

Radio 100th Issue

THE RADIO TECHNOLOGY LEADER

What's in store for NAB2004 Technology unveiled



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NAB Preview



Get an inside peak at the new products
Page 16

A special pull-out map of the Radio Hall
Page 19

Find your way through the show floor fast with our exclusive FASTtrack
Page 32

Technical session spotlight
Page 42

Trends in Technology
Time for a new transmitter?
Page 50

Facility Showcase



All-digital in the Motor City
Page 54

Tomorrow Radio
The details of the NPR project
Page 62

Field Reports
Clear Channel tackles R3DS with Audemat-Aztec
Page 38



Entercom Boston gets connected with Harris
Page 70



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It's Here!

Are You

Ready?

Features

- 16 NAB Extra!**
by Kari Taylor
Preview the products awaiting you at NAB
- 19 NAB Radio Hall Map**
A special pull-out section
- 32 NAB FASTtrack**
A *Radio* magazine exclusive—
Find the quickest route through the show floor
- 42 NAB Events, Seminars & Sessions**
by Chriss Scherer
An overview of not-to-be-missed gatherings
- 52 Trends in Technology:
Transmitters**
by Chriss Scherer
Considerations for the station's flamethrower
- 54 Facility Showcase: Greater Media
Detroit**
by Michael Kernan
Digital cool in the Motor City
- 62 Tomorrow Radio**
by John Battison
What will the NPR project provide to stations?

32



Departments

- Online 06**
at www.beradio.com
- Classifieds 84**
- Contributor Pro-File 85**
Meet Michael Kernan
- Sign Off 86**
by Kari Taylor
Classic remotes, classic radio and satellite's future

Field Reports

- Audemat-Aztec FMB80 68**
by Jeff Littlejohn
- Harris Intraplex SLT Plus 70**
by John Kennedy

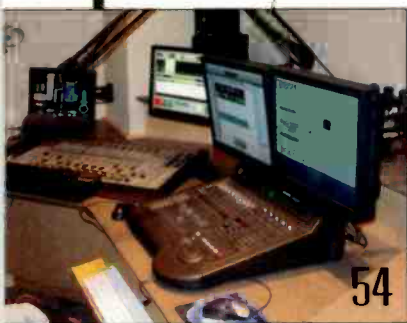
Columns

- Viewpoint 08**
by Chriss Scherer
The IBOC killer app may be here.
- Managing Technology 10**
by Kevin McNamara
The evolving tower standards
- FCC Update 14**
by Harry C. Martin
It's time for translator applications.

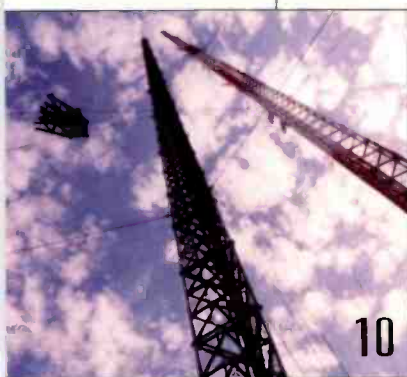
ON THE COVER:

The lights, the late hours and the fabulous shows—we're not talking about Las Vegas, we're talking about NAB2004. The *Radio* magazine convention preview helps you prepare. Cover design by Michael J. Knust.

Not to toot our own horn, but this issue is the 100th issue of *Radio* magazine! 10 years and 100 issues of the Radio Technology Leader is great combination. Look for high-lights from our past 100 issues in the months to come.



54



10



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Currents Online

Highlights of news items from the past month

Webcasting Royalties Set by Copyright Office

The U.S. Copyright Office has published the long-awaited royalty rates for Web music broadcasts, ending the year-long process.

Morse Code Knows Where It's @

To keep up with the electronic times, the ITU has added "@" to International Morse Code.

SBE Celebrates 40 Years

It started as a gathering of about 100 broadcast engineers at the 1964 NAB Convention.

FCC Reports LPFM Interference Findings to Congress

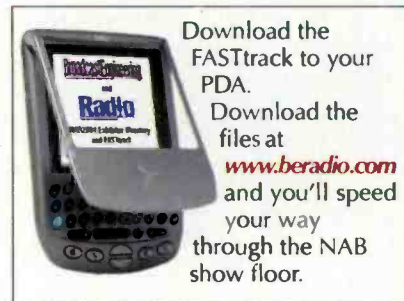
The FCC report looks to relax the third-adjacent spacing rules.

FCC Proposes Rules For Broadband Over Power Lines

The FCC has proposed changes to certain technical rules with the intent of fostering broadband deployment by permitting the use of broadband over power lines (BPL).

NAB Announces Engineering Achievement Winners

Glynn Walden and Ira Goldstone will be honored at the Technology Luncheon, Wednesday, April 21 at NAB2004 in Las Vegas.



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The killer app defined

With the NAB2004 convention just days away, broadcast equipment manufacturers ready their wares for the annual showing while the attendees plan their agendas. The NAB convention is a top-technology show, and I realize that I'm not taking any chances in predicting that this year's convention will be full of clever product introductions. For radio, the hot topic will again be IBOC—but this year it will be different.

There have been demonstrations of the technology, propositions for enhancements and examples of applications at previous conventions, but for the most part the topic has been little more than pie-in-the-sky conjecturing.

One primary concern has always been *when* this transition and wide acceptance to IBOC will occur. In January, several consumer radio receiver manufacturers committed to producing receivers, which are due to be available soon. This eliminates the problem of creating a signal that no one can hear.

Many stations have investigated transmission methods besides the high- and low-level combining approach. The FCC is currently evaluating the use of separate antennas for the analog and digital signals, which will allow some stations to make the transition quicker, either by using a backup facility or by installing a separate digital system.

So while the question of *when* still looms, the answer is that it is as close as it has ever been and is just at our fingertips.

The other side of the IBOC debate is *why*. Many have asked why the transition is necessary, and what the benefit is to stations. The transition will require a capital investment for stations that cannot easily be shown to produce a valid financial return. In addition, IBOC has been called a lateral change; one that creates a solution to a non-existent problem. The key has been in finding the killer app for IBOC.

So what will this killer app be? For some

time we have heard about the data capabilities of an IBOC signal. Demonstrations and mock-ups have shown enhanced program-associated data (PAD) and non-program-associated data (NPAD), such as weather, traffic, stock tickers and sports scores. Because these are proposed ideas and not concrete examples, they are sometimes hard to accept. Analog FM has had the capability to transmit some data for many years, but only recently has it become of widespread interest. Data will be a valuable part of IBOC, but it is not yet showing to be the killer app because it is not fully defined in scope or nature.

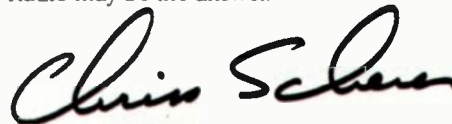
A recently completed project shows real promise as the killer app for IBOC. NPR, Harris and Kenwood worked together on the Tomorrow Radio project, which proposes to provide more than one audio stream on a single channel. (Read John Battison's report on the project on page 62.)

The study and supporting report show that multiple streams are possible and that the system works, which provides a real implementation of the technology. Broadcasters already know how to create a program stream, which provides the link to the practical use of the technology.

The nay sayers complain that there are already too many audio entertainment sources available to an ever-increasingly splintered listening public. This may be true, but the solution is not in complaining about the problem, it is in finding the solution to profit from it.

Can radio stations provide a second audio stream? With current content management and automation systems it should be quite easy. This approach is already being tried on the TV side by WRAL-TV in Raleigh, NC. This station has launched an all-news channel to supplement its regular program stream at a minimal cost. The same approach can be applied to radio.

We have been waiting for IBOC's killer app. Tomorrow Radio may be the answer.



Chris Scherer, editor
cscherer@primediabusiness.com

March 2004 is the 100th issue of *Radio* magazine! Thank you for helping us reach this milestone. 10 years and 100 issues is great combination.



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Changes in tower standards

By Kevin McNamara, CNE

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Sometime this year the Telecommunications Industries Association (TIA) will release the most comprehensive revision to the tower standards since 1996. The standard currently known as EIA/TIA-222-F defines the industry accepted practices and minimum standards for the design of steel antenna supporting structures.

History

The EIA RS-222 standard was first published in 1949 and encountered only two updates until 1980, when the 222C version was published. This was an important document because it took into account more of the real-world knowledge acquired as the deployment of so-called tall towers (up to 2,000 feet) were becoming widespread and the effects of wind and icing were becoming apparent. Not only were these towers taller, but they supported significantly more weight, particularly with antennas used for TV.

Version C provided a perspective for rating wind load based on the height of the tower and where it was located. A map of the United States was delineated into three wind zone categories labeled A, B and C.

The wind loading was considered over the full length of the structure and was measured in pounds per square foot (PSF). The specific PSF rating started at about 30 PSF and increased based on the tower height.

The 222-D specification made a dramatic change to the way wind loading was to be calculated. First, the wind speed was measured in miles per hour (MPH) and a new map was created that depicted basic wind speeds measured at 33 feet above the

ground. The value for basic wind speed increased as a function of tower height.

Revision E was the first iteration of the code to be defined by the TIA and Electronics Industries Association (EIA) and thusly called EIA/TIA 222-E. It further created a wind-loading map based on specific counties within each state, as well as directing the engineer to consider and design for specific conditions that might exceed the standard values.

The current version of the code, called EIA/TIA 222-F, was adopted in 1996 and expanded the scope of the previous version to include the effects of ice loading. Basically, it provided two methods for analysis of ice. Both assume an accumulation of ice based on that specified by the engineer; however, the wind load applied to the tower could be analyzed at full-speed or at about 75 percent of the full assumed speed.

Enter EIA/TIA-222-G

The differences are significant in revision G and will most likely affect tower owners who want to make additions to existing structures or those building new towers.

The philosophy behind the new revision is based on two design limit states—strength and serviceability. The strength limit considers the loading of a tower under extreme conditions; the serviceability limit ensures the tower will provide the proper service under normal conditions.

Towers are also analyzed under four specific types of loading: wind, environmental, ice and seismic.

The effects of wind on a tower are no longer based on a single wind zone chart, but rather a number of external conditions that might change the dynamic of wind, such as terrain, gusts, the method that wind-speed is determined and the value of safety factors used for a specific tower type.

An interesting feature of the new standard is the inclusion of so-called environmental loads. While the underlying thinking for this feature directs the designer to apply wind-loading characteristics based on mean wind speeds averaged over 25, 50 or 100-year periods, it requires that the tower be classified into one of three categories. The categories, labeled I, II or III, define the impact a failure of the tower would have to operational integrity, human life and property then apply a proportionate amount of over design.

Ice loads assume the ice has formed completely around a steel member and is assumed to be twice the maximum projected thickness of the radial ice. To assess the potential for icing a fixed factor for temperature drop is assumed, typically 50°F ice loads are increased as a function of tower height.

The final load criteria, seismic, is also a new consideration within the 222G standard. Generally, this will only be considered within certain seismically active areas.



Photo courtesy of Dielectric

The new tower regulations will require changes in tower design specifications.

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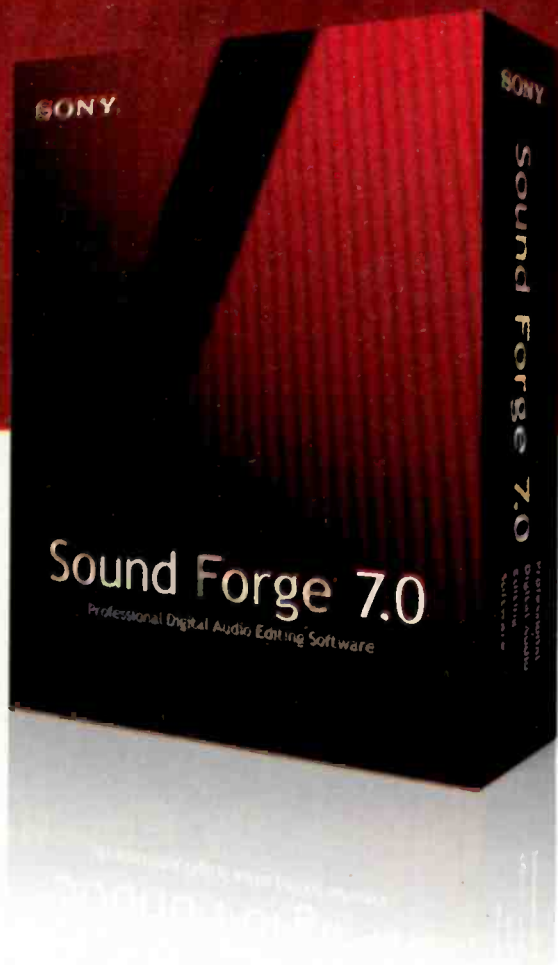
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222G and local building codes

For the first time, the EIA/TIA-222-G code will line-up with national building codes, most notably the 2002 version of the International Building Code (IBC). If you haven't seen a copy of this code, it outlines all of the possible code-related items and refers the reader to several references of other codes,



Towers that meet the standards through revision F may not meet the standards for revision G.

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such as NEC and NFPA. The underlying reference to which the IBC deals with telecommunications towers is called ASCE-7. ASCE is an acronym for the American Society of Civil Engineers and ASCE-7 deals with all things structural, including towers. The latest version of ASCE-7 (2002) will ultimately refer you to what will be the EIA/TIA-222-G standard.

If you have recently constructed a tower in a state or local jurisdiction that has adopted the code, you may have been asked to provide a structural showing compliance with a specific version of the IBC. Note that the previous version of the IBC (2000) references the EIA/TIA-222-F version.

Free tower upgrade?

With the proliferation of wireless services throughout the country, several broadcasters are benefiting from additional rental opportunities from the wireless carriers. In some cases, your tower may be at its structural maximum load limit, particularly under the new standards. But did you know you might be able to get a free upgrade?

If you have been approached from a site acquisition contractor (SAC) working for one of the carriers, but you don't have the structural capacity to accommodate another set of antennas, suggest to the SAC that you will be interested, but the carrier will need to assume the costs of a new structural analysis and upgrade drawings, as well as the labor and materials for the upgrade. The carrier may be willing to take on those costs because the time and associated costs to get zoning approval on an existing tower may be much cheaper than trying to zone for a new structure. Also, the costs to develop a new site are typically much higher.

Of course, the carrier will expect little or no rental payment for a fixed period of time and possibly some form of co-development recovery, should another carrier lease space on the carrier.

McNamara is president of Applied Wireless, Elkins Park, PA.

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Translator applications ripen

By Harry Martin

The FCC now is immersed in evaluating and granting the thousands of FM translator applications filed as "singletons" (non-mutually exclusive applications) in August 2003.

Full-power FM stations must make sure the proposed translator facilities do not encroach on their service areas or extended service areas. A full-power station can have a translator application dismissed if it can show prohibited contour overlap. However, the FCC's overlap criteria includes an exception where the translator applicant can show that there will be no population in the interference area. To show that there is no affected population, the translator applicant may use the undesired-to-desired signal strength comparison ratio formula. In areas where the FM station's signal is strong, this method may show a small interference area that does not reach the ground, and therefore will not affect any population. The U/D methodology is effective when the proposed translator is on a second- or third-adjacent channel to the FM station.

FM translator applicants facing challenges on the basis of second- or third-adjacent channel interference claims must demonstrate that the area where interference would occur indeed has no population. Photos of the area and topographic maps showing no existing structures often are required. Highways are considered populated areas by the FCC, so overlapping interference contours over roads or highways will not be permitted.

Full-power FM stations are entitled to protection from encroaching FM translators outside their protected 1mV/m contours when the FM station can show that it has actual listeners who will lose service if the translator becomes operational. To show that listeners outside a full-power FM's service area will be adversely affected, a petitioning station must produce sworn statements from actual listeners within the service area of the proposed translator. Arbitron survey data showing that an FM station has listeners within certain ZIP codes in the translator service area have been held insufficient because, the Commission

says, such data do not establish where survey respondents do their listening.

After a translator goes on the air, no matter where it is in relation to a complaining full-power station, the FM station can have the translator permit or license cancelled if it can demonstrate, again through producing statements by affected listeners, that the translator is interfering with reception of the FM station.

Biennial ownership reporting

For those radio stations required to file their renewal applications in 2004 (i.e., stations in Arkansas, Colorado, Illinois, Indiana, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Montana, North Dakota, Ohio, South Dakota, Tennessee and Wisconsin) the Commission is requiring the filing of a biennial ownership report along with the renewal even though such reports were filed last year for stations in the listed states. However, no filing fees will be due with such 2004 biennial reports. Licensees have been instructed to label the report as "other" in the box on the first page of the CDBS electronic form where fee exempt status may be claimed. After this year, renewals and ownership reports will be on the same cycle.

Commercialization on noncommercial stations

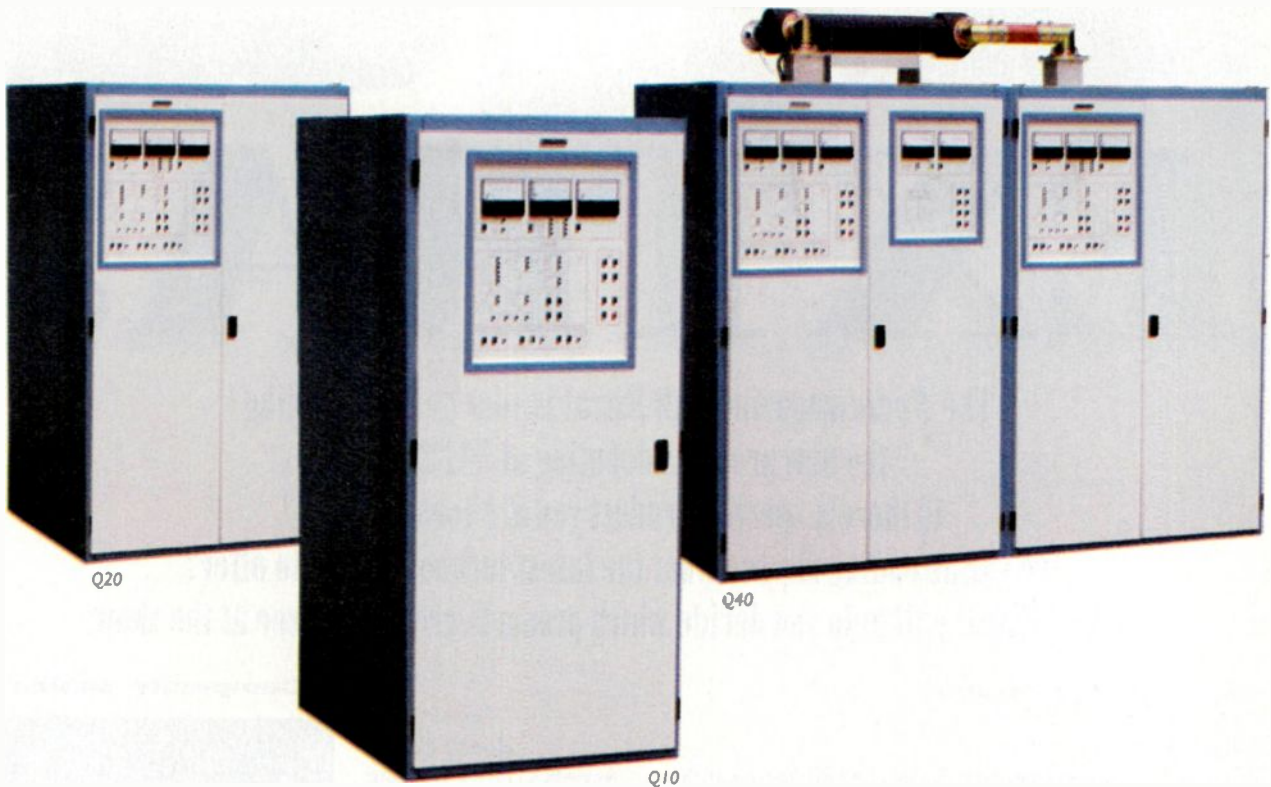
The FCC recently fined a noncommercial station \$10,000 for broadcasting advertisements.

Section 399B of the Communications Act bars the broadcast of advertisements by stations that are licensed for noncommercial educational service. Advertisements are defined in the FCC's policy statements as paid messages, which include calls to action, comparative or price information or qualitative descriptions. Paid acknowledgement announcements, which are not considered commercials, may advise listeners of the name, address and telephone number, the type of business, the products offered and other factual data. To stay clear of an FCC enforcement action remember that an advertisement is promotional while an acknowledgement is descriptive.

Martin is an attorney with Fletcher, Heald & Hildreth, P.L.C., Arlington, VA. E-mail martin@fhhlaw.com.

Dateline:

Stations in Indiana, Kentucky and Tennessee must file their renewal applications and biennial ownership reports on or before April 1, 2004. Stations in Michigan and Ohio must file their renewal applications and biennial ownership reports on or before June 1, 2004, and begin their pre-filing renewal announcements on April 1, 2004.



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Studio Telephone Access Center

Comrex
Booth N2722



STAC6 and STAC12: These Studio Telephone Access Centers incorporate two digital telephone hybrids handling as many as four callers. Designed for listener lines, talk shows and call-in segments, they are offered in six and 12 phone line versions with the ability to upgrade in the field. The accompanying control surface supports unique producer and screener configurations. IP-based call screening and control is embedded, enabling operation from virtually anywhere. Other unique features include auto-attendant and support of up to four control surfaces.

800-237-1776; fax 978-784-1717; www.comrex.com; info@comrex.com

Automation system

D.A.V.I.D.
Booth SL2477

Digasystem Latitude Edition: A scalable platform with network capabilities, the basic version of this system consists of three complete preconfigured workstations and a server with all of the software modules required for editing, organizing, scheduling and playing programming. This product can be upgraded with 20 options to add and customize additional features such as Web applications, automation, file transfer or import modules for a wide range of applications.

703-396-4900; fax 703-396-4939; www.digasystem.com; info@digasystem.com

Broadcast mixer

Senffex
Booth C5236

S2: This small format, modular digital and analog I/O broadcast mixer offers features such as a flush-mounted chassis, several input and output channels, PFL/cue, fader-start operation, automatic monitor muting on mic-live and light switching remote outputs.

Optional EQ on input modules is available. Two main audio buses allow the user to broadcast on the PRG bus while recording on the AUD bus, with bus output selection on each module.

207-773-2424; fax 207-773-2422

www.independentaudio.com; info@independentaudio.com



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NAB EXTRA!

Compact monitor Pyramid

Booth N1300

Speaker: The design philosophy behind this speaker was to replicate the boombox sound, which is created by the plastic housing. The speakers use similar materials to copy this sound to provide a reference point of what the radio audience hears on low-quality audio products. Features of this speaker include 5W to 30W power rating; 8Ω impedance; 80Hz to 18kHz frequency response; and banana jack inputs. The speaker measures 7.12"H x 7.87"W x 6.5"D and it weighs 2.8lbs.

207-773-2424; fax 207-773-2422; www.triplepdesigns.com



Digital STL/TSL system Moseley Associates

Booth N1907

Starlink 9003T1: This digital STL/TSL system for T1 circuits features LAN connectivity for transmitting Ethernet to and from the transmitter site to support datacasting for HD Radio and RBDS song title and artist data. It encodes linear uncompressed stereo program channels at either 44.1kHz or 32kHz digital sample rates. A six-port multiplexer and built-in CSU allows combining of these data channels with the program audio for a bi-directional connection to a T1/E1 line, microwave radio or license-free 5.8GHz link.

805-968-9621; fax 805-685-9638
www.moseleysb.com; info@moseleysb.com



PDA audio recorder Prophet Systems

Booth N3312

Pocketgen: This software allows the transfer of digital files from a remote location back to the station. The system provides recording to hand-held devices that interface to most automation systems. Record the audio and press the transfer button.

Other features include seamless integration of transfer software and audio recorder; record, insert, append and re-record options; the ability to transfer files individually or in a batch; and it interfaces to most automation systems.

800-658-4403; fax 308-284-4181

www.prophetsys.com; sales@prophetsys.com



SBE certification sample test software Society of Broadcast Engineers

Booth Lobby 17

Cert Preview: The Society of Broadcast Engineers Program of Certification has released a sample test software program to assist in preparation for taking an SBE certification exam. Replacing the previous DOS version, the new version operates on Windows and provides a flexible platform for updates, changes and enhancements. The software disc includes tips on taking an SBE certification exam and several types of practice test modes.

317-846-9000; fax 317-846-9120; www.sbe.org; lbaun@sbe.org



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www.altronic.com
altronic@mntnhome.com



NAB EXTRA!

Condenser mic Neumann

Booth N2812

BCM 104: The first product in the broadcast line, this condenser mic offers an independent, functionally-optimized design derived from 3D simulations. The large-diaphragm condenser capsule features a cardioid directional pattern with internally switchable proximity effect compensation. A second switch allows the sensitivity to be reduced by 14dB. The microphone headgrille twists off for quick cleaning. Optional, color-coded headgrilles are available. The BCM 104 has an elastic mount.

860-434-5220; fax 860-434-3148; www.neumannusa.com; neumlit@neumannusa.com



Audio cables Gepco International

Booth C1429



61801EZ: This single-pair audio cable is available in 20 colors with a riser-rated PVC jacket. The cable features stranded, tinned-copper conductors that facilitate quick soldering or punch-down and a polyethylene dielectric. Each pair is shielded with an easy-to-strip, bonded foil shield with drain wire. These materials, combined with Gepco's uniform pair twisting process and tight mechanical tolerances, yield low loss and reduced noise.

800-966-0069; fax 847-795-8770
www.gepco.com; gepco@gepco.com

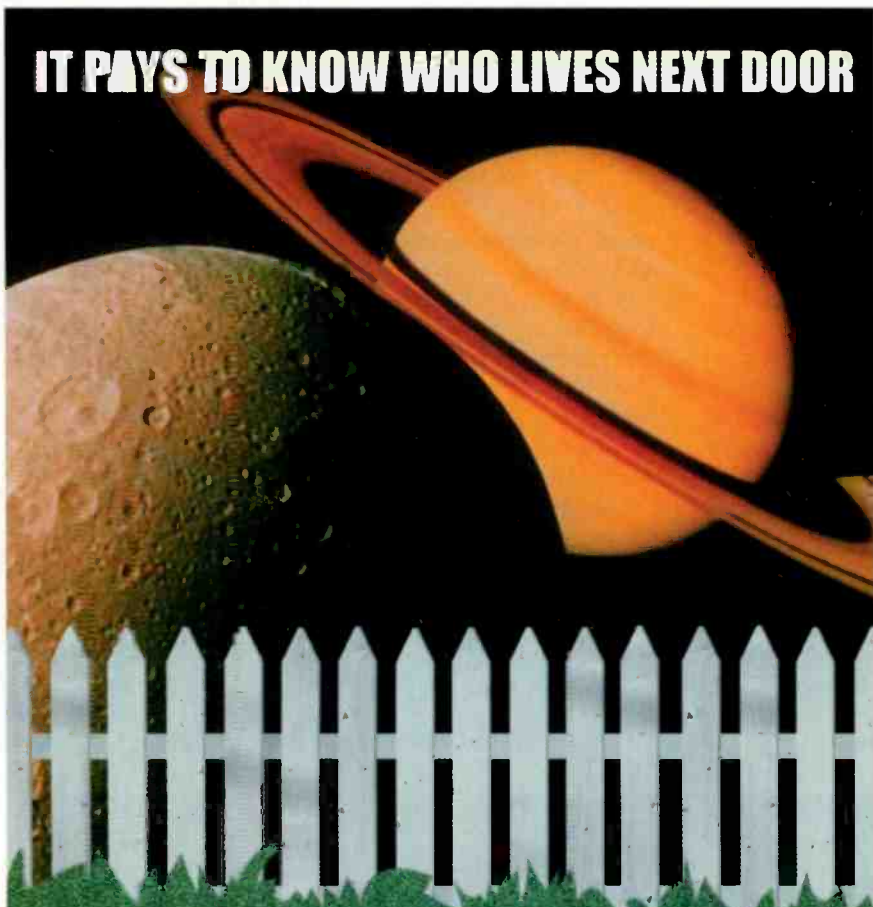
Media management system

Dalet Digital Media
Booth SL3842

DaletPlus Radio Suite: This media management system enables radio broadcasters to produce and deliver news and music programming. The system incorporates a set of easy-to-use production tools as well as a workflow management module that facilitates every step of the process: audio and wires acquisition, search and retrieval, production, script editing with embedded audio, planning, scheduling, broadcasting and archiving.

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- Custom scripting provided by Logitek to pass audio and control from the Numix to other studios in the facility that have old analog boards
- vRoute "virtual" router controllers

WKDF: 1 Numix-12 Console w/12 fully assignable faders, access to 8 stereo buses

WGFX: 1 ROC-5 Console, 1 ROC-10 Console, 1 RTE-3 Router Controller

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—Cameron Adkins, Citadel Broadcasting, Nashville, Tennessee

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www.logitekaudio.com

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NAB EXTRA!

Digital on-air processor
Broadcast Warehouse
Booth N1710



DSP X: Designed for use as an FM, AM, digital radio and Internet streaming audio processor, this device is driven by an eight-bit micro-controller that controls an array of specialized analog and digital circuits. Features include 24-bit A/D and D/A converters, analog level control circuitry, 18 x 24-bit DSPs, an Ethernet port, a trigger port, two RS-232 ports, LED audio metering, an LCD screen, two sample-rate converters, a headphone jack and memory devices to hold the software and firmware.

+44 208 5409992; fax +44 208 5409994
www.broadcastwarehouse.com; info@broadcastwarehouse.com

HD Radio transmitters
Harris
Booth C1906

Mini HD: With this new line of 10W to 600W HD Radio transmitters, Harris can now support multiplexer input, interleaved antenna and separate antenna applications. Like the Z-HD radio transmitters, the Mini-HD line is available with the Neustar option, which enables supplemental audio channels and 5.1 surround-sound applications.

800-622-0022; fax 513-459-3890; www.harris.com; broadcast@harris.com

Audio codec/mixer
Musicam USA
Booth N1006

Roadstar: This portable stereo digital audio codec sends and receives real-time audio, ancillary data and contact closures from remote locations. Based on the Netstar, this product is housed in a compact enclosure with protective elements for controls, cables and connectors. Four XLR inputs feed individual level and pan controls. Each input can be switched for mic, line or unbalanced operation. All inputs are equipped with switchable phantom power. A separate AES/EBU input can bypass the mixer section. Analog and AES/EBU outputs for return audio are standard. The codec can simultaneously send and receive bi-directional audio via IP through its Ethernet port, and can connect to ISDN codecs through its BRI ISDN terminal adapter.



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The new Omnia-5EX HD+FM has enhanced processing for analog FM, and is ready for HD Radio with a second limiter section and digital output. Both FM and HD limiters and outputs are standard.

Knowledgeable broadcasters agree that AM stations will probably benefit most from the dramatic improvements HD Radio can provide. What they may not be sure of is when HD for AM will happen.

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The new Omnia-5EX HD+AM has vigorous new processing algorithms that ignite conventional AM broadcasts – plus a second look-ahead limiter section and digital output for HD Radio. Both limiters and outputs are, of course, standard.



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1-800-438-6040

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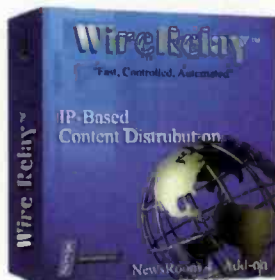
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KLZ Innovations

Booth N724



Wire Relay: An IP-based content distribution system, Wire Relay enables multi-site NewsRoom4 users to create their own news network, keeping affiliates supplied with current, targeted material. Stories received by a hub site are automatically pushed out to wire stores at locations across the system. Any embedded audio travels with the text, creating a local copy with Activex control at the destination. Configuration options allow the hub to determine which stories are forwarded and to where.

800-334-9640; fax 204-663-1970; www.klz.com; info@klz.com

Automation software updates

OMT Technologies

Booth N709

Imediatouch: New live-assist features, satellite interfacing and non-proprietary architecture allow this on-air system to run without constant supervision. The system integrates with most third-party music scheduling, commercial scheduling, a company website and multi-track recording software and dedicated broadcast hardware such as touch screens, consoles or satellite receivers in the environment. The digital system uses the company's audio codec player, recorder and transcoder.

888-665-0501; fax 204-783-5805; www.oml.net; oml@oml.net

Audio engine updates

Logitek

Booth N3307

Digital console enhancements: Enhancements to the digital console are a two-stage talk show delaysilence-sense capability, EQ and dynamics processing, input metering on every fader and compression metering on faders where activated. Enhancements to the audio engine include a full X-Y router, mixed analog and digital I/O, multiple mix-minus buses, IP and multisite operation, and physical and virtual controllers. The Optical STL is available as part of the audio engine and offers as many as 64 channels of bidirectional audio to be sent as far as 10 miles without data loss or compression.

800-231-5870; fax 713-664-4479; www.logitekaudio.com; info@logitekaudio.com



Solid-state FM transmitters
DRS Broadcast Technology

Booth N2402

Continental 815D5 and 815HD5: These are 5kW solid-state FM transmitters with an RF combining and splitting system that withstands as much as three times its operating RF requirements. This transmitter line offers a combiner system that allows the most RF possible to get to the output in the event of single or multiple amplifier module failure. The 815 Series includes 24.5" (12 rack units) of user-available 19" wide rack space and built-in ancillary equipment power outlets.

800-733-5011; fax 214-381-3250; www.contelec.com; sales@contelec.com

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Mic preamp
Aphex Systems
Booth N1009



1100 MKII: A wide dynamic range microphone preamplifier, this product features a discrete Class-A tube design with a 24-bit/192kHz A/D converter. This unit offers an EIN of better than 135dBu and also features a stereo, optical S/PDIF and a full-featured AES/EBU digital audio output. Separate 1/4" jacks are also provided for insert points.

818-767-2929; fax 818-767-2641; www.aphex.com; sales@aphex.com

1100 MKII: A wide dynamic range microphone preamplifier, this product features a

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DRS BROADCAST TECHNOLOGY

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DRS
TECHNOLOGIES

Telephone interface

JK Audio

Booth N4616

Autohybrid: A passive, auto-answer and disconnect telephone line hybrid, this interface provides simultaneous send and receive audio through analog telephone lines. The RA4, an optional rack panel, holds four Autohybrids in 1RU or eight hybrids in 2RU. The dual-transformer hybrid circuit provides a nominal 20dB separation of send and receive audio. A detachable screw terminal block allows for easy connection to remote control features. Balanced XLR jacks provide the audio connections. Other features include off-hook LEDs and auto-answer switch.

800-552-8346; fax 815-786-8502

www.jkaudio.com; info@jkaudio.com

Codecs

Audio Processing Technology - APT

Booth N902

Worldnet Oslo and Worldnet Ohio: These codecs deliver low delay audio over T1, E1, TCP/IP and ISDN networks. The Worldnet Oslo can network WAN/LANs over synchronous circuits and simultaneously send audio over the same circuit. This feature is useful to broadcasters who are attempting to network remote stations within a radio group.

323-463-2963; fax 323-463-8878

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Associations, Societies & Agencies	32
Audio Accessories, Headphones & Speakers	32
Audio Mixers-On Air	32
Audio Mixers-Portable	34
Audio Mixers-Studio, Recording	34
Audio Processing & Encoding	34
Audio Recording, Storage & Playback	34
Audio Routing & Distribution	36
Automation Systems & Content Management	36
Dealers & Distributors	37
Digital Audio Workstations	37
Intercom, IFB Products	37
Internet, Computers, Peripherals & Data	37
Microphones, Accessories	37
Microwave, Fiber Optic & Telco Equipment	38
Power Products, Batteries, Generators, UPS	38
Recording Media & Accessories	38
RF Feedline, Components, Towers & Services	38
Satellite Equipment & Services	39
Software - Business, Traffic, Scheduling, Inventory	39
Sound/Music/Image Libraries	39
Studio & Facility Support Products & Accessories	39
System Integrators, Installers & Consultants	39
Test & Measurement Equipment	40
Transmitters, Antennas, Remote Controls, SCA & Tuners	40
Wire, Cable & Connectors	40

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Exhibitors are listed under specific product categories. These categories are then arranged in booth number order, which makes it easier to locate given exhibitors in a specific area.

For an alphabetical exhibitor listing, use the condensed list on the pull-out Radio Hall map that begins on page 19.



Sonifex Ltd	C 5236
Prime Image	C 5634
Neutrik	C 5842
Wohler	C 6742
Dorough Electronics	C 7814
Whirlwind	C 7819
Electro-Voice	C 9106
Telex Communications	C 9106
Riedel	C11210
Studer	N 700
Eventide	N 704
Danagger Audio Works	N 712
Henry Engineering	N1100
Independent Audio/Sonifex	N1300
AEQ	N1312
Audemat-Aztec	N1426
Broadcast Tools	N1500
Symetrix	N1610
illbruck/Sonex Acoustical Div	N1800
Martinsound	N2017
Arrakis	N2022
RDL (Radio Design Labs)	N2126
Solid State Logic	N2412
Radio Systems	N2416
Enco Systems	N2426
Yamaha	N2434
LPB	N2436
Broadcast Software Int'l	N2534

TFT	N2707
Wheatstone	N2802
Sennheiser Electronics	N2812
Inovonics	N3009
Logitek	N3307
Lectrosnics	N3316
Euphonix	N3616
Audio-Technica	N3712
Sound Devices	N3726
Industrial Acoustics	N3829
Genelec Oy	N4012
AKG	N4018
AudioScience	N405
Acoustic Systems	N4108
Miller & Kreisel	N4613
Leitch	R 716
RealNetworks	SL1280
WhisperRoom	SL2172
Microsoft Corp.	SL5445
Kramer Electronics	SL5810
Gefen Inc	SL5857
Mackie	SL5913
Enco Systems	SU 6764
Leitch	SU 9868
Acoustical Solutions	SU10453
Sony Electronics	SU11051

Associations, Societies & Agencies

American Radio Relay League	Lobby 9
Society of Broadcast Engineers ...	Lobby17
Radio Advertising Bureau	N 600
FCC	N1031

Audio Accessories, Headphones & Speakers

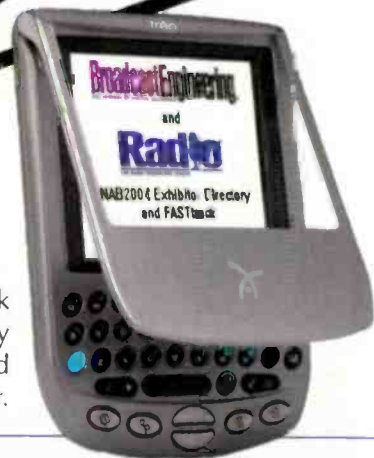
Richardson Electronics	C 1338
Ward-Beck	C 1914
Walters-Storyk	C 2223
Multidyne	C 3151
Panasonic	C 3811
DK-Audio	C 3843

Audio Mixers-On Air

Harris	C 1906
Ward-Beck	C 1914
Studer	N 700
Lawo AG	N 716
AEQ	N1312
Telos Systems	N1416
Arrakis	N2022
Radio Systems	N2416

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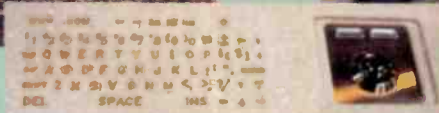
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LPB N2436
Wheatstone **N2802**
Audioarts Engineering **N2802**

Booth N3307



Sierra Automated Systems **N3705**
 AEV N4122
 Klotz Digital N4216
 Tamura SL5511

Audio Mixers- Portable

Zaxcom C 7410
 Studer N 700
 Calrec Audio Ltd N1012
Henry Engineering **N1100**
 Denon Electronics N3026
 Sound Devices N3726
 Professional Sound N3916
AKG **N4018**
 ATA Audio N4026
 AEV N4122
 Klotz Digital N4216
JK Audio **N4616**
 Mackie SL5913

Audio Mixers- Studio, Recording

Harris **C 1906**
 Ward-Beck C 1914

Panasonic C 3811
 Zaxcom C 7410
 Whirlwind C 7819
 Telex Communications C 9106
 Studer N 700
 Calrec Audio Ltd N1012
AEQ **N1312**
 Symetrix N1610
 Martinsound N2017
Arrakis **N2022**
 Solid State Logic N2412
 Tascam/Teac Professional N2418
 Dan Dugan Sound Design N2424
 Yamaha N2434
 LPB N2436
Audioarts Engineering **N2802**
Wheatstone **N2802**
 Sennheiser Electronics N2812
 Harrison by GLW N3016
Logitek **N3307**
 Euphonix N3616
Audio-Technica **N3712**
 Sound Devices N3726
 Klotz Digital N4216
 Mackie SL5913
 Sony Electronics SU11051

Audio Processing & Encoding

Harris **C 1906**
 Leader Instruments C 4142
 Prime Image C 5634
 ADC/Nvision C 6413
 Wohler C 6742
RCS **C 6813**
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Aphex Systems **N1009**
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Broadcast Warehouse **N1710**
 Martinsound N2017
 Dan Dugan Sound Design N2424
 Yamaha N2434
 LPB N2436
Inonyonics **N3009**
 Harrison by GLW N3016
 AEV N4122
 Leitch R 716
 Microsoft Corp. SL5445
 Gefen Inc SL5857
 Broadcast Technology SU 6752
 Leitch SU 9868

Audio Recording, Storage & Playback

PocketRec **C 1906**
Harris **C 1906**
Scott Studios **C 2214**
 Sonifex Ltd C 5236
RCS **C 6813**
 Zaxcom C 7410
 360 Systems C 9606
 Studer N 700
 Eventide N 704
 OMT Technologies N 709
Henry Engineering **N1100**
 Independent Audio/Sonifex N1300
Telos Systems **N1416**
 Audemat-Aztec N1426
RCS **N1622**
Broadcast Electronics **N1902**
 Tascam/Teac Professional N2418
Enco Systems **N2426**
 Yamaha N2434
 Digigram N2522
Broadcast Software Int'l **N2534**
 LakeSoft N2836
Scott Studios **N3007**
 Denon Electronics N3026
 Euphonix N3616
 Microboards Technology SL3706
 Sonic Foundry SL4736
 Mackie SL5913

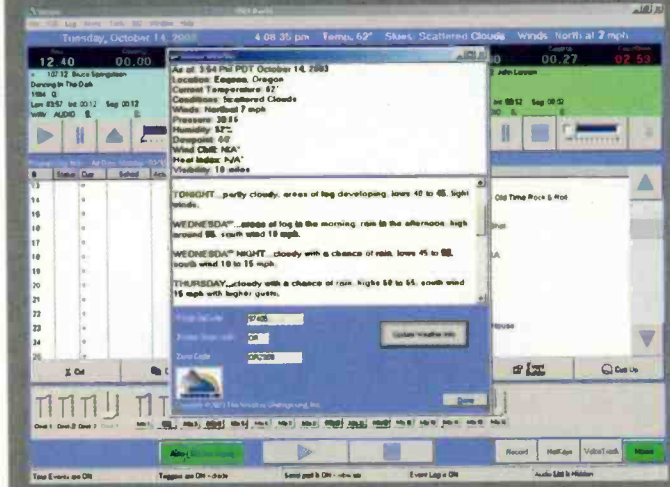
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FASTtrack

Enco Systems SU 6764
 Disc Makers SU 8228
 Nagra SU10424
 Sony Electronics SU11051

Audio Routing & Distribution

Harris C 1906
 Ward-Beck C 1914
Computer Concepts C 2214
 AVP Manufacturing & Supply C 2241
 Audio Accessories C 2928
 Multidyne C 3151
 Switchcraft C 3322
 DK-Audio C 3843
 Sonifex Ltd C 5236
 Neutrik C 5842
 Wohler C 6742
 Whirlwind C 7819
 Clark Wire & Cable C10013
 NPR Satellite Services C11522
 Studer N 700
 Audio Processing Technology N 902
Henry Engineering N1100
 Independent Audio/Sonifex N1300
AEQ N1312
Telos Systems N1416
 Broadcast Tools N1500
 SRSWOWcast Technologies N1502
 Symetrix N1610
Broadcast Electronics N1902
 Martinsound N2017
 RDL (Radio Design Labs) N2126
Radio Systems N2416
 Yamaha N2434
 Digigram N2522
Audioarts Engineering N2802
 Wheatstone N2802
Computer Concepts N3007
 Logitek N3307

Euphonix N3616
 Burk Technology N3702

Booth N3705



Klotz Digital N4216
JK Audio N4616
 Leitch R 716
 Apogee Electronics SL3458
 Dalet Digital Media SL3842
 Avid SL4761
 Kramer Electronics SL5810
 Hosa Technology SL5955
 Leitch SU 9868
 Mohawk/CDT SU11339
 Wegener Communications SU12023

Automation Systems & Content Management

Harris C 1906
Computer Concepts C 2214
Scott Studios C 2214
 Burli Software C 2843
RCS C 6813
 OMT Technologies N 709



Booth N724

Booth N1026



Pristine Systems

AEQ N1312
 Audemat-Aztec N1426
RCS N1622
Broadcast Electronics N1902
Arrakis N2022



Booths N2426 & SU6764

LPB N2436



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Scott Studios N3007
Prophet Systems N3312
 Burli Software N3734
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Smart Technologies SL1765



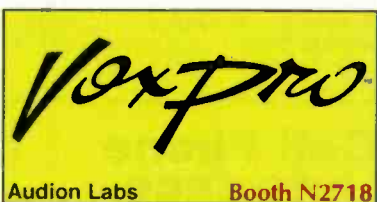
Dalet Digital Media SL3842
Enco Systems **SU 6764**
 IBM SU 9839
 Sony Electronics SU11051

Dealers & Distributors

Richardson Electronics C 1338
Harris **C 1906**
 Joseph Electronics C 2662
 Microwave Service C 2917
 Herman Electronics C 3247
RF Parts **N1022**
 Broadcasters General Store N2718
 Trew Audio N3826

Digital Audio Workstations

360 Systems C 9606
 Studer N 700
 Audio Processing Technology N 902
Pristine Systems **N1026**
Broadcast Electronics **N1902**
Arrakis **N2022**
 Tascam N2418
Enco Systems **N2426**
 Yamaha N2434
 Digigram N2522
Broadcast Software Int'l **N2534**



Prophet Systems **N3312**
 Dalet Digital Media SL3842
 Adobe Systems SL4730
 Sonic Foundry SL4736
 Avid SL4761
 Mackie SL5913

Intercom, IFB Products

Telex Communications C 9106
 Riedel C11210
 Broadcast Tools N1500
Comrex **N2722**
 Anchor Audio/Portaco N3027
Sierra Automated Systems **N3705**
JK Audio **N4616**

Internet, Computers, Peripherals & Data

Anystream 9
 Masterclock C 1735
Computer Concepts **C 2214**
Scott Studios **C 2214**
 Switchcraft C 3322
 Panasonic C 3811
RCS **C 6813**
 Tektronix Inc C 7128
 Telex Communications C 9106
Terawave **C11122**
 OMT Technologies N 709
 Audio Processing Technology N 902
Musicam USA **N1006**
 Audemat-Aztec N1426
 Broadcast Tools N1500
RCS **N1622**
 Tascam/Teac Professional N2418
Enco Systems **N2426**
Mager Systems **N2431**
 Yamaha N2434
 Digigram N2522
Scott Studios **N3007**
Computer Concepts **N3007**

Denon Electronics N3026
AudioScience **N405**
 Leitch R 716
 Studio Network Solutions SL1762
 D.A.V.I.D. SL2477
 Anystream SL2960
 Apple Computer SL3660
 Dalet Digital Media SL3842
 Apple Computer SL4054
 Avid SL4761
 Trenton Technology Inc. SL5252
 Gefen Inc SL5857
 ATTO SL5864
Enco Systems **SU 6764**
 Rorke Data SU 8071
 Rorke Data SU 8269
 IBM SU 9839
 Leitch SU 9868

Microphones, Accessories

Harris **C 1906**

Hollywood Edge, Soundelux C 2045
 Sonifex Ltd C 5236
 Telex Communications C 9106
 Electro-Voice C 9106
 Junger Audio Studioteknik N 819
Aphex Systems **N1009**
 Independent Audio/Sonifex N1300
Omnia Audio **N1416**
 Martinsound N2017
 RDL (Radio Design Labs) N2126
 LPB N2436
 Digigram N2522
DPA Microphones **N2536**
Neumann **N2812**
 Sennheiser Electronics N2812
 Countryman Associates N3022
 Schoeps/Posthorn Recordings N3126
 Rycote N3128
 Lectrosomics N3316
Audio-Technica **N3712**
 Sound Devices N3726

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Sanken Microphones	N3918
Azden	N4016
AKG	N4018
Sanken Microphones	SL1186
Apogee Electronics	SL3458
Sony Electronics	SU11051

Microwave, Fiber Optic & Telco Equipment

Harris	C 1906
Superior Broadcast	C 1930
DMT USA	C 2032
Microwave Service	C 2917
Diversified Marketing Int'l	C 3125
Multidyne	C 3151
Microwave Radio Comms	C 3206
Sonifex Ltd	C 5236
Andrew	C 5706
ADC/Nvision	C 6413
RCS	C 6813
Tektronix Inc	C 7128
Kathrein, Scala Division	C 7817
Armstrong Transmitter	N 706
Audio Processing Technology	N 902
Musicam USA	N1006
Henry Engineering	N1100
Bext	N1202
Independent Audio	N1300
AEQ	N1312
Telos Systems	N1416
Broadcast Tools	N1500
RCS	N1622
Marti Electronics	N1902
Broadcast Electronics	N1902
Moseley Associates	N1907
Radio Systems	N2416
Enco Systems	N2426
TFT	N2707
OMB America	N2709

COMREX

Booth N2722

Inovonics N3009

Tieline

TECHNOLOGY

Booth N3034

Energy-Onix	N4023
ATA Audio	N4026
AEV	N4122
JK Audio	N4616
Enco Systems	SU 6764
Telecast Fiber Systems	SU 9824

Power Products, Batteries, Generators, UPS

Staco Energy Products	C 1211
Active Power	C 1217
Cummins Power Generation	C 3345
Belden	C 3351
Mole-Richardson	C 3546
Neutrik	C 5842
Lightning Eliminators & Cons	C 6239
Techni-Tool	C 7206
Dorough Electronics	C 7814
Telex Communications	C 9106
Superior Electric	N 702
Kay Industries	N1700

ERI-Electronics Research	N3322
MGE UPS Systems	SL1869
Middle Atlantic Products	SL2180

Recording Media & Accessories

Western Media	C 2938
Wireworks	C 7113
Maxell	C 8228
Denon Electronics	N3026
Apogee Electronics	SL3458
Premier Magnetics	SU 7558A
TDK Electronics Corporation	SU 9512

RF Feedline, Components, Towers & Services

Richland Towers	C 1410
Myat	C 1415
SpectraSite Broadcast Group	C 1818
Micro Communications (MCI)	C 2025
CPI Eimac	C 2118
Jampro Antennas Inc	C 2514
CPI Eimac	C 2914
World Tower Company	C 2916
SWR	C 2922
Radian	C 5014
Andrew	C 5706
Neutrik	C 5842
Dielectric	C 7806
RFS Broadcast	C 8617
Kline Towers	C 9114
Allied Tower	C10110
Bird Electronic	N 722
Com-Tech Srl RF Filters	N1024
Altronic Research	N1309
Econco	N1406
EMR Corporation	N1600
Shively Labs	N1606
TWR Lighting	N2018
Unimar	N2129
Dialight	N2834
Honeywell Obstruction Lighting	N3018
ERI-Electronics Research	N3322
American Tower	N3338

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Kintronic Labs	N3709
Phasetek	N3722
Coaxial Dynamics	N4019
Magnum Towers	N4618

Satellite Equipment & Services

Andrew	C 5706
DH Satellite	C11828
Norsat International	C12034
Patriot Antenna Systems	C12039
Satellite Engineering	C12332
Broadcast Tools	N1500
Scientific Atlanta	SU10449
Wegener Communications	SU12023

Software - Business, Traffic, Scheduling, Inventory

Encoda Systems	C 5617
RCS	C 6813, N1622
VizuAll	SU11611

Sound/Music/Image Libraries

Sound Ideas	C 1651
Valentino Prod Music Library	C 1652
Omnimusic	C 2151
Killer Tracks	C 2154
Mediatone Music	C 2245
Selectracks Prod Music Svc	C 2247
Network Music	C 2545
TRF Production Music Library	C 2925
Manhattan Production Music	C 2935
FirstCom Music	C 3328
Megatrax Production Music	N1327
Stephen Arnold Music	R 419
615 Music Library	R 717
Digital Juice	SL4705
Groove Addicts	SL5302
615 Music Library	SU 7262
Megatrax Production Music	SU 7662

Studio & Facility Support Products & Accessories

Zero Cases	C 1230
Masterclock	C 1735
Harris	C 1906
Omnirax	C 2014
Nemal Electronics	C 2338
ESE	C 2522
Switchcraft	C 3322
Mole-Richardson	C 3546
RackFrame.Com	C 3842
Canare	C 5317
Neutrik	C 5842
Will-Burt	C 6441
Techni-Tool	C 7206
Hilomast	C 7443
Allen Osborne	C 7748
Anvil Cases	C 9437
Terawave	C11122
International E-Z Up	C12010
Society of Broadcast Engineers	Lobby17
Superior Electric	N 702
RF Parts	N1022
EDX Engineering	N1122
V-Soft	N1306
Telos Systems	N1416
Broadcast Tools	N1500
Arrakis	N2022
Radio Systems	N2416
Studio Technology	N2416
Mager Systems	N2431
Yamaha	N2434
Wheatstone	N2802
LakeSoft	N2836
Inovonics	N3009
Denon Electronics	N3026
Comet North America	N4210
NOAA	N4426
KD Kanopy	N4626

WhisperRoom	SL2172
Middle Atlantic Products	SL2180
SKB	SL5618
Hardigg	SL5625
Penny & Giles	SL5821
Paladin Tools	SU 6567
NKK Switches	SU 7679
TBC Consoles	SU 8068
Forecast Consoles	SU11639

System Integrators, Installers & Consultants

RadioWave.com	C 1220
Richardson Electronics	C 1338
Harris	C 1906
Scott Studios	C 2214
Walters-Storyk	C 2223
A.F. Associates	C 4722
Wolf Coach	C 5222

Rees Associates, Inc.	C 5336
Encoda Systems	C 5617
E-N-G Mobile Systems	C 6444
RCS	C 6813
Comsearch	C10717
Medical Coaches	MM227
Musicam USA	N1006
RCS	N1622
Broadcast Electronics	N1902
Arrakis	N2022
International Datacasting	N2409
Enco Systems	N2426
Mager Systems	N2431
Scott Studios	N3007
Klotz Digital	N4216
Leitch	R 716
APW Enclosures	SL 970
RealNetworks	SL1280
Dalet Digital Media	SL3842
Sonic Foundry	SL4736
Avid	SL4761



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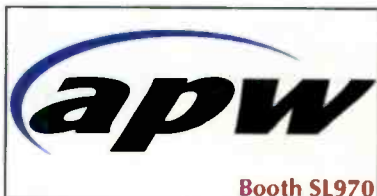
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Booth SL970

FASTtrack

Backbone Networks	SL5253
Microsoft Corp.	SL5445
Good Mood Productions	SL5452
Enco Systems	SU 6764
Rorke Data	SU 8071
Rorke Data	SU 8269
Leitch	SU 9868
Non-Stop Music Library	SU10315

Test & Measurement Equipment

Ward-Beck	C 1914
ESE	C 2522
Leader Instruments	C 4142
Andrew	C 5706

Neutrik	C 5842
RCS	C 6813
Prism Media Products	C 6814
Tektronix Inc	C 7128
Dielectric	C 7806
Dorough Electronics	C 7814
Sencore Electronics	C10343
Bird Electronic	N 722
Calrec Audio Ltd	N1012
Bext	N1202
Altronic Research	N1309
Audemat-Aztec	N1426
Symetrix	N1610
RCS	N1622
Belar	N2012
Potomac Instruments	N2119
RDL (Radio Design Labs)	N2126
Audio Precision	N2716
Inovonics	N3009
Denon Electronics	N3026
Logitek	N3307

ERI-Electronics Research	N3322
Burk Technology	N3702
Coaxial Dynamics	N4019
Prism Media Products	SL5250
Trompeter Electronics	SU10621
Sencore Electronics	SU11011

Transmitters, Antennas, Remote Controls, SCA & Tuners

Propagation Systems Inc	C 1335
Dove Systems	C 1823
Harris	C 1906
Superior Broadcast	C 1930
DMT USA	C 2032
Jampro Antennas Inc	C 2514
SWR	C 2922
Larcan	C 3846
Dielectric	C 7806
Kathrein, Scala Division	C 7817
RFS Broadcast	C 8617
Electronic Associates	C 9323
Delta RF Technology	N 602
Armstrong Transmitter	N 706
Crown Broadcast	N 712
Valcom	N1002
Bext	N1202
Audemat-Aztec	N1426
EMR Corporation	N1600
Shively Labs	N1606
Marti Electronics	N1902
Broadcast Electronics	N1902
Moseley Associates	N1907
DRS Broadcast Technology	N2402
LPB	N2436
TFT	N2707
OMB America	N2709
LakeSoft	N2836
Nautel	N3302
ERI-Electronics Research	N3322
Burk Technology	N3702
Kintronic Labs	N3709
Energy-Onix	N4023
AEV	N4122
Comlab/Davicom	N4610
Broadcast Technology	SU 6752

Wire, Cable & Connectors

Gepco International	C 1429
Ametek Hunter Spring	C 2329
Nemal Electronics	C 2338
Audio Accessories	C 2928
Multidyne	C 3151
Switchcraft	C 3322
Belden	C 3351
Canare	C 5317
Andrew	C 5706
Neutrik	C 5842
Wireworks	C 7113
Whirlwind	C 7819
Kings Electronics	C 8626
Bi-Tronics	C10010
Clark Wire & Cable	C10013
Hannay Reels	C10317
Altronic Research	N1309
AEQ	N1312
Tascam/Teac Professional	N2418
ATA Audio	N4026
Gefen Inc.	SL5857
Hosa Technology	SL5955
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Exhibitor information is current as of February 9.



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The events, seminars



& sessions

at NAB2004

By Chriss Scherer, editor

Each year, the NAB and SBE team up to offer the most concentrated broadcast engineering education opportunity available. Each spring, the NAB convention hosts the Broadcast Engineering Conference (BEC), which has been the launching point for countless broadcast technologies and new ideas. This year, the BEC offers a rich landscape of engineering issues to explore.

While the convention floor doesn't open until Monday, the technical sessions begin Saturday. When planning your trip, be sure to arrive early to participate in all the sessions.

The Broadcast Engineering Conference Saturday, April 17

SBE Ennes Workshop
8:30 a.m. - 5:30 p.m.

Moderators: *Andrea Cummis, Oxygen Network; William Hayes, Iowa Public Television; Fred Baumgartner, Broadcast Technical Services*

8:45 a.m. *Opening Remarks* - John Poray, Society of Broadcast Engineers

9:00 a.m. *An Overview of the IT Conversion* - Al Kovalick, Pinnacle Systems

9:45 a.m. *Managing Content* - Ted Mina, EMC

10:30 a.m. *Storage Systems for Media* - Sujal Patel, Isilon Systems

11:15 a.m. *The Operational Impact of the IT Conversion* - Lynn Rowe, One World Technologies

Noon *Middleware: The Modern IT Infrastructure for Broadcasting* - John Hoehn, IBM Business Consulting Services
 1:45 p.m. *Cataloging Content* - Craig Finseth, Firwood Consulting
 2:30 p.m. *ESPN's Digital Conversion* - Kevin Ivey, BBC Technology
 3:15 p.m. *Clear Channel's IT Conversion* - Michael DeClue, Clear Channel Broadcasting
 4:00 p.m. *Turner's IT Conversion* - Clyde Smith, Turner Broadcasting System
 4:30 p.m. *IT Impacts on Workflow* - Christopher Golson, SGI

Sunday, April 18

NAB Broadcast Engineering Conference Keynote

9:00 - 9:30 a.m.

Consumer Electronics Association President Gary Shapiro will keynote the NAB2004 Broadcast Engineering Conference. The title of Shapiro's talk will be "Broadcasting in the Balance - A Consumer Technology Perspective." Shapiro has been an early and active leader in the launch of digital and high definition television. He co-founded and chaired the HDTV Model Station and served on the board and executive committee of the Advanced Television Test Center (ATTC). He is a charter inductee to the Academy of Digital Television Pioneers, and in 2003 received its highest award as the industry leader most influential in advancing HDTV. Shapiro has also maintained that digital radio is radio's destiny.

State of the Art in Radio 2004

9:30 a.m. - 12 noon

Chairman: Al Kenyon

9:30 a.m. *Expanding Digital Broadcast Services Using MPEG-4 HEAAC and Other SBR-Enabled Technologies* - David Frerichs, Coding Technologies

10:00 a.m. *Tomorrow Radio* - Mike Starling, National Public Radio
 10:30 a.m. *A Modern Radio Station* - Marvin Born, Dispatch Broadcast Group
 11:00 a.m. *State-of-the-Art in Receiver Design for HD Radio* - Trudy Stetzler, Texas Instruments
 11:30 a.m. *Advances in AM Modulation Techniques that Improve Digital Transmission for HD Radio and DRM* - Ky Luu, Harris

**Preparedness, Security and Recovery for Radio and Television
 1:00 - 6:00 p.m.**

Chairman: Thomas Weber, WISH-TV

1:00 p.m. *New Industry Standard for Public Alert Receivers* - David Wilson, Consumer Electronics Association
 1:30 p.m. *Design Considerations for Emergency Power Systems at Broadcast Facilities* - Gregory Forbes, PBS
 2:00 p.m. *Broadcast Business Continuity* - Sidney Skjei, Skjei Telecom
 2:30 p.m. *Violations of Basic Computer Security Principles within the Television Broadcast Community and Some Suggested Solutions* - Paul Claxton, American Forces Radio and Television Service
 3:00 p.m. *DTV Datacast Networking for Homeland Security and Distance Education* - Richard Ducey, Spectrarep
 3:30 p.m. *Network Disaster Recovery Challenges and Implementation* - Tom Mikkelsen, Starz Encore Group
 4:00 p.m. *Eliminating Failover and Achieving Continuous Uptime for Tapeless Windows* - Pablo Esteve, Thomson Grass Valley
 4:30 p.m. *Keeping Broadcast Facilities Online in the Digital Age* - Alan Katz, MGE UPS Systems
 5:00 p.m. *EAS and Disaster Preparedness: Can They Work Together?* - Roswell Clark, Cox Radio
 5:30 p.m. *Mission Critical Broadcast Design; The Show Must Go On* - Leo Soucy and Linda Sand, Facilities Engineering

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Alex Lakey, Chief Engineer, Virgin Radio

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The events, seminars & sessions

Monday, April 19

Digital Radio Transition Worldwide

10:30 a.m. - 12 noon

Chairman: Milford Smith, Greater Media

10:30 a.m. *DRM in the AM Band* - H. Donald Messer, IBB/VOA

11:00 a.m. *Digital Radio Broadcasting in Europe: The Show is on the Road* - Philip Laven, European Broadcasting Union

11:30 a.m. *Metadata for Radio Broadcasting* - Shigeru Aoki, Tokyo FM Broadcasting

IBOC and Digital Facilities Implementation

1:00 - 5:00 p.m.

Chairman: Norm Philips, Susquehanna Corporation

1:00 p.m. *Real-world IBOC Installations* - Paul Shulins, Greater Media

1:30 p.m. *Real-world AM IBOC Coverage Using a Consumer IBOC Radio* - Thomas Ray, Buckley Broadcasting/WOR Radio

2:00 p.m. *IBOC: The Real World* - John Kennedy, Entercom Boston

2:30 p.m. *Dueling Algorithms Meet IBOC (Can Audio Survive?)* - Herb Squire, DSI RF Systems

3:00 p.m. *Enhancing the Digital Path: Digital Multiplex (D-MPX) Connectivity* - R. Scott Martin, Nautel

3:30 p.m. *Test Results of Dual Input Sidemount FM Antenna* - Eric Wandel, ERI

4:00 p.m. *HD Radio: A Cost-effective Approach to Producing Enhanced Radio Programming for a Digital Audience* - Nicolas Hans, Dalet Digital Media Systems

4:30 p.m. *HD Radio Receiver Updates* - Bill Whitehart, Visteon

Tuesday, April 20

Radio RF and Transmission Developments

9:00 a.m. - 12 noon

Chairman: Martin Hadfield, Entercom

9:00 a.m. *Linearity Performance Measurements in Modern AM Transmitters and the Relationship to HD Radio and DRM Performance* - Phil Schmitt, Harris

9:30 a.m. *IBOC RF Measurements* - David Maxson, Broadcast Signal Lab

10:00 a.m. *Evaluation and Improvement of AM Antenna Characteristics for Optimal Digital* - Ronald Rackley, du Treil, Lundin & Rackley

10:30 a.m. *Design and Field Results for the Utilization of Circulators in High-power Broadcast Transmission Systems* - Jim Stenberg, Dielectric Communications

11:00 a.m. *HD Radio FM Broadcast Coverage: What to Expect* - Mike Bergman, Kenwood USA

11:30 a.m. *EH Antenna* - Ted Hart, EH Antenna Systems

RDS and Data Broadcasting

1:00 - 5:00 p.m.

Chairman: David Layer, NAB

1:00 p.m. *RDS Implementation in the U.S.* - Ryan Steelberg, Dmarc Networks; Kelly Christensen, Stratosaudio; Allen Hartle, The Radio Experience; Jeff Littlejohn, Clear Channel; David Layer, NAB

2:00 p.m. *Enabling the Application Layer in Broadcast-based Datacasting* - Jackson Wang, E-Radio

2:30 p.m. *Song Title and Artist over RDS: The Nuts and Bolts* - Tom McGinley and Dave Casey, Infinity Seattle

3:00 p.m. *IBOC Data Services Overview* - Jeff Detweiler, Ibiqity Digital

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- 3:30 p.m. *Methodology for Data Service Multiplexing* - Paul Signorelli, Impulse Radio
 4:00 p.m. *IBOC Data Broadcasting at Your Station* - Ray Miklius, Broadcast Electronics
 4:30 p.m. *Traffic Data: The Killer App?* - Joseph Reed, Mobility Technologies

Wednesday, April 21

Technical Regulatory Issues for Radio and Television

8:30 a.m. - 12 noon

Chairman: *Thomas Ray, Buckley Broadcasting/WOR Radio*

- 10:00 a.m. *RF Exposure Management* - David Maxson, Broadcast Signal Lab
 10:30 a.m. *What is NEPA?* - Robert Repasky, The Payne Firm
 11:00 a.m. *Broadcast Auxiliary Service Frequency Coordination, and Database Issues* - Timothy Hardy, Comsearch
 11:30 a.m. *A Summary of FCC BAS Issues* - Dane Ericksen, Hammett and Edison

Technology Luncheon

12 noon - 1:45 p.m.

Radio Facilities Management

2:00 - 4:30 p.m.

Chairman: *Troy Pennington, Cumulus Broadcasting*

- 2:00 p.m. *Broadcasters in the Open Source Age* - Frederick Gleason Jr., Salem Radio Labs/ Salem Communications
 2:30 p.m. *Quality Assurance in Technical Management* - David Baden, Radio Free Asia

- 3:00 p.m. *Effective Project Management; Implementing New Technologies and Controlling Risk* - Kevin English, EDS
 3:30 p.m. *Grounding Practices for Broadcast Facilities* - Alan Rebeck, RO Associates
 4:00 p.m. *Standby Power Generation's Role in Disaster Preparedness and Recovery* - Charlotte Hanley, Cummins Power Generation

Thursday, April 22

Radio Broadcast Content Collection and Distribution

9:00 - 11:00 a.m.

Moderator: *David Layer, NAB*

- 9:00 a.m. *Exploring New Directions in Radio Production* - Alan Peterson, WMET-AM
 9:30 a.m. *WANcasting; What Are You WANning For?* - Jeff Zigler, Prophet Systems Innovations
 10:00 a.m. *Digital Audio File Distribution for Radio* - Motoko Sasaki and Naruhiko Nihira, Tokyo FM Broadcasting
 10:30 a.m. *Sound Processing: A Time and a Place* - David Reaves, Translantech Sound

Amateur Radio Operators' Reception

Wednesday, April 21

6 p.m. to 8 p.m.

One of the most popular events at the convention, the reception draws broadcasters from all geographic areas and interests. Where else can CEO a comfortably mingle with a shop technician? The event will feature DJ All Night Mike and door prizes. The event is sponsored by Heil Sound.

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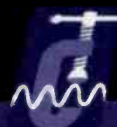


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The events, seminars & sessions

Other sessions of interest

While the Broadcast Engineering Conference by itself is enough to keep you busy, there are other sessions that may carry an interest for the technology manager.

Monday, April 19

2:30 p.m. - 3:15 p.m. **Going Digital: If You Build It...**

3:15 p.m. - 4:30 p.m. **Going Digital: When Will They Come?**

Tuesday, April 20

12:15 p.m. - 1:45 p.m. **Radio Luncheon**

Wednesday, April 21

9:00 p.m. - 10:15 a.m. **Building, Building Out, Building Over: Facilities on Budget**

SBE Events

The Society of Broadcast Engineers has several events and meetings planned during the convention. SBE members are welcome to attend any of these functions, especially the membership meeting.



SBE Board of Directors meeting

Sunday, April 18

8:30 a.m. - 12 noon

Hilton Grand/Royal Salon

SBE/NFL Game Day Coordinators meeting

Monday, April 19

9 - 11:30 a.m.

Hilton Conference Rooms 4 & 5

SBE EAS meeting

Monday, April 19

2 - 4 p.m.

LVCC N255

SBE Ennes Educational Foundation Trust annual meeting

Monday, April 19

12 noon - 1 p.m.

Hilton Conference Room 11

SBE Frequency Coordinators meeting

Tuesday, April 20

10 a.m. - 12 noon

Hilton Conference Rooms 4 & 5

Adhoc group on BAS 2GHz transition

Tuesday, April 20

8 - 9:30 a.m.

Hilton Conference Rooms 4 & 5

SBE certification exams (advance registration required)

Tuesday, April 20

9 a.m. - 12 noon

Hilton Continental/Club Salon

SBE membership meeting

Tuesday, April 20

5 - 6:30 p.m.

LVCC N110

National Public Radio Engineering Conference

NPR will again hold technical training for station engineers, general managers and operations personnel before the NAB convention on April 16 and 17. See details at www.prss.org/training/prec.cfm.

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When it's time for a new **Transmitter**

This crucial component of the transmission system has more possibilities and options than ever before.

A transmitter is a major capital expense and will usually see a long useful life at the station. Unless necessitated by a crisis or change in facility, most transmitters will easily serve 10 years or more as a main transmitter, and often serve at least another 10 as a backup transmitter. With such a long lifespan, the transmitter purchase decision is one that carries a great deal of responsibility. With the possibility of a digital transmission standard looming, there are some decisions to be made today that will affect the station in years to come.

So where do you begin? The first step is determining the needed power level, which is the easiest part. The next question may be a little trickier: tube or solid-state? Both designs are in wide use and will provide reliable service. Tubes are obviously a mature technology, but at this point so are solid-state designs. Defining its long-term plans is the third step and the hardest to determine, but is just as important as the other concerns.

When choosing a tube or solid-state transmitter, price is always a concern, and can show an obvious difference when comparing the two technologies. At lower power levels, solid-state designs are less expensive when comparing price to power. At higher power levels, tube designs tend to have an economical edge. The exact power level varies by manufacturer, but for FM transmitters, the power point is around 10kW. For some manufacturers this point might be lower. The options for a new, tube-based AM transmitter are few if any.

As the FM power level need increases, the price point becomes a consideration of the premium for the performance of the solid-state design.

The long haul

If the installation will cover the station for a long term, then digital transmission should be part of the plan. While the exact path for a

Resource Guide

Some manufacturers and dealers of broadcast transmitters

Company	Contact	Products
Armstrong Transmitters	www.armstrongtx.com sales@armstrongtx.com	exciters, solid-state FM transmitters from 30W to 5kW, tube FM transmitters from 1kW to 30kW, solid-state AM transmitters from 500W to 1kW, IBOC
Bext	www.bext.com sales@bext.com	exciters, solid-state FM transmitters from 100W to 6kW, tube FM transmitters from 800W to 35kW
Broadcast Electronics	www.bdcast.com bdcast@bdcast.com	exciters, solid-state FM transmitters from 100W to 20kW, tube FM transmitters from 5kW to 25kW, AM solid-state transmitters from 1kW to 10kW, IBOC
Broadcast Technology	www.broadcasttech.com sales@broadcasttech.com	solid-state FM transmitters from 300W to 1.2kW
Crown	www.crownbroadcast.com fmsales@irec1.com	exciters, solid-state FM transmitters from 30W to 2kW

digital transmission future is not yet known, Ibiqity's IBOC is currently the leading consideration. (Leonard Kahn has begun testing his Cam-D system for AM, but there are no details available yet on this system.)

The three current methods of transmitting an IBOC signal—low-level combining, high-level combining and separate antennas—require different power levels. All of them require linear amplification of the IBOC signal. The opinions vary on which method is best to transmit the IBOC signal.

If the need for a transmitter is short-term, such as an emergency or a temporary installation, the IBOC compatibility may not be relevant. Likewise, a lower-power transmitter could be used, or a used transmitter might be practical. It might also work out that the temporary-use transmitter can serve a back-up purpose later.

Redundancy has become increasingly important over the past few years. Regardless of the need, whether it's weather-related, the result of malicious intent or just a natural event, having suitable redundancy in the transmission system is critical. A completely redundant transmitter site is the ideal situation, but this is not always economically practical. If the budget only allows for a few back-up systems, carefully consider the available options.

Most, if not all modern transmitters, have the ability to patch around failed sections to provide some type of useable, albeit power-reduced, signal. If you choose this approach, keep in mind that you may not be able to work on the trouble while the transmitter is on the air. One example would be a tube FM transmitter. While the IPA may be able to feed the antenna, the entire transmitter may need to be energized to operate this way. If operating a system in a fractional mode like this is part of the redundancy plan, be sure that it can be done practically when the need arises.

One advantage to solid-state designs is that they do not rely on a single amplifier in the final transmitter stage. The final output is created by several power modules that are combined to make the desired power. This soft failure capability allows most solid-state transmitters to continue operating while some of the power modules are not working. Most designs allow one module to fail with no change to the output power. Most designs also allow you to remove a module so it can be repaired while the transmitter is on the air.

The exciter is the one element that does not have inherent back-up. Because of this, it is a good idea to keep a spare exciter available.

As solid-state transmitter manufacturers have refined their manufacturing processes, they tend to use common elements within a product line. For example, a manufacturer may have two transmitters of different power ranges available, but they might use the same power modules within. This repetition of elements can be an advantage to a station or station group in that fewer unique parts need to be kept on hand.

As solid-state transmitters have evolved, their physical size has also been reduced. It's possible to have up to 1kW available in just a few rack spaces. Because of this, a small power amplifier can be added to accompany the back-up exciter for a complete transmitter package. In addition, most solid-state amplifier designs are wideband. With a frequency-agile exciter, a back-up transmitter could be kept in a road case and moved to the transmitter site where it is needed, whether it is within the market or in another city within the station group.

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Energy-Onix	www.energy-onix.com energy-onix@energy-onix.com	exciters, solid-state FM transmitters from 300W to 10kW, tube FM transmitters from 1kW to 50kW, solid-state AM transmitters from 250W to 50kW
Harris	www.broadcast.harris.com broadcast@harris.com	exciters, solid-state FM transmitters from 2kW to 40kW, tube FM transmitters from 20kW to 35kW, solid-state AM transmitters from 1kW to 50kW, IBOC
LPB	www.lpbinc.com sales@lpbinc.com	solid-state AM transmitters from 30W to 100W and 1kW to 50kW, Part 15 solid-state AM and FM transmitters
Marti Electronics	www.martielectronics.com sales@martielectronics.com	exciters, solid-state FM transmitters from 40W to 1kW

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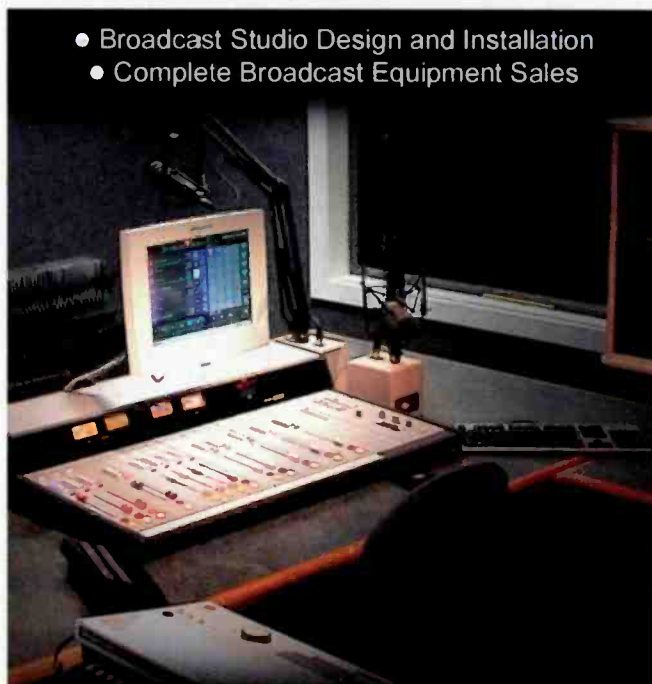
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QEI	www.qei-broadcast.com qeisales@qei-broadcast.com	exciters, solid-state FM transmitters from 100W to 9.6kW, tube FM transmitters from 3.5kW to 30kW
SBS	www.sbsfm.com sales@sbsfm.com	exciters, solid-state FM transmitters from 100W to 1kW
Superior Broadcast Products	www.superiorbroadcast.com jjoynt@superiorbroadcast.com	exciters, solid-state FM transmitters from 100W to 2kW, tube FM transmitters from 3.5kW to 30kW
TFT	www.tftinc.com info@tftinc.com	FM boosters
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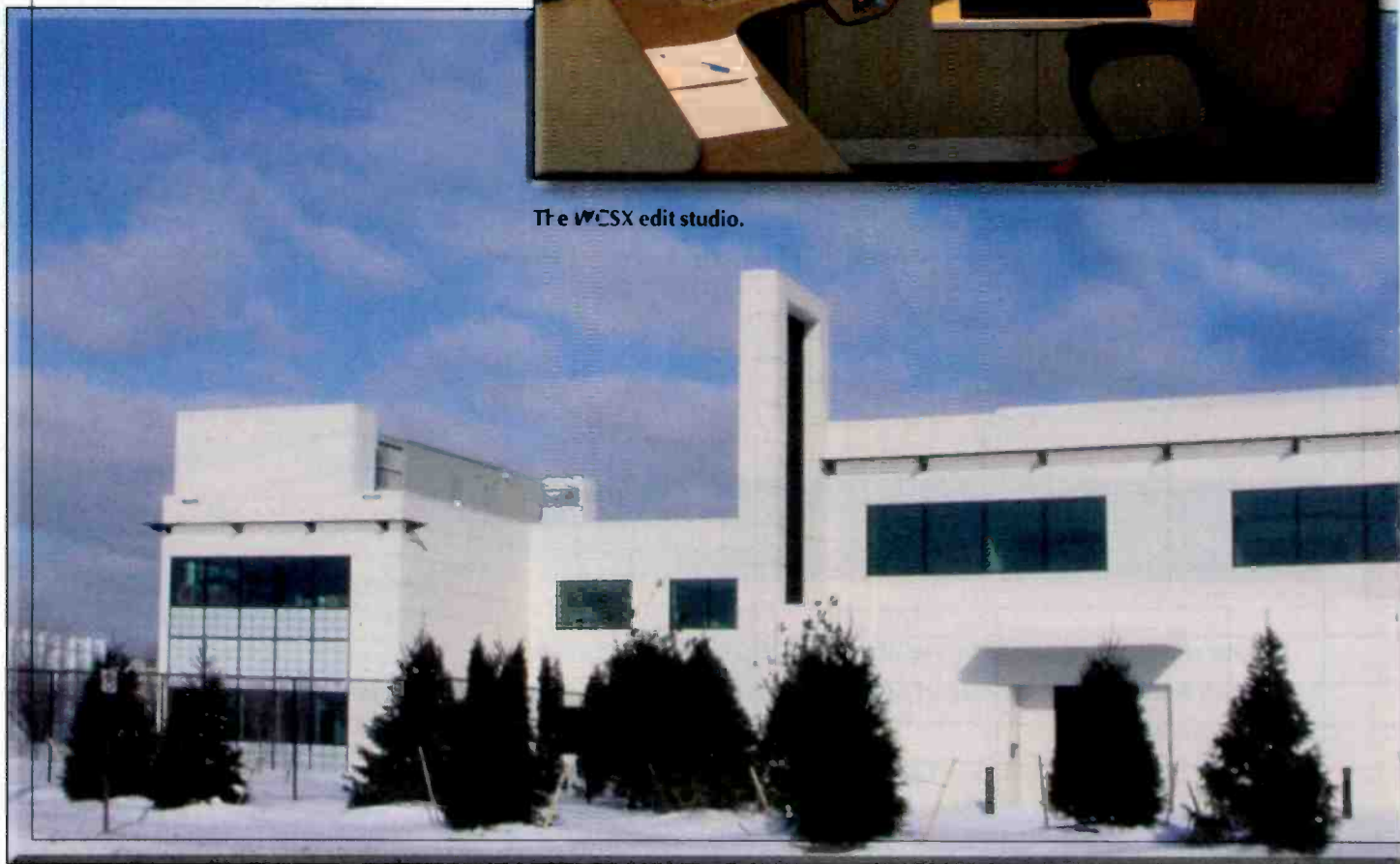
By Michael Kernen

The consolidation of radio stations in markets such as Detroit has no doubt exposed many shortcomings and inefficiencies of facilities. Many studio buildings were designed to house an AM/FM combo or a stand-alone station's studios, but not multiple radio stations. This is the challenge that faced Greater Media in the Detroit market. Having started with an AM and an FM station in the market and later owning three FM signals, the need for a modern and efficient space was never more evident.

Greater Media is a company that emphasizes quality. The Detroit stations are all among the top ranks in their demographic and are all fully staffed and aggressively positioned. We needed



The **WCSX** edit studio.



a facility capable of supporting the stations' needs while staying fully aligned with their aspirations and philosophy.

In 2001, the 12 acres owned by Greater Media just north of the Detroit city limit was home to a 1,000-foot tower, three structures supporting the radio studios, a multi-tenant transmitter building and a C-band satellite uplink facility known as Greater Starlink. With Starlink's business in sharp decline the decision was made to close the facility. To make way for a new state-of-the-art radio facility that would house all three of the Greater Media Detroit stations, it would be necessary to remove the Starlink dishes—three of which were larger than 100 feet in diameter—grade the property and raze the existing building. This alone was a formidable undertaking, but an added obstacle was the extensive protective berm that surrounded the south end of the satellite installation. Standing more than 40 feet high and several hundred feet long, this was one huge dirt mound. The logical thing to do would be to bulldoze



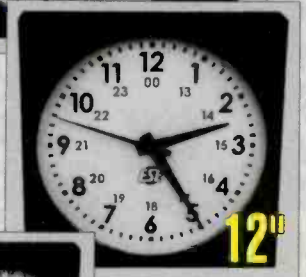
The console in the WCSX production studio. The monitor shows the DSP audio compressor/expander.

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the entire mass into the center of the site where the elevation was actually eight feet to 10 feet below grade, but this area was to be the location of the main building, which required a stable soil base.

The analysis of the berm revealed that it was mostly organic soils, which cannot be used under construction because of their tendency to shrink.

Over the course of six months the berm was razed by trucking more than 500 double-bottom semis of the soil to a landfill and filling the below-grade areas with more than 200 truckloads full of engineered fill. A constant parade of trucks made trips between the site and the landfill until the site was level. The only thing left standing was a 120-foot tower that would be used for STL dishes and other light equipment.



Protools is used in the WCSX production studio.

Getting started

At a May 2001 groundbreaking ceremony, the company announced its plan to combine the three stations into one facility. Plans were laid for a 38,000 square foot, two-story building that would occupy the recently leveled Starlink property on the south-east side of Royal Oak Township, MI. The structure, consisting of a steel superstructure with concrete floors and a metal-decked rubberized roof, allows for the eventual expansion necessary to house four stations should Greater Media acquire one. The build-out was expected to take one year.

For architecture and engineering, Greater Media turned to trusted talent used on prior Philadelphia and Boston consolidation projects. Paul Elia of

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State-of-the-art

Philadelphia's Hellyer, Berman, Lewis were the architects and Clive Samuels of Princeton, NJ, provided the electrical and mechanical engineering. Other principal participants were the project manager, E&L Construction of Flint, MI; and the local architectural firm Brown Teehey of Bloomfield Hills, MI. Acoustical engineering was provided by Kevin Miller of Miller, Beam, and Paganelli in Mc Lean, VA, and studio integration was provided by Radio Systems. Milford Smith, Greater Media vice president of radio engineering, and I managed the project from Greater Media's perspective.

Equipment List

Apple Macintosh G4
Apple Macintosh G5
Apple X-Serve
Belden CAT-5 cable
Blonder Tongue AM-60-860
Blonder Tongue OC-16
Bose Free Space System Controller
Broadcast Electronics AudioVault
Comrex Vector
Crown D-45
Crown PowerBase
Dell PowerEDGE 350
Electro-Voice RE27N/D
Extron MSW-4SV
Gateway 935series
Geffen USB400
Genelec 1029A
Genelec 1030A
Genelec 7050A
Hafler p1000
HP ProCurve hub and switches
Hughes SD-HB8
Hughes Tivo HDHRV-2
IBM eServer xSeries300
JBL control 5
JVCHR-S2902U
Klotz Vadis 880 consoles and router
Mackie Digital Mixer DX8
Mackie HUI
NEC 1855NX
NEC LCD 5V
NVision NV4000
NVision NV5500
Philips 20PF9925/17s
ProTools 001 and 002
Radio GPS Clock
Radio Systems Studio Hub
Raritan LCD monitor KBD combo
Raritan Paragon and IP reach
Raritan UST1 user station
Sage Endec
Shure SM7B
Studio Technology furniture
Sony CDP-D11
Sony CDRW-66
Sony MDS-E12
Sony PCM-R500
Sony PCM-R700
Telos 2101
Telos Profiler
Telos Zephyr

Step inside

The facility is built with a hub-and-spoke arrangement that gives each station its own wing. This helps preserve each station's creative core and individual identity. The wings meet in the center hub room, which is a large multi-purpose area capable of supporting meetings, multi-media presentations, live in-house performances or just lunch. Other specific features of the building include a workout room with showers and lockers, a single-bay garage with a 12-foot door that allows us to maintain the group's fleet, even those vehicles with masts, and a scissor lift to offload large trucks. Twelve studios and a technical operations center (TOC) all with access flooring are provided for the technical core of the operation.

Studios, programming, promotions and engineering occupy the first floor; sales and administrative offices are on the second. Three conference rooms, all with multi-media capabilities, are on the second floor. A high-tech board room with a 35-foot table at its center and a kitchen pantry to its rear offers space for high-level meetings and presentations. High-style fabric walls and cork floors make for elegant surroundings in many common areas. Granite tops and stainless-steel appliances grace the first and second floor kitchen areas.

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Many common areas feature overhead speakers with multi-zone, multi-station capability. By using wall controls, each of these spaces can listen to a variety of sources including each station's program audio, and in the case of the hub room, audio from the plasma TV or the front projection TV with its 8-foot motorized screen. Other multimedia features include several Bose speakers in the conference, hub and board rooms and the ability to connect a computer or playback DVD video.

The physical facilities are protected by a number of backup and secondary systems. Electrical power is backed by a 175kVA UPS with a 1,000kVA CAT diesel electric plant behind it. This enormous generator can power the entire studio building as well as all three stations' transmitter facilities without load shedding. With the UPS and generator, technical loads transition to emergency power without interruption. A fuel storage capacity of 4,000 gallons covers extended outages.

Heating, ventilation and air conditioning is provided by five rooftop systems; four of which are the size of a semi trailer. Technical areas are serviced by completely redundant systems with full humidification and automatic failover. Office spaces are serviced by individual high capacity systems. Each zone has can be heated even if the rest of the



Looking into the technical operations center showing the Raritan KVM cross-point switcher, Klotz Vadis frames and Gateway servers.

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building requires cooling. This is thanks to individual duct-mounted hydronic reheat coils. Hot water is pumped as needed to each zone through a maze of pipes and valves that course throughout the building. The whole system is monitored and controlled by a Johnson Controls building management system that places comfort as its top priority.

To properly supply the fire suppression systems, 30,000 gallons of water has to be stored and available at all times. The Greater Media Detroit facility parking lot hides a tank the size of a semi truck at the bottom of a 30-foot hole excavated in the clay. A transfer pipe leads to a 28-foot deep well in the mechanical space, on top of which sits a pump capable of emptying all 30,000 gallons in just one hour. This pump is tied to the emergency generator via a completely separate feeder and transfer switch.

Security is provided by proximity cards on sensitive areas and at the main gates and entrances. Photos are printed on the cards as well as the employees name and department. Cameras are trained on certain areas and the employee lot and are recorded nonstop by a digital hard drive

security recorder. Other security is accomplished by employing multiple levels of keying in the Sergeant locking system.

A digital extreme

Greater Media Detroit is building possibly the most digital facility in the nation. Except for microphones, analog sources are almost nonexistent. The entire facility is built around the Klotz Vadis platform that enables routing and source control completely in the digital domain. At the center of this platform is a unique fiber optic transmission system that carries 64 channels of audio per fiber. Consoles are simply control surfaces that command the Vadis 880 card frames via their private IPX network. Another unique feature is the fiber links to the transmitter building on the opposite side of the property. Klotz Vadis 880 frames are located in the transmitter rooms where they manage the concentration of RPU and fold-back sources to fiber and the distribution of digital audio to the audio processors. Because WRIF's primary facilities are at a local TV station, the Klotz frame's AES output is routed to an Intraplex digital STL and to WRIF's backup transmitter that is collocated with the main WMGC transmitters.

Also showcased in the facility is a massive Audio Vault system with enough storage to maintain each station's commercial and music inventory. Each transmitter site has an AudioVault server that serves as a worst-case backup should audio fail from the



AUDIO SWITCHERS

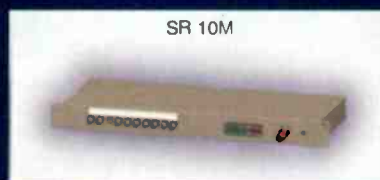
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SR 10M

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SR 210

10 x 2 STEREO SWITCHER



SR 64

6 x 4 STEREO SWITCHER



SR 201

20 x 1 STEREO SWITCHER WITH PARALLEL REMOTE CONTROL



SR 61M

6 x 1 STEREO SWITCHER WITH METERING AND MONITORING

Greater Media Detroit

studio site. This server can provide music and commercial content from the current days logs. This server serves too as an off-site repository for each stations ultra-valuable inventory.

The studios are built with custom furniture from Studio Technology in Philadelphia and feature maple veneers and Corian surfaces. Corian was chosen over granite because it can be worked with standard wood working tools—essential in a radio studio that may need to undergo upgrade and modifications during its service lifetime.

Several construction techniques were used to soundproof the studio rooms. Common walls are

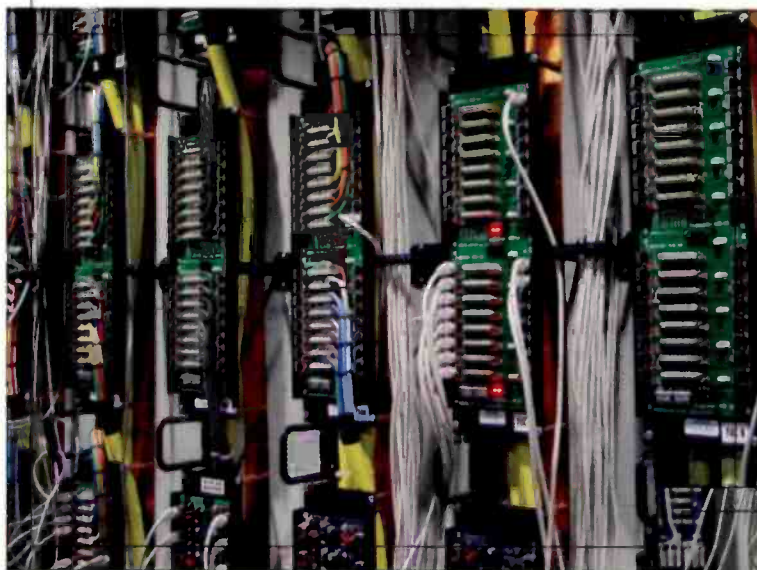
rooms make due with Power Mac G4 machines with dual 1.25GHz processors. Because the G4s are too noisy to locate within the studio environment, they are extended to the studios from the TOC via CAT-5 KVM extenders. The whole system is backed up nightly by an Apple Xserve running Retrospect.

The production and edit studios are linked to the TOC by Klotz and have access to any source in the Klotz fiber optic pool. The Audio Vault and utility computers are provided, as is a multi-purpose Philips TV that can display any video source or the utility computer.

All computers are housed in the TOC with the sole exception of the ultra-quiet Macintosh G5. This exception was made because the Protools Digi002 requires a Firewire connection, which cannot be easily extended from the TOC. The 002 is necessary in the studio to allow the impossible-to-extend MIDI connection to the HUI. Other KVM extension is handled by a four-tier Raritan Paragon system. Each mission-critical system is connected to two Paragon KVM switches in the TOC and extended to the studios via Belden CAT-5 cabling. In the event of a KVM switch failure, critical computers can be accessed by routing them through the other Paragon.

DirecTV satellite receivers are used in all the studios. The edit and on-air rooms are equipped with DirecTV Tivo receivers. A complete master antenna television system stacks DirecTV signals with standard cable TV. An in-house cable system allows internal feeds to be distributed as well as security camera video.

Telephone interfacing is handled by a Telos 2101 system mounted in the TOC. The system uses twin redundant hubs that handle the ISDN PRI circuits and one T1 is used



Part of the Studio Hub installation on the back wall of the TOC.

doubled up and use two layers of drywall on each side. Window walls have a store front system that layers bullet resistant glazing over the traditional thermo pane glass. As it turns out, this is not enough to deaden the noise from the traffic on the nearby road. Two more layers of glass will be added in the future to further attenuate the ultra-low frequency noise.

Each on air studio features three Sony CD players, a Marantz DVD player and a Sony Mini-disc player and recorder. We also installed the networked version of Voxpro and a traditional VCR. NECLCD monitors are used, with 18" units for the AudioVault and 15" units for the Voxpro, Klotz and the Utility (Internet) PC. Featured in the on-air studios is a 20" Philips LCD with an Extron video switcher under Klotz control. Genelec monitors provide quality sound with the 100W subwoofer mounted above the studio ceiling grid in a specially designed box. Time of day clocks are synchronized to the National Bureau of Standards by a Radio Systems GPS clock mounted in the TOC.

The production and edit studios feature Digidesign Protools editors, with a Mackie HUI control surface in production. Production Protools systems run on Apple Macintosh Power Mac G5 systems, the edit



for interconnection to the business phone system. One dual hybrid known as a studio interface handles the DSP for the caller and talent audio and drives the studio desktop and console director units.

At this point, about 80 percent of the construction is complete. Only WCSX is fully moved in, but the facility is ready to accept WMGC as soon as the staff is ready to transition. WRIF will follow in the late spring.

Kernen is chief engineer of the Greater Media stations in Detroit.

More facility photos are available in the online version of this article at www.beradio.com

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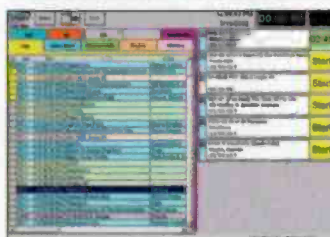
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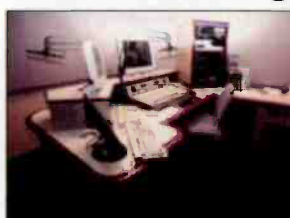


StudioHub, the complete CAT5 facility wiring solution from Radio Systems, is the wiring backbone chosen by Greater Media for its Detroit buildout. Based on IT-standard CAT5 wiring, StudioHub simplifies facility wiring by converting the myriad of audio and remote control connectors into reliable, economical RJ-45 connectors. The system also utilizes DC-Link, a phantom power system that is carried on every CAT5 wire to power remote devices, such as headphones and mic amps, intercom systems and router controllers.

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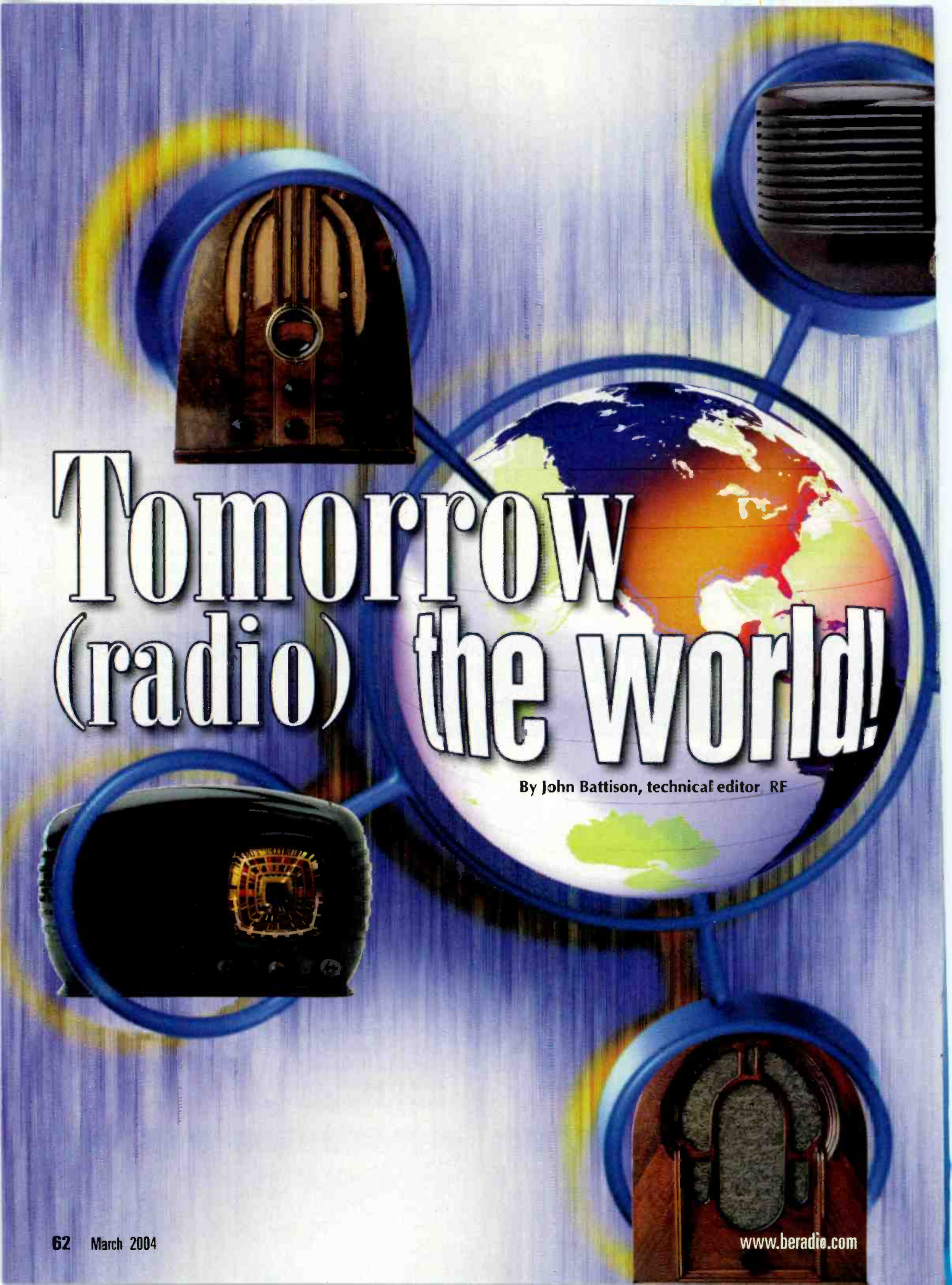
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Tomorrow (radio) the World!

By John Battison, technical editor RF



Conceived by NPR in 2002 and nurtured by Harris and Kenwood USA, National Public Radio's multicasting system has just been proved perfectly suited to expand the use of Ibiqity's HD Radio (IBOC) FM system. This expansion of audio services is particularly gratifying to NPR stations because it opens new avenues for high-quality programming. Classical music is probably the most popular item in the NPR program line up, and the ability to offer more than one source of programming originating from a single channel assignment is something that all noncommercial stations will undoubtedly welcome with open arms.

Both noncommercial and commercial channels have become overcrowded and frequencies are in short supply. The concept of tomorrow-casting should be welcomed by all licensees, both current and hopeful. On Jan. 9, 2004, the triumvirate

announced the completion of development and successful testing of the project. More than \$1 million has been spent by NPR, Harris, Kenwood and NPR stations to foster the development and testing of this new technique.

Although this new system has been developed by a noncommercial entity, its use is not restricted to noncommercial stations, it is hoped that by mid-March the FCC rules will have been amended so that all FM licensees can use this new system whose official technical designation appears to be supplemental audio channel (SAC). As a direct result of the recent tests, the future looks bright for early acceptance of this new system. In fact, hopes are strong for licensing before autumn sets in.

The successful development of SAC is a tribute to the cooperation between NPR as the utilizer and Harris and Kenwood as the builders of the tool. Following the successful development of transmitting and receiving equipment, a series of in-depth field tests were conducted to evaluate reception and coverage not only at fixed locations but in mobile receivers. Standard FM reception characteristics in the stationary receivers are well known, but the vagaries of mobile reception needed to be evaluated to ascertain their effect on the SAC signal.

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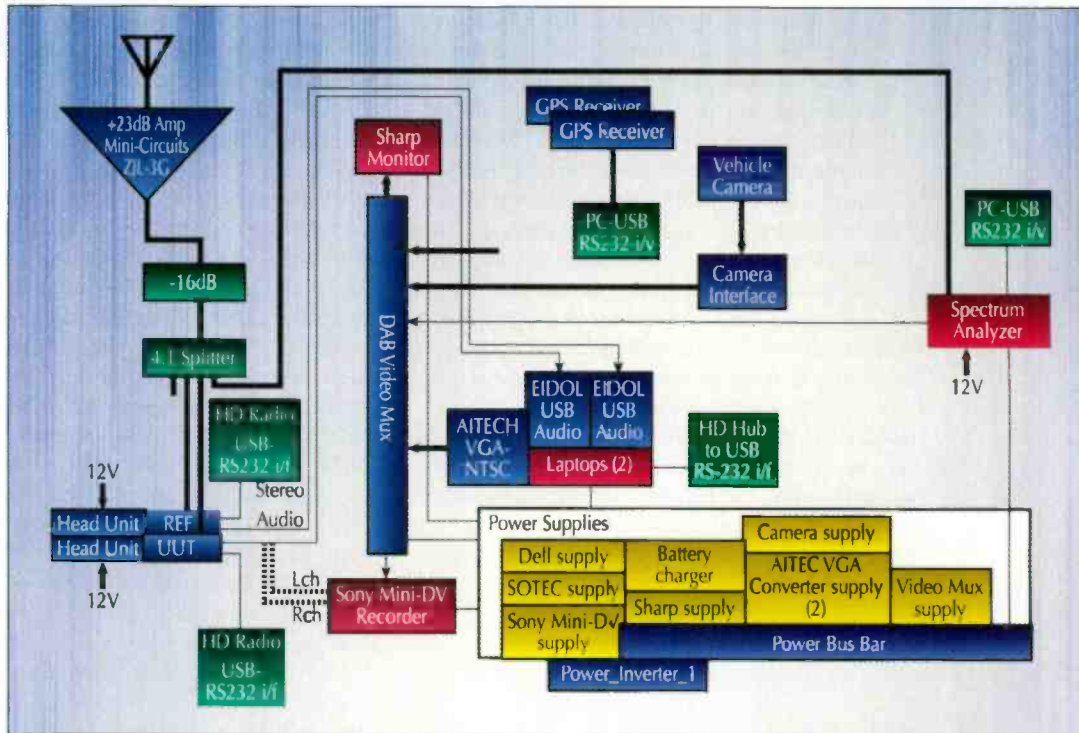




Figure 1. The mobile test equipment as originally connected for all but the San Francisco tests. Diagram supplied by Kenwood.

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It was important to ensure that the signal was sufficiently robust in the real world to provide adequate second program service in the absence of the blend-to-analog feature of the main program channel.

The development of digital radio technology has opened the way to a new era for broadcasters. Supplemental audio channels have been added to the standard IBOC radio spectrum by splitting the digital spectrum into two channels. The regular 96kb/s is split into a main channel of 64kb/s and a supplemental audio channel of 32kb/s respectively. Each digital channel is capable of high-quality sound reproduction. The result is similar to an analog subcarrier, but with higher quality in form that is easier to handle.

Field testing

The NPR retained the engineering firm of Hammett and Edison to perform the necessary field testing of the new system. Four areas of the country were selected. In 2001/2002 IBOC preliminary testing was carried out by WETA (90.9MHz) in Washington, DC, and WNYC-FM (93.9MHz) New York, and the routes selected for the new test series were similar to those used in the earlier tests. In the San Francisco area the test involved KALW (91.7MHz) where earlier IBOC test routes were used and KKJZ (88.1MHz) in Los Angeles and Long Beach where three new test road loops were used.

All four of the test areas were originally measured in August and September of 2003. In Because of perceived problems with the RF distribution in the data gathering system, measurements were rechecked from October through December 2003. The original installation used two antennas, a preamplifier and a power splitter. This was not considered satisfactory because of RF noise and uncertainty involving the RF network. The change to a single antenna resulted in an improved, simplified arrangement.

The original PAC audio coder was also replaced by the new HDC audio coder and it was necessary to retest with the new device. This retesting, referred to as regression in the report, was performed in the Washington and New York markets. Apparently the difference in the results was not considered to be strongly significant and it was confined to the eastern market stations. Standard IBOC test runs were made in the New York and Washington test markets.

Figure One shows the mobile test equipment as originally connected. Figure Two is a block diagram of the test equipment setup as finally modified. The equipment was mounted in a van and every day before tests commenced in each area the van was driven to the same

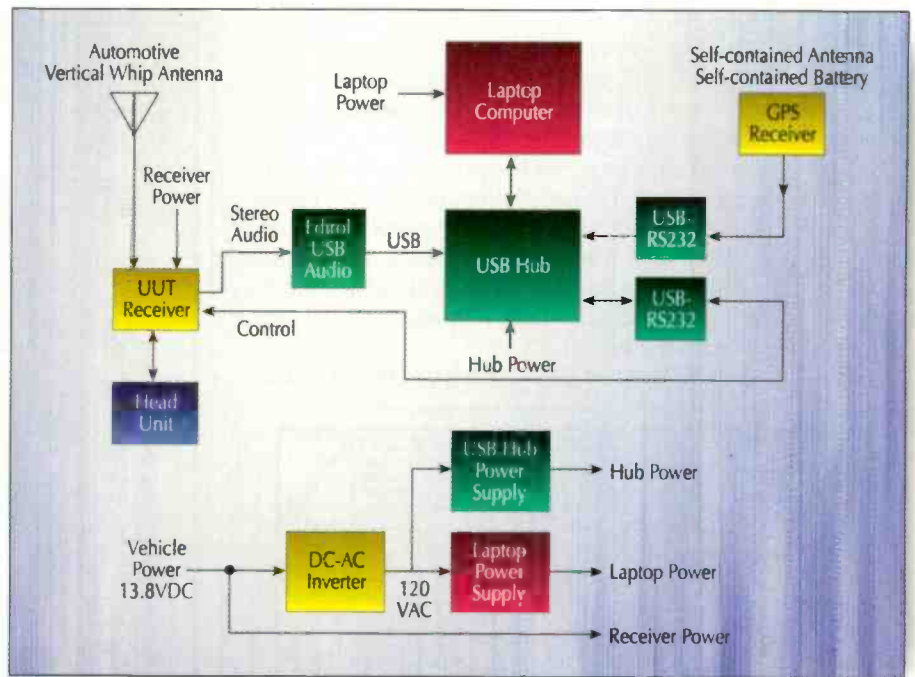


Figure 2. A block diagram of the test equipment setup as finally modified.

spot and calibration checked. The GPS system was used extensively to define measuring points.

Test results

To provide clear and concise test results the report includes maps that show the routes followed, the measured field strengths and signal assessment. The four test areas were chosen to represent for different types of terrain. The standard FCC method

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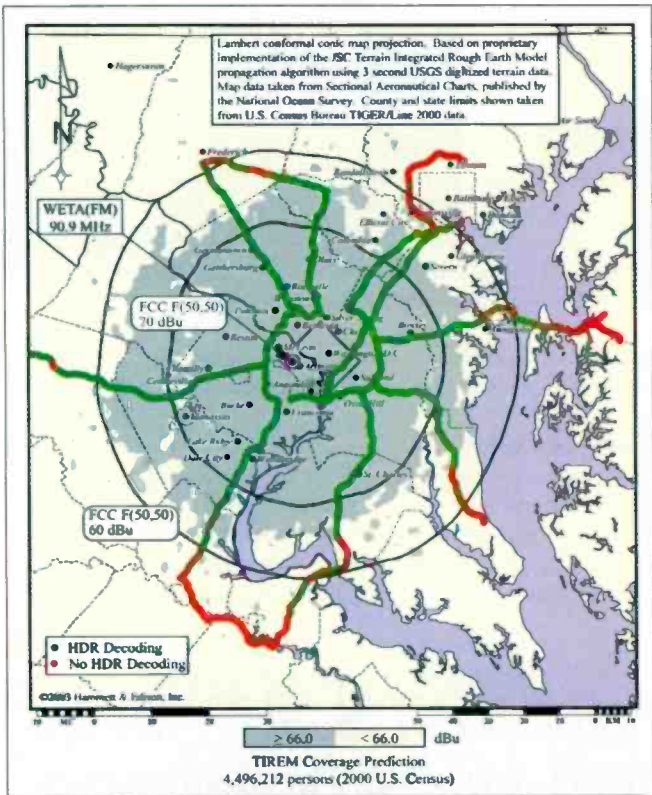
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Tomorrow (radio)

of predicting coverage obviously would not suffice for these widely differing terrain conditions. Therefore the well-known Terrain Integrated

Rough Earth Model (TIREM) was used because it evaluates the profile between sites and selects the most probable mode of propagation that results based on terrain profiles. This system uses the USGS three-second terrain database and is considered to be the most accurate method of predicting signal strength where propagation paths are accurately known.

The FCC defines the receiving antenna height as



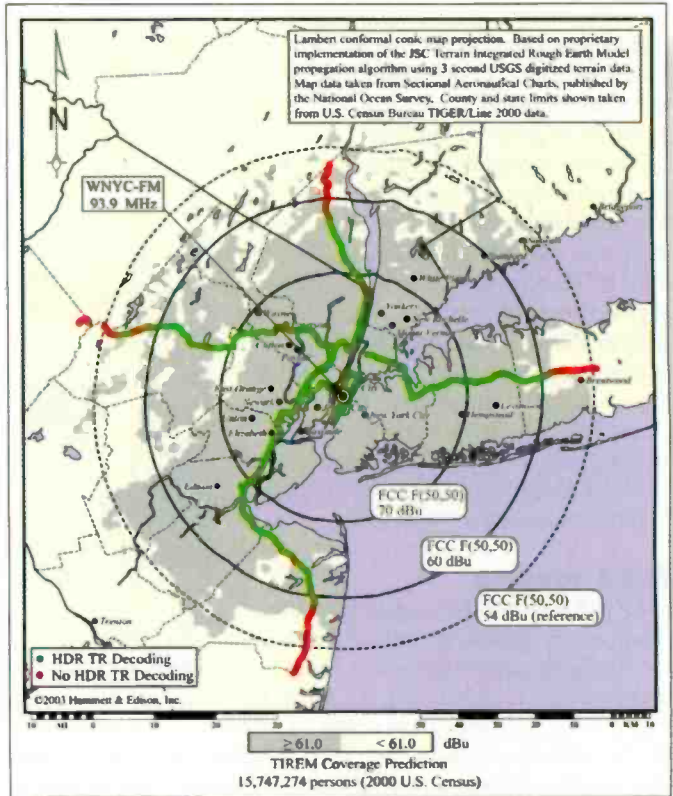
Washington, DC, area field test results for the IBOC signal using the HDC audio encoder.

30ft. above ground. This value was used in the TIREM calculations. Because of this, some of the contours shown represent specified field intensities, which may or may not be the same as FCC service contours. Shading has been used in the maps to improve information presentation.

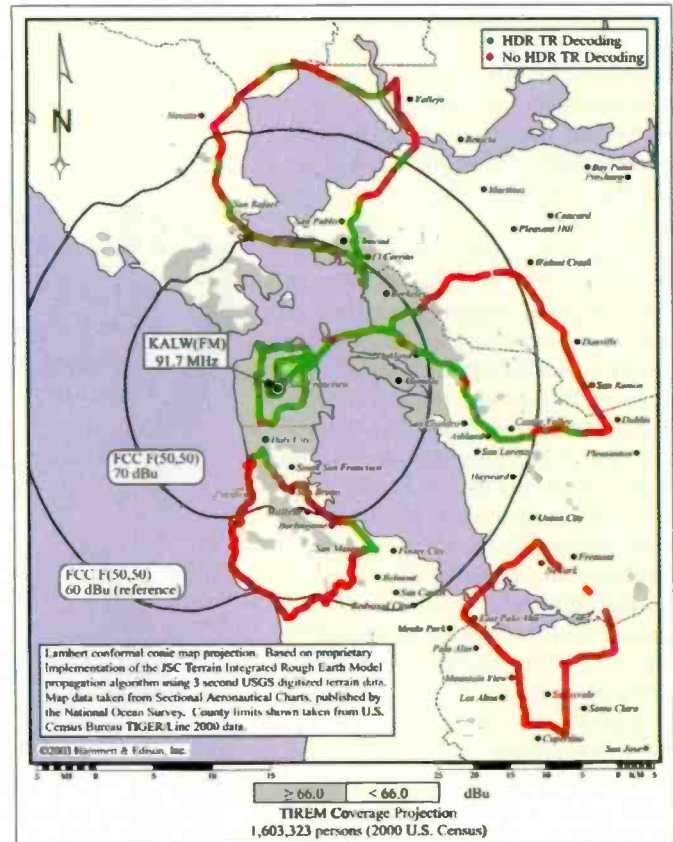
The Hammett and Edison Report includes a large number of maps. Four of these, one for each of the four testing locations, have been reproduced here.

The first map is the HD Radio only run for Washington DC using WETA. This produced a 66dBu TIREM service area compared with 64.9dBu. The difference of 1.1dBu is considered to be acceptable.

Because of the size of the city of New York several maps were provided in the report. Shown here are the results of the outbound group performance. The report shows that a 61dBu TIREM service area



New York City field test results with the HDC audio encoder and the Tomorrow Radio system in use.



The San Francisco tests were made with the PAC audio encoder and the Tomorrow Radio system.

was obtained for the SAC channel.

No regression testing was performed in the Los Angeles/Long Beach area. In this market a 70.8dBu TIREM was obtained. It was anticipated that, based on regression data in other markets, a TIREM service area some 2dB to 3dB lower would be obtained.

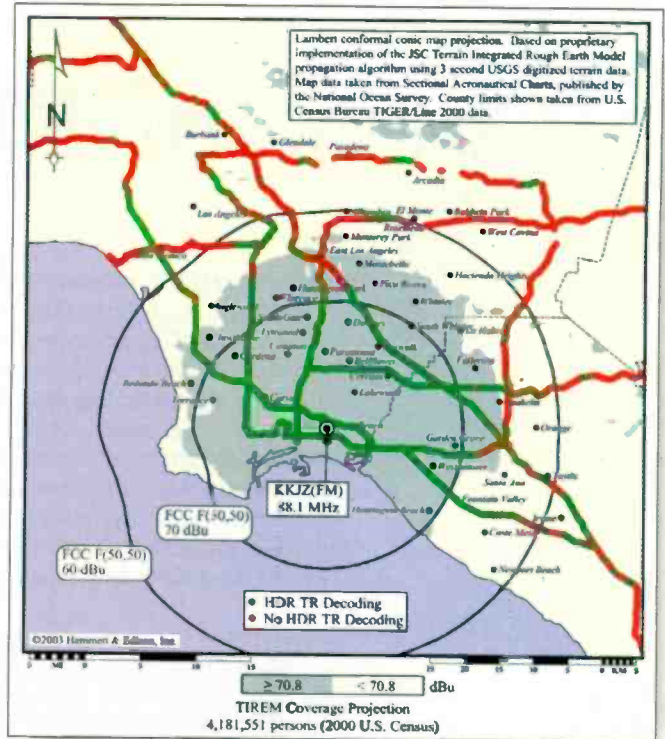
Because of time and expense constraints regression tests were not implemented in the San Francisco Bay area. In this market the test station, KALW, is relatively low power and is located in central San Francisco. Decoder dropout in the Northwest occurred in tunnels and the areas in the Southeast were badly shadowed by financial district buildings.

Comments

Co-channel and adjacent-channel interference were significant at times in the Washington market. It appears that a certain reduction in coverage occurred in the Washington area where the test station's 60dBu contour received strong in-band signals.

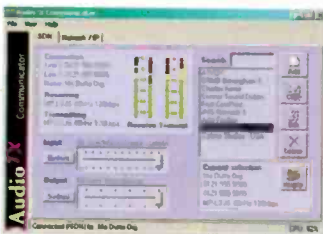
Based on the contents of this report, it appears 95 percent certain that Tomorrow Radio will provide a usable service area within an FM station's 60dBu to 70dBu service area, assuming that the IBOC performance of production line receivers from Kenwood and other manufactures will be the same as the equipment used in the tests. It is possible that short-spaced co-channel or adjacent-channel stations and unusual terrain features could degrade the Tomorrow Radio service area. On the other hand, given ideal conditions the service area could exist below 60dBu.

Map images courtesy of Hammet and Edison Consulting Engineers.



The Los Angeles tests also used the PAC audio encoder with the Tomorrow Radio system.

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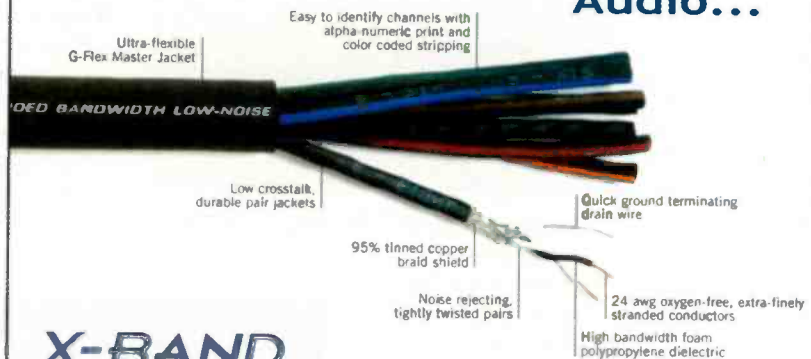
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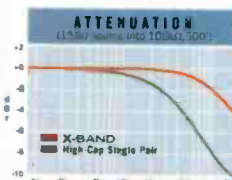
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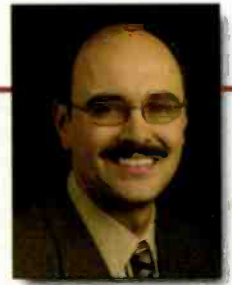
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Audemat-Aztec FMB80

By Jeff Littlejohn

The Audemat FMB80 is a feature-rich RBDS generator that is fully compliant with the CENELEC EN50067 standard and the RBDS standard. It comes in a 1RU package. In addition to the basic features found in almost any RBDS generator, the FMB80 includes a few functions that make it unique.

The first such feature is communications with the device. Connections are made via serial through the front panel connector or via IP/10base-T Ethernet through an RJ-45

The basic setup and adjustment was simple. With a Web browser, I was able to easily make changes by inputting settings and options into a Web form. Settings include PS (program service name), RT (radio text), PI (program identifier), PTY (program type), PTYN (program type name), TA (traffic announce), TP (traffic program), AF (alternate frequency), RBDS output level and output phase. Once everything is set, press the update button and the settings take effect immediately.

The generator's RBDS signal is digitally synthesized so no calibration is required. Only the level needs to be set.

However, you may want to synchronize the RBDS frequency with the frequency of the station's stereo pilot. This is accomplished automatically by connecting an MPX sample to the MPX In/Sync connection. For additional control, the specific phase relationship between the two subcarriers can be set in six-degree increments.

The functionality of the generator is determined in firmware, which can be flashed via FTP. I used this capability to update the firmware on the unit a couple of times as features were added. With this sort of flexibility, there's no reason to worry about getting stuck with out-of-date equipment.



Performance at a glance

- Easy set up via internal Web server
- Can be used to generate scrolling PS
- Synthesized RBDS generator
- No calibration required
- Automatic synchronization with stereo pilot
- Firmware updates available

Top marks

The most unique function of the FMB80 is the ability to scroll PS messages automatically. One limiting function of the RBDS standard has been the size of the display. With only eight characters to display, it's tough to use for more than displaying call letters. While radio text allows for a message of as many as 64 characters in length, most car radios will not display radio text. Audemat has solved this problem by allowing a longer message to be stored in the

generator, then dynamically updating the eight-character PS setting every few seconds to provide a pseudo-scrolling functionality.

Clear Channel is using this feature in its top 50 markets to display the title and artist of the current song across the RBDS display. Both the speed of the update and the number of characters that are indexed can be set. Through some

connector. Telnet, TCP/IP, FTP, HTTP, SNMP and SMTP are all supported.

Using the serial connection, the user can connect to the device with Hyper Terminal. While all of the device's functionality can be reached in this manner, it is typically used only to set up the IP address. The preferred way to communicate with the Audemat FMB80 is via IP, using either Telnet or the built-in Web server.



Figure 1. Scrolling is simulated by transmitting strings of text in shifted sets. The string above would display "BEATLES - LET IT BE."



The FMB80 setup screen provides access to all the operating parameters.

experimentation, we found that a three-character index and a two-second refresh rate worked best. For example, if the song being played conveyed the text "BEATLES - LET IT BE," the radio would display the title by shifting the text by three letters every two seconds. While this works well, some people complained that the updating was too jumpy. Audemat has since updated the firmware so that scrolling PS can recognize words and more intelligently update the display. With the new firmware, this same song would display "BEATLES," then "LET IT," then "BE" as shown in Figure 1.

The device did have a few shortcomings. First, the internal Web interface tended to lock up and needed to be reset. This reset could be accomplished remotely via Telnet, but it was an extra step that shouldn't have been necessary. However, I'm told it has recently been fixed with a Web server update. Secondly, there are no front-panel controls. Everything, including the output level, requires a computer to be adjusted. This may be problematic if your tool kit does not

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

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

include a laptop computer. All things considered, I am impressed with the quality, functionality and features of the Audemat FMB80.

Littlejohn is senior vice president of engineering for Clear Channel Radio, Covington, KY.

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Harris Intraplex STL Plus

By John D. Kennedy

In December 2002, the decision was made to upgrade WQSX-FM to IBOC. That decision brought many questions, not only about how to properly install the system at the transmitter site, but also how to best get the audio to the transmitter site.

We were already using a digital STL system on a T-1 circuit to send discrete left and right channels to the site, but there was a compression algorithm applied

The STL Plus is a versatile STL system because of its frame design. A three rack-unit frame with slots accommodates the interface cards for the given application. We knew that for our setup, we would have the main audio going to the transmitter site. We also knew that the STL Plus would allow us enough bandwidth to backhaul left- and right-channel off-air audio for monitoring the radio station. We also have two RPU receivers at the site that we needed to backhaul to the studio on their own cards. Last, but not least, we could use the STL Plus to carry the data for our transmitter remote control.

For WQSX on-air audio, we chose the PT-353 card to deliver the audio to the transmitter site. A fairly new card made by Intraplex, it has the flexibility that any station would want when considering IBOC.

Audio response of this card is up to 22.5kHz depending on the sample rate chosen. It will work with 48-, 44.1- or 32ks/s sampling rates. The card has the option of left and right discrete inputs or AES/EBU inputs, but also allows the user to feed the input with left and right discrete audio and take the output in AES/EBU format at the transmitter site. The last feature of the card is a 9.6kb/s data channel, which we are using to transmit RBDS data.

PT-350C cards are used for the off-air audio backhaul from the transmitter site to our studios, which are analog-only cards delivering linear audio quality of 15kHz. For the audio channels carrying our RPU audio, we used the PT-150C cards, which use Apt-x compression at a rate of 4:1. For our application, it was an acceptable compression rate that allowed the RPU audio to still sound quite good while reducing the bandwidth that it occupies within the T-1 circuit.

For our transmitter remote control data, we use the VF-25 card, which is a four-wire data application. Converting our remote control system from two-wire to four-wire was necessary, and in the end saved us the cost of a data line from the telephone company by allowing us to use the Intraplex system.

The last item we purchased for the system was a redundant power supply; basically low-cost insurance.

Our future plans have us adding another Intraplex STL Plus system later this month, but instead of using a T-1 circuit, we will use a Harris Aurora 5800 wireless 5.8GHz spread spectrum link.

When it came to the installation, it was plug and play. Because all of the cards were set up and tested at the factory, we were up and running with our Intraplex STL system within a couple of hours. Our initial reaction was one of marvel at how much better the on-air audio sounded with the uncompressed PT-353 card from our old system, which, as I mentioned, we thought sounded quite good.

This system has been on for almost a year, now. Our

Performance at a glance

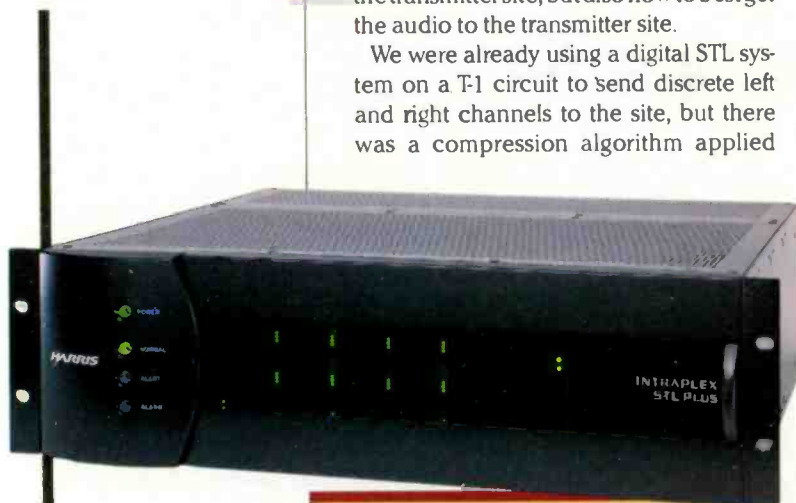
- Multiple I/O card options available
- Work with wired or wireless T-1 links
- PT-353 card good for IBOC applications
- 3RU chassis has slots for many cards
- Redundant power supply option available

that, although acceptable to us in our analog setup, was of concern to us with the new technology.

Total preparedness

Everything that I had read up to this point directed us to keep everything uncompressed wherever we could. We also knew that we were going to potentially have other functions that we would want to accommodate with the evolution of the new IBOC technology.

After some research, we knew we wanted the Intraplex STL Plus system. We were already using the STL Plus on two of our other stations with great reliability and flexibility to accommodate our needs. We found that working with the Intraplex sales engineer made the process painless.





A variety of functional cards is available, as are I/O connector modules.

experience with not only this Intraplex STL system, but our other two has been great. When we've had questions, we have always found the Intraplex tech support to be responsive and knowledgeable. And, most importantly, I can say that we've had no failures, ever, with our Intraplex equipment ... and, knock on wood, that will stay that way for a long time.



Kennedy is director of engineering, Entercom Boston.

Harris

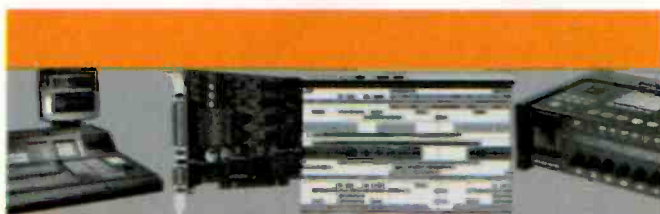
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It's all about the Content

**As the amount of content increases,
the content management system needs
to be revised to stay up to date.
NPR is doing just that.**

By Gordon Carter, CPBE

For several years National Public Radio (NPR) has been on the leading edge of satellite audio distribution. Its first satellite distribution system was a C-band analog single channel per carrier (SCPC) system established in the 1970s. As an adjunct to this system, NPR instituted the DACS system using one-way data transmission on an analog channel. In the 1990s, that system was built on while the analog SCPC system was replaced with a digital system. Then the DACS system was replaced with the Satellite Operating Support System (SOSS). The SOSS system includes DACS as well as the ability to provide some level of remote control and automation.


NPR has now announced plans for its new Content Depot. The pieces are being put together to bring the plan to fruition. The plan is for the Content Depot to eventually replace the distribution system currently being used. At this time, NPR expects to begin parallel operation of the Content Depot and the existing system in November 2004, with complete conversion of operations by the end of 2005.

The sum of the parts

The Content Depot is a multifaceted programming, marketing and distribution concept comprised of several varied but integrated systems. From an interactive Web-based system for program marketing to an IP-based satellite distribution system to complete integration with automation systems, the Content Depot takes advantage of current off-the-shelf technology. NPR has attempted to use as much off-the-shelf equipment as possible to keep the capital costs to a minimum. Also, with the rapid pace of changing technology, flexibility is an important element of the plan.

To explain the concepts and implementation of the Content Depot, let's follow the complete life cycle of a program or program series.

As a program producer develops a concept for a program or program series, he enters general program information, including audio samples, into the Content Depot via a Web interface. Stations that have expressed previous interest in this type of program will be notified automatically, and the audio sample will be available online for preview. The station, from the NPR website, can listen to



and download programs, promos and associated materials such as bios and photos. This provides producers with a centralized and searchable location for marketing and storing programs and associated materials. It also supplies producers with a venue to test program concepts and ascertain possible interest.

As the audio program is developed, the producer can enter detailed information about the program into the Content Depot. NPR distribution staff will schedule the program for distribution, confirm the schedule and track and store the associated audio when it becomes available. Stations that have expressed an interest will be alerted to the schedule and can subscribe to the program, series or a single episode at any time prior to transmission.

The Content Depot will allow stations to subscribe to programs or series directly through the Content Depot via the Web. The station can then establish its local schedule and routing instructions during the subscription process. The Content Depot then adds the station to the distribution address list for the program. Producers will be able to view the list of subscribed stations at any time during the process.

Once the program is ready for distribution, the producer can send it to the Content Depot in one of several ways. He can upload a digital file through a Web interface. He can stream or upload the program from a system Point of Presence (called an uplink in the current

system). He can also mail physical media to the Content Depot staff to be entered into the system. The digital file can then be captured and stored for later distribution. By maintaining the material in digital form as much as possible and using the above upload methods, greater efficiency is achieved in terms of transfer time and convenience of transfer. Transfers can be done when convenient without having to wait for a scheduled time, and transcoding (encode-decode-encode cycles) can be minimized.

When the time comes for transmission, the audio file and its metadata are transmitted. Metadata is a fairly new term, meaning information (data) that goes with a piece of digitized content. In other words, it is data about the data. It may include a description, subject heading and file format. As this information is defined and standardized the information can then be easily indexed, cataloged and searched.

Live programs are fed directly to the Content Depot, skipping the upload step above. Live programs are received by the stations and can be stored or routed directly to air. Stored programs (those that are not live) can be held in the stations' Content Depot equipment until copied to the stations' own automation system. Stored programs must be copied from the LAN-connected receiver to the station's audio storage system for playback. Stations with Internet connectivity will automatically confirm the status of the file transfer with the Content Depot. This will be done using IP (Internet protocol) over satellite. The system can check for errors in transmission and notify the system and even retransmit the program if needed. If a program is missed, it can be downloaded via the Internet if the program is short enough.

At the scheduled time, stored programs are decoded and streamed from the station's storage in analog or digital format



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It's all about the Content

(whichever the station needs for its system) along with any associated automation control cues. The Content Depot provides the producer with a listing of stations that have aired the program. It also provides program directors with a listing of all programs aired by the station.

Routing and distribution

The audio distribution system will be a wide-band IP service. Individual stations will be provided with two receivers (one for backup) and a separate audio decoder stack for live programs (streams) that is connected to the LAN. Live programs will be fed in real time, just as they are now, and the receivers drop a data stream on the LAN with all the live audio packets for the audio decoder cards to process. The current plan is to provide four stereo analog and digital outputs per station that can then be routed through the station's audio system. Programs and program elements intended



Users can browse available content and download materials through the Content Depot catalog.

for later playback will be delivered as files that can be temporarily stored on hard drives in the satellite receivers and then copied to the station's storage system through the LAN. Local automation systems will then be able to retrieve the files and transfer them so they can be played through the automation system. NPR is working with the major providers of automation systems to ensure a seamless interface.

The many elements of the Content Depot are based on the concepts of asset management. Asset management systems store audio files, program elements and metadata in a centralized location. This concept can be expanded to include video and still picture elements for those operations that use these elements.

The current system depends on information being sent from program producers to the individual stations to distribute this information. As the Content Depot catalog is developed and comes online, stations will be able to browse through all of the options available to them at one place. They will be able to view program schedules, content and other information about the programs at their leisure, printing hard copies of only what they need. Electronic capture of promotional information, such as photos and bios, will make production of local programming schedules easier and faster.

As the system develops and equipment is deployed, most of the existing hardware for the NPR distribution system will be replaced. The satellite dishes will remain, and most stations have already converted to LNBs instead of LNAs. The satellite receivers, SOSS system and all ancillary equipment will be replaced. The new equipment will provide a bridge between the satellite system and the station's automation system and computer network. Stations

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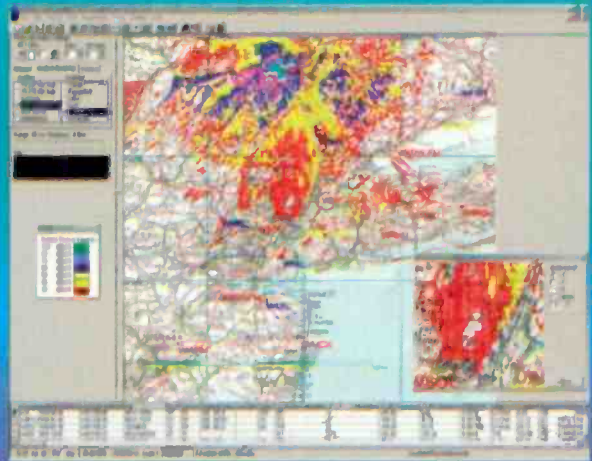
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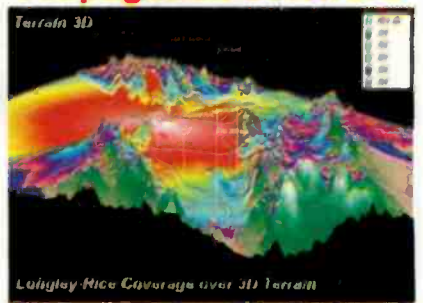


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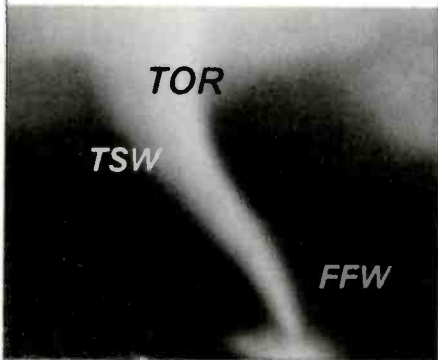
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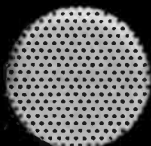
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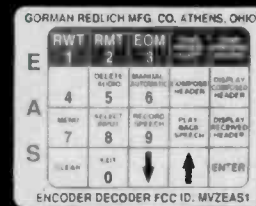
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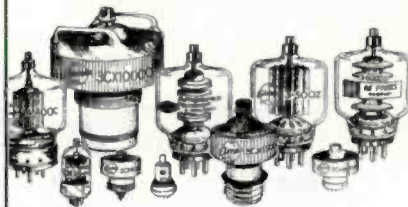
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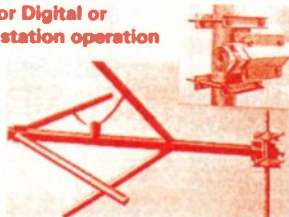
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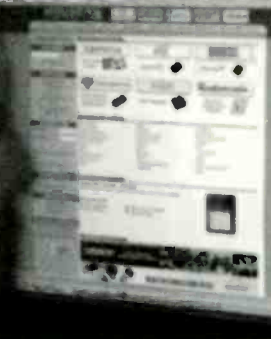
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Contributor Pro-file

Meet the professionals who write for *Radio*.
This month: Facility Showcase, page 54.



Michael Kernen
Chief Engineer
Greater Media
Detroit

Kernen became interested in radio at an early age because of his love of music. Growing up he was a fan of WRIF. His start

in radio began when his uncle, Dick Kernen, invited Mike to screen calls for his weekly local radio show.

Kernen graduated from the Specs Howard School of Broadcast Arts in Southfield, MI, in 1984. After graduation, he worked for WJR-AM and WHYT-FM as an engineering assistant and promotions assistant. He joined WRIF in 1988, becoming the station's chief engineer in 1992.



Written by radio professionals
Written for radio professionals

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Shaping radio today and tomorrow

By Kari Taylor, associate editor

Do you remember?

Introduced in the early 1960s, the Collins four-channel 212Z-1 remote amplifier's design was influenced by answers to a questionnaire mailed to a sample of broadcast stations across the country. Its features included a tone oscillator for line-level setup, an auxiliary output for public address feed and a maximum gain of 90dB. It could be powered by 115Vac or batteries, with an automatic changeover when ac power failed or when it was restored. Instead of



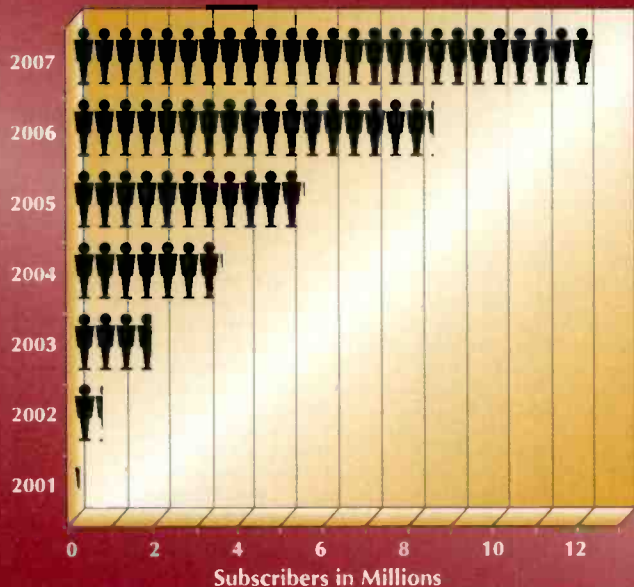
composition-type faders, step faders were used.

All terminals and jacks were located at the back of the unit. Four microphones could be accommodated, while one or two headsets could be plugged into the monitor jacks. When loud speaker monitoring or a feed for a local PA was needed, the PA terminals could be used. An individual gain control

allowed the operator to handle the program and simultaneously ride gain on the PA system.

Sample and Hold Growth of U.S. S-DARS Subscribers

A bright future is expected for satellite radio



Source: In-Stat/MDR, 12/03, for more information visit www.instat.com.

That was then



On March 15, 2003, *On the Air!*, a traveling broadcasting exhibit, opened at the Grand Traverse Heritage Center in Traverse City, MI. Produced in cooperation with the Michigan Association of Broadcasters, *On the Air!* tells the story of the birth and growth of broadcasting in Michigan, presenting the people, the events and the technology that shaped radio and television in the state.

The exhibit includes more than 40 artifacts dating from 1910 to the 1980s; a Remembered Radio section where visitors can hear the sounds of each broadcast decade; and a hands-on sound effects section. There is also an *On the Air!* Wall of Fame that acknowledges outstanding people who have earned notable places in Michigan's broadcasting history.

From March 15 to June 6, 2003, more than 1,500 visitors toured the exhibit before it moved on to its next destination, the Port Huron Museum.

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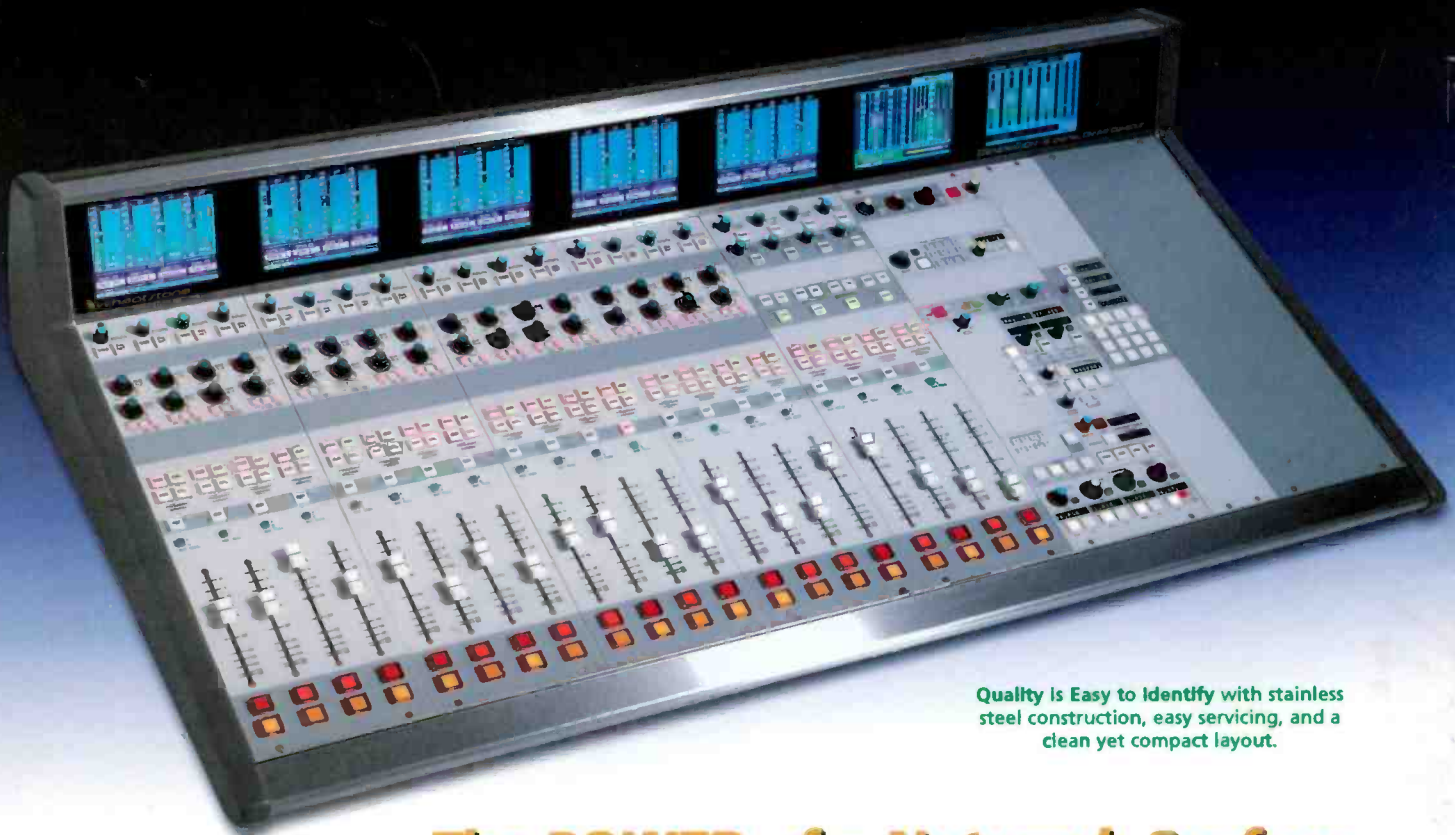
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THIS MAJOR MARKET CONSOLE can handle all the call-ins and remotes you'll encounter. Four faders dedicated specifically to phone segments provide errorfree interface to four callers or remotes, each with independent caller and fader feeds, user

selectable talkback communication and adjacent channel linking. A dedicated LCD display screen keeps the operator informed and in control.

YOU CAN STORE AND NAME switch and fader settings for each operator's task and recall them by simply spinning an encoder and hitting a TAKE button. And like our larger G-9, the G-8 has 12 user programmable switches for salvos and intercoms plus additional programmable TALK buttons for IFB functions. And with full color LCD display screens the operator will know for certain that his signal is clean, his sources correct, and his preset signal is ready and waiting. *The G-8 has the layout and features to let your operators work fast and accurately!*

 **Wheatstone**

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