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THE RADIO TECHNOLOGY LEADER

March 2009  
RadioMagOnline.com

## The Engineer's Guide



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Vorsis is the first line of air-chain processors designed for today's 21st century radio listener. It's a complete ground-up rethinking of the tired and traditional approach that is inescapable with those well-known processors. Here we talk about a few of the innovations that make the flagship AP-2000 Spectral Dynamics Processor the incredible tool that it is. Many of these advances are shared among the entire range of Vorsis solutions.

### Intuitive Interface and Operation

No processor can meet its full potential if it's not something that's easy to use or if the full

Think about having the full engineering control you've always dreamed of — being able to find the whispers as well as the screams in your station's sound, crafting an aural signature that's so good, so transparent, you will have people calling to find out how you do it.

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what the incoming level or era of the music.

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and use L+R to L-R signal ganging to prevent the image from wandering uncontrolled. It's already field-proven to manage wide discrepancies between the recording techniques of various eras (oldies to the over-mastered music of today) and even reduce multipath interference.

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other radio processor. It puts deep pristine bass on the air without the distortions of common bass clipper technologies. VoiceMaster is a special Vorsis clipper management tool that has its own automatic processing chain dedicated to detecting and specially processing live speech signals, giving you the loudest and cleanest on-air voices ever.

### Superior Stereo Enhancement

In rethinking Vorsis, it became clear that stereo enhancement HAS to be integral to the processing. It is, after all, a manipulation of the amplitude of the L/R difference signal that creates the perception of a wider sound field. With Vorsis, you'll get smear-free enhancement that can be as wide as you desire. But that's only the beginning — you can also control the stereo image width on a frequency-conscious basis



palette of controls are not accessible. The Vorsis GUI is designed for intuitive operation, from the front panel or remotely on your PC. No control is more than two clicks of the mouse away. The screens offer a logical layout with a virtual control surface above and monitoring graphs and meters below. You can see and hear the results instantly. Nothing is easier.

it always operates in its "sweet spot." The multi-band compressor, operating in concert with the AGC, provides unprecedented dynamics control. All operate in sum and difference — the highest signal controls the amount of processing. This is a completely new way to manage multiband dynamics to maximize the consistency of your station's on-air presentation — no matter

### The Vorsis Lineup



**AP-2000**  
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• 5-band dynamics controller  
• 31-band limiter/clipper



**FM-2000**  
AP-2000 without HD/DAB section



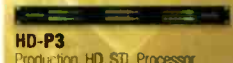
**AM-10HD**  
Digital Audio Processor for AM analog and HD  
• 5-band dynamics controller  
• 10-band limiter/clipper



**FM-10HD**  
Digital Audio Processor for FM analog and HD/DAB  
• 5-band dynamics controller  
• 10-band limiter/clipper



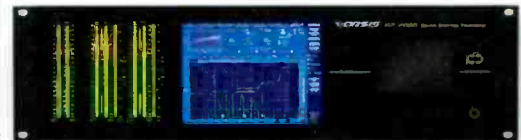
**VP-8**  
Multi-Mode Processor for FM, AM, FM-HD/DAB, AM HD, MP3/AAC  
• 4-band dynamics controller  
• 8-band limiter/clipper



**HD-P3**  
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• 3-band AGC



**M-1**  
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### ON THE COVER

Get a first look at the 2009 NAB Show with our Engineer's Guide, featuring new products, a session overview and pull-out map, starting on page 14.

Cover design by Michael J. Knust.



# Tieline IP Audio Codec Solutions

## Low Cost, IP STL and Audio Distribution

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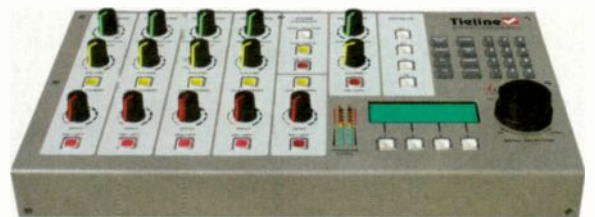
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## Currents Online

Selected headlines from the past month.

### Senate Says No to Fairness Doctrine Revival

The ban was passed as an amendment to an unrelated bill. The House gets the next shot.

### Obama Announces Intent to Nominate Genachowski for FCC Post ➔

President Obama has made the official announcement to appoint Julius Genachowski as Chairman of the FCC. The unofficial announcement was made in January.

### Verizon Hub Adds 14 Clear Channel Stations from Iheartradio

The initial streaming channels will include a wide variety of stations with diverse programming of interest to many different listeners.



**Genachowski**

### Sam Lane of RF Specialties Dies

The owner of RF Specialties of California and co-owner of RF Specialties of Washington died at his home in Santa Barbara, CA, on Feb. 19, 2009, following a two-year battle with cancer.

### Arbitron Plans PPM Improvements

The changes are tied to the the key methodological enhancements that the company committed to in its agreements with the Attorneys General of New Jersey, New York and Maryland.

### Broadcast Electronics Adds RF Courses

The courses, held in Quincy, IL, cover RF fundamentals and HD Radio topics.

### BIA, Kelsey Group Forecast Contracting Local Ad Market Through 2013

The U.S. Local Media Annual Forecast indicates current economic conditions may accelerate the shift from traditional to digital platforms.

## Find the mic and win!

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## Site Features

### Monthly Podcast

[RadioMagOnline.com/podcast](http://RadioMagOnline.com/podcast)

Want to know more about the WGBH installation? Get additional insight on digital STLs? How about more information on the new AM modeling techniques? They're all in the March podcast, which is online now.



### Advertiser Links

[RadioMagOnline.com/advertisers](http://RadioMagOnline.com/advertisers)

Access Web links to the advertisers in the March issue.

### Digital Radio Update Twice a Month

[RadioMagOnline.com/newsletters](http://RadioMagOnline.com/newsletters)

Stay up to date with the source of digital audio broadcasting news and information. The coverage extends to DRM, satellite radio and more. Subscribe today.

### Industry Events

[RadioMagOnline.com/calendar](http://RadioMagOnline.com/calendar)

The Radio magazine Industry Events section lists upcoming conventions and conferences.



# Audio and Communications Equipment for Broadcasters

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## Quality of service

**I**n my daily job, I have the opportunity to meet lots of people, visit many stations and see first-hand a variety of situations. I visit large and small markets, and I talk to seasoned veterans and freshmen engineers. In most cases I learn or see something new.

While touring a station recently, the chief engineer (he's one of the seasoned veterans) took a moment to share his concern about some recent experiences with broadcast equipment. He shared the information, not sure about what could be done about it. I told him I would share his concerns without mentioning the specific manufacturers – yet. There are two sides to every story, and while I'm only telling his side, it's his experience that sets the message. Because of my connection to *Radio* magazine, if I were to call these manufacturers I would not be surprised to get a different story.

So for now, the names will be protected in fairness to the manufacturers. Perhaps they will recognize the story and take steps to correct these problems.

The first situation concerns a certain type of popular mic processor that another contract engineer installs at many of his stations. Five of these processors – not all in the same facility – have experienced the same failure. The veteran engineer has worked with the contract engineer to repair all the units himself. The challenge was in repairing the unit without a schematic, as the owner's manual does not include one. When he called the manufacturer to get a schematic, he was told that company will not release a schematic to the field for a product that is currently in production.

There are two problems here. One, a current product has the same field failure that has yet to be corrected, and two, the manufacturer will not provide a schematic to help in field repairs.

I can appreciate a manufacturer protecting some intellectual property, but even a basic schematic doesn't give away all the secrets. The veteran engineer knows exactly how to fix the problem, but his initial diagnostic work took some time. Also, the manufacturer now knows about the problem because of this engineer's calls. Hopefully, future units will not have the same weakness.

The second situation deals with a certain model of AM transmitters. There are three of these transmitters installed in this market, and two of them, again at different facilities, have both had problems. The third one has just been installed, and the veteran engineer is concerned that his new transmitter will suffer the same fate.

He says all the transmitters are properly installed. The two earlier transmitters both caught fire and suffered severe damage. Neither suffered any unusual fate, such as lightning or severe weather, but both experienced some power supply problem that caused the fire. In the case of one station, the manufacturer offered to send two field engineers to rebuild the transmitter at a cost of several thousand dollars. Instead of rebuilding the molten transmitter, the station used the insurance money to buy a transmitter from another manufacturer.

The third situation he described involved needing a connector for a flexible-coaxial cable. The cable is currently in production and in wide use. When a new connector was needed to replace one that overheated, the cable manufacturer said the connector was not available and would be back ordered for several months.

Stocking large quantities of parts is not practical for a manufacturer, but having to wait several months could be a problem in many situations.

I understand the engineer's concern. There is an expectation for a professional product to provide reliable service. He is not expecting unrealistic support, but he is expecting the product to work. What can you do? Talk to the manufacturer when you experience a problem. Also, post a note to the helpline at [forums.radiomagonline.com](http://forums.radiomagonline.com). We can do this to improve the broadcast products we use every day.

*Chris Scherer*



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Photo: Jonathan Tichler/Metropolitan Opera



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# The application of NEC programs

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

**T**he Numerical Electromagnetics Code (NEC) is probably the origin of one of the engineering mathematician's most popular computer programs. It seems to be the culmination of most of the attempts to develop a universal use, directional AM antenna modeling and designing tool.

It's now about 80 or more years since directional AM antennas were first being designed and built. The FCC probably had not previously considered the need for directional antennas in the then-rather-new, AM broadcast service. In the early 1930s a dedicated broadcast engineer filed an application with the FCC for an AM station in the medium wave AM service which would use a directional antenna to avoid interference to a co-channel station. In those days the involved and somewhat tedious calculations were performed on a "simple" slide rule, and only a few brave radio engineers even contemplated their widespread use.

As AM directional antenna design advanced and mechanical aids in the performance of mathematical calculations were developed, large and rather cumbersome devices known as comptometers were developed to help speed up the solution of directional antenna design problems. The Burroughs comptometer is the one I remember best, and that plus a well-used slide rule remained the major tools of most consulting engineers for a considerable time. In those days the FCC required all applications to use directional antenna systems including complete information on the formulae and equations used as well as a sample calculation. The Commission's engineers in turn had to work through the equations and data contained in Form 301 to satisfy themselves that the promised interference-free service would be produced.

From the mid-1950s onward, computers were beginning to develop and appear on the market. By the 1980s, companies such as Dataworld began to offer services and programs, based on computer operations. These programs produced the desired directional antenna patterns and provided the requisite protection factors for all the stations involved. Soon after this it became possible to purchase patented computer programs for use by individual engineers. As a result, the use of directional antennas in the AM band greatly increased and after a while the reasons for some shortcomings in the design of some of the older directional antennas became apparent.

## Finding specs

Without intending any criticism of the earlier directional antenna designs it should be noted that the work was onerous and somewhat repetitive. Quite frequently it took many weeks to find a directional antenna design that met all the specification requirements. Some assumptions had to be made and constants developed to fit the antenna operating specifications concerning horizontal radiation limits, azimuths and vertical radiation limits and angles. Relieved by finding a working answer, the engineer might accept a solution without checking all the possible drawbacks such as negative towers, unworkable or unstable base operating impedances, unfavorable mutual values and other RF problems. In extreme cases it might eventually turn out to be embarrassingly clear that the design was unworkable. Fortunately, where perhaps a less-than-perfect design had been built, such imperfections might not show up until much later in the life of the antenna system when more precise operating parameter requirements could not be achieved. Usually it was possible to make design corrections using new computer programs. These new programs made it possible to run enough iterations of a given situation with many minor changes until the best solution was found.

As computer usage increased, computer programs for modeling directional and non-directional antennas made their appearance. It was necessary to make many assumptions; for instance, it is usual to assume sinusoidal current distribution in an antenna. We now know that this is not always the case, and work has continued making allowances for non-sinusoidal current distribution. A great deal of work has been done on "antenna modeling" in an effort to decrease the number of assumptions that have to be made in the design of a directional antenna so that performance can be predicted with far greater accuracy. Such accuracy very recently resulted in a profound change in the FCC's Rules defining directional antenna proof of performance.

Some of the work done in developing computer modeling is in the public domain, other programs are available on payment of a user fee or license. The Lawrence Livermore National Laboratories has been the forerunner in the developmental search for a convenient, accurate and available tool.

A program known as NEC-2 (Numerical Electromagnetics Code-2) was developed by Messrs.



**Comptometers once helped speed solutions for directional antenna calculations.**

A. Poggio and G. Ruggles in the early 1980s. It was an excellent tool and it became available in the public domain, although it was not designed specifically for broadcast directional antenna design use. It formed the foundation for many variations that are used for broadcast directional antenna design. A book entitled *Basic NEC with Broadcast Applications* was written recently by J. L. Smith, PE. It takes the reader through the application of NEC-2 and shows working examples of directional antenna design. It also provides interesting examples, and extremely useful, easily available, essential design and operating information. Several typical and necessary pieces of information are easily extracted when using this program.

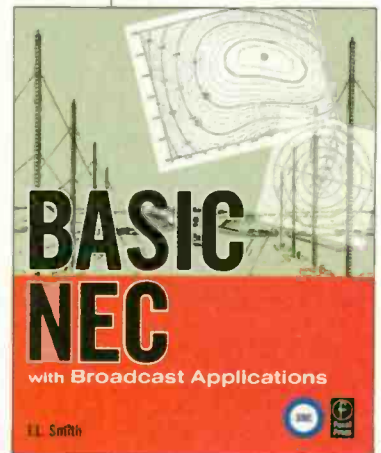
When making the required non-directional measurements on a directional antenna, the unused antennas in a multi-tower array are usually either grounded or left open depending on the tower height. Short towers were usually left floating and taller towers shorted to ground. This was generally reasonably satisfactory, although as the number of towers in an array increases, the effects of reradiated energy can cause bad distortion of the nondirectional pattern. This has sometimes become a time-consuming part of a proof. One of the advantages of using NEC-2

is what amounts to an invitation to model the effects on the non-directional pattern with the ability to nullify their effects. The recently approved FCC rules concerning directional antenna design and proof of performance depend very greatly on the NEC products.

The program used by the FCC when dealing with AM directional antennas is the NEC 4-1 which was designed specifically for modeling and designing directional antennas. This program allows the engineer to model, and thus observe the effect of almost any design modification he wishes. Generally speaking, a change in a single tower's operating parameters can cause a significant change in the overall antenna pattern. The opportunity for instant and basically unlimited iteration makes this program an ideal tool for the consulting engineer.

The NEC programs offer a great improvement over the slide rule era when the sheer volume of manual operations involved tended to influence full and comprehensive searches for perfection.

E-mail Battison at [batcom@chio.net](mailto:batcom@chio.net).



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# KINTRONIC LABS

## FCC cracks down on noncommercial "commercials"

By Harry Martin

**I**n recent enforcement actions the FCC has fined three noncommercial radio stations for running what the agency said were commercials.

What precisely constitutes a commercial is not easily determined. Generally NCE stations cannot accept payment in return for the on-air promotion of commercial activities. But they may accept underwriting contributions and may, in turn, acknowledge the generosity of the contributing underwriter by providing on-air mentions of the business. The question is: When does such an announcement cross the line from being a mere acknowledgement to becoming a promotional announcement?

*Acknowledgement Standards.* As in past cases, the announcements that got the three licensees in trouble included qualitative statements, price-related information and/or prohibited calls to action. Phrases like "flexible financing" (price-related),

### Dateline

April 1 is the deadline for submission of biennial ownership reports by radio stations in Texas.

April 1 is the deadline for radio stations in Texas with more than 10 full-time employees to electronically file their Broadcast EEO Mid-Term Reports (Form 397) with the FCC.

April 1 is the deadline for radio stations licensed in the following states to place their annual EEO Reports in their public files: Delaware, Indiana, Kentucky, Pennsylvania, Tennessee and Texas.

"Bud and Bud Lite are discounted" (price related), "our aim is excellence and our goal is perfection" (qualitative), and "let me suggest a visit ..." (call to action), all go over the line according to the FCC. Thus, a reference to a 10 percent discount cannot be included in acknowledgement announcements. Information such as "longest continuous builder in Northeast Florida" is similarly banned. While it

is OK for stations to mention the year a business was founded, a statement comparing the age of one business to the age of others is considered a qualitative comparison of businesses and is out.

*Length of Announcements.* The FCC pointed to the 60-second length of the underwriting announcements. It did not explicitly prohibit 60-second announcements, but suggested that the longer the announcement, the more likely it is that prohibited content will creep into the copy.

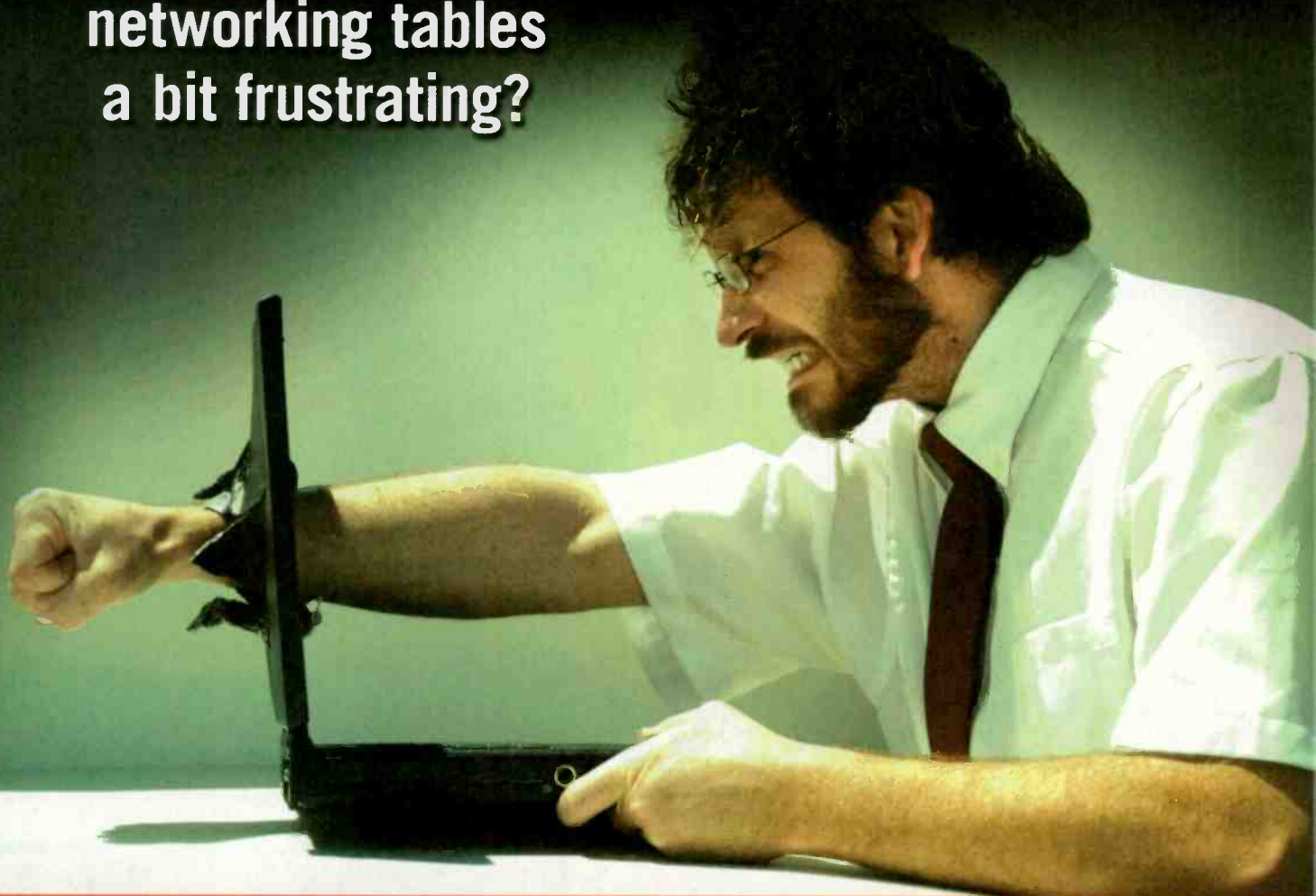
*Airing Free Program Material.* Another point was that the mere furnishing of a program to a station constitutes consideration. In one of the three cases, the offending commercial matter was aired in the course of a program that was produced by an independent person who provided the programming at no charge. The licensee pointed out that, even if the program producer had received consideration in return for including the announcements in his show, the licensee had not received any such consideration.

The FCC did not credit that argument. The fact that the independent producer received consideration for promotion of a commercial product or service was enough to trigger the FCC's enforcement process. A \$5,000 fine was assessed.

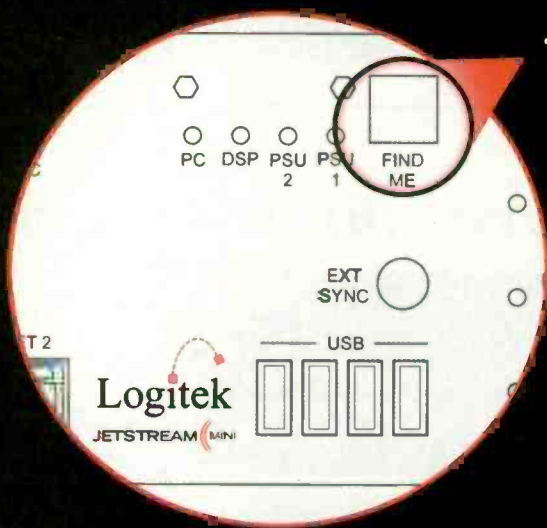
*The Other Cases.* The other two licensees got off easier, each with a \$2,500 fine. One involved a number of "commercial" announcements which were made during the course of play-by-play coverage of a local non-profit baseball team. The other involved a total of 12 announcements for two local businesses which, in the Commission's view, crossed the line into commercial territory. ♣

*Martin is a member of Fletcher, Heald & Hildreth, PLC, Arlington, Virginia. E-mail: martin@fhhlaw.com*

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# The Engineer's Guide



It's a big convention, and your time is limited, which is why we have assembled this preview. There's almost too much to do. By formulating a plan in advance you can make the most of your time, piecing together an efficient plan.

We're all faced with squeezing to make ends meet. While some travel budgets have been eliminated, others are being trimmed to the very basic needs. However, many Las Vegas hotels have reduced their rates significantly. I also have heard that deep discounts can be found through travel packages. I expect attendance to be down this year, but a smaller crowd means an easier path to navigate the floor, and possibly more time with exhibitors.

This issue holds three tools to help you at the show. The NAB Extra is your key to the new technology on display. Get a head start on what to see by making an early list.

Next we help you find your way in the North Hall with the pull-out map, which also includes a partial booth listing. It's easy to get lost if you just wander to floor, but our map guides a clear path.

The sessions are an important part of the convention, and we have listed the Broadcast Engineering Conference presentations that relate to radio, as well as a few other key events. Add these to your calendar and you won't miss anything important.

But the printed issue is only part of the preview. Each year we produce our exclusive NAB FASTtrack, which sorts the exhibitors into product categories and then arranges them into booth order so you can plan the fastest track around the convention.

The FASTtrack, exhibitor guide and session outline are also available for your handheld device. Download the *Radio* magazine FASTtrack, Exhibitor Directory and BEC Session Guide to your Palm or Pocket PC today. The files are on the *Radio* magazine website. Look for the FASTtrack for PDA link.

*Chris Scherer*

— Chris Scherer, editor

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**BluePack**



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# Helping you find the exact products you need.



## IP codec Tieline Technology Booth N8123

**Bridge-IT:** Bridge-IT allows the user to tailor the codec to suit individual requirements. Available in encode-only, decode-only versions or both, Bridge-IT has an SD card slot for failover playback of prerecorded audio, and the unit's menus can be fully programmed using comprehensive front-panel hardware that includes a keypad and LCD display, or by using a Web interface. It is designed for desktop use, or two units can be installed side-by-side in a purpose-built 1RU mounting bracket.

Bridge-IT comes with a range of high performance broadcast algorithms plus optional AAC LC and AAC HE. Standard algorithms include 16-bit 22kHz linear audio at less than 12ms encode delay for uncompromised audio, G.711 G.722, MPEG Layer 2 and Tieline Music. The Tieline Music Plus algorithm also provides 22kHz mono, dual mono and stereo with 20ms encode delay at under 100kb/s. Bridge-IT has all the broadcast input connectors you would expect on a fully-featured codec. Simultaneous analog and digital AES/EBU audio outputs are provided on XLR connectors and it includes a 1/4" stereo headphone output.

888-211-6989; [www.tieline.com](http://www.tieline.com); [sales@tieline.com](mailto:sales@tieline.com)



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# NAB Extra

This section provides access to products long before you get to the show, so you can plan which booths to visit. With booth numbers included, the NAB Extra will help you find precisely what you're looking for.

## Portable recorder Samson Technologies Booth SL10125

**Zoom H4n:** The H4n's onboard X/Y stereo condenser mics are arranged with the right and left mics on the same axis. This design ensures that the mics are always equidistant from the sound source for proper localization without phase shift. Each mic capsule can be rotated from 90 degrees (standard) to 120 degrees (wide-angle) stereo. The H4n allows four-channel simultaneous recording by using its onboard mics with either external mics or direct inputs. Choose up to 24-bit/96kHz linear PCM WAV files a variety of MP3 formats from 320kb/s down to 48kb/s.

631-784-2200; [www.samsontech.com](http://www.samsontech.com); [info@samsontech.com](mailto:info@samsontech.com)



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# NABExtra

## Single-phase rack-mount UPS Staco Energy Products Booth N2814



**Unistar C:** Standard functions on these 1, 2 and 3kVA rack-mount models includes hot-swappable batteries, an internal battery charger, emergency shut-down and programmable receptacles. This double-conversion UPS protects from outages and irregularities in incoming line voltages from 60 to 144Vac or 120 to 288Vac at 45-65Hz. A steady sine wave protects downstream equipment even without going to battery mode. Each Unistar C features PWM sine-wave topology. The high crest factor of the inverter handles all high in-rush current loads without the need to upgrade the power rating. DC-start function ensures that the UPS will start even during a power outage. An LCD display provides real-time indication of all major system parameters and status, including load level, battery remaining and fault signals. Digital signal processing (DSP) provides the UPS with powerful communication capability, which enhances the flexibility for easy remote control and monitoring.

937-253-1191; [www.stacoenergy.com](http://www.stacoenergy.com)  
[sales@stacoenergy.com](mailto:sales@stacoenergy.com)

## Solid-state FM transmitters

Nautel

Booth N7016



**NV Series:** Building on the NV40, Nautel now offers FM output power ranging from 3.5kW to 44kW with the following product models: NV3.5, NV5, NV7.5, NV10, NV15, NV20, NV30 and the flagship NV40. The NV Series of products offer several unique capabilities. An Advanced User Interface provides more control with access from virtually anywhere, and the AUI increases station efficiency by making it easy for engineers to monitor and control their Nautel transmitters. Nautel provides a control system with a 17" touch screen interface that manages the whole transmitter and multiple exciters. Realtime instrument-grade spectral analysis allows a station engineers to quickly ensure that the station's signal is optimized for digital broadcast. All NV Series transmitters are digital-ready, allowing a plug-in Engine upgrade to HD Radio broadcasting. Adaptive pre-correction provides linearity and IBOC transmission with no need for additional filters. Common modules across the product line are a plus for customers with multiple transmission sites.

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



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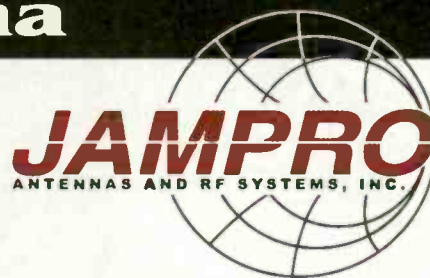
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# NABExtra

## Audio-over-IP transmission Comrex Booth N6729

**BRIC-Link:** BRIC-Link transmits audio over IP networks and is suited for point-to-point "nailed up" audio links over a wide variety of data circuits including ISM band IP radios, T1/E1s, satellite data channels, WANs and LANs. Contained in a small, desktop package, two BRIC-Links can be mounted in a 1RU rack space. Balanced analog 1/4" I/O, as well as switchable AES I/O, four contact closures, ancillary data and consumer level front panel I/O for monitoring are provided on BRIC-Link's compact and rugged chassis.

800-237-1776; [www.comrex.com](http://www.comrex.com); [info@comrex.com](mailto:info@comrex.com)



## High-speed digital audio router AEQ Booth N5429



**Titan:** The Titan BC 2000 D router/concentrator is designed to serve as the audio switching core in critical systems. It is equipped with five bidirectional optical fiber ports that use non-blocking architecture. Each port is capable of connecting up to 1,024 channels. As with the rest of the BC 2000 D, the control system is based upon the TCP/IP architecture. Communication with its two controller boards working in cluster mode provides control interface access via a single virtual IP. Audio connections are made within the BC 2000 D system by means of the five bidirectional fiber-optic ports, and are directly compatible with the BC 2213 high speed router linking module.

800-728-0536; [www.aeqbroadcast.com](http://www.aeqbroadcast.com)  
[sales@aeqbroadcast.com](mailto:sales@aeqbroadcast.com)

## Live streaming Abacast Booth C1744

**Universal Media Player:** The Universal Media Player is for both audio and video streams and works in any browser or operating system combination. This universal solution employs the technologies of Adobe, Microsoft, and standard HTML to make it truly cross-browser cross-platform and cross-device. This frees you from needing multiple player/format links on your website and simplifies the user experience. Adding banner ads and corporate branding ensures inbound revenue and brand promotion.

360-834-5229; [www.abacast.com](http://www.abacast.com)  
[info@abacast.com](mailto:info@abacast.com)

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## Mini IP audio router

**Logitek**

**Booth N7124**

**Jetstream Mini:** The Jetstream Series includes IP-based audio routers that provide audio I/O, mixing, processing and audio distribution needs for radio applications. The first in the series, the Jetstream Mini, provides enough capacity for one 24-channel radio console. Logitek's existing control surfaces – Mosaic, Artisan and Remora – provide the user interface to the Jetstream. One Jetstream Mini unit provides eight I/O card slots that accommodate five types of I/O cards: four mic preamps (with phantom power); four stereo analog line inputs; four stereo analog line outputs; four stereo AES or S/PDIF digital inputs and four stereo AES or S/PDIF digital outputs. Also included are 12 GPI and 16 GPO contacts; four RS-485 ports with AES cue audio; 2 GbE Ethernet ports and redundant power supplies in a single two rack unit enclosure.

800-231-5870; [www.logitekaudio.com](http://www.logitekaudio.com); [info@logitekaudio.com](mailto:info@logitekaudio.com)

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**Booth N2518**



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**Booth C11843**



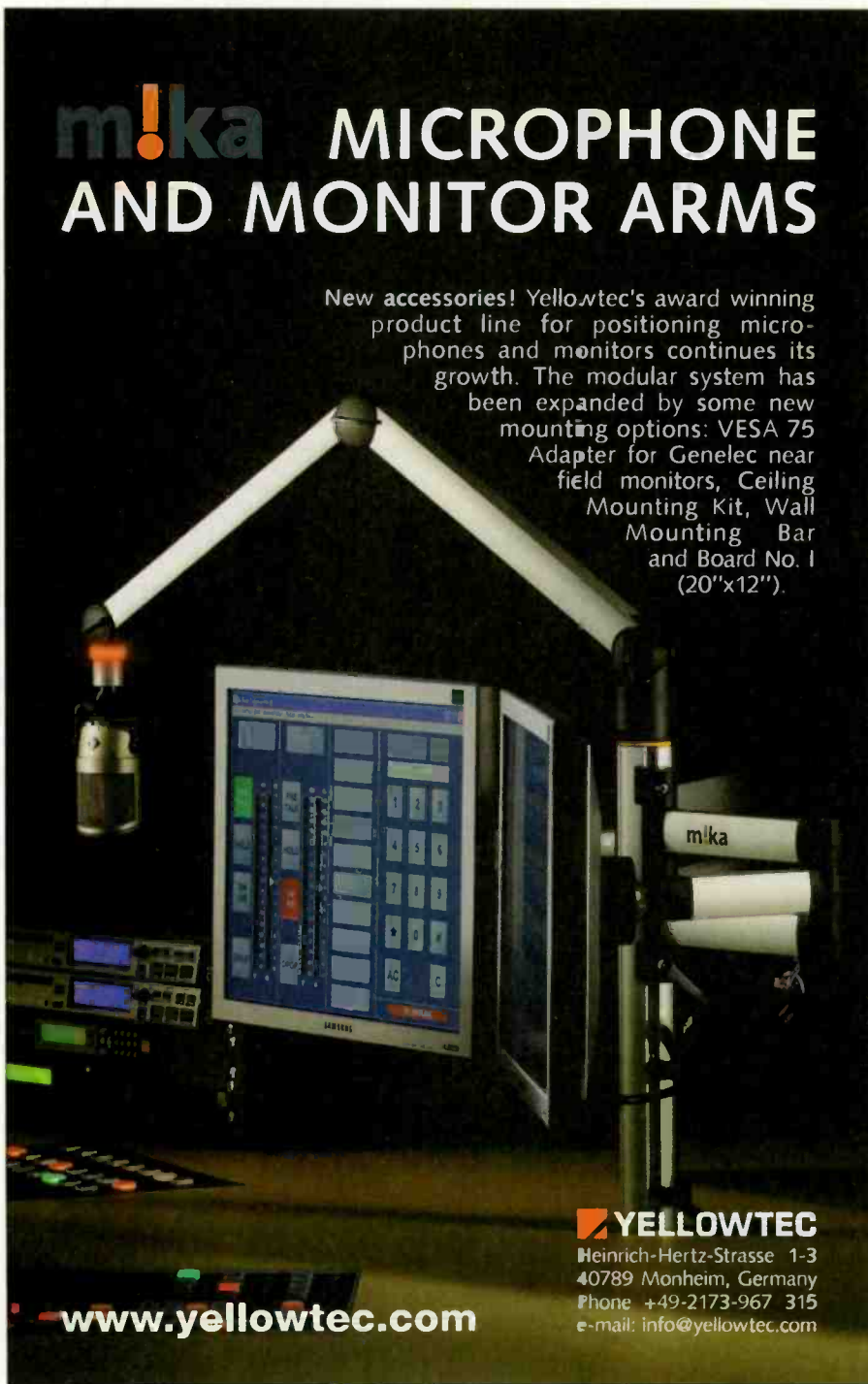
system interfacing applications can also be supported. The unit provides a full-featured two-channel interface which includes two hybrid circuits with automatic nulling capability.

**Model 45:** The Model 45 is designed to interface a two-wire full-duplex party-line intercom circuit with a four-wire audio circuit associated with a matrix intercom system. Other specialized audio For flexibility, the Model 45 can be powered by the connected two-wire party-line circuit or by means of an external source of 24Vdc. When powered by an external source, the Model 45 is capable of supplying dc power to the two-wire intercom circuit. This unique feature allows direct operation of devices such as user belt packs. Audio level meters provide confirmation of system performance during setup and operation. Standard audio connectors are used for all input and output signals.

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**Avlex**

**Booth N5113**

**Superlux S125:** Featuring a pressure gradient, 0.5" shock mounted condenser capsule, high SPL characteristics, a -10 dB pad, a low-cut switch, and conductive shielding to minimize RF and handling noise, the Superlux S125 delivers studio caliber qualities in a robust form factor designed for live performance. It is a cardioid condenser mic with a triple pop filter. Since the microphone's multistage pop filter does not use any

foam components, it will maintain its high performance characteristics for years. Similarly, the pressure gradient capsule is shock mounted for low handling noise, and both the microphone's case and grille are conductive to resist RF interference from cell phones and other sources. The mic features a wide, flat frequency response that extends from 20Hz - 20kHz. The Superlux S125 has a switchable -10dB attenuator and a switchable 150Hz low cut filter. Gold-plated connectors sit between the microphone's capsule and electronics.

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# NABExtra



## Digital monitor RTW Radio-Technische Werkstätten Booth N3123

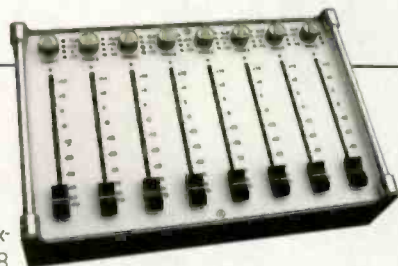
**10500X-Plus:** RTW Digital Monitor 10500X-PLUS now incorporates ITU-compliant loudness display and full-screen mode. The RTW Digital Monitor 10500X-PLUS, a high-performance, cost-effective display system for monitoring digital stereo audio signals, now comes with an integrated loudness display in compliance with the ITU BS.1771 guideline. Further enhancements include a new full-screen mode for enlarged display showing the individual instruments in use. All current-production Digital Monitor 10500X-PLUS systems leave the factory with the new loudness display options included.

+49 221 709130; [www.rtw.de](http://www.rtw.de)

## Control panel Zaxcom Booth N3114

**Deva Mix-8:** Zaxcom's Deva Mix-8 eight-fader mixing control panel integrates directly with the company's Deva and high-resolution Fusion audio recording systems to provide a more compact, mobile, and precise control panel for audio mixing. The Deva Mix-8 incorporates the familiarity of fader-based mixing controls into a control panel that's compact enough for over-the-shoulder use. All mixing functions and powering of the unit are supported through a single cable connecting the Mix-8 to its host system.

973-835-5000; [www.zaxcom.com](http://www.zaxcom.com); [info@zaxcom.com](mailto:info@zaxcom.com)



## Master clock Antelope Audio Booth N2234

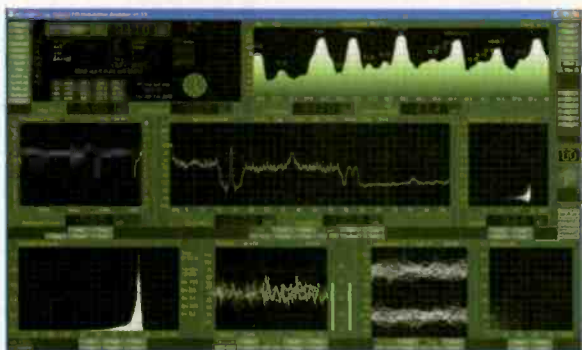
**Trinity:** The Trinity's features include three Independent Audio Generators up to 384kHz, with Varispeed Control; three Independent SD Generators, simultaneously offering PAL and NTSC; three Independent HD Generators, presenting a choice of 16 formats, and Antelope's fourth Generation of Acoustically Focused Clocking (AFC) which now employs 64-bit DSP. Also, a triple display shows the frequencies for the Independent Audio Generators. Trinity maintains all of the features from Antelope's current OCX-V Audio/Video Master Clock, such as Jitter Management Module, Black burst generator, and full audio and video Gearboxing with simultaneous 0.1 and 4 percent pull-ups/pull-downs.

415-869-9661; [www.antelopeaudio.com](http://www.antelopeaudio.com); [info@antelopeaudio.com](mailto:info@antelopeaudio.com)

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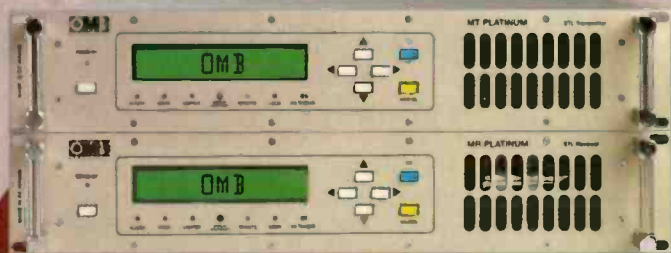




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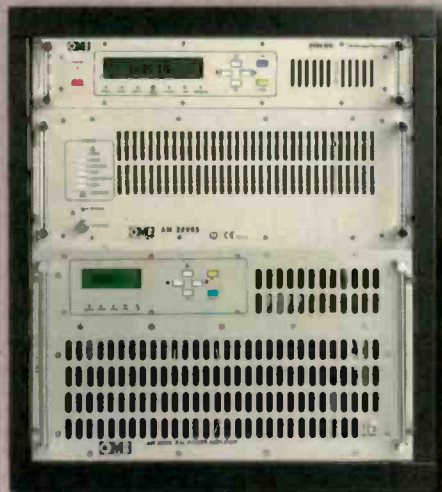
# FM TRANSMITTERS

All transmitter powers with the best quality price ratio



## MT/MR PLATINUM > 1 GHz

is a high-performance Studio-to-Transmitter Link. It is made up of the 5W MT transmitter externally synthesized in 10MHz sub-bands with a step of 100KHz, and the MR double conversion receiver, that is externally synthesized, too. The MT is microprocessor controlled, and includes LCD display for the visualization of the most relevant transmission parameters (frequency (6-digit), forward and reflected power, modulation level), balanced Mono, Stereo (MPX). The MR receiver has the same visualization system as the transmitter. It includes balanced Mono and Stereo (MPX) outputs. Furthermore, the MT/MR Platinum STL includes a jumper in order to get a proper operation with digital signals.



**EM 2000** is a 2000W FM transmitter made up of the EM 25 DIG exciter (or EM 20/30 exciter) and the AM 2000 FM amplifier. AM 2000 includes eight 300W high-efficiency MOSFET technology amplifying modules, fed by 2 independent switching power supplies, which are made to withstand the working conditions. The amplifying modules work independently thanks to a power combining structure that provides high isolation between them.

**EM 10000** is a 10000W FM transmitter made up of the EM 250 COMPACT DIG exciter and three control units which combine the power of six AM 2000 FM amplifiers. AM 2000 includes eight 300W high-efficiency MOSFET technology amplifying modules, fed by 2 independent switching power supplies, which are made to withstand the working conditions. The amplifying modules work independently thanks to a power combining structure that provides high isolation between them.

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teléfono. 902-187878  
fax. 902-187878  
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LA MUELA  
50196 Zaragoza, ESPAÑA



# NABExtra



**On-air signs**  
**Sonifex**  
**Booth N3217**



**Signal LED Illuminated Signs:** Designed for studio installers and systems integrators, this range of illuminated RGB LED studio signs contain the control electronics themselves so they can be simply configured for color and operation on site.

207-773-2424; [www.sonifex.co.uk](http://www.sonifex.co.uk)  
[info@independentaudio.com](mailto:info@independentaudio.com)



**Sound system packages**  
**Anchor Audio Communications/Portaco**  
**Booth N6123**

**Xtreme:** Xtreme is one of Anchor's loudest portable sound systems. The two wireless microphones allow users to roam the venue with clear sound. Press conferences, sporting events, movie screenings or remotes are just some of the possible uses for this powerful sound system.

800-262-4671; [www.anchoraudio.com](http://www.anchoraudio.com)

**Radio automation**  
**Netia Digital Audio**  
**Booth SU822**  
**Radio-Assist 8:**



Equipped with a broad range of tools for end-to-end multimedia workflows, the newest version of Radio-Assist now extends beyond traditional broadcasting by allowing users to prepare publication at an early stage of the workflow. Publication is prepared at the same level as the on-air thanks to new planning tools. It integrates with Netia's Media Asset Management system for all media: video, images, texts and audio. It also offers an automatic publishing engine for all media as well as managing associated metadata and linked media.

866-638-4222; [www.netia.net](http://www.netia.net)  
[j.martin@netia.net](mailto:j.martin@netia.net)

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# NABExtra

## Traffic/business system RCS

**Booth N5917**

**Aqira:** Aqira is scalable from a single station to multi-station or multi-location broadcast groups. With a modern user interface, a user can open multiple logs at the same time and drag and drop spots from one log to another. Its report writing gives the user the power to create custom reports and save them with an easy-to-use Report Builder Tool. With Flexible Rate management, the user can maintain special control over each station. Powerful accounting functions generate a single invoice or send a group of invoices from a customized list at the click of a button.

914-428-4600; [www.rcsworks.com](http://www.rcsworks.com)  
[info@rcsworks.com](mailto:info@rcsworks.com)

## Digital audio cable Belden

**Booth C6508**

**Brilliance AES/EBU:** This single-pair cable is ideal for use in permanent installations of balanced-line analog or digital audio. In the presence of unbalanced signals, the addition of a balun will enable the cable to support many coax-based signal types, such as analog audio, S/PDIF digital audio and professional AES3-ID digital audio, as well as surveillance cameras.

800-BELDEN1; [www.belden.com](http://www.belden.com); [info@belden.com](mailto:info@belden.com)

## Radio broadcast transmitters Harris

**Harris**

**Booth N2502**

**HPX Series:** HPX transmitters are available in analog FM-only or common amplification HD Radio versions, and incorporate an advanced transmitter control system. The compact design of the HPX transmitter utilizes matching amplifier and power supply cabinets to minimize the footprint at the transmission facility. Its common architecture at all power levels simplifies the upgrade path for stations who wish to migrate from analog-only to an HD Radio common-amplification system or increase HD Radio broadcasting power to the proposed -10dB when needed.

800-622-0022; [www.broadcast.harris.com](http://www.broadcast.harris.com)  
[broadcast@harris.com](mailto:broadcast@harris.com)



# Patriot

COBHAM

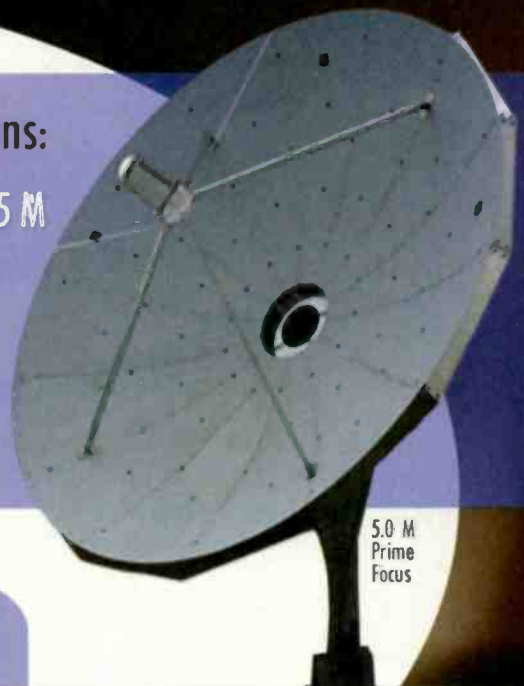
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PHONE: 517-630-2609 or 563-873-1410 FAX: 563-873-1411



### Automatic mixing controller Dan Dugan Sound Design Booth N2515

**Model E-1:** The Model E-1 automatic mixing controller handles multiple live mics without having to continually ride individual faders.

This eight-channel signal processor patches into the input insert points of an audio mixing console. It detects which mics are being used and makes fast, transparent cross-fades, freeing the mixer to focus on balance and sound quality instead of being chained to the faders. The Model E-1's voice-controlled crossfades track unscripted dialogue perfectly, eliminating cueing mistakes and late fade-ups while avoiding the choppy and distracting effects common to noise gates. Without the need for gating, a natural low-level room ambience is maintained.

415-821-9776; [www.dandugan.com](http://www.dandugan.com); [dan@dandugan.com](mailto:dan@dandugan.com)

### Cavity backed antenna Propagation Systems Inc

#### Booth C23

**PSI CB Series:** The PSI CB series cavity backed broadband antenna is optimum for a single station or multiple stations. This antenna features a wide band dipole element that excites a cavity resonator, maximum beam control, extremely low VSWR and a uniform pattern with flat response across a wide band of frequencies. This antenna may be arranged for an omnidirectional or directional pattern. In the omni mode, circularity is  $\pm 2.0$  dB or better. Made of marine brass, copper and Teflon, this antenna is rugged and accepts deicers or radomes for environmental protection. The cavity itself is a galvanized welded mesh. Because of the extremely wide band frequency response offered by this antenna, the total number of frequencies is limited only by the total input power.

814-472-5540; [www.psibroadcast.com](http://www.psibroadcast.com); [sales@psibroadcast.com](mailto:sales@psibroadcast.com)

### Portable surround sound mixing system

#### Beyerdynamic

#### Booth N6129

**Headzone PRO XT:** As with the original Headzone system, Headzone PRO XT utilizes current DSP technology to provide superior headphone-based 5.1 surround sound reproduction. It also offers a unique patented ultrasonic-headtracking system, which locates the orientation of the listener's head with respect to the source material and adjusts the audio accordingly. Headzone PRO XT allows complete freedom of movement. The PRO XT includes enhanced headtracking functionality by providing more routing possibilities (left/right and front/back) in the software control panel. Also new to the PRO XT are added XLR inputs, an adjustable communication input with volume control, and a second headphone output. The Headzone PRO XT also allows for three individual user presets to be directly accessed through buttons on the unit's front panel and includes an adjustable, password protected limiter for hearing protection.

800-293-4463; [www.beyerdynamic-usa.com](http://www.beyerdynamic-usa.com); [info@beyerdynamic-usa.com](mailto:info@beyerdynamic-usa.com)



### Helix connectors

#### ERI-Electronics Research

#### Booth C1307

**HJ4-50, HJ5-50, HJ9-50:** ERI expands its line of air Helix coaxial cable connectors with the introduction of an HJ4-50 (1/2" cable) to 7/8" EIA connector, HJ5-50 (7/8" cable) to 7/8" EIA connector, and HJ9-50 (5" cable) to 6" EIA connector. With these additions, ERI now offers the full range of broadcast connectors for Helix air-dielectric coaxial cable. ERI maintains a 30,000-square-foot stock area housing an inventory of standard components and accessories for coaxial cable and rigid transmission line systems. In cases of emergency, these items can generally be ordered for next day delivery to any transmission facility within the United States.

812-925-6000; [www.ERInc.com](http://www.ERInc.com); [sales@ERInc.com](mailto:sales@ERInc.com)

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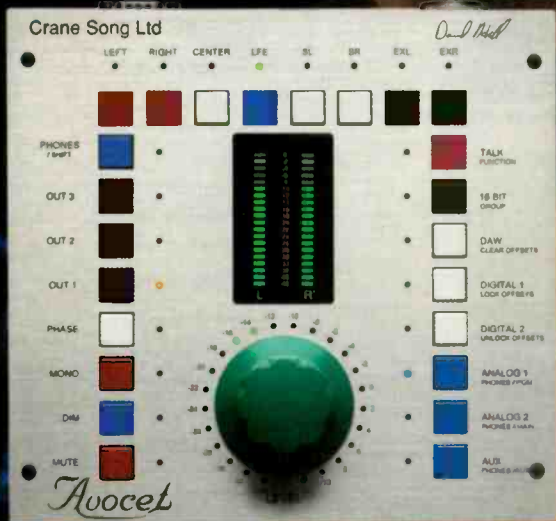
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# NABExtra

Wireless audio  
gateway  
**JK Audio**  
Booth N2125



**Bluekeeper:** Bluekeeper sends mic and line level signals to a wireless phone while maintaining separation between the local voice and the caller. The stereo output jack on the back of the unit provides the sending voice on one channel and only the caller's voice on the other channel. The balanced XLR output jack contains only the caller's voice. Bluekeeper pairs to a cell phone like a Bluetooth wireless headset. Bluekeeper also pairs to Bluetooth-equipped sound cards and music players in full bandwidth stereo A2DP mode. The 3.5mm stereo line input jack allows recordings to be sent into the Bluetooth device. The 3.5mm stereo line output jack provides the full bandwidth send mix on the left channel and Bluetooth caller audio on the right channel. The headphone output provides a mix of the XLR input, 3.5 mm input and Bluetooth audio.

800-552-8346; [www.jkaudio.com](http://www.jkaudio.com); [info@jkaudio.com](mailto:info@jkaudio.com)

## Mobile recording studio VocalBooth.com Booth SL9612

**VB Mobile Studio:** The 20' VB Mobile Studio includes a control room, vocal booth and a performance space. This studio is housed in a large trailer that can be hauled behind any tour bus or heavy duty pickup truck. This smaller option utilizes a side-out expansion system adding more than 30 percent more space to the trailer. There are also 30' and 40' VB Mobile Studio trailers available. The much larger 53' VB Mobile Studio is housed in a full 18-wheeler truck trailer with a slide-out feature and includes a restroom, mini bar, lounge, vocal booth, control room and performance space. Each studio is fully customizable including interior design choices and exterior trailer graphics. Each size abounds with options related to temperature control, cable conduits, custom lighting and other luxury amenities.



541-330-6045; [www.vocalbooth.com](http://www.vocalbooth.com)



**IBOC FM  
translator  
Larcan**  
Booth C2616

**Encore Series:** Incorporating TV transmitter amplifier designs and applying them to digital radio, the Encore IBOC FM Translator delivers a high-quality digital FM radio quality sound. Highly linear amplifiers and custom designed IF filtering enable optimum reception and output power in digital operation. Integrating filtering and new linear conversion technologies, the Encore Series of translators takes the digital FM signal and translates/repeats it, keeping the IBOC digital signal intact. The result is an IBOC FM translator that delivers the original analog FM signal and the digital portion of the signal together to an audience. The Encore Series is available from 25W to 250W.

303-665-8000; [www.larcan.com](http://www.larcan.com); [pPhillips@larcan.com](mailto:pPhillips@larcan.com)

**Pushbutton switches**  
**NKK Switches**  
**Booth N2816**

**GB2 Series:** With a footprint of just 7mm high, 7mm wide and 2.5mm thick, the GB2 Series of ultra thin and ultra miniature pushbutton switches are suited for high density PCB mounting and other applications where board space is at a minimum. These switches are also suitable for block or ganged mounting. The GB2 Series features off-center plungers that further facilitate mounting in tight spaces, and the unique plunger design also helps prevent accidental actuation. These switches are momentary circuit, single pole-single throw and feature an off momentary on configuration. They carry a rating of 0.4Vac maximum at 28Vac/dc maximum and their mechanical and electrical life is recommended for 50,000 operations minimum. They can be ordered in straight PC, straight PC with support bracket and right angle bracketed PC in a single or double switch mounted configuration.

480-991-0942; [www.nkkswitches.com](http://www.nkkswitches.com); [sales@nkkswitches.com](mailto:sales@nkkswitches.com)



**PC-free audio streaming**  
**Barix Technology**  
**Booth N8036**

**Radiobox Pro:** This PC-free, two-channel encoding/decoding solution is based on a Barix audio-over-IP electronic architecture. The IP-based platform is ideal for broadcasters seeking reliable STL and IP transport. The 1RU rack-mountable box adds XLR and AES/EBU connections, full-duplex capability and support of uncompressed audio data throughout the transport chain. In addition to STL, Radiobox Pro can be used for solid-state audio payout in the broadcast studio or at the transmission tower. It adds a built-in Compact Flash card slot to store standby programming in the event the live connection is temporarily lost. The presence of the card slot marks a significant design change from the previous version, which included a USB slot for program redundancy. The Barix Instreamer/Extreamer audio-over-IP technology enables automatic reconnection to the live stream once the connection is back online. Radiobox Pro offers multiple local and remote control options including access to the Radiobox interface from 3G mobile.

866-815-0866; [www.barix.com](http://www.barix.com); [info@barix.com](mailto:info@barix.com)

**Automatic AC power controller**  
**Henry Engineering**

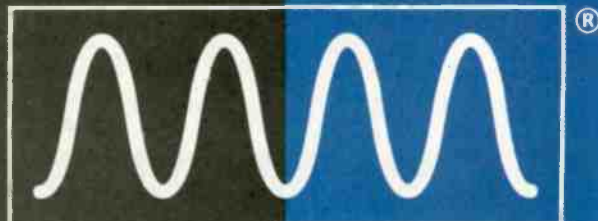


**Booth N8215**

**Powerswitch:** This automatic failsafe ac power controller switches ac power to backup equipment if main equipment fails. Powerswitch

was developed for use with Arbitron PPM encoders. If a PPM Monitor is used, the Powerswitch will automatically switch to the backup PPM encoder if the main encoder fails. This redundancy with automatic backup ensures that radio stations never lose ratings data in the event of a fault with their main PPM encoder. Powerswitch can also be used as a remote rebooter, to reboot a PC at a transmitter site or other remote location. It can also be used in any application where ac power needs to be remotely turned on or off.

626-355-3656; [www.henryeng.com](http://www.henryeng.com); [info@henryeng.com](mailto:info@henryeng.com)



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# NAB Sessions

Radio Highlights of the Broadcast Engineering Conference



Saturday, April 18			Room
SBE Ennes Workshop Continuing the Digital Transition	8 a.m. - 9 a.m.	Digital Transmission 101 Part 1	S219
	9 a.m. - 9:10 a.m.	Opening Remarks	
	9:10 a.m. - 9:55 a.m.	Digital Transmission 101 Part 2	
	9:55 a.m. - 10:40 a.m.	IBOC Performance: The 1% or 10% Solution	
	10:30 a.m. - 11 a.m.	IBOC's Opportunities	
	11 a.m. - 11:35 a.m.	Five Good Reasons to use a Tube for High Power FM+HD Radio	
	11:35 a.m. - 12:10 p.m.	DTV Transmission Status	
	1:10 p.m. - 2:40 p.m.	Implementing Mobile/Handheld	
	2:40 p.m. - 3:30 p.m.	Improving DTV and Mobile TV Coverage through On-Channel and Translator Technologies	
3:30 p.m. - 4:10 p.m.	DTV Maximization: The Value of the Power	S219	
4:10 p.m. - 5 p.m.	Antenna Choices for Digital Systems		
Sunday, April 19			Room
HD Radio Implementations & Improvements Part I	9 a.m. - 9:30 a.m.	Broadcast Engineering Conference Opening	S219
	9:30 a.m. - 10 a.m.	On-Channel Repeater Implementation for HD Radio Coverage Improvement	S226/S227
	10 a.m. - 10:30 a.m.	Report from Brazilian Association of Broadcasting on the Tests Results In AM and FM Stations using the IBOC Standard	
	10:30 a.m. - 11 a.m.	High-Power, Common Amplification of FM+HD Radio Transmissions with Elevated Sideband Levels	
11 a.m. - 11:30 a.m.	FM+IBOC Broadcast Systems Architecture Considerations for Single Frequency Networks	S226/S227	
HD Radio Implementations & Improvements Part I	1 p.m. - 1:30 p.m.		HD Radio in Romania
	1:30 p.m. - 2 p.m.		FM Radio Reception in the DC Market for Various IBOC Power Levels
	2 p.m. - 2:30 p.m.		Optimizing Analog + HD Radio Transport Over an Existing 950MHz STL Channel
	2:30 p.m. - 3 p.m.		IBOC Combining Schemes for 10dB Injection
	3 p.m. - 3:30 p.m.		Field Reconfigurable HD Radio Combiner Provides a Path Forward
	3:30 p.m. - 4 p.m.		Centralized and Multipoint Content Management and Control of HD Radio Networks via HD Protocol over IP
	4 p.m. - 4:30 p.m.		FM Digital Radio Power Increase - An Update
3 p.m. - 6 p.m.	The Consumer Experience	S219	
5 p.m. - 6:30 p.m.	Broadcast Engineering Conference Reception	S224/S225	
Monday, April 20			Room
Radio Engineering Forum Part I	10:30 a.m. - 11 a.m.	Internet Protocol without the Internet Deployment of IP Audio without Compromises	S228
	11 a.m. - 11:30 a.m.	Data Delivery Capacity over FM	
	11:30 a.m. - 12 noon	Virtual LAN (VLAN) Segmentation for Radio Broadcasters. What your Network Administrator Needs to Know	
Radio Engineering Forum Part II	1 p.m. - 1:30 p.m.	Leveraging Standard IP Protocols for Audio Sharing	S228
	1:30 p.m. - 2 p.m.	Cleaner...Yet Still Loud!	
	2 p.m. - 2:30 p.m.	20 Things You Should Know Before Migrating Your Audio Links to IP	
	2:30 p.m. - 3 p.m.	Next Generation Radio Networks	
	3 p.m. - 3:30 p.m.	Microcasting - Applying Automation with Customization to Radio Station Affiliates	
	3:30 p.m. - 4 p.m.	Send a High Quality Audio Feed From Anywhere	
	4:30 p.m. - 5 p.m.	Practical Strategies for Effective Remote PPM Monitoring	
5 p.m. - 5:30 p.m.	Tests of Digital Radio Broadcasting Potential to Cover a Large Area (Alaska) with Shortwave Signals		
Tuesday, April 21			Room
New Technologies for Radio	9 a.m. - 9:30 a.m.	Energy Conservation in AM Broadcast Transmitters using Carrier Control Algorithms	S228
	9:30 a.m. - 10 a.m.	Got Green? The Engineer's Guide	
	10 a.m. - 10:30 a.m.	The Application of Software-Defined Radio Technology to Multi-Standard Waveform Generation for TV and Radio	
	10:30 a.m. - 11 a.m.	Using the Resource Description Framework (RDF) to Simplify Content Management	
	11 a.m. - 11:30 a.m.	Implications of increasing Man Made Noise Floor levels on Radio Broadcasting	
	11:30 a.m. - 12 noon	Same Basket - Different Eggs	
Antenna Solutions and Case Studies for Radio	12:30 p.m. - 2 p.m.	Radio Luncheon	Barron
	1 p.m. - 1:30 p.m.	HD Radio Combining - a New Solution to an Old Challenge	S228
	1:30 p.m. - 2 p.m.	An AM Directional Antenna and HD Radio	
	2 p.m. - 2:30 p.m.	The NRSC IBOC Mask Measurement Guideline G201	
	2:30 p.m. - 3 p.m.	Real World Installation of AM HD Radio	
	3:30 p.m. - 4 p.m.	Easing the Transition to AM HD: Tools and Techniques to Help the Broadcaster	
	4 p.m. - 4:30 p.m.	High-level IBOC Combining Using Filters	
	4:30 p.m. - 5 p.m.	The Inaugural Installation of the First Kinstar AM Low-profile Antenna	
	5 p.m. - 5:30 p.m.	Transmission Systems for Mobile TV	
	5 p.m. - 6 p.m.	SBE Membership Meeting	



Wednesday, April 22			Room
	8 a.m. - 9 a.m.	Broadcast Engineering Conference Wednesday Breakfast	S228
New AM Technical Rules	10 a.m. - 10:30 a.m.	Feld Measurements for AM Modeling	S228
	10:30 a.m. - 11 a.m.	New AM Technical Rules - Panel Discussion	
Disaster Preparedness and Public Alerting	9 a.m. - 9:30 a.m.	Access to Emergency and Non-Emergency Broadcast Information for People with Disabilities	N231/N233
	10 a.m. - 10:30 a.m.	National VSAT - Safety Net	
	10:30 a.m. - 11 a.m.	One-Seg Technologies for Emergency Warning Services based on Digital Terrestrial Television Broadcasting	
	11 a.m. - 11:30 a.m.	Emergency Preparedness: Essential Elements for Business Continuity When Disasters Strike	
	11:30 a.m. - 12 noon	Predictable, Certain and Greer - Ensuring Reliable Power and Green Systems at TV Facilities and Transmitter Sites	
Towers & Transmission Systems Part I	10:30 a.m. - 3:30 p.m.	NABEF Career Day	Ballroom C
	11 a.m. - 11:30 a.m.	Tower Failures Resulting from Hidden Galvanic Corrosion	
	11:30 a.m. - 12 noon	Application of High Power Radio Frequency Loads and Attenuators in Digital Broadcast Systems	
	12 noon - 1:45 p.m.	Technology Luncheon	Ballroom
Towers & Transmission Systems Part II	2 p.m. - 2:30 p.m.	The Application of New LD-MOS Technology to a UHF Multimedia Transmitter Design	S228
	2 p.m. - 2:30 p.m.	The New FCC Rules for Distributed Transmission Systems (DTS)	
	3 p.m. - 3:30 p.m.	DTV Transmission Status	
	3:30 p.m. - 4 p.m.	Peak Power Ratings for Transmission Line Carrying Multi-Channel OFDM Broadcasts	
	4 p.m. - 4:30 p.m.	Improved Lightning Protection for Radio Transmitter Stations	
	4:30 p.m. - 5 p.m.	New Consensus Standards for Construction Rigging and Protocol	
	5 p.m. - 5:30 p.m.	Transmission Systems for Mobile TV	
	5:30 p.m. - 6 p.m.	DVB-T2 deployment and impacts	
	6 p.m. - 8 p.m.	Amateur Radio Operator's Reception	Ballroom B
Thursday, April 23			Room
	8 a.m. - 9 a.m.	Broadcast Engineering Conference Thursday Breakfast	S228

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North East	1.315.623.7655	Jim Peck
South West	1.210.775.2725	John Lackness
North Central	1.513.376.8600	Pam Leffler
Pro Audio	1.877.640.8205	Ric Goldstein
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Bradley Division	1.800.732.7665	Art Reed/Bob Eburg

# Digilink-**Xtreme** Automation

Read what our users say about Xtreme automation...

**WZOC FM / WTCA AM**, Plymouth, Indiana

*"The things I love about Xtreme are its reliability and simplicity. Xtreme runs circles around other automation systems. I have had the Xtreme for over 4 years and have never needed a service call."*

Jim Kunze, Station Manager

**WFIW AM & FM**, Fairfield, Illinois

*"Once I did the original install I didn't have to do anything at all. It's easy to use and it doesn't take a lot to keep it going. I've got three here."*

Kirk Wallace

**KWCL FM**, Oak Grove, Louisiana

*"We love the system. I don't know why you would go with anything else. Easy to program, very responsive. I recommend it."*

Ivy Robinson, Owner

**KLAM AM / KCDV FM**, Cordova, Alaska

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# Digital wireline STLs

By Doug Irwin, CPBE, AMD

**T**he link from the studio to the transmitter is a critical, but often overlooked part of the transmission system. There are generally two options: wired or wireless. There are some common reasons behind building a wireline STL system as opposed to using a radio system:

- A move to a new studio location where there is no line-of-sight to the transmitter.
- A move where there aren't any channels in the 950MHz band that can be coordinated.
- The radio station already has a radio link established, but wants a wireline STL as an alternate or backup.
- The station has data or program audio (such as a satellite receiver) that needs to be backhauled from the transmitter site.

There could easily be additional reasons, but these offer a good foundation. I'll look at what is available in the equipment marketplace for wireline STLs in the categories of what we used to call audio loops; equipment that makes use of T1; and finally, I'll expand the capability greatly and see how to use T3.

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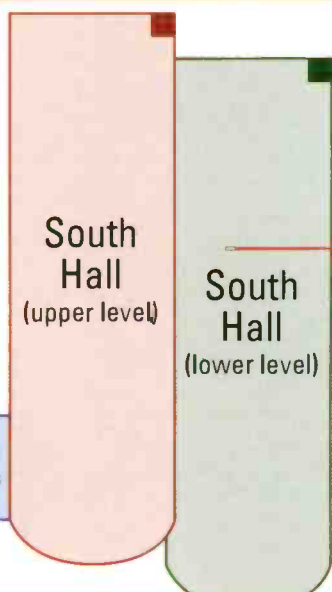
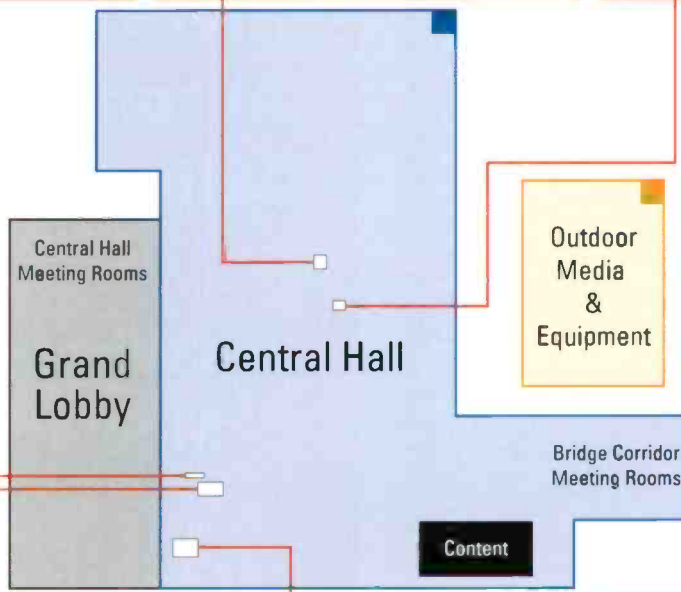
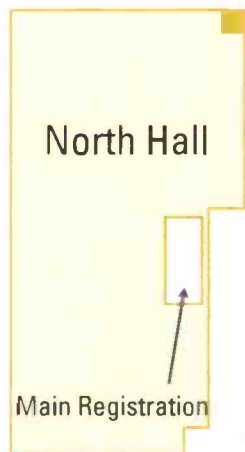


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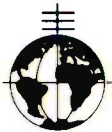
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Supplement to March 2009

# Radio

THE RADIO TECHNOLOGY LEADER

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# Digital wireline STLs



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Ordering 1.5kHz loops from the telephone company used to be standard operating procedure for STL purposes (and remote broadcasts of course). The results were hard to predict ahead of time: it depended very much upon the quality of the telco techs you just happened to get to align the system from end to end. If you ordered a stereo pair, you were really willing to test the limits of your own patience.

Here in New York City, our local phone company (Verizon) still offers 1.5kHz loops but fortunately for us, the modern version. These circuits are built around the Pulsecom PCAU.

The PCAU card looks very much like the old Tellabs 4008 cards, and it accepts analog in, and puts analog out on the far end. That's pretty much where the resemblance ends though. The reality is that the PCAU is an A/D converter and communicates with the far end via a digital path through the phone company. By making use of Apt-x coding, the bandwidth requirement is lowered (making telco happy). According to Pulsecom, the units automatically align themselves with one another, for flat frequency response and zero loss on the far end. Two units can be made into a stereo pair by means of a short interconnect cable on both the near and far ends.

Pulsecom also makes the HD PCAU, which is suitable for HD Radio purposes. This card has 20kHz of audio bandwidth (once again relying upon Apt-x coding); accepts analog or AES; has provision to accept the sample rate reference clock; and finally, it has built in provisioning to transport PAD and SIS data to the far end as well.

## Moving on to T1

The explosion in data requirements for both the cellular telephone system and other types of wireless data have caused local phone companies to greatly expand their

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**Moseley Starlink SL9003T1**

infrastructure into remote mountain tops and other tower sites in order to accommodate these customers. Fortunately broadcasters have been able to take advantage of this. Several manufacturers offer equipment designed to use the now-ubiquitous T1 for transport.

There are several compelling reasons to use T1 for transport of an STL system:

- Buying in quantity reduces the unit price. Obviously I don't know every tariff in every state, but my experience in California, Washington and New York is that the cost of a stereo pair is usually at least as much if not more than an entire T1.

- Not only do you buy the A to Z direction with a T1, but you get the Z to A direction as well. This makes it easy to configure a TSL system should you need it.

- The TDM nature of T1 makes it easy to combine multiple types of service in to one link: audio, telephone, serial data, and ethernet can be combined into one system.

Let's take a look at some of the equipment out there.

Moseley offers the Starlink SL9003T1. The heart of this system is the 3RU intelligent multiplexer into which daughter cards of various functions are installed. (An entire system

is made up of two of these frames, of course, with sets of cards.) The cards for audio transport will accept analog input (+18dBu limit of headroom) or AES (or S/PDIF) via



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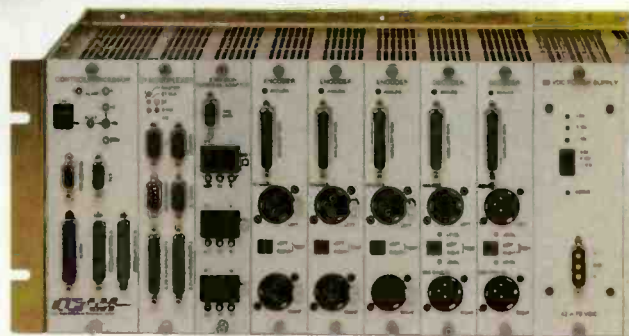
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# Digital wireline STLs

110-ohm balanced XLR; sample rate 32, 44.1 or 48kHz with built-in SRC; and an auxiliary port for RS-232 that will run up to 9600 baud. If you want to accommodate HD Radio with multicast (or any of the other reasons to have a LAN extension at the transmitter) you would add the card that functions as an 802.3 Ethernet bridge; and you could build an off-premise telephone extension by adding the voice module data cards. The multiplexer frame can accommodate up to two T1 interfaces (one for redundancy), each of which has a built-in CSU. Management of the system is by a windows-based GUI that goes on a client computer; remote management is done via a built-in communications channel that operates over the link.

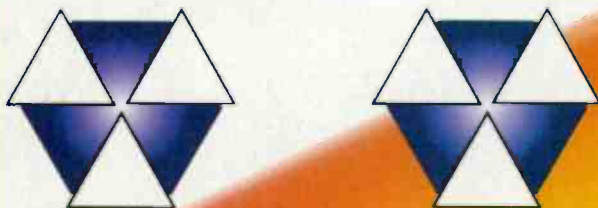
Probably the most well-known manufacturer of T-1 based equipment is Harris/Intralex. The STL



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Plus (previous page) is a system made up of two frames into which daughter cards are installed. For an HD Radio application, this would consist of a PT353 (encoder card) and PR353 (decoder card) and a pair of DS64NC cards (making up the LAN bridge). The audio cards accept analog audio, or an AES data stream (selectable sample rate, with built-in SRC). Because the audio cards have both AES and analog inputs and outputs, the end-user can select the type of interface card that plugs in to the rear apron of the frame; analog only, digital only, or analog plus digital (XLR connectors all the way) are available as options. The plug-in interface card (known by Harris as module adaptors) for the DS64NC pair has an RJ-45 connector. Harris makes other card sets for OPX, and for data-reduced audio paths as well. Management of the system is via a serial connection, and remote management can be over the link using one of the dsO timeslots.

Musicam USA makes a frame-based system as well, known as Team. The frame is 4RU and can accommodate up to 14 encoder or decoder modules in one frame. (Up to eight frames can be integrated to make up one system.) The frame can accept up to four T1s since each T1 interface card will connect up to two separate T1s. The audio modules accommodate analog and AES (via XLR connectors on the standard modules, or via D-connectors on the slim modules). MPEG layers 2 and 3, as well as Apt-X and Enhanced Apt-X are the options available for audio transport.

The local or remote units can be managed via Ethernet or RS-232, and have the ability to dynamically change the number of timeslots allocated for network communications on its LAN bridge, as well as the configuration of the audio cards (whether analog or AES is picked, and the audio coder in use).

One of APT's products that uses T1 for transport is the Worldnet Oslo. Like all the others discussed so far, the Oslo is a system made up of a mainframe, with plug-in modules that accomplish various functions. The frame can accommodate up to 12 audio channels in either direction: Individual audio modules come as two-channel duplex analog cards, four-channel analog simplex cards (one input and one complementary output card per system of course) and two-channel duplex cards with AES and analog inputs/outputs. Audio can be sent as linear PCM, or via compressed data codecs MPEG layer 2 or via Apt-X or Enhanced Apt-X. System management is by an Ethernet connection and a GUI called Worldnet NMS that lives on



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# Digital wireline STLs

**The great thing about T3s is the scalability; just because you have 28 T1s doesn't mean you have to turn all of them on right away.**

a client computer. I should note also that the mainframe will hold a redundant power supply.

So to review quickly: Each of these systems is mainframe-based, modular and configurable. Each system has 24 timeslots (24 ds0s) or a grand total of 1536kb/s of payload capability.

## Beyond T1

What do you do if a single T-1 isn't enough for you?

I wrote earlier that if you buy in quantity, you get a better deal on a per-unit basis. Turns out here in NY that the cost of five T1s is the same as an entire T3, which is 28 T1s. Because we have five stations in New York we went with T3 all the way.

Let's say though for the sake of argument that you don't need 28 T1s, although you do need more than one. What could you do in that case? Let's make up an example and then look at one potential solution. Say you have two stations on a mountain top, and through budget analysis, you've determined you can afford four T1s through your local telco. You want to use linear PCM for audio on both stations, and you also want the most bandwidth for the transmitter site LAN as you can get a hold of. Of course you don't

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**Adtran 4305**

want the failure of any particular T1 to take either station off the air; in fact, it would be really sweet if you could stay on the air even if two of the T1s were to fail – no matter which two.

For station A you purchase a frame-based T1 system. In that frame, you configure two audio cards to use 18 timeslots. That becomes your primary STL for station A. In the same frame, you configure a data-reduced audio path that uses four timeslots. That becomes the backup path for station B. For station B, you do the same thing after buying a second frame-based system; 18 timeslots as the main station B STL, and a data-reduced path of four timeslots that is a backup for station A. Station A uses T1-1, and station B uses T1-2.

For T1-3 and T1-4 you may need some help from your IT people (unless that of course is you). For this example, you could spec a set of routers that have multiple T1 interfaces. One example of that is the Adtran 4305. With a router such as this, you can literally bundle multiple T1s in to one network link. The cool thing also is that the link will

continue to operate even if one of the T1s goes down. Obviously the data throughput will be reduced.

The two bundled T1s make up your LAN extension now, giving you a LAN bandwidth of 3072kb/s.

Taking this one step further, you could develop an audio stream for stations A and B (though the data rate can't be that high unless you want the streams to hog your network) that go through the routers to reach the far-end site.

A system such as this can easily continue to operate (albeit at reduced audio quality) through the failures of two of the four normally connected T1s.

I wrote earlier about using a T3 data circuit for data transport between the studio and the transmitter site (assuming that makes financial sense for your station). Again, let me point out that Adtran makes equipment for just such purposes. The MX2800 (as the name implies) takes 28 T1s and aggregates (or muxes) them together to build up a T3 data stream, and provides the network clock reference. The interface for both send and receive directions (since this is also a full-duplex link) are in the

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# Digital wireline STLs

form of 75-ohm BNCs. You'll hand off your T3 to your local telco via these cables.

The great thing about T3 is the scalability; just because you have 28 T1s to start doesn't mean you have to turn all of them on right way. You can use what you need at first, and turn more on as needed. Remember, the cost is the same whether you use 5, 10 or 25 of the T1s. Using a router such as the one I mentioned earlier allows you to bundle multiple T1s together to form a high-bandwidth link.

If you were to build a high-bandwidth LAN extension to the transmitter site, another set of possibilities comes in to being for your station's STL (and TSL of course) systems.

For example, the APT Oslo, mentioned earlier, can also be built for IP transport by the addition of the dual IP MUX card (the dual part referring to its separate Ethernet ports, which can live on separate networks).

Harris/Inraplex offers the Net Express, which is very similar to the system I wrote of earlier, but T1 transport is replaced by IP transport.

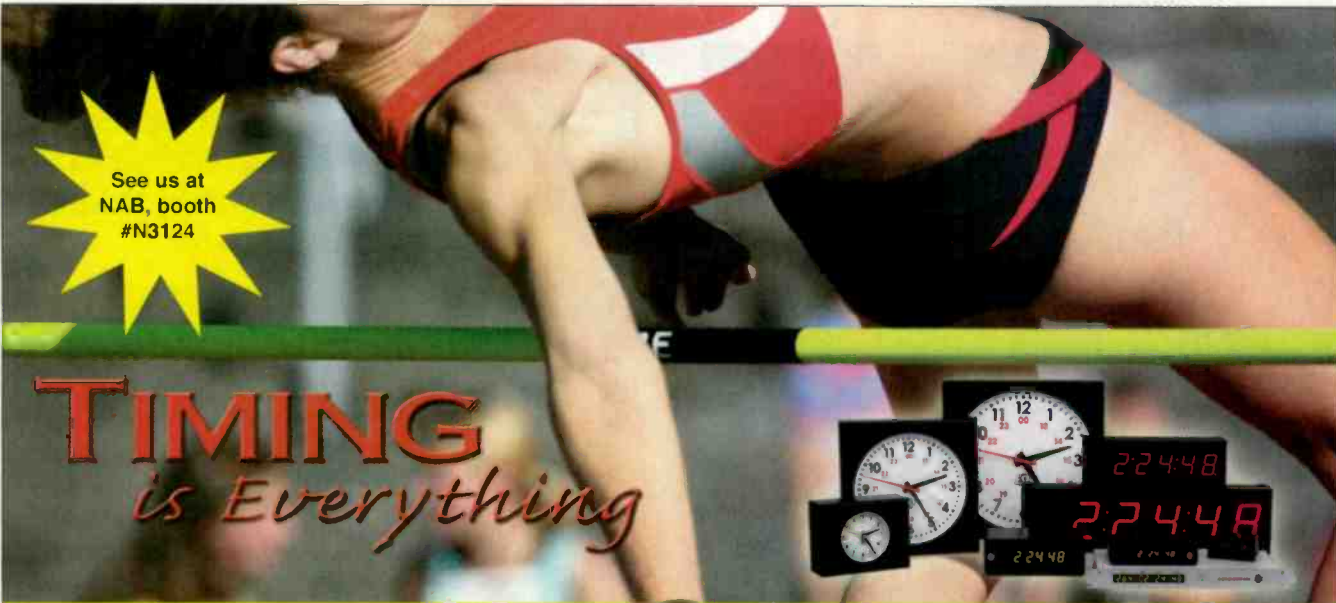
## T1 Basics

When studying the specs of T1 equipment you need to keep a couple of things in mind:

The various services will use up some number of timeslots in the T1, each of which is 64kb/s. At minimum, any one service will use one 64kb/s timeslot (or 'ds0') and at maximum, 24 timeslots.

The grand total of all timeslots used cannot exceed 24 since that is the most data that can be carried by a T1.

For example, if you wanted to use 18 timeslots for your audio path, and six for the Ethernet bridge, there would be nothing left over for any other services. Six timeslots would give your LAN extension a maximum bandwidth of 256kb/s, which is rather slow considering all that goes on at transmitter sites nowadays. Read on in the main article to see how to get around that problem.



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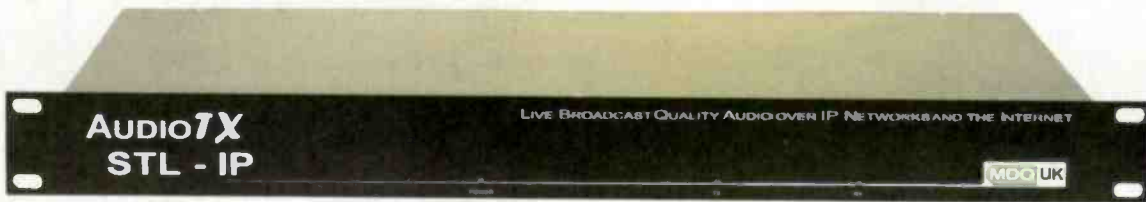


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### Audio TX STL-IP

Another possibility for the transmission of audio over a network such as this is the STL-IP from Audio TX. This is a 1RU box with analog or AES inputs and outputs, wordclock in, and of course the network interface (RJ-45 100baseT). Sample rate up to 96kHz and word length up to 24 bits; linear PCM, AAC, layer 2, layer 3 and G-722 are the most well-known of its available coding schemes. Management is done via a Web browser or a telnet session using command line.

Likewise, many of the codecs commonly used for remotes, such as Tieline, are capable of communicating via an IP link and can be used to interface via a network.

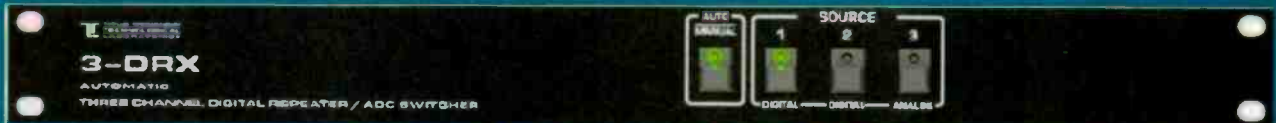
And finally, you can take the approach that your transmitter site isn't really for away after all, and that it's just another node on your network. This would be your approach should you chose to go with Axia and one of its AES nodes. This device has eight AES inputs, and eight AES outs, and makes use of an Ethernet network for transport of audio

from point A to point Z. (An entire full-bandwidth 100baseT connection is required between the two nodes.) If you have that much bandwidth available to your transmitter site, this is an approach you may want to consider. Alternatively, if the site is in the general proximity of the studio, you may want to consider a fiber optic run between the two points. You could extend your network by adding two Ethernet switches (one at point A and the other at point Z) that are trunked via a fiber interface.

Wireline STLs have come a long way in the last 10 years or so. As the proliferation of networking has changed the way radio stations are put together, so has it expanded the possibilities for STL systems. I hope I've given you some ideas about how powerful and useful the current technologies are, along with some ideas to consider in the future.

*Irwin is transmission systems supervisor for Clear Channel NYC and chief engineer of WKTU, New York. Contact him at [doug@douglrwin.net](mailto:doug@douglrwin.net).*

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10:29:17



# GREEN

# Boston

By Jackie Broo



# W

GBH-FM is one of the largest providers of programming for public radio stations across the United States. This includes a global news and public affairs show, *The World*, co-produced by WGBH Radio, BBC and Public Radio International (broadcast nationally to more than 230 public stations), production of live performances, and programming featuring classical, jazz and Celtic music.

In 2002, WGBH Television and Radio announced plans to move to a new location in Boston's Brighton Landing that would feature new broadcast studios and a 200-seat theater. The new facility would also have a 40'-by-30' video mural featuring light-emitting diodes that can be seen from the Massachusetts Turnpike.

WGBH's new Brighton complex is officially green, with LEED certification granted by the U.S. Green Building Council's Leadership in Energy and Environmental Design program. The green designation features construction from recycled steel, motion-sensitive office lighting, UV-filtering glass and motorized sunshades, water-conserving features, solar panels generating 100kW of power, and a "green roof."

## Making connections

WGBH-FM General Manager John Voci said, "One of the design criteria was to increase our visibility within the institution. We were kind of hidden away in the old facilities, and you could have walked by us and not realized that a radio station was there. Today we have two high-profile studios [Fraser Performance Recording Studio and *The World* news complex] sitting on both ends of the new building. It is pretty hard to ignore us right now."

For the new studios, Janson Design Group created floor-to-ceiling windows in *The World* and Fraser studio that look out on Boston streets. The glass windows weigh three tons and have three layers of special glass. Voci said, "It is kind of nice to go from a subterranean environment to where you have some visual connection with the outside world."

The new WGBH radio facility is comprised of two on-air control rooms, four production control rooms, five studios, two digital mix rooms, a 34-desk newsroom and a radio master control room. A striking focal point of the new facility is the recording studio.

## Fraser studio

The Fraser Performance Recording Studio is a 2,000-square-foot, state-of-the-art recording and live FM broadcast studio with a 28' acoustically isolated ceiling, 5.1 surround sound control room, three isolation rooms and a green room.

The studio opened in September 2007. Acoustical features include double-wall construction around the studio on spring-isolated, floating concrete floors. RPG Quadratic Diffusers are installed on the lower half of the walls, with 2"-thick, fabric-wrapped panels attached to the upper-half of the studio walls. Ceiling panels are RPG Skyline 3-D diffusers, and corner bass traps are built in.

**Left: Radio Control 2 is dedicated to music post production.  
Below: The 2,000 square foot Fraser Performance Recording Studio broadcasts live events.**



Photos courtesy of Andy Washnik of Capricorn



# Eco-friendly facility fulfills many needs for WGBH-FM

# GREEN Boston



Photo courtesy of Andy Washnik of Carpincom

**The World newsroom holds 34 reporters and producers.**

Some 150 live-to-air radio performances are produced every year in the studio that showcases local, national and international artists.

Voci said if the Fraser studio is the centerpiece of the station, then Solid State Logic's (SSL) digital HD music

production console is the heart of the Fraser studio, "Everyone loved our old SSL analog console. The new SSL digital console simulates or duplicates all those traditional analog controls and so much more."

The Fraser studio (Radio Control 1) is equipped with the SSL C200 HD console. The C200 is SSL's 64-channel, digital recording console, capable of mixing up to 128 sources. WGBH's C-200 is also equipped with a Solid State Logic 48-channel stage box. The stage box allows producers to connect 48 microphones to the C200 through a fiber optic link.

In addition, Radio Control 1 features a 48-channel Steinberg Nuendo digital audio workstation, ATC mains, and an Aviom Pro 16-channel headphone mix/monitoring to supplement a proprietary headphone/cue system and a TC electronics System 6000 reverb and mastering system.

Chris Gefken of The Systems Group, project integrator, said, "From a radio standpoint, there is nothing standard about the Fraser studio. It's a classic film scoring sound stage with an orchestra-sized live room. It's a large format recording studio environment."

Radio Control 2 is used for music postproduction. It is built around the Euphonics MC controller, a Steinberg Nuendo digital audio workstation, and the TC electronics System 6000 reverb and mastering system. Both Radio Control 1 and 2 are equipped for stereo and 5.1 surround sound.

According to Studio Designer Dennis Janson, "First and foremost, the acoustic design of the studio and the ele-

## Shhh...



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**The World control room broadcasts news five days a week.**

ments that you see on the walls and ceilings are all there for very specific reasons – to provide a uniform sound decay rate (RT60) in the room.”

### The World newsroom and production facilities

The World covers 4,500 square feet of floor space in the new facility, including: a news room that holds about 34 reporters and producers; a control room that broadcasts the Monday-Friday news program; a studio for the program host, a small production room built around a digital work station featuring a Sadie DAW; and a small announce booth.

The critical phase in moving for *The World* was closing the show out on a Friday afternoon and making sure that on Monday morning the production team could walk into the new facility and start producing at 7:30 a.m. Voci said, “Fortunately, Friday was a slow news day, and we were able to wind up the show relatively early.”

### Facility flexibility

According to Voci the move was not only an opportunity to make the conversion from analog to digital, but to fulfill a wide range of needs for the station’s programming.

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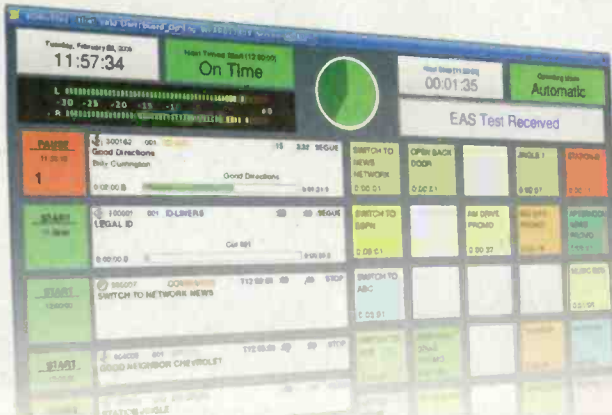
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# GREEN Boston



"We took a look at all of the things that we do here. We're not just a radio station that has broadcast and production facilities. We also do the national news program, and we record live performances," Voci said.

Voci's goals for the station's new technology included reliability, usability, flexibility and redundancy. Voci said, "We're doing six feeds

a day for *The World* and we need to make sure that everything is there. We also needed to have flexibility built into the system so that projects can be transferred anywhere."

Voci's team went with Broadcast Electronics' Audio Vault AV2 playback and control systems (upgrades) and a Wheatstone Router System to address those needs. The Wheatstone Bridge Router, along with their G3-9 series and D9 model control surfaces, were chosen to span the generational gap from old (analog) to new (digital). The Wheatstone system consists of 10 router frames, two redundant routing hubs and control surfaces.

The five Audio Vault AV2 servers and workstations are responsible for the station's live audio playback/recording and production (including its Cape Cod and Martha's Vineyard affiliates, WNAF-FM 91.1, WCAI-FM 90.1), as well as audio production and playback for *The World*.

## Equipment accessibility and usability

"Accessibility was a big part of their criteria," Gefken said. "Everyone has their own level of technological comfort, and we had to tailor things accordingly, from the on-air operators to their advanced classical recordists."

Gefken also said that a considerable effort went into the ergonomics and design of the custom furniture (Time Base Consoles). "We went through an extensive design phase with the staff to give them such things as a table top

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console that lifts to expose a turntable underneath or keyboard tray that slips and travels the underside of the counters as needed. The keyboards can also slide up and down and left to right. It is pretty cool."

### The reviews are in

According to Janson, the feedback on the Fraser Performance Recording Studio has been terrific, "From a technical point, it is one of the best studios in New England. The room was originally intended to be used only for music, but with the ambiance, acoustics and overall feeling in the room, it is now being used for fundraising events." (Note: The Fraser Studio is also wired for high-definition television with feeds to the WGBH TV production group.)

Voci agrees, "The real wow to our facility is the Fraser Performance Recording Studio. It is a beautiful space. It allows us to do things that we that could have only dreamt of in the past in terms of accommodating ensembles of different sizes, bringing in audiences for live performances and being able to do commercial work for recording (new revenue stream)."

In regard to the whole relocation process, Voci said, "We held meetings with the engineering staff from the beginning. Everyone was invested in the design, and that created a real sense of ownership."

The design team includes Dennis Corriea, Thomas Devlin, Jon Frank, Miles Smith and John Voci from WGBH Radio; Chris Gefken and Scott Griffin from The Systems Group; and Dennis Janson of Janson Design Group. 

*Broo is a freelance writer based in Cincinnati.*



More photos online at [www.RadioMagOnline.com](http://www.RadioMagOnline.com)

## FACILITY FOCUS

### The technology behind WGBH

#### Wheatstone Consoles and Router

The G-4 Radio Broadcast Console Control Surface (shown) is one of a series of seven surfaces for radio on air and production, with varying features



to meet the needs of facilities large and small. WGBH chose the larger G-9 for its main network control room, and the G-4 for the other on-air and production rooms. All interface with the Wheatstone Bridge and WheatNet.

The Bridge system provides analog and digital audio and logic I/O connectivity, and generates the console mixes. Typically a Bridge frame or one of its smaller siblings is installed in each control room/studio suite for a completely self-contained system. Each Bridge then connects to Wheatnet via one or more CAT-5 cables.

WheatNet is the Wheatstone central core routing system to make all systems sources and mixes available anywhere throughout a facility.

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as the integrated STAC IP Screening and Control Software and Auto Attendant mode, STAC has become increasingly popular among broadcasters looking for a simple-to-use, easy-to-integrate phone system to handle call-in talk shows, remote IFBs, request and contest lines. Each STAC mainframe can accommodate up to 12 phone lines and up to four control surfaces. Up to 12 STAC Mainframes can be interconnected for facility wide sharing of phone lines. STAC is available as a six or 12 line system and STAC 6 can be easily upgraded to a STAC12 in the field. Each system comes with the dual digital hybrid mainframe, a single control surface and the integrated STAC IP for call screening and control.

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## Tips, tricks, hints and more

By Chriss Scherer, editor

### Clean and neat wiring

We've all seen the extremes of wiring in a facility. Some are rat's nests, and some are works of flowing art. Most are in between. But it's not just the wire path that makes the job look good and work well. Attaching connectors and placing wire ties are part of the plan, too. In the old days, cable lacing was a major part of wiring installation. This mostly lost art looks amazing when it's done right.

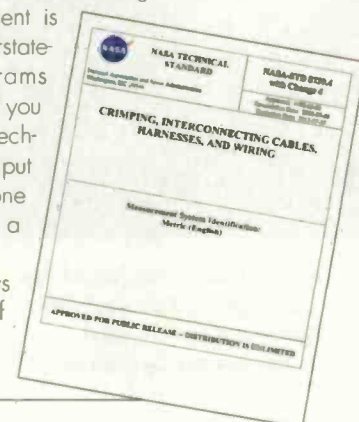
A few years ago while working on a studio installation project, one of the installers – an ex-navy man – was telling me about some of the electronics training he received and how he still applies the practices to his studio installation work. This includes soldering skills, applying heat shrink and cable preparation.

But not everyone has that training available. What standards do you observe in your wiring? I was referred to a source that addresses this topic in great detail. It's from NASA, so you know it has to pass some high standards since there aren't many second chances in space.

The publication is titled *Crimping, Interconnecting Cables, Harnesses, and Wiring* (NASA-STD 8739.4 with Change 4). It sets requirements for interconnecting cable and harness assemblies that connect electrical/electronic and electromechanical components. It's posted at RadioMagOnline.com.

To say the document is thorough is an understatement. With diagrams and descriptions that you would expect from a technical agency, I would put this publication as one of the must-haves in a technical library.

I guess these guys really are a bunch of rocket scientists.



### With this ring...

The E-VRE-20 is a popular radio mic, and many accessories are available for it. One accessory is the Popless Voice Screens VAC-RE20 pop filter. Robin Cross, chief engineer at KCUR-FM, noticed the arms that support the screens were drooping over time. To cure this, he tried several ideas. He finally settled on adding O-rings around the arm that holds the filter. After

trying a few sizes he settled on rings with a 0.5" inside diameter. He also found that using a larger outside diameter ring increases the clamping effect. He ordered a bag of 75 rings from Grainger (part # 1CGZ2) for less than \$10.

He says the best way to install the ring is to remove the arm from the slot, put the O-ring around it, then reinsert the arm and work the ring into place. Placing the ring and then inserting the arm is too difficult.

### No more missed cues

The new generation of satellite receivers is much more than a simple audio delivery device. They now include store-and-forward capability, which moves the function of capturing the feed to be played back later from the automation system to the satellite receiver.

I had heard that some stations were having difficulty with some delayed programs missing closures at the end of the program. (They're not really closures any more, they're cues, but we still think of them as closures to trigger an event.)

The problem occurs at the end of the recorded program when the automation system doesn't receive the last closure. Usually, the closure is sent slightly late. For example, if the program is set to end at 58:50 but the final closure is sent at 58:52, the receiver does not capture that final closure because it stopped recording at 58:50.

Kevin Trueblood, an engineer with Mid-West Family Broadcasting in Madison, WI, suggested a solution. He has considered adding a hard-synced closure in the automation system to occur at 58:53. If the XDS satellite receiver misses the last scheduled closure at 58:50, the automation system will see the hard-synced closure at 58:53 and begin the break at 58:53. Three seconds of silence is better than minutes (or more).

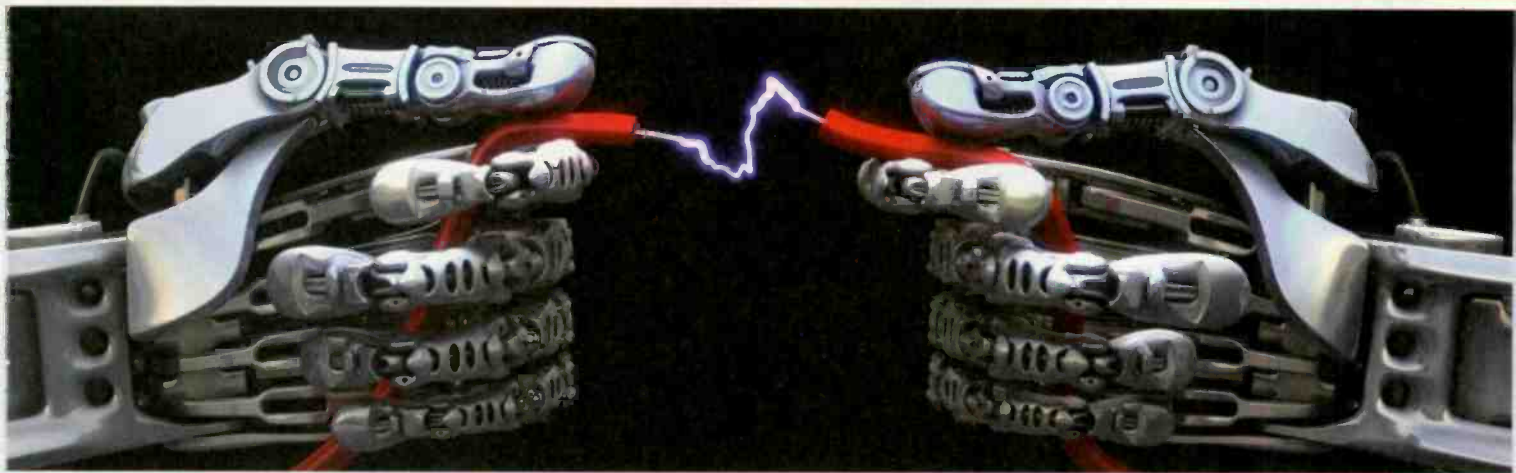
If the 58:50 closure is recorded on the satellite receiver, the automation system starts the break at 58:50 and ignores the hard sync because it's already in the break. He warns that the automation system must be configured to accept this series of events without accepting the potential double closure.

This idea has not been tested yet, but he was planning to implement it soon. Perhaps you have another solution. If so, send it to us or post it at forums.radiomagonline.com.

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# Automation

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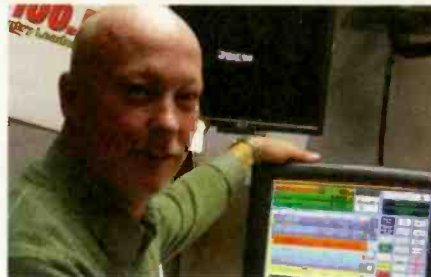


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~ Jim Franklin, Program Director  
WVBO, Appleton/Oshkosh - Wisconsin



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~ Matt Scarry, Operations Manager  
WWFN/WHLZ, Florence - SC



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~ Leslie Whittle, Program Director  
KRBE, Houston - TX

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## FM Services TLM-1

By Lloyd Mintzmyer,  
CPBE

**I**t was inevitable, with the changes in technology over the past years, that items started shifting to a microprocessor-based design. From studio automation systems to remote control units and transmitters, those pesky, rectangular ICs with all the leads cropped up everywhere. I could hardly believe my eyes when I saw an ad for the FM Services TLM-1, a microprocessor-controlled tower light monitor. What really caught my attention was the claim that multiple beacons and sidelights could be monitored by sensing one wire. Over the years I have used other types that required each beacon level and each sidelight level to be monitored by a separate wire going up the tower

to that level; a condition that didn't always exist either by design or tower wiring changes over the years. I have built several of my own basic design tower light monitors using a toroid core to sense the current and then rectify and smooth the flash transitions for a remote control to sense. However, the idea of being able to monitor the whole tower with a single current sense was intriguing.

With the TLM-1, installation is very easy and straightforward if your system uses single-phase power and either 120V or 240V supply. With a 120V feed system, the hot wire from the breaker panel is

unit is calibrated by pressing a button. This tells it what normal current flow is for beacons, sidelights, and even if you have a steady burning bulb in the tower light circuit. This is a handy feature if you leave a light on constantly for humidity control. It is now ready to provide status alarms for changes it senses as abnormal operation.

### System status

- The TLM-1's status outputs indicate problems:
- *Photocell circuit failure.* If the status of the lights does not change in 20 hours, it is assumed there may be a problem with the photocell circuit. Instances where the tower lights are on 24 hours each day, this function can be disabled by a dip switch.
  - *Flasher failure.* If beacon current is constantly on or off, or if the flash rate and duration are not according to FAA specs, then this status will alarm. Note: the beacon on vs. off time is monitored for FAA specifications.
  - *Beacon failure.* Activated if a beacon bulb fails or flasher is in constant off state.
  - *Marker failure.* Activates with a failure of any sidelight bulb.
  - *Summary Alarm.* Any of the four above alarm conditions causes a summary alarm. This alarm may be reset locally or remotely and the unit is ready to monitor for an additional lamp or condition to fail.

## Performance at a glance

- Senses current on power supply lines
- Multiple alarm outputs
- Opto-isolater alarm and status outputs
- Remote alarm reset
- Single-phase or three-phase monitoring

fed through the current-sense transformer so the total current – beacon and sidelights – is sampled by the TLM-1. In the case of a 240V feed, where two hot wires are used to feed the tower light system, both are fed through the current sense transformer, but one lead is inserted in a reverse direction so the currents, which are 180 degrees out of phase, will be additive through the current transformer. Sampling of a tower light system fed by three-phase power will require three of the TLM-1 units. Single-phase power was used in both locations where this unit was tested.

Once the electrical feed to the tower light system is fed through the current sense transformer, with the lights all operational in a normal mode, the

### More indicators

The status outputs can be programmed to either high level or low level on alarm. However, I noticed that no alarm indication will be present if all power is lost to the system, unless the unit is programmed for alarm condition to be active high status output. An example would be if the site was without primary electrical power. Assuming the remote control system was on a UPS and could alert the operator with a status change to open for alarm when a power failure



A feature I like about the TLM-1 is the ease in which the unit can be reset for a change in the "normal" status. For example, assume one of the beacon lights has a failure of one bulb. This will trigger an alarm so the remote operator knows an abnormal situation exists. When a visual check confirms that all beacon levels are still flashing, the unit may be reset and it will be ready to alarm if an additional bulb, either a beacon or sidelight, goes out. This allows time to schedule a tower crew for relamping, but still be fully compliant in monitoring for additional outages.

I first evaluated this unit at an FM tower running analog and digital transmitters. The site had one side light bulb outage and also one beacon bulb outage, so it allowed me to evaluate each condition. The unit found these discrepancies within seconds of having calibrated for normal current operation. The second evaluation site was a directional AM, with transmitter power of 10kW at 750kHz. I've previously had sensor problems at this site with other brands of sensors due to the high RF levels. The TLM-1 operated flawlessly at this site also, although the only simulation I made this time was the loss of one sidelight. I'm sure the loss of a single beacon lamp would have also been detected. Initially, I was concerned since the unit is shipped from the factory in a plastic housing,

but the circuit seems to be immune to AM radiation, at least to the level present at our 10kW transmitter site.

The status outputs and reset command input are all fed through opto-isolators, a good design feature. Personally, I would install the unit with ferrite beads on all wires connecting to the unit, but for this evaluation no RF suppression was used, and the unit performed well. The TLM-1 is manufactured by FM Services in Wilkesboro, NC, and questions about installation and operation were readily answered by telephone. I would recommend you consider this when the need for a tower light monitor arises, especially if you have a tower light circuit where a separate wire is not available for each sidelight and beacon level. 📻

*Mintzmyer is the president of The Praire Network, with AM/FM stations in Nebraska, Kansas, Colorado and South Dakota.*

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

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## ATI DM500

By Doug Irwin,  
CPBE AMD

It seems like I start off every article with "back in the old days..." and the reality is that it makes sense when evaluating new equipment to put it in the proper context. Back in the old days when the broadcast facility was completely analog, you could get away with hanging a pair of headphones across a line to hear what was going on. All you needed was a convenient cable that would allow you to bridge on one end, and a way to plug in headphones on the other. The only protocol you had to be concerned with was analog audio.

So once again, segue to the future – or now. Your facility could be nearly completely digital, or at the very least, it has some digital sources and destinations. Now we have at least two protocols to be concerned with: analog audio and digital audio. It'd be nice if you could just hang headphones across the digital circuits, wouldn't it? Too bad it doesn't work that way.

Fortunately for all of us, several manufacturers make devices that will allow you to effectively hang your headphones across that digital circuit. It's just that you have to put their box between the digital line and your headphones. One such box is the ATI DM500 digital audio monitor.

### Performance at a glance

- Battery powered and portable
- AES3, AES3-ID and S/PDIF inputs with loop through
- D/A converter with line level balanced out
- Variable gain headphone output
- Multiple error indicators
- LED level indicators

One interesting spec is the unit's ability to output a full +24dBm from its balanced analog output. This was something I was anxious to prove.

The first thing I did with this unit was to compare its level readings with a more expensive, laboratory-grade AES test set (the Audio Precision dual-domain). Each channel has a bar graph on the front of the unit made up of six LEDs. That doesn't provide a lot of resolution, of course, but it gives you an idea of where the level is – it isn't for measurement purposes anyway. Mainly you want to know if you have audio, and that you aren't too close to 0dBFS. I found that the

level indications of these LEDs agreed with our other instrument.

I also decided to calibrate the analog outputs for a specific relationship to the peak of headroom for the digital signal; it makes sense that the line level outputs correspond to the audio level encoded in the AES data stream after all. I set the analog output level to be +23dBm when the encoded audio level was set for -1 dBFS. Increasing the encoded audio level to near 0dBFS obviously also increases the line-level out; I noted no clipping in the analog outputs. This is impressive for a portable, battery-operated piece of equipment.

After testing the unit on the bench it was imperative to put it to use. It comes with a shoulder strap so you're not forced to set it in a rack somewhere while using it. I slung the unit over my shoulder and headed into the Clear Channel master control (MCR) here in New York to see what I could learn with it.

The easiest source to connect to was the AES output from a Belar FMSA-1. The DM500 indicated this output has a sample rate of 48kHz and had no digital errors; my ears told me this audio was still emphasized. The DM500 has a headphone output that can get very loud – in fact the user manual cautions against keeping the volume up too high for too long. I found that I generally had the gain control throttled down to about 9:00, and that was plenty of level with a pair of Sony MDR7506 headphones.

While the unit was in my possession for this evaluation a particular situation came up in our MCR and the DM500 proved its worth. We were in the process of evaluating an issue with our router affecting the audio transmitted over one of our HD Radio signals.

We wanted to decode the audio and study phase relationships between the channels, but at

digital patch bay; we then took the looped output and sent that back to the same patchbay, which inserted the DM500 into the air chain.

The decoded analog outputs were routed over to a scope so we could evaluate the Lissajous pattern.

The loop through capability of the DM500 is especially useful, and it works with the balanced input/output, the BNC input/output, as well as the S/PDIF input/output.

The battery life of the unit seems quite good – the battery pack is made up of four 9V batteries. There is a short cable that runs from the battery pack – which slides on to the bottom of the unit – and plugs in to the DM500. It probably would be a good idea to yank the cable out when you set the unit on the shelf to maximize the battery life (in case you forget to turn the DM500 off when you are done using it). Alternatively you could use a 24Vdc power lump. I noted that the analog outputs, while clean sounding, had a little bit of noise in them. Nothing to be too concerned about, but it did show up in the Lissajous pattern mentioned above, and it's audible in the headphone out.

Overall I would rate the DM500 as very useful around the radio station facility. It seemed obvious

to me it was designed by someone who knew what the end users were looking for and expected. It appears to be made very well, and I would expect that it could be inserted and left in an air chain with very little to worry about (except keeping it powered). The input/output connectors are the gold-flash type.

When looking at test equipment for use in and around the radio station facility I think it would be very worth your time to look at the ATI DM500.

*Irwin is transmission systems supervisor for Clear Channel NYC and chief engineer of WKTU, New York. Email: doug@dougirwin.net.*

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## Thermo Bond Buildings

By Charles Dozier

Last year I found myself in need of a new transmitter building. As most projects go, I was already behind schedule because of some siting issues. To make matters worse, this was a new and undeveloped site located roughly 30 driving miles outside the city of Gillette, WY, which was at the time going through a bit of a boom. Of the half dozen contractors I originally called, only two even bothered to return my calls and once they heard details they also turned down the job. I was in a bad situation. I had never really given serious consideration to a pre-fab building. All those I had seen before had been relatively small structures, and they all seemed pretty similar, like they were all made from the same cookie-cutter design. I needed a big, complicated building, one capable of holding two Harris HT-30s, a combiner and all the associated equipment. Definitely a unique structure.

But quoting a Charlie Daniels song, "I was in a bind, I was way behind and I was willin' to make a deal." So I called Chuck McKeever at Thermo Bond. I had run into him the year before at the NAB

tions provided by Harris. Thermo Bond took care of designing, sizing and locating all of the electrical drops. It placed AC units and HVAC venting and fans. Over the course of a few weeks my cruddy little drawing had become a stamped set of blue prints for the local planning, building and zoning committee, which was another huge time saver. The only time I had to have an inspector on site was to verify that the pad was constructed per the drawing and once more for the final electrical service connection. The building and all of its contents came pre-inspected by Wyoming licensed inspectors.

Up until now, I still hadn't seen the building, so I was pretty excited when the truck driver called. The next morning I met him as he exited the interstate and I guided him to the site where we already had a crane standing by.

An hour and a half later the building was on the pad and I got my first look inside. I was impressed. Not only was everything exactly as we had planned, but the building was bright, well lit and even included a few extras, like hi/lo temp, loss of power, fire, smoke and intrusion alarms. It was pretty obvious that Thermo Bond didn't cut any corners. All materials were high quality and workmanship was unsurpassed. A week later we slid the two new transmitters onto the floor, under the pre-installed power drops. Everything was exactly where it was supposed to be.

Electrical distribution panels were neatly laid out, well marked and for once I didn't have to explain to an electrician why I wanted separate fused disconnects instead of breakers. Every breaker in the panel was marked, as were all switches, outlets and service connections.

### Performance at a glance

Single and multiple room shelters

Wired to custom needs

Insulated steel doors

Aggregate exterior finish

Water and air tight

Bullet resistance options available

Show and I figured the least I could do is see what he could provide, when he could get it, and what it would cost. After a few minutes on the phone and a couple of exchanged emails, I faxed him a very crude drawing of the building I had in mind. This drawing was just one step over something you might pencil out on a bar napkin, but it did include placement of the two transmitters and the combiner. Beyond that it was a pretty blank slate.

A week later I had a rough set of blue prints, a very reasonable price and a delivery date. As the project moved forward, we made some minor tweaks, but Thermo Bond basically worked from the original drawing and the pre-installation instruc-

Thermo Bond even handled strange requests. Here in Wyoming we really only need air conditioning a few months out of the year. The rest of the year cooling needs can be met with air circulation. Thermo Bond installed exhaust fans, one for each transmitter, but I had a special request for intakes. In order to keep the building positively pressured, just installing a set of intake louvers doesn't cut it. Instead we've been installing large swamp coolers on thermostats. They're a very efficient way to move large volumes of air at low pressure and the mats provide some decent filtering. We don't even bother installing the pumps. When I explained this to the folks at Thermo Bond, they scratched their heads and said, "Just tell us where to leave the holes and how big you want them".

It turned out perfect. Everything is redundant. Each side of the building has an exhaust fan, a swamp cooler and three tons of supplemental air conditioning. Failure of any one device is hardly noticeable.

Because this building sits under a 1,150' tower, falling ice was a huge concern. So during the design process we discussed various ways to handle the problem with Thermo Bond and eventually settled on having a 1/4" steel plate installed under the neoprene roofing material. It

was a relatively inexpensive fix to a problem that has plagued us at other sites.

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*Dozier is director of engineering for Legend Communications of Wyoming, Cody, WY.*

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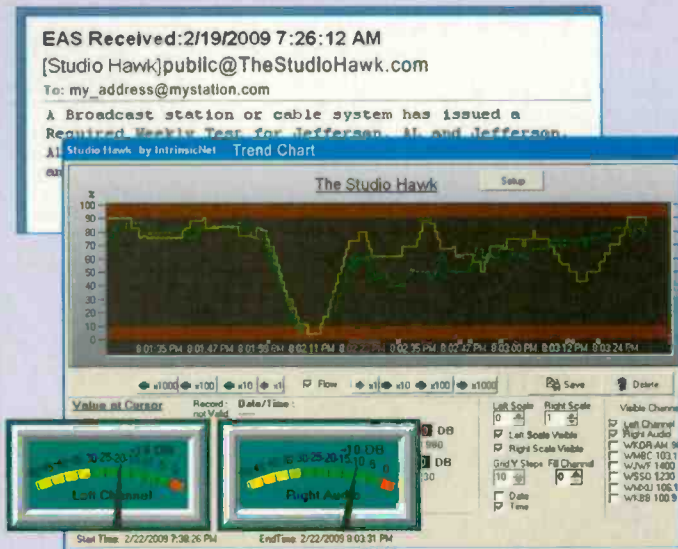
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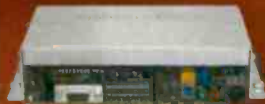
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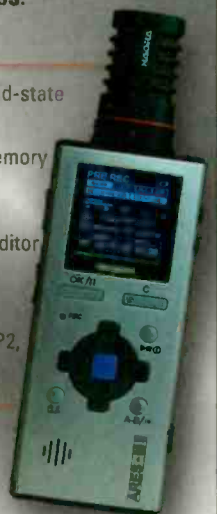
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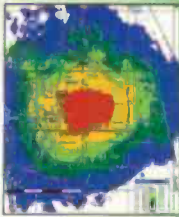
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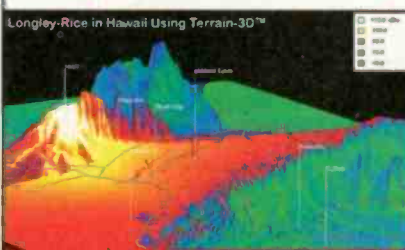
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# Contributor Pro-file

Meet the professionals who write for *Radio* magazine.  
**This month:**  
**Field Report, page 60**



**Lloyd Mintzmyer**  
**President,**  
**Praise Network**

Lloyd Mintzmyer is the president of the Praise Network, AM/FM radio stations serving Kansas, Nebraska, South Dakota and Colorado. He spent

23 years with Smoky Hills Public TV as director of engineering, 10 years with Nebraska Television Network as chief engineer and served as an electronics technician in the U.S. Navy. He graduated from the electronics program at Denver Tech, has been a Ham radio operator (K0JKC) since 1961 and loves restoring pre-WWII radio receivers.



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Nautel Electronics	31	902-823-2233	www.nautel.com
Nott Ltd.	68	505-327-5646	www.nottltd.com
OMB America	25	305-477-0973	www.omb.com
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RF Software, Inc.	69	352-367-1700	www.rfsoftware.com
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by Erin Shipps, associate editor

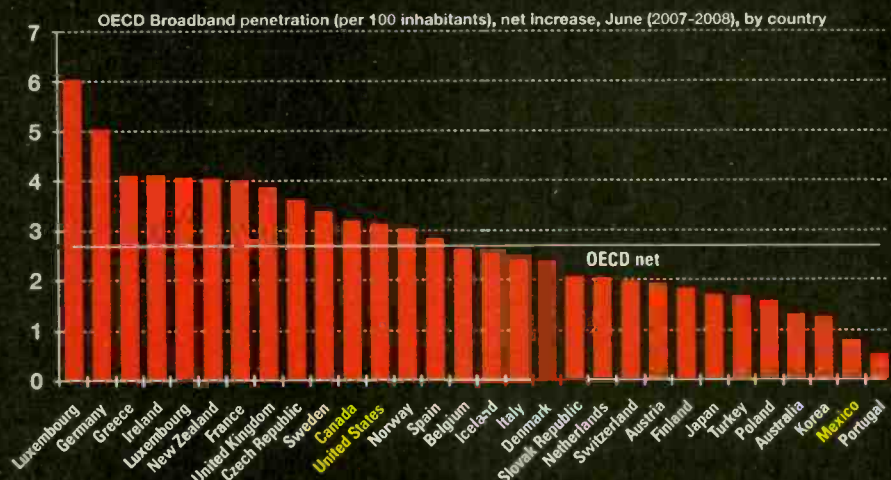
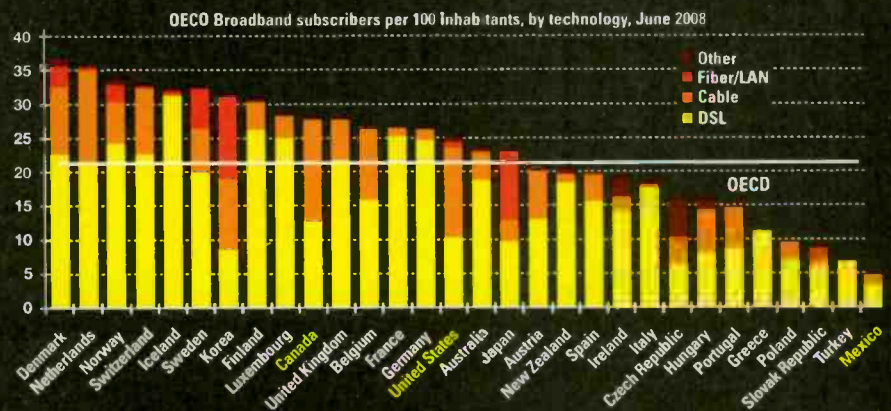
## That was then

Dave Land sent us this photo to use "if we were desperate." While we're not desperate, we do enjoy old photos. The photo is circa 1966 while he was in high school in Fairfield, IL, working nights and weekends at his dad's radio stations, WFIW-AM/FM. After graduating high school in 1968, Dave attended SIU-Carbondale, IL and graduated in 1972 with a BS in Radio-TV. He went to work for WGOM in Marion, IN, in June 1972 and then was drafted into the U.S. Army in Dec. He was still able to work weekends at KCCO in Lawton, OK, during his Army stint. He returned to Fairfield in January 1975 and has been there ever since. Dave is now president and general manager of Wayne County Broadcasting Company. His dad, Tom Land turned 89 in January and still comes in to the station every day.



## Sample and Hold Broadband Penetration

According to [www.oecd.org](http://www.oecd.org), the number of broadband subscribers in the Organisation for Economic Co-Operation and Development reached 251 million by June 2008, an increase of 14 percent from June 2007. This growth increased broadband penetration rates to 21.3 subscriptions per 100 inhabitants, up from 20 percent in December 2007. The United States is the largest broadband market in the OECD with 75 million subscribers. U.S. broadband subscribers consistently represent 30 percent of all broadband connections in the OECD. For more information and statistics, visit [www.oecd.org/sti/ict/broadband](http://www.oecd.org/sti/ict/broadband).



Source: Organisation for Economic Co-Operation and Development

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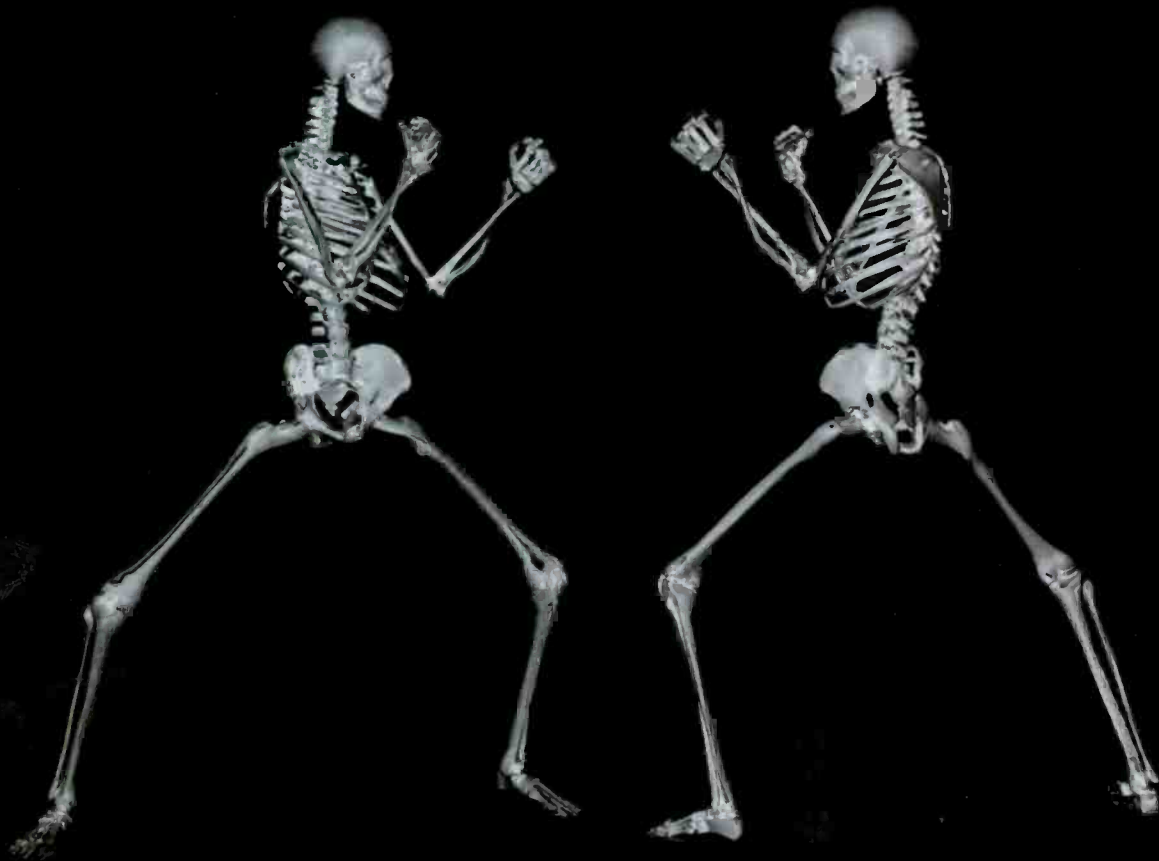
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