV, DTV, & LPTV channels with graphics oriented programs and FCC databases.
- Plot STL paths in 3-D using 3-Arc second terrain databases...and more!

**VSoft**  
COMMUNICATIONS  
Broadcast Communications Software  
and Engineering Consulting

800-743-3684 • [www.v-soft.com](http://www.v-soft.com)

Circle (166) on Free Info Card

**THE ANTENNA IS DH!  
THE PRICE IS RIGHT!  
WHAT MORE COULD  
YOU ASK FOR?**



3m Antenna  
w/48° Ring Mount

**Quick Delivery!  
Easy Assembly!  
Delivered Right To The Job Site!**

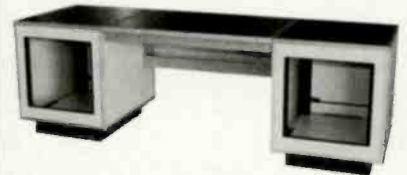
**Call Now!**

**DH Satellite**

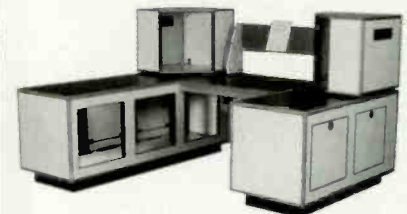
600 North Marquette Rd.  
Prairie du Chien, WI 53821  
**1-800-627-9443**  
Fax: 608-326-4233  
Internet: [designhomes.com/dhsat.html](http://designhomes.com/dhsat.html)

Circle (168) on Free Info Card

## The finest in Modular Studio Furniture



*endless combinations ...  
precision quality ...  
attractive design ...*



**and on SALE!!!!**

**AFS**

**Advanced  
Furniture  
Systems**

1545 N. Washington Ave, Loveland CO 80538  
Phone: 970-663-4123 Fax: 970-663-6338  
Email: [afs@mail.omn.com](mailto:afs@mail.omn.com) Website: [www.omn.com/afs](http://www.omn.com/afs)

Circle (167) on Free Info Card



**Crown**  
Broadcast



## We've got you covered

Crown Broadcast transmitters are designed and carefully engineered to the same reliable high performance standards known worldwide as the hallmarks of Crown products.

Enjoy on-air confidence with compact stand-alone transmitter designs that integrate audio processing, stereo generation and RF amplification. Or choose from custom configurations for versatile solutions to meet your unique broadcast needs. And be confident in your choice, with a three-year warranty backed with service from some of the finest talent in the industry. *Ask us, we can help!*

Call us, visit our web site, or send us e-mail for more information about the versatile transmitters from Crown Broadcast. Crown International, 1718 W. Mishawaka Road, PO Box 1000, Elkhart, Indiana, U.S.A. 46515-1000  
Phone: 800-294-8050 or 219-294-8050; Fax: 219-294-8222 Email: [broadcast@crowntnl.com](mailto:broadcast@crowntnl.com)

[www.crownbroadcast.com](http://www.crownbroadcast.com)

**Crown Broadcast...**  
**making a world of difference**

**STATEMENT OF OWNERSHIP**

Statement of Ownership, Management and Circulation (Act of Aug. 12, 1970; Section 3685, Title 39, United States Code).

1. Publication title: *BE Radio*.
2. Publication number: 1081-3357.
3. Filing date: 9/27/99.
4. Issue frequency: Monthly except bi-monthly in May/June and Nov/Dec.
5. Number of issues published annually: 10.
6. Annual subscription price: Free to qualified.
7. Mailing address of office of publication (street, city, county, state, zip code): Intertec Publishing Corporation, 9800 Metcalf, Overland Park, KS, 66212-2215, Johnson County.
8. Mailing address of the headquarters of general business office of publisher: Intertec Publishing Corporation, 9800 Metcalf, Overland Park, KS 66215-2215, Johnson County.
9. Names and mailing address of publisher, editor and managing editor. Publisher: Dennis Triola, 9800 Metcalf, Overland Park, KS 66215-2215. Editor: Chriss Scherer, 9800 Metcalf, Overland Park, KS 66215-2215. Managing Editor: Tom Cook, 9800 Metcalf, Overland Park, KS 66215-2215.
10. Owner (If owned by a corporation, the name and address of the corporation must be stated followed by the names and addresses of all stockholders owning or holding 1% or more of total amount of stock. If not owned by a corporation, the name and address of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as those of each individual owner must be given. If the publication is published by a non-profit organization, its name and address must be stated: PRIMEDIA Inc., 745 Fifth Avenue, New York, NY 10151.
11. Known bondholders, mortgagees and other security holders owning or holding 1% or more of total amount of bonds, mortgages or other securities (if there are none, so state): None.
12. Tax status: Has not changed during preceding 12 months.
13. Publication title: *BE Radio*.
14. Issue date for circulation data below: September 1999.

**Extent and nature of circulation:**

Average No. of copies each issue during preceding 12 months	Actual No. of copies of single issue published nearest to filing date
A. Total No. of copies printed (net press run)	16,330
B. Paid and/or requested circulation	
1. Paid/Requested Outside-County Mail Subscriptions stated on form 3541 (include advertiser's proof and exchange copies)	14,034
2. Paid in-County Subscriptions (include advertiser's proof and exchange copies)	0
3. Sales through dealers and carriers, street vendors and counter sales, and other Non-USPS Paid Distribution	0
4. Other classes mailed through the USPS	0
C. Total paid and/or requested circulation	14,034
D. Free distribution by mail (samples, complimentary and other free)	
1018	953
1. Outside-county as stated on form 3541	
1018	1018
2. In-county as stated on form 3541	0
3. Other classes mailed through the USPS	0
E. Free distribution outside the mail (carrier or other means)	500
480	
F. Total free distribution (sum of D and E)	1,453
1,498	
G. Total distribution (sum of C and F)	15,487
14,418	
H. Copies not distributed	843
862	
I. Total (sum of G, H)	16,330
15,280	
Percent paid and/or requested circulation (C/Gx100)	89.6%
89.6%	

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including multiple damages and civil penalties).

Dennis Triola,  
Publisher

**CLASSIFIED**



**PROFESSIONAL SERVICES**

**D.L. MARKLEY**  
& Associates, Inc.  
**CONSULTING ENGINEERS**  
2104 West Moss Ave.  
Peoria, Illinois 61604  
(309) 673-7511  
FAX (309) 673-8128  
Member AFCEC

**JOHN H. BATTISON P.E.**  
**CONSULTING BROADCAST ENGINEER,**  
FCC APPLICATIONS AM, FM, TV, LPTV  
Antenna Design, Proofs, Fieldwork  
2684 State Route 60 RD #1  
Loudonville, OH 44842  
419-994-3849 FAX 419-994-5419

**RUSS BERGER DESIGN GROUP INC**  
INDEPENDENT CONSULTANTS  
SPECIALIZING IN:  
RECORDING & BROADCAST FACILITY  
DESIGN & PLANNING,  
ARCHITECTURAL ACOUSTICS,  
NOISE & VIBRATION CONTROL,  
& TECHNICAL SYSTEMS DESIGN  
4006 BELTLINE SUITE 160 DALLAS TEXAS 75001  
972/661-5222 FAX 972/934-3935

**Your Best Source for FCC Rules!**  
**Pike & Fischer, Inc.**  
Available in loose-leaf print, disk, and CD-ROM.  
Call 800-255-8131.

**Rules covered:**  
1, 11, 17, 25, 26, 27, 73, 74, 79, 101

**Applied Wireless, Inc**  
... providing options.  
PO Box 926  
New Market, MD 21774  
tel.: 301.865.1011  
fax.: 301.865.4422  
email: kevinmc@appliedwireless.com  
www.appliedwireless.com  
Kevin McNamara  
President & CEO

Promote your company and products!  
Advertise in BE Radio's Classifieds!  
Call Brian Huber at 1-800-896-9939

**For Sale**

**VIF IDLERS HOLD DOWN KNOBS SEQUOIA ELECTRONICS**  
(408) 363-1646 FAX (408) 363-0957

**Services**

**Consulting Communications Engineers EMC Test Lab**  
• FCC Applications and Field Engineering  
• Frequency Searches and Coordination  
• AM-FM-CATV-TVS-LPTV  
• EMC Test FCC and European (IEC)  
**OWL ENGINEERING, INC.**  
E-mail: info@owleng.com 1-800-797-1338 Fax (612)785-4631  
8899 Hastings ST NE, Blaine, MN 55449 (612)785-4115 Member AFCEC

**HELP WANTED**

**Chief Engineer/WFAN**  
CBS RADIO'S 50KW NON-DA WFAN IN NYC SEEKS A HANDS-ON C.E. EXP. MUST INCLUDE HIGH POWER RF, EAS, Y2K, COMPUTERS, STUDIOS, DIGITAL WORKSTATIONS, NEWSROOM SYSTEMS, BUILDING SYSTEMS, NETWORK ORIGINATIONS, FCC RULES AND REGULATIONS, RESP FOR ALL TECH OPER. & MAINTEN SELF STARTER W/GOOD PEOPLE SKILLS IN A UNION ENVIRON FAX RESUMES: G.M. 718-361-1059. E.O.E.



# Advertiser Index

	Page Number	Reader Service Number	Advertiser Headline	Page Number	Reader Service Number	Advertiser Headline	
Advanced Furniture Systems	76	167	970-663-4123	Innovative Devices, Inc.	57	139	250-260-2661
AETA Audio Corporation	2	101	973-659-0555	Inovonics	48	138	800-733-0562
Aircorp	76	157	9723040455	Intertec Publishing	60		800-298-8606
AKG Acoustics	49	145	615-360-0499	Itelco	9	107	303-464-8000
Antenna Concepts	54	149	530-621-2015	JK Audio	16	119	800-JKA-UDIO
Armstrong Transmitters	56	151	315-673-1269	Kintronic Labs Inc.	20	123	423-878-3141
Audio Broadcast Group	36	131	800-999-9281	Logitek	25	114	800-231-5870
Autogram Corporation	73	154	800-327-6901	Maycom Automation Systems	69	152	+31-481-377740
Bay Country Broadcast Equip.	76	158	410-335-3136	Medialouch	12	110	204-786-3994
Broadcast Electronics	11	109	217-224-9600	Musicam	59	141	732-739-5600
Broadcast Electronics	67	142	217-224-9600	Nautel Electronics	19	122	902-823-2233
Broadcast Software Intl	10	108	888-BSI-USA1	Neumann	17	121	860-434-5220
Broadcast Technology	46	136	719-336-3902	NPR Satellite Services	15	118	202-414-2620
Broadcast Tools	72	161	360-428-6099	OMB America	75	155	305-477-0974
CBSI Custom Business Sys	81	102	800-547-3930	Orban	39	132	510-297-2774
Circuit Research Labs	45	135	800-535-7648	Prime Image Inc.	23	113	408-867-6519
Circuitwerkes	74	162	352-335-6555	Propagation Systems Inc.	74	163	814-472-5540
Coaxial Dynamics, Inc.	40	134	800-COAXIAL	Satellite Export	31	116	800-470-3510
Computer Concepts Corp.	53	148	913-541-0900	Scott Studios	41	117	800-726-8877
Comrex Corp.	51	146	800-237-1776	Shively Labs	70	159	207-647-3327
Comrex Corp.	7	105	800-237-1776	Sierra Automated Systems	37	130	818-840-6749
Crown Broadcast	77	144	800-294-8050	Silicon Valley Pwr Amplifier	40	133	408-986-9700
Cutting Edge	21	125	216-241-7225	Sine Systems	58	140	615-228-3500
DH Satellite	76	168	608-326-8406	Solid Electronics Labs	16	120	610-353-9449
Dielectric	71	153	207-655-4555	Studer Professional Audio	35	128	411-870-7511
DPA Mics/TGI N.A.	34	127	519-745-1158	Superior Broadcast Prod.	68	143	972-473-2577
Electronic Associates	50	147	915-595-3103	Superscope/BGS	55	150	352-622-7700
ERI - Electronics Research Inc.	72	160	812-925-6000	S.W.R. Inc.	38	129	800-762-7743
ESE	70	156	310-322-2136	Transcom Corp.	70	165	800-441-8454
Gentner Communications	5	106	800-945-7730	V-Soft Communications	75	166	319-266-8402
Gorman Redlich Mtg. Co.	74	164	740-583-3150	Wheatstone Corporation	82	103	252-638-7000
Harris Corp./Enco	3	104	800-622-0022	Windows to the Web	65		913-967-1848
Harris Corp.	26-29	115	800-622-0022	Wireready	14, 22, 66	112	800-833-4459
Harris Corp.	47	137	800-622-0022	360 Systems	13	111	818-991-0360
Henry Engineering	20	124	626-355-3656				
Industry Click	33	126	816-300-0323				

# BE Radio

## EDITORIAL

Chris Scherer, CSRE, Editor  
Skip Pizzi, Executive Editor  
John H. Battison, P.E., Technical Editor, RF  
Dana Martin, Associate Editor

## ART

Michael J. Knust, Art Director

## BUSINESS

Dennis Triola, Group Publisher  
Rachelle Thomas, Marketing Director  
Kathy Lewis, Advertising Coordinator  
Mary Mitchell, Classified Advertising Coordinator  
Sherr Gronli, Corporate Circulation Director  
Leann Sandfar, Circulation Manager  
Customer Service: 913-967-1711 or 800-441-0294

## TECHNICAL CONSULTANTS

Harry C. Martin, Legal  
Kevin McNamara, CNE, Computer Technology  
Russ Berger, Broadcast Acoustics  
Donald L. Markley, P.E., Transmission Facilities  
Jerry Whitaker, CPBE, Contributing Editor  
Yasmin Hashmi, International Correspondent  
Stella Plumbridge, European Correspondent

## MEMBER ORGANIZATIONS

Sustaining Members of the following:

- Acoustical Society of America
- ARMA
- Audio Engineering Society
- Society of Broadcast Engineers
- Member, American Business Press
- Member, BPA International



## Intertec Publishing Corporation

Raymond E. Maloney, Chairman  
Cameron Bishop, President & CEO  
Ron Wall, Chief Operating Officer  
John Torre, Vice President, Entertainment Division  
Tom Cook, Director of Editorial Development  
Stephanie Hanaway, Div. Dir. of Marketing  
Doug Coonrod, Corporate Creative Director

## PRIMEDIA Information Group

Curtis Thompson, President/CEO

## PRIMEDIA Inc.

William F. Reilly, Chairman and CEO  
Charles McCurdy, President  
Beverly C. Chell, Vice Chairman

**BE RADIO** (ISSN 1081-3357) is published monthly (except bimonthly in May/June and November/December) and mailed free to qualified recipients by INTERTEC, 9800 Metcalf, Overland Park, KS 66212-2215. Non-qualified persons may subscribe at the following rates: USA and Canada, one year, \$30.00; all other countries, one year, \$35.00 (surface mail), \$70.00 (air mail). Single copy price, \$10.00. Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canada Post International Publications Mail (Canadian Distribution) Sales Agreement No. 0956244. POSTMASTER: Send address changes to *BE Radio*, P.O. Box 12937, Overland Park, KS 66282-2937.

*BE Radio* is edited for corporate management, technical management/engineering and operations and station management at radio stations and recording studios. Qualified persons also include consultants, contract engineers and dealer/distributors of radio broadcast equipment.

## PHOTOCOPY RIGHTS

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by INTERTEC provided that the base fee of U.S. \$2.25 per copy, plus U.S. \$0.00 per page is paid to Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. The fee code for users of the Transactional Reporting Service is ISSN 1081-3357/1999\$2.25+0.00.

For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. Prior to photocopying items for educational classroom use, contact CCC at 978-750-8400. Organizations or individuals with large quantity photocopy or reprint requirements should contact Jenny Eisele, 913-967-1966. Microfilm copies of *BE Radio* are available by calling/writing Bell & Howell Info & Learning, 300 N. Zeeb Rd, P.O. Box 1346, Ann Arbor, MI 48106-1346. Phone: 313-761-4700 or 800-521-0600.

## CORRESPONDENCE

Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2215. Phone: 913-341-1300; Edit. Fax: 913-967-1905. Advt. Fax: 913-967-1904.

© 1999 by INTERTEC.

All rights reserved.

**INTERTEC PUBLISHING**  
A K-III MEDIA COMPANY

## Sales Offices

### NATIONAL & INTERNATIONAL

Steven Bell

9800 Metcalf Avenue  
Overland Park, KS 66212-2215  
Telephone: (913) 967-1848  
Fax: (913) 967-1900  
E-mail: steven\_bell@intertec.com

### CLASSIFIED ADVERTISING

Brian Huber

Telephone: (800) 896-9939  
(913) 967-1732  
Fax: (913) 967-1735  
E-mail: brian\_huber@intertec.com

### REGIONAL MKTNG MGR

Anna Bannister

9800 Metcalf Avenue  
Overland Park, KS 66212-2215  
Telephone: (913) 967-1947  
Fax: (913) 967-1901  
E-mail: anna\_bannister@intertec.com

### LIST RENTAL SERVICES

Lori Christie

Telephone: (913) 967-1875  
Fax: (913) 967-1897

Jenny Eisele (Editorial Reprints)

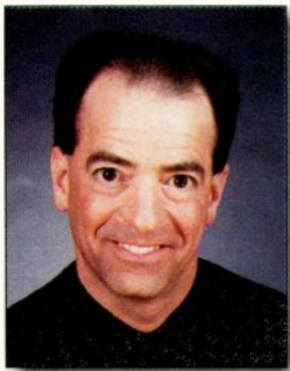
Telephone: (913) 967-1966  
Fax: (913) 967-1898  
E-mail: jenny\_eisele@intertec.com

## Boombox with a browser — and beyond

By Skip Pizzi, executive editor

It's time to get serious about multimedia broadcasting. Radio isn't just audio anymore. That may sound like heresy, but face it, if new media is to have a breakthrough value, it will come in its integration of content types. Old (i.e., analog) media was medium-locked, meaning radio was an aural-only medium; TV was aural and visual; and print was text and graphics.

Now the rules are changing, thanks to digital technology. The bits-is-bits axiom implies that anything you can digitize can be transmitted in a digital bitstream (including multiple media simultaneously), as long as the receiver can recognize and interpret what the transmitter is sending. The limits are set only by transmission bandwidth and the penetration of standardized content and delivery formats.



### Delivery options

One way to deliver multimedia is via a device that converges a radio with a wireless Web browser. This could work today, although it's not an elegant solution (the user has to tune the radio and enter the URL). One step better is the hyperlinked website, in which the broadcast signal automatically loads the URL into the browser (via RBDS, for example), so the station's website is automatically called up on the browser display when the station is tuned in. Nevertheless, wireless Internet connectivity is still fairly expensive and rarified.

Most of the applications discussed above could be accomplished without a return-channel, in a point-to-multipoint, one-way wireless fashion. This implies that the traditional radio broadcast model could survive, with the addition of standardized multimedia content and appropriate receivers. In this approach, the actual *content* displayed on the radio's "browser" would be delivered as auxiliary data over the air, either in real time or in pre-cached form for later display.

The over-the-air delivery is far cheaper than wireless Internet (essentially it is free, like radio), its bandwidth is potentially more plentiful, and it intrinsically allows the same portability and coverage that traditional radio enjoys today. The content could be carried on today's analog radio signals using high-speed subcarriers (again,

something that's been under exploration for several years), or on future DAB channels using part of the bitstream set aside for auxiliary data. Although only a limited number of websites would be available in this case, the selection of this content would be under the station's control, so it could sell access to this premium delivery space.

A key enabler (which has yet to be developed) is a *standardized content format*, which would provide an analogous function to that of HTML on the World Wide Web.

**One way to deliver multimedia is via a device that converges a portable radio with a wireless Web browser.**

Without the standardized use of HTML the Web would never have achieved its massive popularity, and a similar common content base is required for multimedia broadcast content to succeed. It makes sense to build this format on a foundation of HTML, since substantial content and design expertise in this area already exists.

### Making it happen

For such non-aural content to become popular, it has to look good on the display device. This implies that current Web pages can't simply be sent to the multimedia radio's screen. Rather, content must be customized for the display. The interactive TV industry has learned this lesson, finding that what displays nicely on a PC screen doesn't necessarily work on the TV (even though it's essentially the same display device), because the two systems are used and viewed differently. Radio has never had a visual display tradition, so there are no established norms or aesthetics. Before a successful multimedia content style and standard can be developed, some understanding of the display parameters will be required.

Easy-to-use content-creating tools will also be needed. The computer workstation that is in increasing use by radio producers today bodes well here. It won't be much of a stretch to incorporate multimedia content-authoring applications on the same platforms used today for audio-only production. Yet unless these tools are quick and user-friendly, the whole concept won't fly.

Of course, even if multimedia broadcasting becomes wildly successful for radio stations, there will still be many users who are listening to audio only. Always remember the main product while developing new ancillary services. For more on this topic, see next month's Next Wave column; we'll look at CEMA's proposal for a Mobile Multimedia Broadcast Service (MMBS).



**"It was simple enough for even my most computer-phobic jocks to understand."**

**—Troy Richards at KCCS**

KCCS had challenges to overcome. With their mixture of talk and music, they needed a digital audio delivery system that wouldn't be high maintenance. Something easy for their air talent to handle. And it had to serve up a professional sound in everything from their voice tracks to satellite material.

After looking at the available options, Operations Manager Troy Richards chose Digital Universe.

**"Digital Universe has been a wonderful addition to KCCS and has resolved many, if not all, of the conflicts we have faced in the past."**

KCCS salespeople are auditioning spots for clients right from their desktop workstations. Production staff are using sound files more flexibly than ever, with the universal format of uncompressed audio.



**"I want to personally thank you for making my life easier and for building us a system that brings us peace of mind. Thank you also for your excellent customer service. That was your greatest selling point."**

Easy to use, flexible to work with, and designed for the long haul – what can CBSI's Digital Universe do for your station? Call us today to find out more about how broadcasters around the country are stepping into the future with Digital Universe.

**cbsi**  
Custom Business Systems Inc

800 547 3930  
[www.digitaluniverse.org](http://www.digitaluniverse.org)

Circle (102) on Free Info Card

# A Word to the Competition



Wheatstone  
Direct

SPEED  
LIMIT  
OdB

MOVE OVER.

## AND A WORD TO THEIR CUSTOMERS

WE KNOW loyalty is a good thing, but the broadcast industry has changed dramatically in recent years, with some winners and some losers.

If you haven't looked at Wheatstone lately, it's time you checked out our new product line. Wheatstone has grown with the industry; in the last 3 years alone we've developed 5 digital and 9 analog consoles, plus a digital AES router that can integrate smoothly with our consoles and your automation system. We've constructed a brand new high-tech manufacturing facility

in New Bern, North Carolina, taking full advantage of the latest robotics and laser fabricating machinery.

All this self-funded—25 years of continual growth, profitable every single year; a responsibly managed company with a long term view.

Isn't it time to re-assess your suppliers?

**SO...** While our competition has been busy cashing in their chips, Wheatstone's been getting bigger and better, developing the **products** you need today, and the **support** you can count on tomorrow.

CALL WHEATSTONE—DIRECT.

 **Wheatstone**

600 Industrial Drive, New Bern, North Carolina 28562  
tel 252-638-7000 / fax 252-637-1285 / email: sales@wheatstone.com