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THE RADIO TECHNOLOGY LEADER
Radio Magazine
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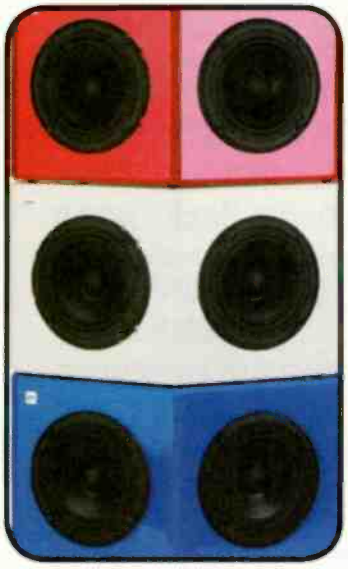
ON THE COVER:
The little devices that work behind the scenes are sometimes the most important workhorses in a facility. Take a look at some of the gems that we found.
Cover design by Michael J. Knust.



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Currents Online

Highlights of news items from the past month

College Physicist Invents New Antenna Technology

An employee in the University of Rhode Island's Physics Department has invented a reduced-size monopole antenna.

Vermont Tower Felled by Vandals

The self-supporting tower for WDOT-FM had its anchor nuts removed on June 16.

Defense Bill Passes with Indecency Language in Place

After a 99-1 vote, the Senate bill moves to the House committee for a final draft.

Radio Automation Pioneer Passes

Dane Roach (1959-2004) died June 20 in Emmetsburg, IA. He last worked for Smarts Broadcast Systems.

Site Features

June Facility Showcase

Read about the renovation of the ESPN Radio facility and view the studios.

Split-level Combining

A white paper with a detailed description of the system is included in the online article.

Engineers Notebook

A handy reference of tools and equations.

Browse Back Issues

Review back issues of *Radio* magazine with the online article archive.

Demo Room

View online demos of the latest products.

Buyers Guide

The annual printed reference is continuously updated online.

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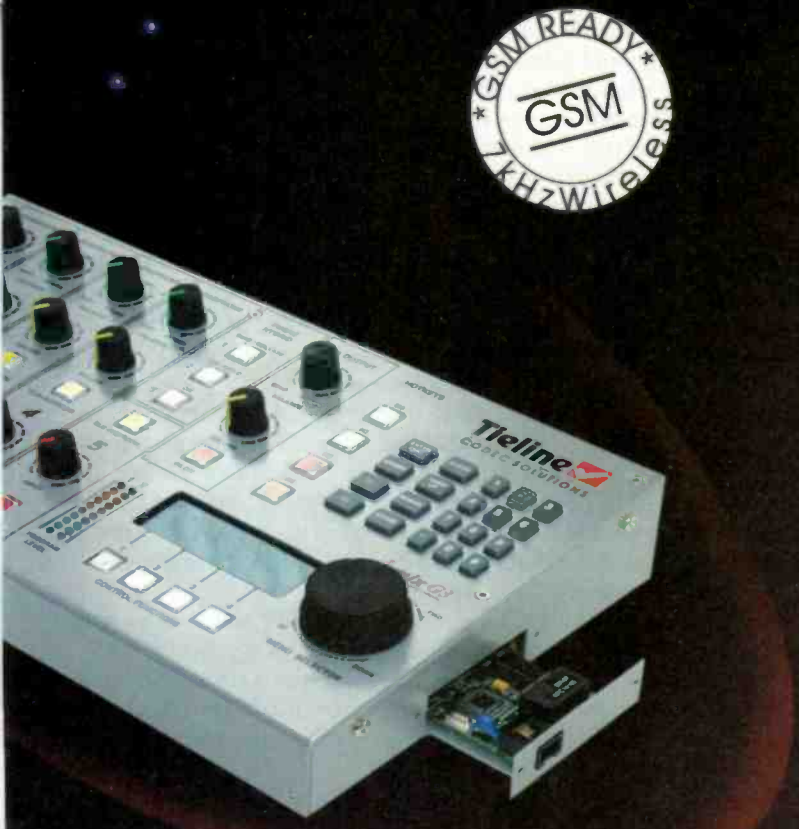

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A miniature expansion slot accepts a range of new hardware modules to suit individual remote applications such as GSM to landline for wireless remotes, Stereo/Mono ISDN, Stereo or Dual Mono POTS plus new IFB and front panel controlled live on-air caller facilities

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10 years of progress

The FCC just closed the window for comments regarding IBOC. In its quest for information, the FCC requested ideas relating to the use of AM IBOC at night, separate antennas for FM use and the general question if IBOC is in fact ready for prime time.

We have discussed IBOC for many years now. With the current questions on the table, I decided to look back at some of the ideas and concepts that were presented in 1994 to see how we have progressed on the matter. We have effectively narrowed the choices to a single system, but we don't appear to be any closer to wide acceptance.

While the IBOC path was set earlier than 1994, publicized work in the early 90s was little more than a few demonstrations. The reports that I can find from these early demos all state that the tests went well. In some cases, there were reports of some problems with adjacent-channel interference to the IBOC signal. Today, adjacent-channel interference is still a concern, only now the concern is from the IBOC station interfering with the analog adjacent channel.

During most of 1994, the EIA and NRSC conducted an intense testing process at the NASA Lewis Research Center in Cleveland to evaluate seven systems providing nine modes. AT&T, TCE, USA Digital Radio and VOA/JPL gathered their systems to be evaluated. Of these, five systems produced IBOC signals (USADR, AT&T/Amati), one produced an IBAC (in-band adjacent-channel) signal (AT&T), one provided an L-band Eureka-147 signal (TCE) and one produced an S-band satellite signal (VOA/JPL).

In the end, all the IBOC systems present then have in some way contributed to the Ibiquity IBOC systems we are considering today, through AT&T rolling into Lucent, which then merged with USA Digital Radio to become Ibiquity.

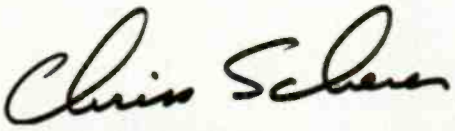
Late in 1994, we reported that IBOC was likely the only available choice for a digital transmission system in the United States. The L-band spectrum was not available. The S-band spectrum had already been allocated for S-DARS, where Sirius and XM have been creating a strong presence in the past few years. These spectrum limitations are still true today. No new spectrum has been allocated, nor will it likely be.

The debate over IBOC is as strong as ever. Some openly embrace it and are ready to take the plunge. A highly vocal opposition cites the problems of adjacent-channel interference, a hard to justify return on investment and the inherent problems of any perceptually encoded digital audio. Still others mention the more recent introductions of DRM and Kahn's yet-to-be demonstrated Cam-D.

Has progress been made? The short answer is yes. Ibiquity's IBOC system can successfully produce a transmitted IBOC signal. There are some limitations that are being refined, such as the occupied spectrum mask and the capacity of the ancillary data, but the system is inherently future flexible. IBOC is a data path. In time the receivers will be flexible data receivers.

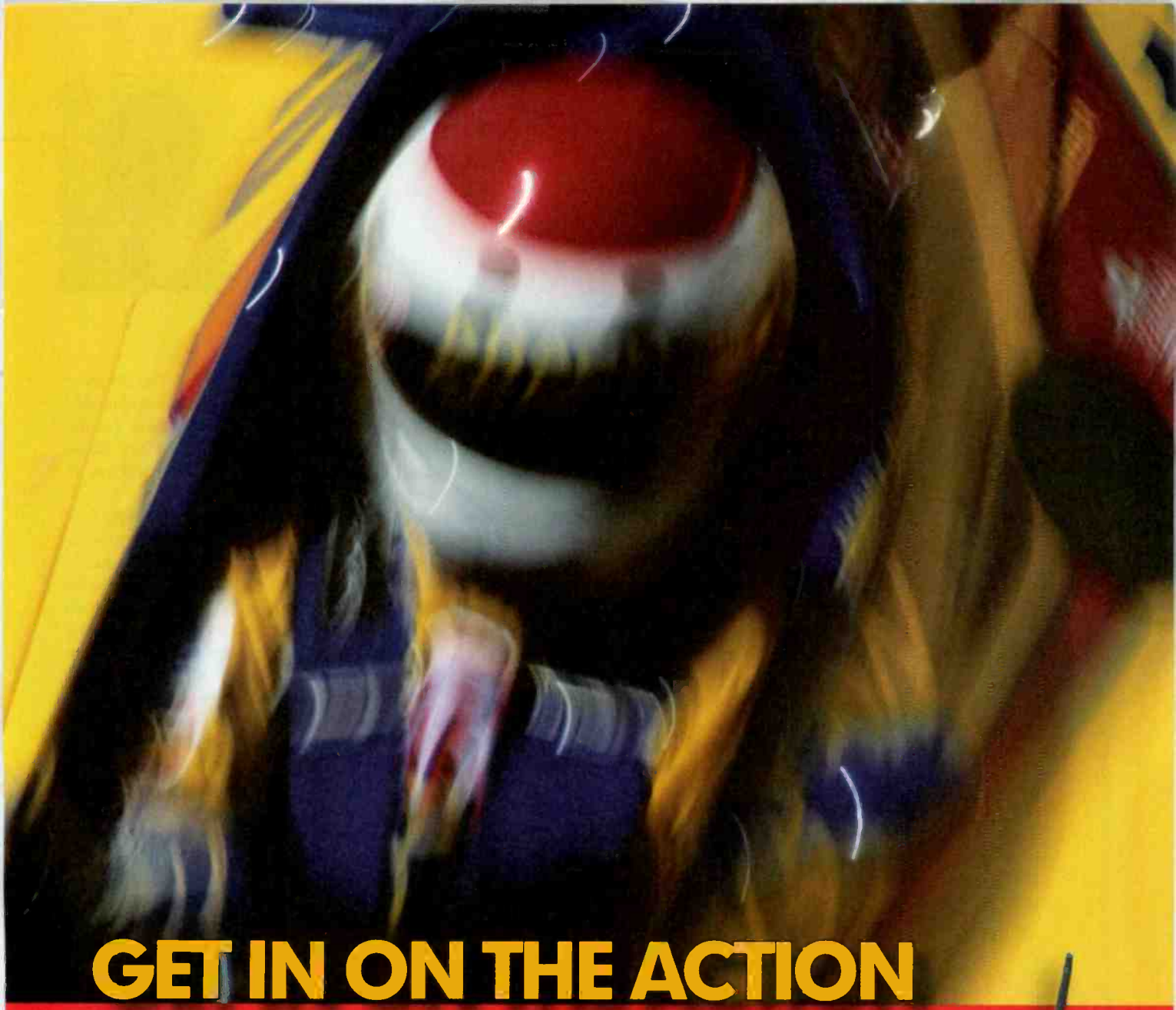
Today, IBOC has a strong foothold and it is moving forward, whether you support or it or oppose it.

The FCC's inquiry for comments was a great opportunity for broadcasters to establish their own futures. Those who missed the opportunity to contribute must now live with what is provided.



Chriss Scherer, editor
cscherer@primediabusiness.com

Send comments to: **E-mail:** *radio@primediabusiness.com*
Fax: *913-967-1905*



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Update on the PPM

By Kevin McNamara, CNE

The race to occupy space on the average American's belt is heating up. Along with the cell phone (or two), PDA, Blackberry and multipurpose knife, the Portable People Meter (PPM) will become a familiar site in the United States in the near future. Developed by Arbitron in 1992, the PPM has undergone trials in Europe and the United States. It is expected to see widespread deployment after 2006.

It is hoped that the PPM will level the ratings playing field by having the unique ability to take into account virtually all forms of media, including those originating from Internet streaming, digital satellite, cable and background sources, as well as traditional over-the-air radio and TV broadcasting. The potential capabilities of this technology could also be expanded to gather information about consumer preferences with respect to where they shop, what billboards they are reading and even to what CDs or DVDs a respondent might be listening.

The PPM is a pager-sized monitor that automatically tracks listening.

Another major advantage of the PPM is that it doesn't require the participant to write down any information in a diary or do anything that demands a person's time. The ability to passively measure a respondent's media use, no longer limited to over-the-air broadcasting, both in and out of the home, might paint an entirely different landscape of media use in the coming years.

The Technology behind the PPM, called Critical Band Encoding Technology or CBET, was developed by Lockheed Martin under contract to Arbitron. A CBET Encoder, inserted into the program chain, cleverly embeds specials codes in an audio stream. These codes are psycho-acoustically masked to make them undetectable to the human ear, but can be decoded with a pager-sized device that is fitted with a sensitive microphone.

The components

The encoder unit must be inserted into the program chain of the station. It can interface with analog and AES/EBU digital audio streams, as well as television-specific digital formats such as SDI and, soon, HDTV. Arbitron is also in the process of developing multichannel encoders intended for satellite or cable operations.

The deployment of the PPM into a typical household is somewhat hardware-intensive and consists of three devices: the PPM, the base station and the household hub.

The PPM is the pager-sized device that is intended to be carried by respondents throughout the day. It is described as measuring four cubic inches and weighing 2.6 ounces. The PPM is built around a custom digital signal processor that recognizes and decodes the assigned encoded signals originating from the station or other source. Those decoded codes, called event-codes, can be stored in the pager. The PPM also contains a motion detector, which is used to verify that a respondent is actually carrying the device with him throughout the day. A green light on the PPM remains lit while in motion as a reminder to the participant that he is fulfilling his obligation to Arbitron. The PPM can store a day's worth of data containing event and motion detector information.

The base station is reminiscent of early pager and cell phone base-charger units and, similar to those chargers, the base station provides a convenient means to charge the PPM's internal battery. The major difference, though, is that the base station has three other functions: to extract the codes from the PPM; to display the participants "points" accumulated as a result of the amount of time the PPM was active; and to send the data to the Household Hub.

The Household Hub collects the data from one or more base stations and subsequently delivers the data to Arbitron through standard telephone lines. The data transfer between the base station and the Household Hub takes place through the existing house ac wiring.

How it works

The fundamental concept is pretty simple; a station encodes its audio with an inaudible (to humans) code unique to the particular station. Participants are asked to carry the pager-sized PPM throughout the day. The PPM listens to what the participant is also hearing. If the source to which the participant and device are listening happens to be encoded with certain signals, the PPM records the unique code. When the participant is ready for bed, he drops the PPM into the base station where the codes can then be downloaded to Arbitron to compile the data into useable ratings information. As an incentive, participates are compensated based on the amount of points, or the amount of time, they carry the PPM.

The first test of the PPM occurred in Manchester, England

A consumer's PPM system has three elements: (left to right) The PPM base station, the PPM and the household hub.

in 1998 using a total of 50 participants in 25 households for a three-month period. The test was principally used to ascertain that all of the physical components of the system performed properly. In 1999 the testing was expanded in Manchester to include 300 participants in 140 households.

December 2001 marked the first U.S. deployment of the PPM in the Wilmington, DE, market, in which the test was expanded to include radio, TV and cable outlets. As many as 300 participants were included in this phase of testing. The second phase of this trial was expanded to the Philadelphia market in March of 2002 with 1,500 additional participants and is currently underway.

A final test of the PPM is planned for 2005/2006. It will take place in the Houston market and will be a final opportunity for broadcasters to evaluate and make comments on the system.

It's not hard to imagine applications for the PPM that go beyond a tool for broadcast ratings. Future versions of the PPM may include a GPS subsystem that will not only be able to determine listening habits, but can also record where the listener is located, i.e traveling in a vehicle, what time, which direction, how much time was spent in a car. Specific habits of participants at a grocery or other retail store could be recorded based on what departments or aisles that are frequented and how much time was spent in the store. Arbitron has also suggested applying the technology to car dealerships to analyze potential buyer interest in a particular vehicle.

In May of 2000, Neilsen signed an agreement with Arbitron to access the technology for its TV ratings service. As part of the agreement, Neilsen agreed to assist with a portion of the costs for development and deployment of the PPM. It is not clear if Neilsen will ultimately embrace the PPM as its system of choice, or if it will move forward with its own version of a portable measurement device that is currently being tested.

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

The NAB attacks satellite localism

By Harry Martin

As satellite-delivered radio services make increased headway in the marketplace, they are attempting to provide more locally oriented programming, presumably to attract listeners away from conventional radio stations. But the satellite services' ability to do so has thus far been limited by past promises made to the FCC that the service would not be locally oriented.

In an effort to maintain this status quo, the NAB has asked the FCC for a declaratory ruling that would prohibit:

1. Satellite Digital Audio Radio Service (SDARS) licensees such as XM Radio and Sirius Satellite Radio from delivering different programming content to specifically-designated receiver locations.

2. SDARS licensees from broadcasting nationally any local services, such as local weather, sports, traffic and advertisements.

According to the NAB, SDARS licensees are currently developing the technology to vary content by receiver location. Such technology could potentially allow XM or Sirius to broadcast information to all of their customers' receivers, and then play locally-oriented material selected out of that nationally distributed content based on GPS devices embedded into each individual radio receiver, or based on the subscriber's unique customer number.

As of mid-May 2004, XM Radio began broadcasting continuous local weather and traffic reports over dedicated channels to 16 metropolitan markets (with plans to expand to 21 later this year). According to Sirius's website, it now offers nine channels of weather and traffic covering 20 metropolitan areas.

In the early 1990s, when the FCC was considering authorization of SDARS, its proponents repeatedly told the FCC that they had no intention of offering local service to their customers. It seemed at the time that there was no way for satellite radio broadcasters to compete with existing local AM and FM stations, and the FCC did not even consider the study the NAB commissioned at the time, which purported to show how harmful competition would be to the existing local stations.

The NAB wants the FCC to stop XM and Sirius from doing what they do now—nationwide distribution of major-market traffic and weather to all subscribers—and prohibit them from developing or implementing new technology to deliver such information in a more sophisticated way.

According to the NAB's petition, allowing SDARS licensees to continue along their present path will cause "either a loss of service [to AM and FM over-the-air listeners] or a need to find greater efficiencies in operations through increased consolidation." In other words, the local broadcaster will either go out of business, or sell his or her station to a consolidator.

Some of the responses to the NAB's petition suggest considerable support for SDARS. Some criticized broadcasters for what the commenters referred to as canned programming, blathering and too many commercials.

While it is premature to write off the future of terrestrial radio, the inroads that satellite services have made and appear intent on making cannot be ignored. If broadcasting is to survive the competitive attack from space, the radio industry should be focusing on how to assure that its programming remains more responsive to local needs than a satellite competitor ever could be.

FCC fines NCE-FM

The FCC has imposed a $13,000 fine on a New Jersey noncommercial FM for failing to operate from its licensed location and for failing to maintain EAS equipment. FCC agents inspected the Asbury Park station and found that the transmitting antenna was at neither the height nor the location specified in the station's license. In addition, there was no EAS equipment to be found at the station. The station pleaded with the FCC to reduce the fine because it was a small noncommercial entity with limited financial resources—it even submitted a bank statement to support its pleas of poverty. The FCC showed no mercy, finding the single bank statement unpersuasive of an inability to pay.

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

Dateline:

Radio stations in Illinois and Ohio must file their renewal applications, ownership reports and EEO program reports on or before Aug. 1, 2004.

Also on Aug. 1, stations in Iowa and Missouri must begin their pre-filing renewal announcements.

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TRENDS IN TECHNOLOGY

Round cord in a Square plug

By Chriss Scherer, editor

"The good thing about standards is that there are so many to choose from."
–Andrew S. Tanenbaum

Converting a signal from one system to apply it to another is the daily routine of a radio facility technical manager, and creating the bridge between different systems can sometimes be a challenge. The interface might be as simple as an adapter. In other cases, it may be an active component that manipulates the signal to create something completely different. The devices used in your facility can range from very large to barely noticeable, but each one plays an important role. Without the smaller utility interfaces, many stations would not be on the air.

The Trends in Technology feature usually focuses on clearly defined systems and components that can be grouped into specific categories. However, we decided that it was time to highlight some of the less-obvious but no-less-important devices that serve essential functions. Call them widgets, gadgets, interfaces or problem-solvers, we assembled a list of 14 products that illustrate the utilitarian functions that simplify integrating systems.■

Resource Guide

A sample of available widgets, gadgets, interfaces and problem-solvers.

While the Resource Guide is far from a complete list, it should provide enough basic information to help you get started.

Switching four stereo audio sources and controlling four relay closures from an auto-answer telephone line via DTMF commands is the purpose of the **Conex Electro-systems DT-90**. The unit can connect the selected audio source, the first channel audio source or a mic on the device to feed the telephone line for monitoring. In addition to the four audio sources, audio from the telephone line can be routed to the output. The four relays provide SPDT contacts and can be set as momentary or latching. Connections are made via plug-in terminal strips. An access code can be set to prevent unauthorized switching.

www.conex-electro.com • 800-645-1061

The **RDL FP-UBC6** is part of the company's Flat-Pak line and provides six channels of unbalanced-to-balanced audio conversion. A gain trim pot on each channel fine-tunes the audio levels to convert an incoming signal ranging from -20dBV to -5dBV to provide a +4dBu output. The unit operates from a 24Vdc power supply. Input impedance is 10kΩ, while the output impedance is 150Ω. One possible application is to convert multiple unbalanced audio channels from computer sound cards to feed a console or routing system. The unit can be attached with its mounting ears or mounted with the optional rack-mount adapter.

www.rdlnet.com • 800-281-2683

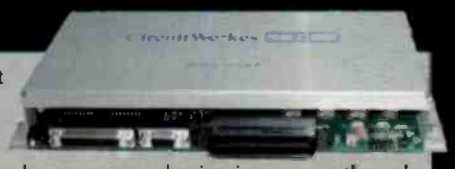
The **SBS Guardian 2** is a stereo audio and composite signal-fail control unit. It automatically selects a main stereo audio input, alternate stereo audio input or a reserve stereo audio input on signal failure. It will also select a single audio channel if half a stereo pair is lost. Closures are available to activate a backup audio source, such as a CD player. It can also accept and switch between composite audio signals. Signals are filtered to prevent false triggering from line noises. Level thresholds can be set from the front panel. Available through Broadcasters General Store.

www.sbsfm.com • 352-622-7700

Building on the capabilities of the original Plan B Silence Eliminator, the **Danagger Audio Works Plan B Plus** silence sensor incorporates an additional level of audio failure detection and backup. An extra set of passively switched analog and digital audio inputs allows automatic connection to an alternate live program feed, such as an STL, dial-up codec or off-air receiver. If both incoming program feeds are down, an internal CD/MP3/DVD drive provides continuous replacement audio while a built-in voice remote control alerts station personnel. Delay range is four seconds to 10 minutes, and users can program a unique system ID number into each unit for multi-site installations.

www.danagger.com • 250-762-8346

Round cord in a Square plug



The **Circuitwerkes Prex** manages and multiplies contact closures. It accepts a variety of input signals and converts them to contact closure outputs. The microprocessor allows each relay to be individually programmed and triggered by any number of inputs, combined together using basic logic functions. Relay operating modes include momentary, toggled, leading or trailing edge, pulse stretching as long as 4.5 hours, input debounce and maximum ontime. The Prex can be programmed using jumpers or through a computer serial port. The Prex configuration manager provides instant, graphical access to all of the setup commands.

www.circuitwerkes.com • 352-335-6555

The **Aphex 228** converts eight channels of unbalanced -10dBV audio to balanced +4dBm audio. This allows multiple audio channels to be converted without the need for multiple discrete interfaces. The front-panel extended-range VU meter provides calibration and monitoring of each channel individually. Eight two-color signal presence/clip indicators show signal presence and overload conditions. Front-panel gain trims for all eight channels are provided. The front-panel indicator lights can be dimmed if desired. All connectors are gold-plated. A test CD with commonly used reference levels is included to set levels for specific equipment.

www.aphex.com • 818-767-2929

The **Titus Technological Laboratories Web-Rem** controls and monitors the functions of Titus products or any other device via a local LAN or Internet connection. Several modes are available that provide relays or open-collector outputs for control or TTL signals, and analog outputs for monitoring a remote device. Monitoring and control is via a Web page generated by the unit's own internal Web server. Connections to the remote device are via a db-style connector or plug-in terminal block. Each unit is powered by a 5Vdc supply, with less than 1A consumption. Metering shows link status, system activity, I/O status and power.

www.tituslabs.com • 860-633-5472

Conversion between AES3 standards

Find this and other handy tricks online in the Engineer's Notebook at *beradio.com*. Click on Resources.

There are two versions of the AES3 digital audio standard. One is a balanced signal passed over a twisted-pair wire with a characteristic impedance of 110Ω. Its complete name is AES3-1992. The other is an unbalanced signal passed over coaxial cable with a characteristic impedance of 75Ω. This is called AES3-ID-1995. Both formats are commonly referenced without the last four digits, which indicate the year the standard was adopted.

Apart from the voltage level and ground reference, the formats are identical. A passive circuit can be used to convert signals from one format to the other. An example of this is available at beradio.com int he Engineer's Notebook. The example circuits account for the difference in impedance. The balanced-to-unbalanced converter also reduces the voltage level by 14dB

Because these are passive circuits, the unbalanced-to-balanced converter cannot increase the voltage level. This circuit is better suited to applications where a long signal path is needed and an amplifier can be placed at the receiving end. ■

The **Sine Systems MBC-1** replaces the basic signaling lights with a customized message on a Beta-Brite or other Adaptive Micro Systems LED message boards. Each MBC-1 can control several displays. The MBC-1 monitors as many as 15 control room devices and can display a unique message for each one. Any message that

can be displayed on the message sign can be triggered by the MBC-1. Several messages are preprogrammed and can be changed. Inputs are individually programmed for a momentary or latched display. Latched messages are cleared with a common reset input.

www.sinesystems.com
615-228-3500

The **Henry Engineering Matchbox HD** is a bi-directional balanced-to-unbalanced interface. It offers a 100dB S/N ratio, with 22dB of headroom to yield 122dB of dynamic range. The four direct-coupled, independent amplifiers convert stereo inputs and outputs from unbalanced -10dBv levels to +4dBm balanced 600Ω lines. All four outputs can be adjusted to accommodate a

range of operating levels. The Matchbox HD also features a high gain mode to properly match the low-level unbalanced outputs of computer sound cards. The unit features an internal ac power supply. It is 1/3 rack width and can be mounted using a rack shelf, or wall mounted with wall/cabinet mounting brackets.

626-355-3656
www.henryeng.com

Round cord in a Square plug

JK Audio manufactures a wide range of telephone audio interfaces, and the **That-2** might be considered the premium unit of the passive adapters available. Designed to provide audio in and out of a standard telephone set, the unit connects between the telephone and handset. Audio can be taken from and fed into the phone simultaneously. Audio connections are made via RCA or XLR connectors and can be adjusted with separate level controls. A selector switch configures the handset jack for use with different types of phone systems. A handset switch disconnects the handset mic when feeding audio.

www.jkaudio.com • 800-552-8346

The **ATI Matchmaker BI400** is a bi-directional RCA to XLR audio converter. The unbalanced connections are made via -10dBu, 10kΩ RCA connectors and +4dBm, 600Ω XLRs. All connectors are rear-mounted. The front-panel controls allow output level matching as needed. Companions to this unit include the BU400, which has four balanced XLR inputs to four unbalanced RCA outputs, and the UB400, which features four unbalanced RCA inputs to four balanced XLR outputs. All RCA connectors are gold-plated.

www.atlaudio.com
800-922-8001

Broadcast Tools, a prolific manufacturer of utility devices, offers the **AVR-8**, a voice remote control system that reports changes detected on any of its eight digital inputs to a remote telephone or pager. After delivering a greeting, the AVR-8 then speaks a unique message for each input. Messages come factory programmed but can be rerecorded with customized messages. After reporting, the AVR-8 can be given commands via the telephone keypad to report on the input state of any of the eight digital inputs or controlling one of the four relays. Voice confirmation is provided after a command is executed. Each input stores as many as eight, 16-digit numbers and one 32-digit phone number.

www.broadcasttools.com • 360-854-9559

The **Radio Systems B.O.B.** (break-out box) for **Audio Science** sound cards provides a simpler way to make audio connections in and out of the computer system. It is designed for use with the ASI4300 and ASI6000 sound cards. The rack mount units are available in XLR and RJ-45 Studio Hub versions and

allow access to all analog and digital audio I/O, as well as clocking and sync signals. One multi-pin connector connects the unit to the audio card. Multiple B.O.B.s can be ganged when access to all eight stereo analog input and output channels is needed. Connections to the audio adapter are via a 50-pin, high density SCSI-type connector for analog connections and a 26-pin, high-density connector for digital (AES/EBU) connections.

www.radiosystems.com
856-467-8000

www.audioscience.com
302-324-5333

While this is not really an interface, it is a handy gadget that caught our eye. The **Middle Atlantic Products Rack Ruler** tape measure is unique in that it is marked in inches and in rack units. The Mylar-coated, retracting steel tape extends to 96" and is housed in an ABS case with a thumb lock and belt clip. The back of the tape includes audio tables, charts and pinouts, or data tables, charts and contact wiring depending on the model.

www.middleatlantic.com
973-839-1011

Do you have a favorite gadget or interface that you use regularly?

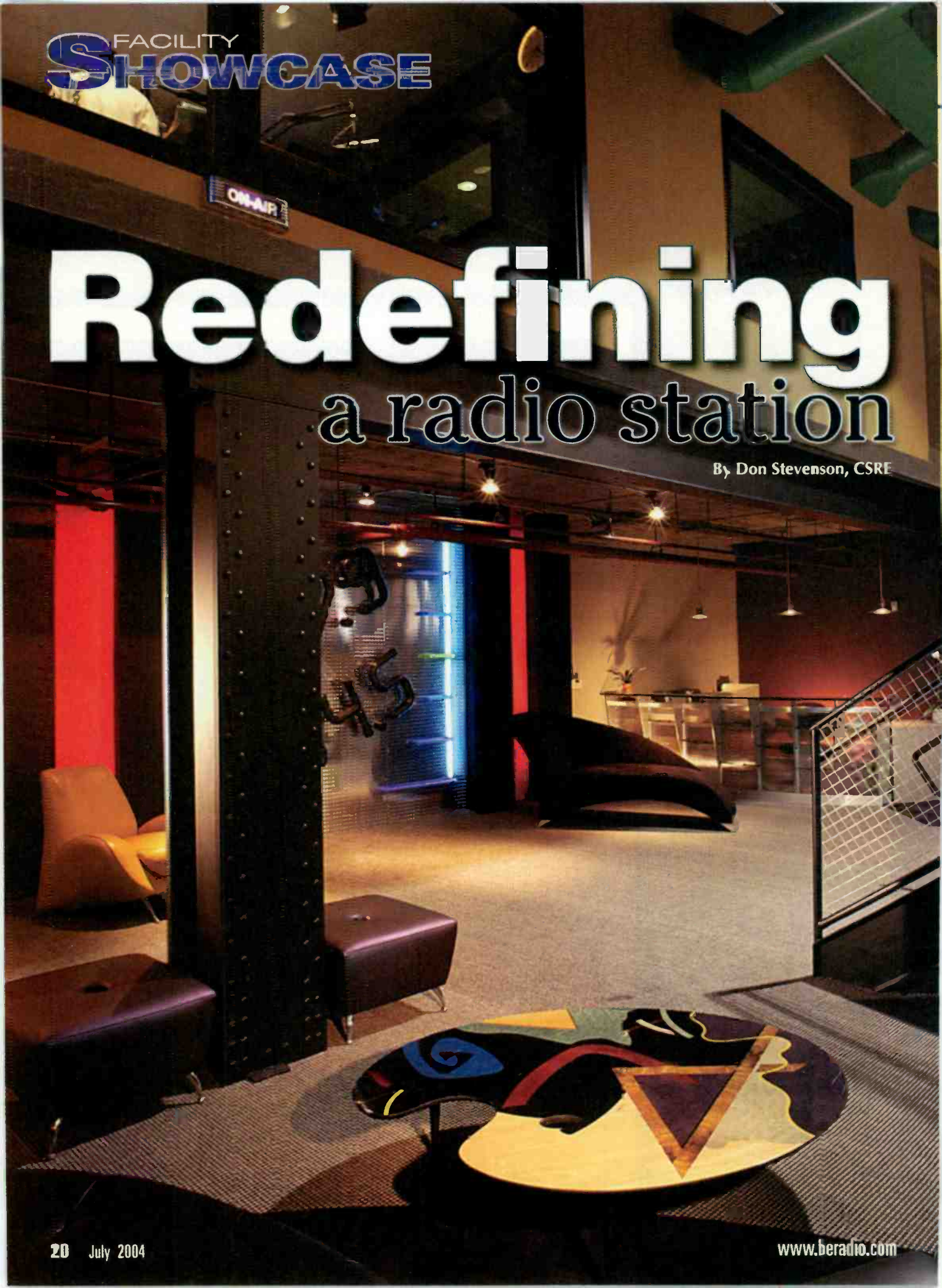
Tell us about it:
radio@primediabusiness.com

The **Presonus Central Station** is a studio-monitoring interface that features three sets of stereo analog inputs on two sets of TRS-balanced inputs and an unbalanced RCA input with level trim control. It provides two digital inputs via S/PDIF or TOSLINK with

D/A conversion up to 24-bit/192kHz rates. It features three sets of monitor outputs, each with its own set of passive trim controls. The monitoring section also provides mute, dim and mono switches, and a set of cue outputs that can feed headphone amplifiers and a separate stereo main line level output. The audio switching paths are completely passive and use sealed relays. An optional remote control is available.

www.presonus.com • 800-750-0323

FACILITY SHOWCASE



Redefining a radio station

By Don Stevenson, CSRE

Radio One in Dallas recently built a new facility to consolidate its two stations in the Dallas-Fort Worth area. A local shopping mall was selected to house the stations. The general manager, George Laughlin, determined that the visitors to the Valley View Mall in North Dallas are a direct reflection of the target demo for the Radio One stations, which made moving to the mall a natural fit. The goal for the studio facility was to create a presence in the mall that would allow the listeners to interact with their favorite radio stations and allow us to promote our stations at the same time.

No easy task

There were several problems to overcome in building a radio station in a mall. The location that we selected had been a two-screen movie theater many years before. It had been vacant for more than 20 years. The mall had tried to lease that space many times, but the construction costs kept them from ever getting it leased. The biggest problem with the space was that the floor had a six-foot slope from front to back for each theater. The cost to level the floor kept the average mall tenant from being interested in the space.

Radio One (rā´dē-ō´wuñ) *n.* **1.** Located in a shopping mall **2.** Used to be a movie theater **3.** Designed to resemble a warehouse **4.** Houses a basketball gym **5.** A top notch radio facility

The theater actually had more space than we needed to complete the build. Because the space was not dividable and had not been rented in years, the mall management was motivated to give us a rate on the space that would close the deal. The general manager decided that the extra space should be made into a half-court basketball gymnasium. While this sounds like a strange thing to put into a radio station, it has been great. We have used the gym for several mini concerts, and many various promotions. Some of the promotions have been Super Bowl watching parties, client events and one event had a local company that operates haunted houses actually build a haunted house inside the gym. We have had Steve Harvey broadcast his morning show live from the gym with 200 listeners and a catered breakfast buffet. It has been great to have a multipurpose area attached to the station.

Despite the luxury of the generous space, we still had other problems that needed to be addressed. This mall is a relatively short building with tall office buildings on all sides of it. Those buildings created a wall preventing us from making an STL microwave shot to either transmitter site. We initially tried to negotiate with the mall to allow us to put a small tower on the roof of the mall. When we actually conducted the path studies we discovered that the required elevation was not possible at this location. We decided to install T1 circuits to each transmitter site to be used as the main STL circuit. The microwave STL system had to use a repeater before arriving at the transmitter sites. We installed the STL repeater on the rooftop of one of the tall buildings near the mall.

As we began construction, we had to level the floor. To do this, a portion of the exterior wall was removed and a small Bobcat loader spent two weeks hauling sand into the space and leveling it. Once the sand was in place, rebar was installed and then concrete was poured. When that was completed we were ready to begin building walls in the station.

We decided to go for the warehouse look and take advantage of the 20-foot-high ceilings with exposed ceiling iron. The architectural firm of Meriman and Associates in Dallas was hired to design the facility because it had previous experience with projects with a similar theme. They helped us use as much of the existing infrastructure as possible to reduce construction cost. Meriman and Associates has since been involved with designing Radio One facilities in Houston, Cincinnati, Boston and Baltimore.

Rooms with a view

The studios were placed in the area that formerly housed the movie projectors. This gives the studios the ability to have exposure to the mall so that mall visitors can see either station in action. We had to install an elevated catwalk outside the studios. This allows access to the studio core without taking away any of the precious floor space that once housed the projectors. The advantage to this is also this gives a great feel of openness to the station. When walking on the catwalk, you can see the entire radio station at one time.

The engineering technical operations center (TOC) was placed on the ground floor. We installed a cable tray that ran from the TOC straight up and above the catwalk. It runs the entire length of the building and goes past every studio. We left it open and exposed with the plan that it would become part of the warehouse look of the facility. Because the cable tray was being used to project a look, a visitor's eyes are automatically drawn to it. This made it important that every cable be neatly placed in the tray. We later noticed that even cable ties that were not installed in the same manner began to stand out.

Redefining a radio station

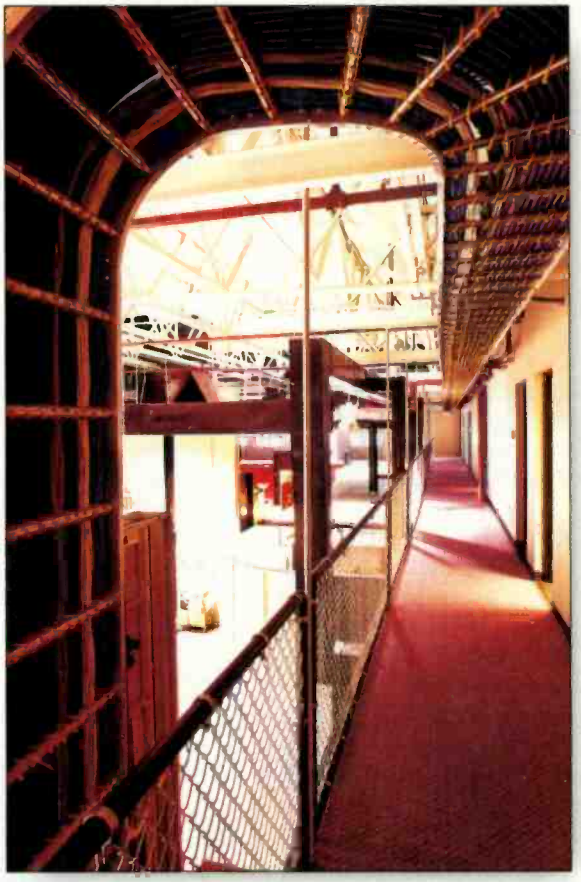
Because the TOC was located just below the catwalk, the cable trays above the racks became another focal point. We immediately became aware of the aesthetics involved with the cable placement and had to adopt several rules for the cable trays. This ensured an orderly look for the finished product.

We built six studios to handle on air and production needs for both stations. The audio for the facility was based around the Logitek Audio Engine routers with the Logitek Numix 18 consoles used on the air. Each Audio Engine can support as many as three audio consoles or audio routers control panels. We installed five Audio Engines for our six studios and TOC routing needs.

All the audio engines are networked to each other through fiber optic cable. The audio engines can be located either in the studio next to the console, or all in the same location, such as the TOC. We chose to install all of the audio engines in the TOC. This allowed us to minimize the amount of wiring in the studios, which became important when the timetable on the studio construction became short. All of the audio generated inside the studio (microphones, CD players) was run to the TOC. We installed Gepco digital audio wire to run between the studios and the TOC. We use it for both digital and analog audio.

Right on time

Due to delays in getting the lease signed, and some construction delays, the time frame for construction was more than two months behind. We had a firm deadline on when we had to have both stations moved. The original time frame for the studio and TOC construction was to be 10 weeks. When we were able to start pulling audio cable, we had less than four weeks to have both stations on the air from the new facility. This created a lot of pressure on the engineering staff, but with the Logitek audio consoles, we were able to pull it off on schedule.



The wiring trough serves a functional and decorative purpose in the facility design.

The main reason for our ability to meet the deadline was due to the new audio consoles and routers. The topology of the system significantly reduces the infrastructure requirements of the facility. We no longer needed racks full of distribution amps and all of the wiring associated with running all of that audio in and out of each studio. All the audio inputs and outputs are connected to the Audio Engine. Once that has been done, the audio can be directed to any location in the facility by programming the Audio Engines.

The Audio Engines are programmed through a computer that has RS-232 access to each audio engine. Logitek supplies a program called Supervisor that runs on that PC. The Supervisor program allows the engineering department to instantly see the status of all studios and audio cross points. From that program, we can control any parameter in the studio. That has been helpful to us, because the studios are located

on a different floor than the engineering TOC.

For audio storage and playback, we use the Computer Concepts Maestro system. We have six workstations and a central audio server. All of the workstations and the server were installed in a rack in the TOC. The computer screens and keyboards were extended using KVM extenders. We also ran the KVM signals into a KVM switch. This is connected to a monitor and keyboard in the TOC. This gives us the ability to monitor all actions on the Maestro system and also take control of the computer screen.

Shortly after moving into our new facility, we began running a new syndicated morning show, *The Steve Harvey Morning Show*. The show was currently running on Radio One's KKBT in Los Angeles and was to also air on KBFB in Dallas. This was the first step to syndicating the show nationally. Steve Harvey is well known for his starring roles in various movies, his own sitcom, many standup comedy appearances and he currently has a variety show on the WB network. The show is based in LA, but Steve spends a lot of time in the DFW area. Harvey wanted to be able to broadcast from Dallas anytime with little notice.

The first step to achieving this goal was to install a dedicated T1 from LA to Dallas. When Harvey would broadcast from Dallas we would relocate the KBFB broadcast to another studio and give the KBFB control room to him. This allowed Harvey to comfortably have guests in to interview and also allowed us to showcase his show. The KBFB studio has a glass wall from floor to ceiling that is open to the mall. Listeners can walk by in the mall and see Steve Harvey in action. That has been a tremendous help in achieving a local feel for the show.

Each studio has a conventional layout, but the integration of routing and control adds to the flexibility.

The only problem with this design was that when Harvey first came to town, many technical aspects of the facility had to be changed. There were many audio routing changes that had to take place. I personally came in to manage this for the first couple of months. I needed to get back to a normal sleep schedule, so I now use a program called Command Builder. This program comes with the Logitek audio engines. It allows simple command scripts to be written and execute automatically based on parameters that I define, allowing me to completely automate the changes. Once the script was written and implemented it has run without any problems. The operators have no idea that there are any changes happening in the background. They just know that it is always there and working, no matter what they are doing.

Redefining a radio station

Comfortable digs

We have been in the new space for about two years now. I have become so used to the capabilities that we have built into this facility that I could not imagine going back to the old days. One morning I received a call from our Houston station, who was hosting Steve Harvey in the studio. The Los Angeles station was having a problem with its ISDN line, and audio needed to be routed through the Dallas facility. I walked to my computer, changed the routing points and dialed the ISDN from the house. Just a few years ago, this is something that I could have never imagined being able to do.

Because the cable is visible, extra attention was made to ensure that it looked good.

While the generous floor space and unique location of our studios make this facility a showcase, the flexibility and convenience that is available to us now through the various audio sources, the ease of routing and controlling these sources, and the ability to monitor and make changes remotely have made the job of the engineering department much simpler.

Stevenson is chief engineer of Radio One Dallas.

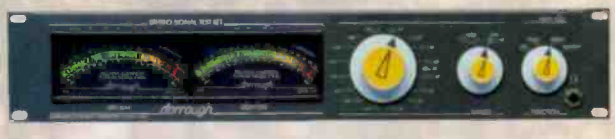
Equipment list

360 Systems Instant Replay
Adobe Audition
Audio Labs Voxpro
Audio-Technica AT4050
Broadcast Tools 8.1 switcher
Broadcast Tools SS8.2 switcher
Computer Concepts Maestro
Comrex Hotline POTS codec
Comrex Matrix POTS codec
Denon DN 790 cassette deck
Denon DN951FA CD player
Denon TU 1500 receiver
Digidesign ProTools
Dorrough 1200B stereo test set
Electro-Voice RE27
ESE 103 Master clock system
ESE LX 5112 clock
Eventide BD500 delay
Genelec 1029 speakers
Genelec 7050A subwoofer
Harris Intraplex T1 interface
HHB CDR-850 CD recorder
JBL EON 12 speakers
Logitek Audio Engine
Logitek Numix 18 consoles
Logitek Roc 10 consoles
Logitek Roc 5 console
Mediatouch Imedia Logger
Moseley SL9003 STL
Orban 8200
Panasonic SV3900 DAT recorder
Pioneer CDJ-1000MK2 CD
Rane HC6 headphone amp
Rane TTM 56 DJ mixer
Sony MDS-E12 Minidisc player
Sony PCM-R500 DAT recorder
Statmon remote control system
Symetrix 528E mic processor
Tascam 122 MKIII cassette deck
Tascam DA-20 MKII DAT
Tascam PA-150 amp
Technics SL1200 MK5 turntables
Telos 1X6 phone system
Telos 2X6 phone system
Telos X-Stream ISDN codec
Telos Zephyr codec
TFT EAS 911
TFT EAS 930 EAS receiver

Facility

Focus
the technology behind Radio One Dallas

Dorrough Model 1200.tif



The Dorrough Stereo Test Set Model 1200 is a 2RU instrument that allows instant, dynamic monitoring of audio levels, balance, cross-talk, system gain, signal-to-noise ratios and program center-channel buildup. Verifying proper polarity and balance of stereo broadcast lines is a primary application. Two Relative Loudness to Peak Modulation Meters are provided. Function, Range and Attenuation controls are set in tandem with the meters to achieve all measurements. Left and right channels are input via loop-through XLR connectors or a parallel barrier strip. The back panel also sports a line-level 1/4" stereo output for connection to a scope, etc. A front-mounted, amplified, stereo headphone jack is also provided for monitoring. The Dorrough Test set provides consistency and quality assurance to program material.

www.dorrough.com
818-998-2824

Electro-voice RE27N/D

This professional-quality dynamic cardioid microphone is designed for broadcast announcing and voice-over applications. The RE27N/D utilizes a revolutionary neodymium-alloy magnet and a reinforced diaphragm dome, a combination offering increased sensitivity (up to 6dB more output), undistorted output at high sound pressure levels and an extended high-frequency response. The exceptional sensitivity, excellent transient response and inherently low noise of the dynamic transducer combine to ensure a superior signal-to-noise ratio, easily comparable to the finest condenser cardioid microphones. A highly effective hum-bucking coil is used to attenuate hum from lighting and other sources. The RE27N/D's continuously Variable-D design reduces proximity effect to maintain a uniform low-frequency response. Two bass roll-off switches offer a sharp low-frequency cut at 200Hz or a gentle roll-off. A third switch is available to reduce the high-frequency treble boost.

www.electrovoice.com
800-392-3497

Comrex Matrix

The Comrex Matrix offers the ultimate in flexibility for remote broadcasts. Whether on regular telephone (POTS) service, ISDN lines, or GSM wireless networks, the Matrix can send high-quality remote audio to the studio from virtually anywhere. As a 15kHz POTS codec, the Matrix can connect with all Comrex POTS codecs, and with the optional ISDN module, the Matrix is compatible with most ISDN standards. When the remote site has no phone line, the optional GSM module allows the Matrix to transmit 7kHz audio with an internal GSM wireless phone. Along with the full line of Comrex codecs and telephone hybrids, the Matrix will help your station broadcast great-sounding audio from anywhere.

www.comrex.com
800-237-1776

Computer Concepts Maestro

When it comes to robust and reliable digital studio systems, Computer Concepts' Maestro is one of the best. It's the choice of many major market broadcasters, including Radio One in Dallas, Los Angeles, Houston, Detroit and many more.

Maestro complies with all Microsoft standards. It works the way other Windows programs work, so your staff already knows a lot about using it. Maestro plays any recording from any Windows PC, including WAVE and MP3.

Computer Concepts pioneered satellite formats, with automatic fills and fail safes other systems still don't have. Maestro's Voice Tracker is easiest to use and sounds great. As part of Scott Studios family, Computer Concepts has an exceptional reputation for superb 24/7 tech support.

computerconceptscorp.com
888-GET-SCOTT

SPLIT-LEVEL COMBINING

By Steve Fluker

A new approach to IBOC

The excitement of HD Radio is rapidly building momentum. Some of this has been fueled by the promise of new features, such as the additional audio channels of Tomorrow Radio, 5.1 surround sound and the fact that radios have finally become available for sale in the retail stores. Even still, radio stations are hesitating to convert to IBOC operations because of the cost to install and operate the HD Radio transmission equipment. These issues center on inefficiencies in the current combining scheme. This inefficiency is responsible for an increase in operating costs, the need for more physical space in the transmitter building, possibly being forced to replace existing transmitters and increased HVAC needs.

The WPYO split-level combining prototype using a Harris HT-5 and a Z-16HD transmitter. Above the center rack is the 3dB hybrid used for the combining of the outputs of the two transmitters.

These are major hurdles for some station owners to jump and it's causing them to sit back and wait for a better way. The recent introduction of the dual-antenna method has caught people's attention, and is an efficient method for stations that already have a licensed auxiliary antenna to get on the air fast. Stations without this luxury are faced with the high cost of purchasing, installing and licensing a new antenna and transmission line, plus they may be faced with the cost of tower loading studies and additional monthly tower rental costs. These costs could easily exceed the savings realized from the improved efficiency. The dual-antenna method also produces variances in the digital and analog signal propagation, requires an STA from the FCC and cannot be used for directional FM stations.

Offered solutions

The new split-level combining method addresses all of these issues and can finally make HD Radio affordable. Invented and developed by Steve Fluker, director of engineering for Cox Radio in Orlando, and George Cabrara, Harris RF design engineer, this patent-pending technology is now available for delivery.

To see how split-level combining works, first examine the high-level combining system shown in Figure 1. Until recently, this has been the more popular method of transmitting the IBOC signal. In this example we have a radio station operating with a transmitter power output (TPO) of 14,000W. To convert this station to IBOC, a new digital carrier with a power of 140W must be added. While this sounds easy, there are challenges around every corner. Traditional tube type transmitter amplifiers operate in a Class C mode and are not able to carry both signals simultaneously due to linearity issues. A second transmitter is needed to transmit this digital signal, which must be a solid-state transmitter, set up to operate in a linear Class AB mode. The outputs of the two transmitters are then combined through a 10dB hybrid to produce the final mixed signal to the antenna.

This method is inefficient because the outputs of the two transmitters are so different in level and difficult to combine. Because of this mismatch of the signals, 10 percent of the analog and 90 percent of the digital output signals never make it to the antenna and are instead routed to and absorbed by

SPLIT-LEVEL COMBINING

a reject load. Because of this loss, the digital transmitter output must be increased to 1,400W, just to get 140W of the power to the antenna. Something else to notice in this method is the need to increase the power of the analog transmitter as well. In this example, the power level must be increased from 14,000W to 15,500W just to maintain the licensed power. If the analog transmitter has sufficient headroom, this can be done, but in many cases, the existing transmitter is already pushed to the limit, which may force a perfectly good transmitter to be replaced. As you can see, the wasted power of these two transmitters adds up to 2,810W, which is converted to heat. This additional heat places a new burden on the HVAC system in the building.

Locating the reject load outside is a good idea to help reduce the heating problems, but this will incur even more costs for the parts and labor. Because the load can run extremely hot, it's also advisable to protect it from people accidentally touching it, and

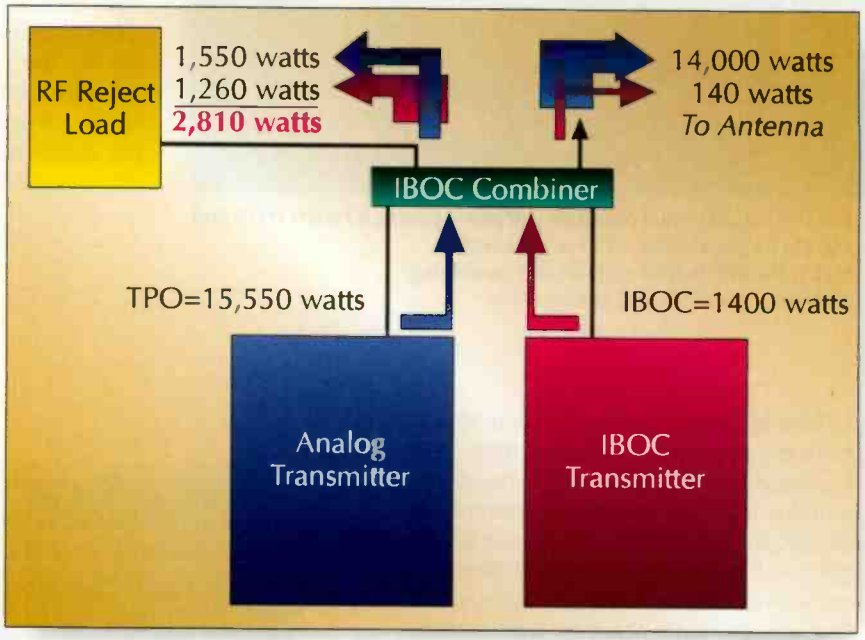


Figure 1: A typical high-level combining system.

to keep animals away from it. Weather protection would also be advisable.

Figure 2 shows how the split-level combining system resolves these issues. Notice the addition of an analog component injected from the digital transmitter. In this example, the IBOC transmitter provides 7,000W, or 50 percent, of the total analog power. This eliminates the need to increase the output of the old analog transmitter, and in fact, the power is reduced, which will increase tube life and further lowers operating costs. Also notice that analog outputs of both transmitters are now equally matched, allowing the signals to be combined with no losses. As for the digital signal, because the transmitter must be linear, the output of the digital exciter must be fed into the digital transmitter only. This creates a mismatch at the outputs causing 50 percent of the digital carrier to be lost, but in this example you can see that we've reduced the power to the reject load from 2,810W down to only 140W. This power loss can easily be absorbed into a reject load with virtually no heating inside the building.

At first glance it would appear that the power savings would be equal to the 2,670W, however, keep in mind that the digital transmitter is operating in class AB mode, which is not as efficient as a standard Class C transmitter. Even taking this into account, the station will still be looking at an expense savings in the area of $300 per month, depending on the cost of electricity in the area. Keep in mind that this amount of savings is compared to the operating cost of the equivalent high-level combined method. The overall power bill will still increase when the IBOC signal is added, just not by as much. Split-level combining can be used for virtually any TPO level and can yield a cost savings between 5 and 25 percent over the high- level combining method.

Space saver

Another concern with implementing HD Radio is a lack of physical space in the transmitter room. Everyone has seen the typical transmitter where the back of the transmitter is accessible only by squeezing between the wall and equipment rack. It's no secret that many transmitter buildings were built to fit a main and back-up transmitter only, with no room to spare. Both the high-level and dual-antenna IBOC methods require the addition of yet another transmitter and equipment rack. If the room isn't big enough there is no choice but to add on to the building. This obviously adds a significant amount to the cost of conversion. Worse yet, what if the building cannot be expanded? A choice between a back-up transmitter and IBOC must be made. The split-level combined system addresses this issue.

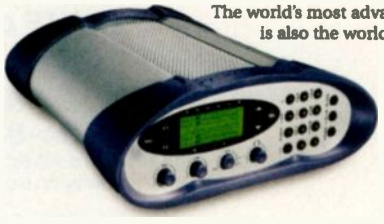
With both transmitters carrying an analog component, either transmitter can be used individually in an emergency to keep the station on the air. If space is an issue, remove the old auxiliary transmitter and

More Online

Read a white paper that further details split-level combining at the *Radio* magazine website. Access this article at beradio.com and follow the link to the PDF.

Leading POTS Codecs Compared.

	Comrex Matrix	Tieline Commander	Zephyr Xport
Audio Bandwidth @ 24 kbps @ 19 kbps	14 kHz 11.2 kHz	15 kHz 9 kHz	15 kHz 15 kHz
Direct Internet Software Updates	No	No	Yes, via Ethernet port
Digital PC Audio Input	No	No	Yes, via Ethernet port and supplied driver
Audio Metering (XMIT/RCV)	Transmit only	One-at-a-time	Simultaneous
Audio Processing	None	Simple AGC	Digital multi-band AGC with look-ahead limiter by Omnia
Remote Control	No	RS-232 and dedicated computer	Ethernet via Web browser
Auto Dial Storage	19 Numbers	50 Numbers	100 Numbers
Frequently-Used Settings Storage	none	none	30
Standards-based POTS Codec	No - Proprietary	No - Proprietary	Yes - aacPlus (MPEG HEAAC)
Transmit-Receive Quality Display	No	Yes	Yes
Contact Closures	2	2	3
Display Resolution	120x32 LCD	120x32 LCD	128x64 LCD
Analog Cell Phone Interface	Optional	Standard	Standard
Mixer Inputs	1 mic, 1 mic / line	2 mic / line	1 mic, 1 line
Phantom Power	No	No	Yes - 12 volt
Automatic Voice-Grade Backup	No	No	Yes
Power Supply	External	External	Internal auto-switching
Local Mix Audio Outputs Headphone Line Level	 Yes Yes	 Yes No	 Yes Yes
Direct Receive Audio Output	No	Yes	Yes
Uses ISDN at the Studio Side for More Reliable Connections	No	No	Yes - your Zephyr Xstream becomes universal POTS and ISDN codec.
Available ISDN Option	$850.00 (adds MPEG L3 & G.722)	$850.00 (adds G.722)	$495.00 (adds G.722 & state-of-the-art AAC-LD for high fidelity and low delay)
List Price:*	$3,700.00	$3,650.00	$2,495.00



The world's most advanced POTS codec
is also the world's lowest priced POTS codec.

Telos
AUDIO | NETWORKS

The routing switcher gets a new twist.

(About five twists per inch, actually.)

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

If you need a routing switcher but aren't made of money, consider Axia, the Ethernet-based audio network. Yes, Ethernet. Axia is a *true network*. Place our audio adapter nodes next to your sources and destinations, then connect using standard Ethernet switches and Cat-6. Imagine the simplicity and power of Ethernet connecting any studio device to any other, any room to any other, any building to any other... you get the idea.

Routers are OK... but a network is so much more modern. With Axia, your ins and outs are next to the audio, where they belong. No frame, no cards, no sweat.

Scalable, flexible, reliable... pick any three.

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

Are you still using PC sound cards?

Even the best sound cards are compromised by PC noise, inconvenient output connectors, poor headroom, and other gremlins. Instead, load the Axia IP-Audio Driver for Windows® on your workstations and connect *directly* to the Axia audio network using their Ethernet ports. Not only will your PC productions sound fantastic, you'll eliminate sound cards and the hardware they usually feed (like router or console input modules). Just think of all the cash you'll save.

There's a better way to get audio out of your PC. No more consumer grade ⅛" connectors – with Axia your digital audio stays clean and pristine.

Put an Axia Microphone Node next to your mics and send preamplified audio anywhere you need it, over Ethernet -- with no line loss or signal degradation.

Put your preamps where your mics are.

Most mainframe routers have no mic inputs, so you need to buy preamps. With Axia you get ultra-low-noise preamps with Phantom power. Put a node in each studio, right next to the mics, to keep mic cables nice and tight, then send multiple mic channels to the network on a single Cat-6 cable. And did we mention that each Mic Node has eight stereo line outputs for headphones? Nice bonus.

Put your snake on a diet.

Nobody loves cable snakes. Besides soldering a jillion connectors, just try finding the pair you want when there's a change to make. Axia Audio Nodes come in AES/EBU and balanced stereo analog flavors. Put a batch of Nodes on each end of a Cat-6 run, and BAM! a bi-directional multi-channel snake. Use media converters and a fiber link for extra-long runs between studios — or between buildings.

An Axia digital audio snake can carry hundreds of channels of digital audio on one skinny CAT-6 cable. We know you're not going to miss soldering all that multi-pair...

With a little help from our friends.

A networked audio system doesn't just replace a traditional router — it *improves* upon it. Already, companies in our industry are realizing the advantages of tightly integrated systems, and are making new products that reap those benefits. Working with our partners, Axia Audio is bringing new thinking and ideas to audio distribution, machine control, Program Associated Data (PAD), and even wiring convenience.

Would you like some control with that?

There are plenty of ways to control your Axia network. For instance, you'll find built-in webservers on all Axia equipment for easy configuration via browser. PathfinderPC® software for Windows gives you central control of every audio path in your plant. Router Selector nodes allow quick local source selection, and intelligent studio control surfaces let talent easily access and mix any source in your networked facility.

Control freaks of the world, rejoice: Intelligent Axia mixing surfaces give talent complete control of their working environment. Reconfigure studios instantly and assign often-used sources just where they're most useful.

Axia is already working with some great companies. Like Enco Systems, Scott Studios, Radio Systems, Bailys Technology Group, and of course Telos and Omnia. Check AxiaAudio.com/partners/ to find out who's next.

"This sounds expensive." Just the opposite, really. Axia saves money by eliminating distribution amps, line selectors, sound cards, patch bays, multi-pair cables, and tons of discrete wiring — not to mention the installation and maintenance time you'll recover. And those are just side benefits: our hardware is about half the cost of those big mainframe routers. That's right... *half*. Once you experience the benefits of networked audio, you will never want to go back. AxiaAudio.com for details.

AXIA
A TELOS COMPANY

put the new digital transmitter in its place. It might also be possible to convert an old dummy load into the needed reject load for the combined system, which not only saves space, but also saves more money.

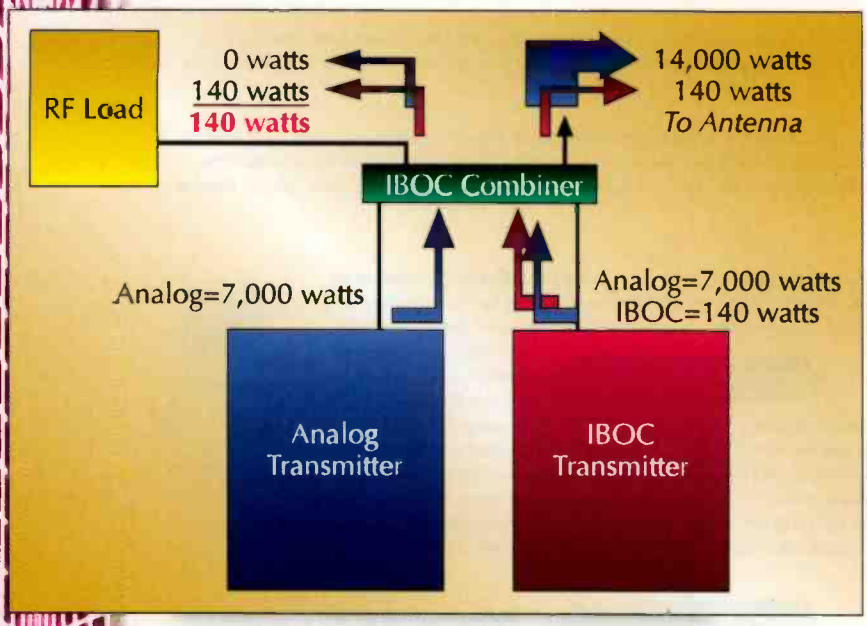


Figure 2: The split-level combining system.

Testing in Orlando

Split-level combining was put to the test in April on Cox Radio's Power 95.3 in Orlando. A recent class upgrade from A to C3 required the station to purchase a new transmitter, creating the perfect opportunity to test this new technology. The main transmitter was a 5kW tube transmitter, which could not make the new 7.3kW TPO, so a new Harris Z-HD transmitter was purchased. Both transmitters were set at 3,650W of analog power, and the digital signal was adjusted to 146W. In a standard high-level combined mode, the reject power level would have been about 1,560W. With the two transmitters properly tuned and phased together, the reject load power dropped to under 73W. This reflects the 50 percent loss of the digital signal. The transmitters were then switched into test loads and both transmitters were turned up to 5,000W. The forward power increased to simulate a TPO of 10,000W, and the reject power was just below 100W, as expected. High-level combining would

The exciter rack with a Harris Digit exciter, Dexstar IBOC exciter and Epal audio interface.

have rejected more than 2,000W in this case.

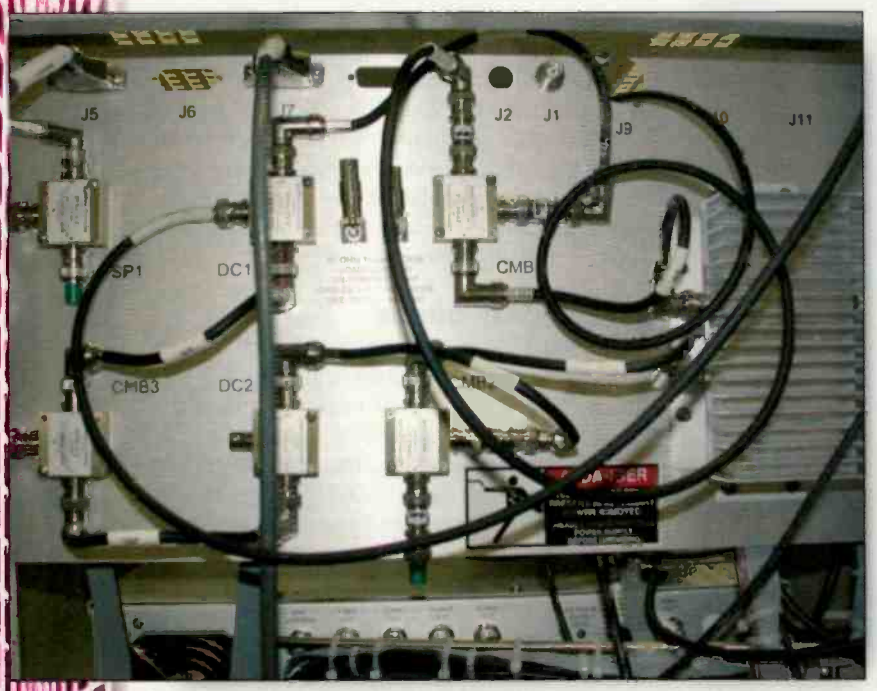
In both of these experiments the power output of each transmitter was matched. It is not always possible to match the power levels, nor is it necessary or even always desirable. There is a lot of flexibility in this combining method, which can be customized to fit the needs of a facility. In some cases it may make more sense to give up some of the gained efficiency to save tens of thousands of dollars in installation costs.

Installation costs

In this example, let's assume a radio station with a TPO of 36,000W. Most 35,000W transmitters can actually be pushed to make the extra 1,000W, but not much more. If this station wants to convert using the high-level system, the analog TPO must be increased to just over 40,000W. This transmitter cannot produce this power. The most economical way to achieve this extra power is to purchase another high-power transmitter to combine with the existing transmitter to be able to reach the new power needs.

On the digital side, the power output to the antenna must be 360W, but with a 90 percent loss, the transmitter must be able to produce 3,600W. To achieve this power level, a dual-cabinet transmitter

SPLIT-LEVEL COMBINING



The HD Radio analog low-level combiner section to feed the analog and digital exciters into the hybrid-mode digital transmitter.

is required. The building must be large enough to house a new analog transmitter, a dual-cabinet digital transmitter, plus additional rack space and a new reject load. All of this adds up to a lot of floor space, which may not be available.

In this arrangement, 7,240W of power will be lost into the reject load. This is not a peak power reached occasionally, but a constant power 24 hours a day. It is unlikely that the building air conditioning system will be able to handle this increased heat load. The options are to add additional cooling, or to move the reject load outside.

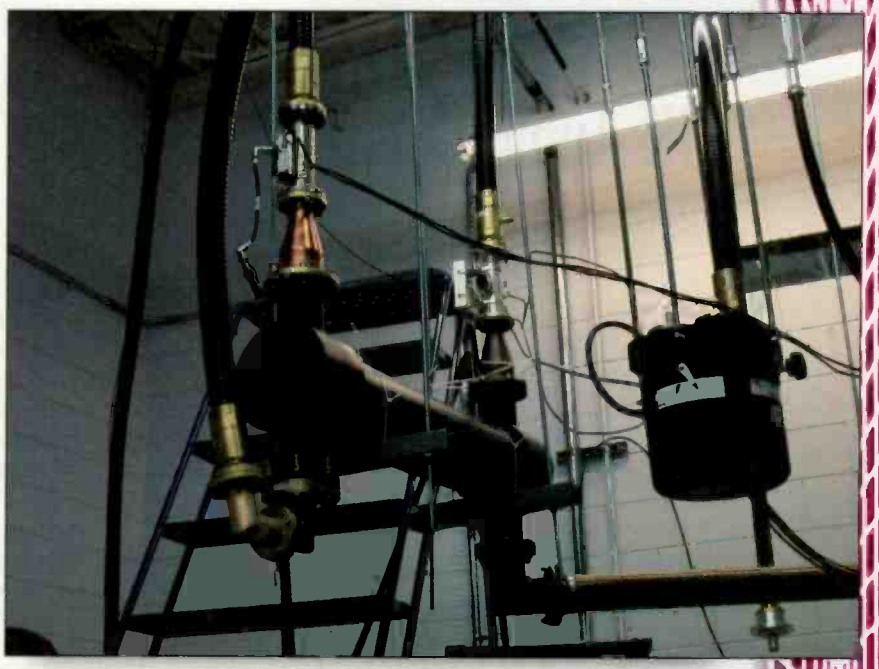
The same station using split-level combining will have several configuration options to choose from. To gain the most efficiency, the station may still choose to purchase a dual-cabinet digital/analog transmitter that can produce about 14,000W of analog power along with the digital signal. The old analog transmitter's power will now actually be reduced to about 22,000W and will not need to be replaced or upgraded. Tube life will also be extended because it's not being taxed to the limits. In this case the installation costs

could be reduced by as much as $65,000. Because the digital transmitter carries a significant amount of analog signal, it can replace the older auxiliary transmitter, so this installation might fit in the same or only slightly larger footprint as the old transmitters.

A second option to save even more money up front would be to use a single-cabinet digital transmitter. The efficiency will not improve nearly as much, but the installation costs could be lowered by as much as $150,000. This may also be an attractive option when floor space is restricted, as it may actually consume less space than the existing configuration. The key is in the planning.

Editor's note: Split-level combining has several patents pending. At this time, the technology is sold exclusively through Harris.

Fluker is director of engineering for Cox Radio Orlando.



The prototype 3dB high-level hybrid used for split-level combining the two transmitters in the Orlando test. The digital Thru-line sections for the wattmeters are used to accurately measure the true average power of the IBOC signal.

JK Audio Compack

By Richard Hamilton

When I first came up with the idea to create an Internet talk show on trains, I scheduled the show on a day and time that would make it viable to produce the show on the road. Saturday at 10 a.m. Pacific Time meant I could be on the East Coast or the West Coast at a train exhibition and have a live show with a participating audience at a good time of day.

The majority of broadcasts that I planned would be held on fairgrounds or convention centers. With various vendors and exhibitors set up throughout the halls, I wanted to be mobile enough to walk around and talk to the attendees. This is not exactly easy to do when tied to a phone line. In addition, I planned to do all of this without a traveling engineer.

So how do you create a show live on the road? This is a staple of radio. However, this is an Internet radio show in a talk-show format. I did not want to hold a cell phone to my ear while interviewing people. I also wanted to reduce any phone-like qualities as much as possible. The studio and I were not ready to jump straight to a GSM codec. After all, streaming mono on the Internet does not necessarily call for a high-quality signal.

Performance at a glance

- Compack offers landline, handset or cell connectivity
- Separates audio up and down
- Keypad can be turned off
- It has both mic and line level inputs
- Battery or ac operated
- LED overload indicator
- Individual controls for headphone, line and mic levels

Not having the budget of a broadcast station, my resources were pretty thin, especially when you consider that I do this show as a hobby. Dollars were an issue but we wanted to sound as professional as possible. I needed to hear callers and hold conversations.

Hold the phone

After talking to my audio engineer, we decided to go mobile with a cell phone interface to the studio, where my feed would be handled just like any other caller, with the exception that I am a co-host. Most of the time the other co-host is in the studio because her schedule is not as flexible for travel.

The choice was made to use the JK Audio Compack telephone audio interface. This unit allows flexibility while offering a good audio interface. I connect to the studio using the supplied ¼" to 2.5mm cell phone headset cable. The unit also has two RJ connectors, one for connection to an analog POTS line and a handset connection. The RJ handset connector has a slide switch to select the type of handset being used.

The unit accepts mic and line-level signals. A slide switch selects mic or line level for the XLR connects. The XLR and 3.5mm jack are two separate inputs with separate volume controls.

Power is supplied by a battery (with a push-button LED indicator) or ac power adapter. So far, battery operation has not let me down, however I always carry a spare 9V battery in my mobile pack. I change the battery after about six months of use, and I never store the battery in the unit between shows.

There is one ¼" stereo headphone connection for stereo headphones and the keypad on the unit is a standard 12-button DTMF keypad.

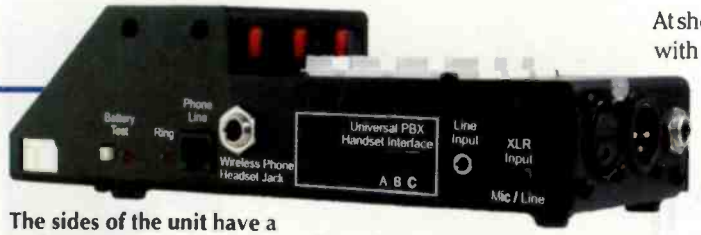
Of the three visual indicators (LEDs) I watch the clip LED to make sure I am not overdriving audio back to the studio. I use the battery LED when I fire up to make sure the battery is in good shape. I don't use it with my setup, but there is also a ring LED.

There are three rocker switches for control: power, phone line, keypad. The power switch function is obvious. The phone line rocker switch takes the unit on or off hook when connected to a POTS line. The keypad rocker switch allows the user to deactivate the keypad to prevent button presses while he is on the air.

The equipment setup is pretty straightforward. When I have it all attached to me I look like a wired geek. On my left hip is my cell phone. On my right hip is the Compack with the cell phone cable, headphone cable and microphone cable all dangling off to their respective pieces of equipment.

When used with the strap, the three main controls (headphone, line, input) are located on the top of the unit. The headphone pot controls the level of audio being fed to the headphones. The line and input pots control their respective level of audio sent back to the studio.

I operate on the theory of when all else fails, consult the manual. The guide is user-friendly and uses the picture feature/number method.



The sides of the unit have a variety of connections and configuration switches.

Going live

The limiting factor here is the cell phone service. This is the weakest link in the setup due to occasional questionable coverage. The cell phone operation would give a greater flexibility of movement at the show if the cell coverage allowed. Also, at these venues it is sometimes a huge headache to arrange for a landline for two hours of use.

The Compack allows me to communicate as one would on any normal remote broadcast as well as hear the studio audio. We have gotten to the point where the studio keeps the pot on the board up on my line and I control the levels at my end. I can hear the studio audio and know when to tease and when to drop out for breaks by listening for the musical cues coming back at me.

The next mobile broadcast is scheduled for July 10 at the 25th Annual Moon Amtrak event in Laguna Niguel, CA.

At showtime, this weird-looking guy wired with headphones, a mic and this black box comes out. I am free to walk around and talk to visitors and participants of the show. None of the equipment gets in the way and I am as mobile as I can be.

Hamilton is the host of Let's Talk Trains, *www.letstalktrains.us.*

JK Audio

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F	815-786-8502
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E	info@jkaudio.com

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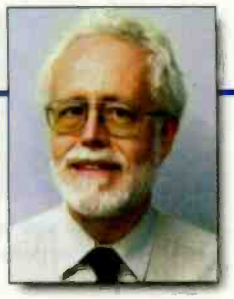

Klotz Digital Vadis DC II

by Tim Wright, CPBE

When Clear Channel Communications consolidated its Chicago broadcast facilities in 2002 and 2003, a search began for an integrated solution to tie all seven of the stations together as one technical facility. Several vendors came up with solutions, but for us the Vadis DC II from Klotz Digital stood out above all the rest.

What we were looking for was the ability to dynamically route digital and analog audio, as well as dynamically route machine control, across 28 studios that could potentially be shared by any of the seven stations. The facility was designed with clusters of four studios for each station, with several of those studios shared by everyone. A central Technical Operations Center (TOC) houses the bulk of the audio equipment, but each station's main studio is configured so it can act as a stand-alone island, and go on the air independently.

Performance at a glance

- Integrated router and console design
- Software-defined operation
- Hardware and software modularity
- End-user programmable
- Expandable console work surfaces

When we reviewed the various systems, the sales staff at Klotz explained carefully that the Vadis system is a completely new concept of how to do things, and showed us exactly what their hardware was capable of doing. The full effect of that statement did not sink in until things were operational for a year, and changes needed to be made in the facility. Forget the punch tools and soldering irons, just rewrite some configuration files and the entire personality of the facility can change.

Equipment setup

The Vadis system is a versatile hardware routing system that has every cross point, button, lamp, relay and opto-isolated input defined in software. The basis of operation is time-domain multiplex (TDM) routing of digital data that is clocked serially through the system at the sample rate. That rate is defined at sample rates of 44.056kHz, 44.1kHz, 47.925kHz or 48kHz.

Hardware cards plug into mainframes handling functions such as fiber I/O (64 channels wide), AES in/out (eight stereo pairs), AD/DA (four channels) and digital signal processing (DSP). All inter-frame audio data is handled on fiber, and all supervisory control data is handled on a proprietary Ethernet network using the 802.3 protocol. External machine control is handled by Ethernet based hardware GPI boxes each capable of 32 I/O channels, or directly off the frame itself in the case of the compact audio frame, the V220.

The user interface can be a modular (hardware-based) console work surface, a virtual PC-based (touch-screen) work surface or a combination of both. Because every button and fader is defined and controlled in software, imagination is the only limitation on the configuration possibilities.

The software to accomplish all of this is a text-based programming language that is made available to the end user. Using Klotz standard syntax, the entire system can be defined to meet specific needs. The learning curve for the code is somewhat steep, but once the basics are learned it is easy to implement. Klotz Digital offers a week-long training school so that engineers in the field can modify and maintain their own facilities. Users are encouraged to attend these classes.

As for running a console on a Microsoft product, it's not a problem. A PC runs the GUI, control and routing for the attached Vadis frame. The Windows 2000 OS itself is stable, as long as it is not running MS software applications. The system architecture is designed so that shutting down anything except the Vadis frame itself does not interrupt the audio. For service of the frame, we have two levels of bypass. First, a software bypass done in the TOC with Vadis routing, and second, a total Vadis bypass by putting the station's automation system direct to air. This is used in case we want to update firmware or software in parts of the Vadis system that are common to all stations. In addition, each air studio can act as a stand-alone island, routing direct to air, in case the entire technical operations center was to go down. This

The Vadis 880 frame is the engine behind the system.

is unlikely due to the multiple soft-switched fiber paths and routings designed into the system as we configured it.

From the board operator's point of view the entire system acts like a standard console. The only studios that are a bit different are the voice-track rooms, which house a four-fader work surface and a touch screen. The functions of monitor switching and level control are all handled with soft keys written into the GUI. Those four-faders can be programmed on the fly to be any source in the facility if we choose. Normally we limit the jock to seeing only what he needs to see for the job at hand. If we wanted, the consoles could be day-parted so that the less experienced operators could not get into trouble. They would see only what we want them to.

The next step of development for our system will be integration of a front door intercom system to the studios. Included will be a touch screen interface, a menu driven GUI designed to be non-technical, GPI control of two-way video (externally switched) and interactive station audio monitoring. As I said, the imagination is the only limit to what can be done.

After a year's operation, the system has proven that the choice was right. When asked by a competitor what he thought of the Klotz Vadis DC II system, Market

The operating screen can be customized.

Director of Engineering Bob Fukuda said, "They will have to pry it out of my cold dead fingers, before I give this system up."

Wright is a senior studio engineer for the Clear Channel stations in Chicago.

Klotz Digital

P 678-966-9900
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W www.klotzdigital.com
E sales@klotzdigital.com

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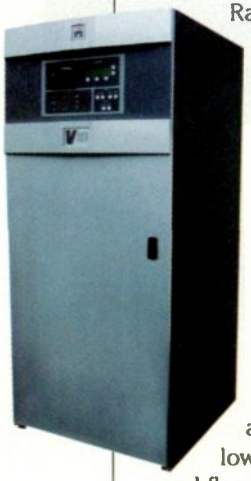
New Products

By Kari Taylor, associate editor

www.beradio.com

FM, digital transmitter
Nautel



V10: The Virtuoso, V10, is a 10kW FM/HD Radio transmitter with a linear, adjustable-bias, broadband design. It is capable of 3.2kW digital, 7.7kW hybrid or 11kW analog operation. Because it is frequency agile, it can be used for N+1 configurations in conjunction with the Maestro digital exciter. RF power modules and associated switch mode power supply modules are hot-plug for ease of service. The unit features a graphic user interface, diagnostic flow diagram and event log. Compact and lightweight construction allows installation at sites with space and floor loading constraints.

207-947-8200; fax 207-947-3693
www.nautel.com; info@nautel.com

Broadcast mixer
Lawo AG

Z4: The Z4 is a digital, four-fader broadcast mixer including integrated signal processing with freely combinable interfaces. It is equipped with two fixed mic/line inputs and combinable analog and AES3 inputs. The unit offers as many as 14 local analog or digital inputs. Sample rate converters on the inputs and adjustable clock frequencies of 44.1kHz and 48kHz are also features. All output signals can be analog as well as digital. Other features of this product include 19" 1RU mounting frame; remote control unit; different input interfaces; stereo, mono, left or right signal channel modes; four stereo summing busses with limiter and Ethernet 10Mb/s for control of external matrices.

+49 7222 1002 0; fax +49 7222 1002 24; www.lawo.de; info@lawo.de

Diatonic pitch shifter plug-in
Eventide

Octavox Harmonizer: The Reverb and Octavox Harmonizer diatonic pitch shifter plug-ins for Pro Tools for Mac v5.1.3 or greater, are based on the sounds of the Orville digital audio effects processor. Octavox allows users to create stacked harmonies and wide choirs locked to the tempo of the session. The GUI allows the user to load, edit and save a preset, and allows access to the pitch-shifting capabilities, as well as providing musical control of the pitch and delays using the Notation Grid. Each reverb offers three-band stereo parametric equalization before and after the reverb, reverb contour for built-in tone shaping, a pair of delay lines with filters and a high-quality compressor.

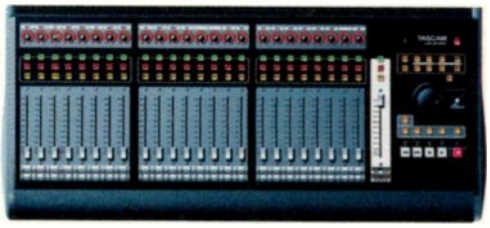
201-641-1200; fax 201-641-1640
www.eventide.com; audio@eventide.com

Remote wattmeters
Coaxial Dynamics

RF Wattmeters: These high-power, remote wattmeters measure RF waveforms such as CDMA, DAB, CW and AM and FM. Several models are available to measure forward and reflected power in 50Ω coaxial transmission line systems with 5/10/25 or 15/30/60 scales. The 98952-A wattmeter with 5/10/25 scales includes two 10' cables and an ac adapter. The 98954-1 with 5/10/25 scales includes forward/reflected switch, four 10' cables and ac adapter. The 98958-A and 98959-A with 15/30/60 scales include forward/reflected switch, four 10' cables and ac adapter.

800-COAXIAL; fax 216-267-3142
www.coaxial.com; sales@coaxial.com

DAW controller
Tascam



US-2400: This controller features 25 touch-sensitive 100mm moving faders for full mix control without patching together multiple expanders. Each of the 24 channels has an assignable encoder with an LED ring that displays the current value or doubles as a signal meter. A full transport section is also included for DAW control, as well as a joystick for surround panning. Other features include touch-sensitive motorized master fader, 24 encoders assignable to pan, aux or channel strip and transport section with smooth jog/shuttle wheel. Bank switching provides access to 192 channels.

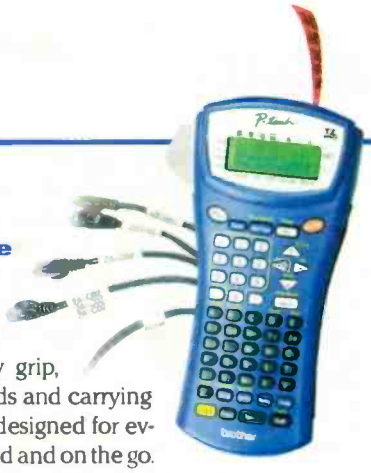
323-726-0303; fax 323-727-7635
www.tascam.com; tascamlit@tascam.com

Broadcast tuner adapter
Audioscience

ASI8702 and ASI8703: The ASI8702 is a universal PCI card that contains eight AM/FM tuners. Each tuner may be set to an independent AM or FM radio station. The audio from each tuner is presented to the computer host as a mono or stereo record stream, which may be accessed through a high-speed bus master interface. The ASI8703 is similar to the ASI8702 except it contains eight FM/TV audio tuners. The AM portion of each tuner (ASI8702 only) has a medium wave tuning range of 520kHz to 1,750kHz. FM capabilities include a tuning range of 76MHz to 108MHz with software-controlled stereo decoding. An onboard 225MHz 32-bit floating point DSP from Texas Instruments provides audio routing, processing and streaming allowing as many as eight stereo streams to be sent to the host PC for recording or further analysis.

302-324-5333; fax 302-738-9434
www.audioscience.com; sales@audioscience.com

Portable labeller
Brother



PT-1400 and PT-1600: With an easy grip, rubber impact guards and carrying case, the PT-1600 is designed for everyday use in the field and on the go. The labeller features rotated text, easy-swap tape cassettes, bar code symbologies, telecom/datacom templates and built-in telecom and data symbols. The PT-1400 offers easy-swap tape cassettes and the ability to automatically number the labels. The vertical handheld design with its calculator-style keypad provides six built-in telecom/datacom specific templates and 10 pre-formatted general label designs and print options for printing multiple copies, serialized labels, vertical, horizontal, rotated and mirror text. The labeller also offers memory functions and a built-in library of symbols.

908-704-1700; fax 908-704-8235; www.brother.com

RBDS generator
Audemat-Aztec

FMX480: This product combines a stereo generator with a full range of RBDS services in a system that can be securely managed from anywhere via TCP/IP. The unit includes a digital stereo generator with analog and digital inputs, the FMB80 RBDS encoder and a digital composite clipper. The generator uses high speed DSP to create the stereo signal and RBDS subcarrier. Plug the unit into any data network, or the Internet, for secure management of the signal and messaging from anywhere in the world. Subcarriers are combined in a single digital operation for a clean signal. There are no analog bandpass filters in the encoder to degrade audio quality.

305-692-7555; fax 305-682-2233; www.audemat-aztec.com; contact@audemat-aztec.com

Upgrades and Updates

Orban has released version 3.0 software for the Optimod-AM 9200. The software adds two new presets as well as improved PC Remote Control software, which increases connection reliability over modems and adds Ethernet connectivity.
www.orban.com

Adobe has unveiled Audition 1.5. This software release is the first revision since the product was taken under the Adobe brand. New features of the software include integrated CD burning, pitch correction, automatic click/pop elimination and the ability to save custom keyboard shortcuts.
www.adobe.com

Eventide has added a 40-second option to the BD500 profanity delay. Existing BD500 units can be upgraded.
www.eventide.com

Harris has released version 1.6 firmware update for the Sage Endec. It adds new event codes, subdivision names and marine location FIPS codes to the EAS system as per the April 2002 FCC Report and Order. Users are cautioned to use versions 1.7 or greater of the Endec Pro and Endec DJ software packages or version 2.0 of the Endecset program.
www.broadcast.harris.com/radio/sage

The Logitek Audio Engine router and its line of digital console control surfaces now offer intercom functionality that may be run as a stand-alone system or may be integrated with a Logitek digital console. Switched or party line operation is possible, along with Director priority switching and standard IFB functions. ■
www.logitekaudio.com

Class-A discrete mic preamp
Blue

Robbie: Robbie is a single-channel Class-A discrete tube microphone and instrument preamplifier with no ICs and discrete components from input to output. Features of the mic include audiophile-grade ultra low noise metal film resistors and polystyrene capacitors. The mic preamp provides an electronically-balanced, fully discrete input stage, tube gain stage (ECC88 twin triode), and an electronically-balanced solid-state output stage. There is no switching crossover distortion in the balanced audio signal path. The unit achieves 34dB headroom before clipping.

818-879-5200; fax 818-879-7259; www.bluemic.com

Adobe Audition Training
Total Training

Adobe Audition training: With multitracking capability to record, mix and edit sessions with up to 128 stereo tracks, this audio program–*Total Training Presents: The Essentials of Adobe Audition*–offers four hours of instruction on two DVDs. The instructor walks users through the full scope of Audition's advanced audio capabilities, from quickly constructing soundtracks with convenient looping tools, to creating high-quality effects, to using the program's mastering tools to finalize the audio mixes.

888-368-6825; fax 760-517-9060
www.totaltraining.com; info@totaltraining.com

Crimp connector for coax
Bomar

Crimp RCA Connector: These crimp-on plugs are designed for RG59 and RG6 coaxial cable and are the latest addition to the Specialty Broadcast Connector series. The high frequency, 75Ω impedance of the RCA plugs offers audio accuracy. Manufactured of precision-machined brass with heavy nickel plating, these corrosion-resistant interconnects feature gold-plated, semi-captive contacts for durable, long-lasting connections. The connectors' shielding technology provides isolation from EMI and RFI interference. A crimp tool is also available.

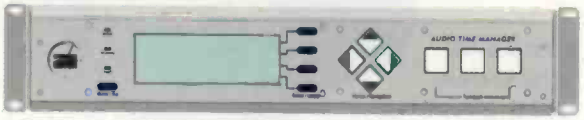
973-347-4040; fax 973-347-2111
www.bomarinterconnect.com; mail@bomarinterconnect.com

On-air console
Harris

RMX Digital: The newest addition to the family of Vistamax-enabled, networkable consoles is the RMX Digital on-air digital radio console. The RMX Digital was developed for radio broadcasters who want a digital version of the PR&E Radiomixer analog console, but with the features of the BMX Digital and Legacy consoles. RMX Digital offers a secure upgrade path with analog and digital inputs and outputs, allowing broadcasters to start with analog and easily upgrade to digital when they are ready. The system features the same BMX Digital switches and LED illuminators, and the same construction with support for multiple telcos.

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

Time shifter
25-Seven



Audio Time Manager: ATM allows users to delay the start of live programs and shorten their duration, in real-time, to accommodate unexpected breaks or to create additional availabilities on an on-going basis. Its time compression technology is clean so that users can conservatively add about three minutes per hour to a schedule. Depending on the program source, users can more than double that and still maintain acceptable broadcast spoken language quality. The scheduler does not remove important content, change pitch, damage inflection or create artifacts. It integrates into digital and analog facilities providing smooth content insertions, network rejoins and broadcast delays.

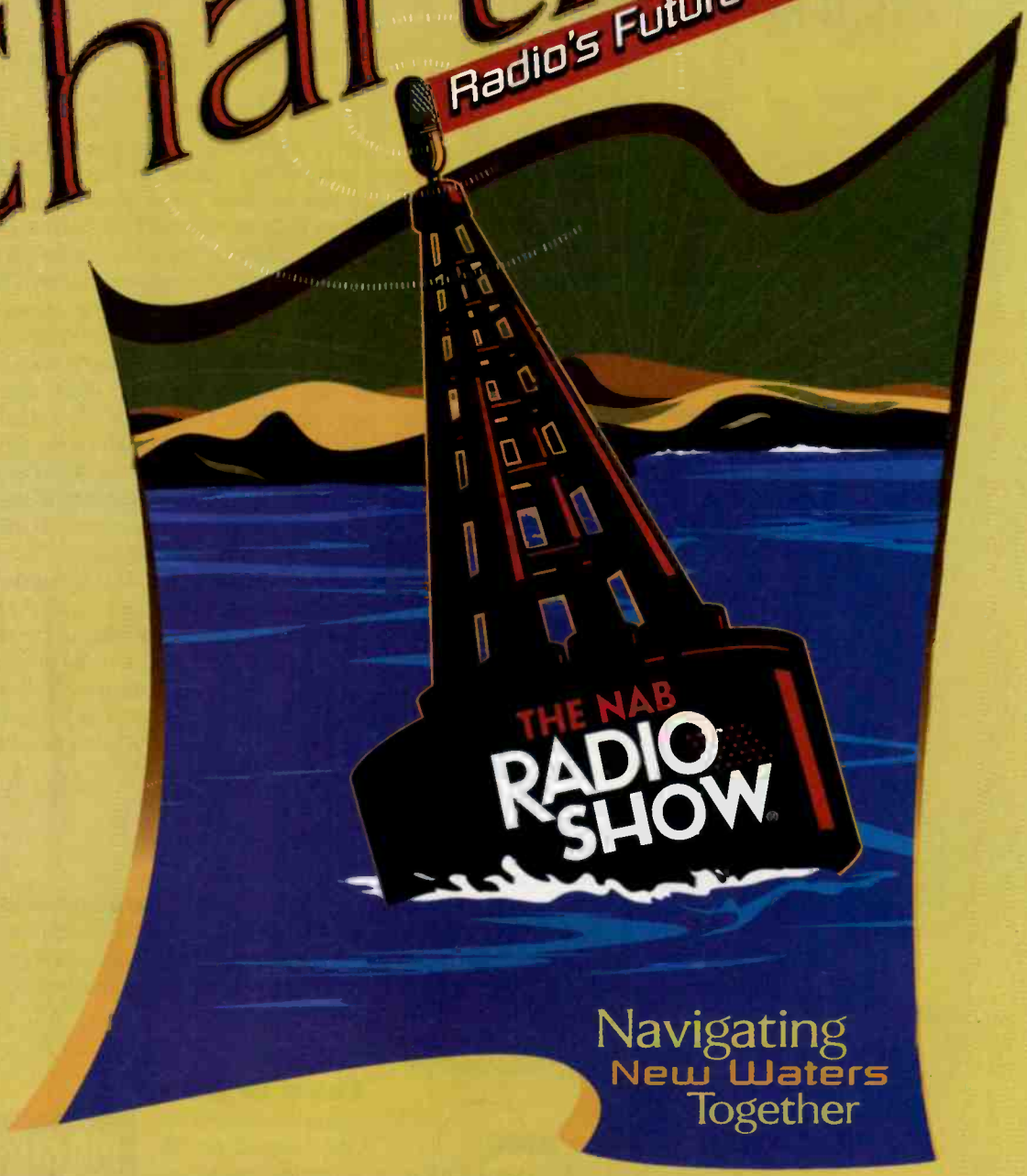
888-257-2578; www.25-seven.com; info@25-seven.com

Audio file converter
Acoustica

MP3 To Wave Converter: Features of this converter are: converts MP3 into CD quality format WAV files ready to burn; converts freely between WMA, MP3 and WAV; batch convert folders and subfolders with a single right click; automatically normalizes audio files to a consistent volume level; will sense incomplete music downloads or blank songs; automatically trims unwanted silence from the start and end of songs; and converts music play lists (.M3U, .PLS) to WAV.

559-692-2224; fax 559-692-2214; www.acoustica.com

Charting Radio's Future



Navigating
New Waters
Together

October 6-8, 2004
Manchester Grand Hyatt, San Diego, CA

www.nab.org/conventions/radioshow

Reader Feedback

More hi-fi WiFi

Nice editorial in the June issue [When hi-fi meets WiFi]. In addition to the relatively slow national roll-out of broadband, the user interface on all Internet appliances needs serious help. Users require the ability to seek programming content on the Internet in as easy a fashion as it is to punch a button on a radio or television remote control.

Last week I ordered and received a new Linksys audio media adapter. This unit essentially picks up where Kerbango left off. Initial provisioning of the Linksys unit was far too complex—and my networking skills are excellent.

Once the unit was provisioned and streaming, searching for local network hard drive content and available Internet stations was an absolutely painful experience. Finally, I gave up and sent it back for a refund.

The concept of Internet multimedia portability is a good one. Access to high-speed networks via WiFi and wired connections is becoming more prevalent every passing day, giving users the ability to watch and listen a wide variety of programming choices. But until my grandmother can make use of these devices without requiring CBNT certification, the companies who manufacture Internet appliances are destined to keep failing.

Paul Christensen, CPBE
attorney
Jacksonville, FL

DRM, the other IBOC

I really liked your DRM coverage [in the May 26 issue of the IBOC Update e-mail newsletter]. I would like to point out that depending on the mode DRM is capable of more than 24kb/s. In a 20kHz channel and low interference, the rate could be as high as 72kb/s. The DRM specification permits user selection of either 16 or 64 QAM modulation, channel bandwidth and error correction as well as three types of audio coding, ACC SBR being used at normal data rates. Modulation type and error correction is determined primarily by the available channel, the amount of fading and interference. With higher data rates, more than one program can be delivered. Even at 24 kb/s, multiple programs can be delivered at voice quality or capacity can be scaled for more data delivery. In hybrid mode where only 10kHz is available for digital carriers, the 24kb/s you stated would usually be correct; although this could be as high as 26.6kb/s or as low as 14 to 18kb/s if heavy interference is involved. This is based on North American 10kHz spacing (10kHz bandwidth). I believe the 24kb/s you cited is for a European 9kHz spaced channel. 55kb/s is the usual top data rate for ground wave or moderate skywave propagation in a 20kHz-wide channel, which is how one would expect any digital-only system to function in North America.

As I mentioned, a maximum of 72kb/s can be achieved in a low-interference (64 QAM) mode while at the other end of the spectrum where a typical AM signal would be considered unlistenable; rates under 10kb/s can be delivered in 16 QAM mode. It is not unreasonable to expect 64kb/s performance in the typical US AM channel, which is the same data rate currently suggested for the primary Audio channel in the NPR Tomorrow Radio project, which operates in the FM band.

Robert Meuser
New York

Mark Krieger responds:

Yes, It's true that with 20kHz of bandwidth more data can be moved, but that's a fantasy in the US, Canada or even Europe, so I didn't see the point in elaborating on it. The higher data rate may prove useful in some developing nations and on shortwave, however.

Learn to burn

Excellent article by Alex Kosiorek on CD recording (Maximum Burn) in the April 2004 issue. Very informative and enlightening! The writer obviously got his hands dirty doing the research.

Michael Feerick
development manager
Audio Processing Technology
Belfast, N. Ireland

comments?
radio@primediabusiness.com

Success for IBOC

There have been many online discussions about IBOC, covering a wide range of ideas. I have a few IBOC thoughts to add.

1. Content. If people want to hear it, then the delivery won't matter.

2. If the consumers don't buy the radios, it is dead. Game over.

3. Maybe the overly simplistic way to go beyond the "does too/does not" argument of IBOC interference is to simply run a proof on a station's radials. Measure the first-adjacent apparent signal strength of the digital carriers. Then you can calculate the effective carrier strength of the two new allocations you've just built. A carrier is not a sideband.

4. If a station I work for has enjoyed coverage out to the fringes for a few decades, I'll be a bit upset if a neighbor comes along and tries to steal it. I've had the constructive use of that covered area for a long time, and could probably argue that in a court as an adverse possession matter. Might not go anywhere, but all it takes is one sympathetic judge somewhere to stop the whole IBOC thing dead in its tracks.

5. How many years will it take to get a good installed base of IBOC stations? For a good penetration of the receivers? Now, how many years before we get G3 or G4 portable Internet connections? Factor in streaming.

6. Just what is going to derail XM and Sirius at this point? Some grousing about local content? Lack of EAS? It's all about content. See #1. Cost? Ten bucks a month is chump change.

Some IBOC opponents denigrate DXers and radio hobbyists. I would dare say that the overwhelming majority of radio engineers got interested in this business via that route. Maybe the lack of radio hobbyists is why there are so darn few new engineers coming into the field. I can personally thank Fibber McGee and Molly over my grandmother's radio for my nudge in this direction.

IBOC needs to become open source so there is a real interest from other manufacturers and even hobbyists. DRM has this as a strong point. Set standards, publish them

and stand back. Huge fees and yearly licensing will pretty much guarantee that Mom n' Pop broadcasters won't upgrade. They can't afford it. If you don't have a large enough percentage of broadcasters doing IBOC, you can't (politically) force the transition out of hybrid to only digital.

Stations need to upgrade their facilities to properly pass the IBOC signal. For some AM stations, especially directional arrays, this can be a real hurdle. It is possible some licensees simply won't be able to afford this. It may come to some form of government grant or zero interest loan program so these places can employ IBOC. Otherwise there may be a number of stations simply going dark, disproportionally in smaller markets. Politically, this can be a big issue.

The transition period of hybrid mode is going to be a real problem. For every station that lights up IBOC, two adjacent frequencies are negatively affected. This transition needs to be done with some reduced IBOC carrier strength so the neighbors aren't blasted out by the sounds of your digital party. Receivers need to be out there and available at cheap prices. I really have no answer to the interference issue vs. the need for digital to work over a served market. The requirements are mutually exclusive.

IBOC will be competing with other emerging technologies such as XM/Sirius and Internet streaming. Some of the streaming sites are beginning to make money. If it wasn't for the draconian licensing requirements published by the Library of Congress, streaming would likely be far more important than it is now. The Library of Congress licensing essentially killed streaming a few years ago. However, they may have given AM and FM broadcasters a bit of breathing room.

I honestly don't see IBOC as the real problem facing broadcasters. It isn't delivery, it's content. IBOC needs to accompany a real shakeup of the on-air product. In the end, IBOC will be entirely a political matter, with the broadcasters simply doing what they are told or going dark. I will say that none of my clients have indicated any interest in buying IBOC capability. Several AMs and a couple of FMs are on my list.

Craig Healy
www.am-dx.com, Chowdanet BBS
Providence, RI

The Kenwood HD Radio receiver

I installed the Kenwood HD Radio system in one of our Ford station vans. The head unit is the Kenwood KDC-V7022 with the requisite Kenwood KTC-HR100 HD Radio black box. I also replaced the speakers with a pair of Alpine SPR574a coaxial 5x7" drivers.

The sound quality improvement of the HD Radio system is immediately evident. On FM, the receiver takes six to eight seconds to acquire the digital signal and cross-fade the audio. At that point the high end opens up and becomes musical and cleaner. Much of this could be attributed to the differences in audio processing between the two air chains but I must say I've never heard this much top on any analog system. Also, cascaded compression, while noticeable, is not offensive if the HD Radio exciter is the second pass. Three or four passes might be nasty.

The HD Radio receiver's head unit has Kenwood's usual tiny buttons and overly zany Carnival display. Its flip down front panel (which would likely obscure factory HVAC controls in some cars) is attractive and offers a ton of extra room for controls, but is for some reason left largely blank to the right of its volume control. This layout offers more room for the display too; room that is also squandered because roughly one-third of it is used for a chasing graphic showing EQ settings and random light shows. The frustrating and convoluted menu system could be much easier to use. Many of the receiver's functions are accessed by either holding or dynamically reassigning the tiny buttons. In some cases, the station preset buttons are used to access sub menus and don't return to preset duty until that mode is manually exited. Also annoying is the unit's tendency to mute while performing non-audio related functions. Also disappointing is the lack of any HD Radio indication when in digital mode and the inability to display the station's call sign, frequency and the TOD clock simultaneously. It also doesn't receive RBDS.

AM sound is likely the most dramatic improvement. When a station is selected, its analog audio is routed to the speakers for a couple of seconds then the system cross fades to digital audio stream. The difference is dramatic. Music is perfectly listenable and voices sound natural and clear. As advertised, AM digital is easily as good as FM analog. I wonder how well it works in a thunderstorm.

I applaud Kenwood for being first to the HD Radio party, really. But these nagging operational issues make me wish for the Panasonic CQ-CB99000U—even at $320 more.

Michael Kernen
chief engineer/building project manager
Greater Media Detroit

Note: The KDC-V7022 is a discontinued model. Newer models have replaced this version.

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Radio®

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Radio M.A.R.S.

On March 2, 1897 Marconi was granted the first wireless patent.

On March 2, 2004 radio signals capable of changing the way we see the universe and ourselves were being beamed to earth from the red planet.

In other words, radio is just getting started.

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Contributor Pro-file

Meet the professionals who write for *Radio*.
Every month: FCC Update, page 12.

Harry Martin
Member, law firm of Fletcher, Heald & Hildreth
Rosslyn, VA

The technical consultant for legal issues in *Radio* magazine, he has contributed the FCC Update column to *Broadcast Engineering* and *Radio* magazines since 1982.

Martin is a member of the law firm of Fletcher, Heald & Hildreth, specializing in broadcast law. He spent four years on the Executive Committee of the Federal Communications Bar Association (FCBA) and served as the group's secretary for two years. Currently, he is the president of the organization. He is a regular speaker at broadcast conventions and FCBA Consulting Legal Education seminars.

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Written by radio professionals
Written for radio professionals

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Sign Off

By Kari Taylor, associate editor

www.beradio.com

Do you remember?

Advertised in 1981, the MAP II Multiband Audio Processor from Inovonics offered users eight-band compression. Each band had its own compression and equalization controls to tailor the sound while maintaining high program density. The compressor would change gain in response to inputs to its own and adjacent bands.

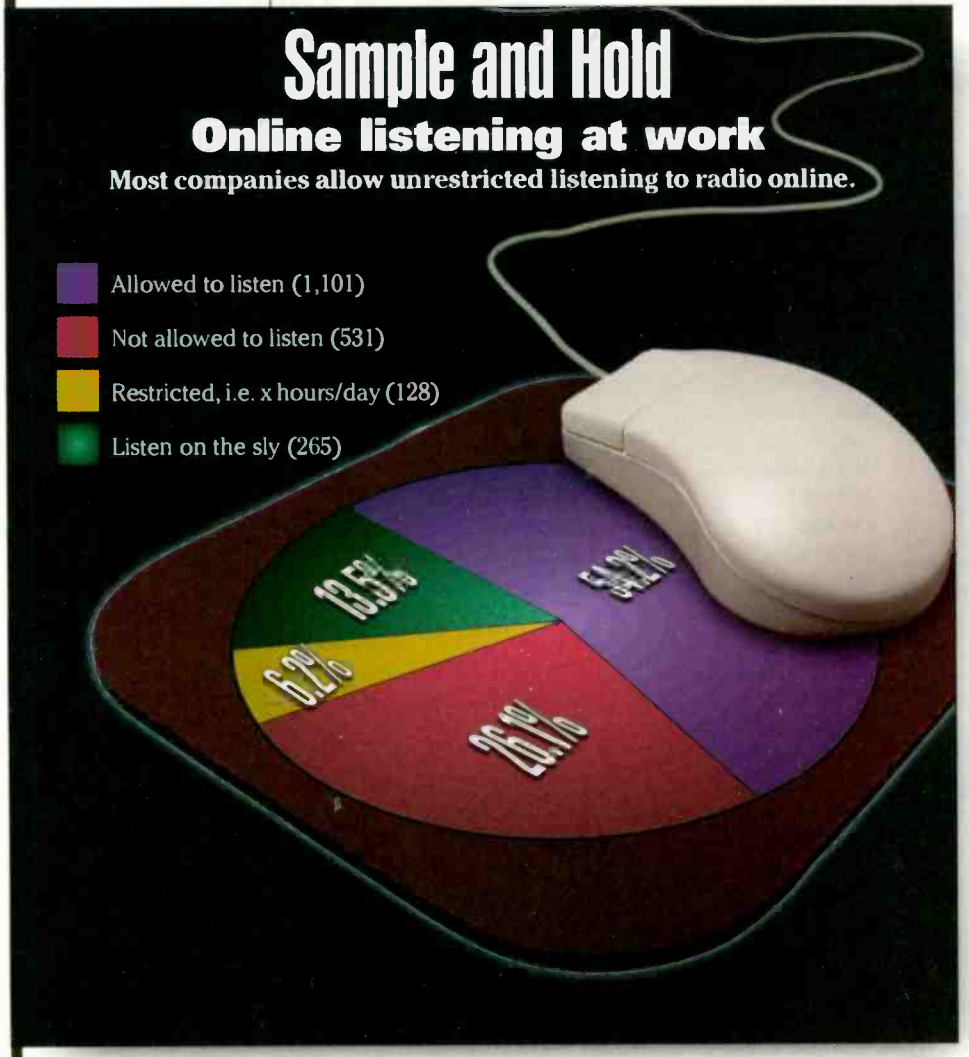
The processor featured inaudible phase optimization, which meant the program phase was silently rotated rather than instantaneously switched to maintain positive modulation.

The processor's peak controller combined a hard clipper with a low-distortion peak limiter. For stations with remote transmitters, the peak controller could be unplugged and installed at the transmitter site.

Sample and Hold

Online listening at work

Most companies allow unrestricted listening to radio online.



Source: RRadio Network, "Survey 22" – 2,025 respondents, Feb. to March 2004.

That was then

This picture is from the cover of the November 1979 issue of *Broadcast Engineering*. The station, WBNO-AM of Bryan, OH, worked with MIT Lincoln Laboratory and the Department of Energy to install the 800-module solar array in the foreground. The 33,600 photovoltaic cells could produce as much as 15kW of peak power for the station. The solar array occupied 1/3 of an acre of land.

To read the original article on WBNO from 1979, access this article online at beradio.com.

Wheatstone Corporation

D-8000

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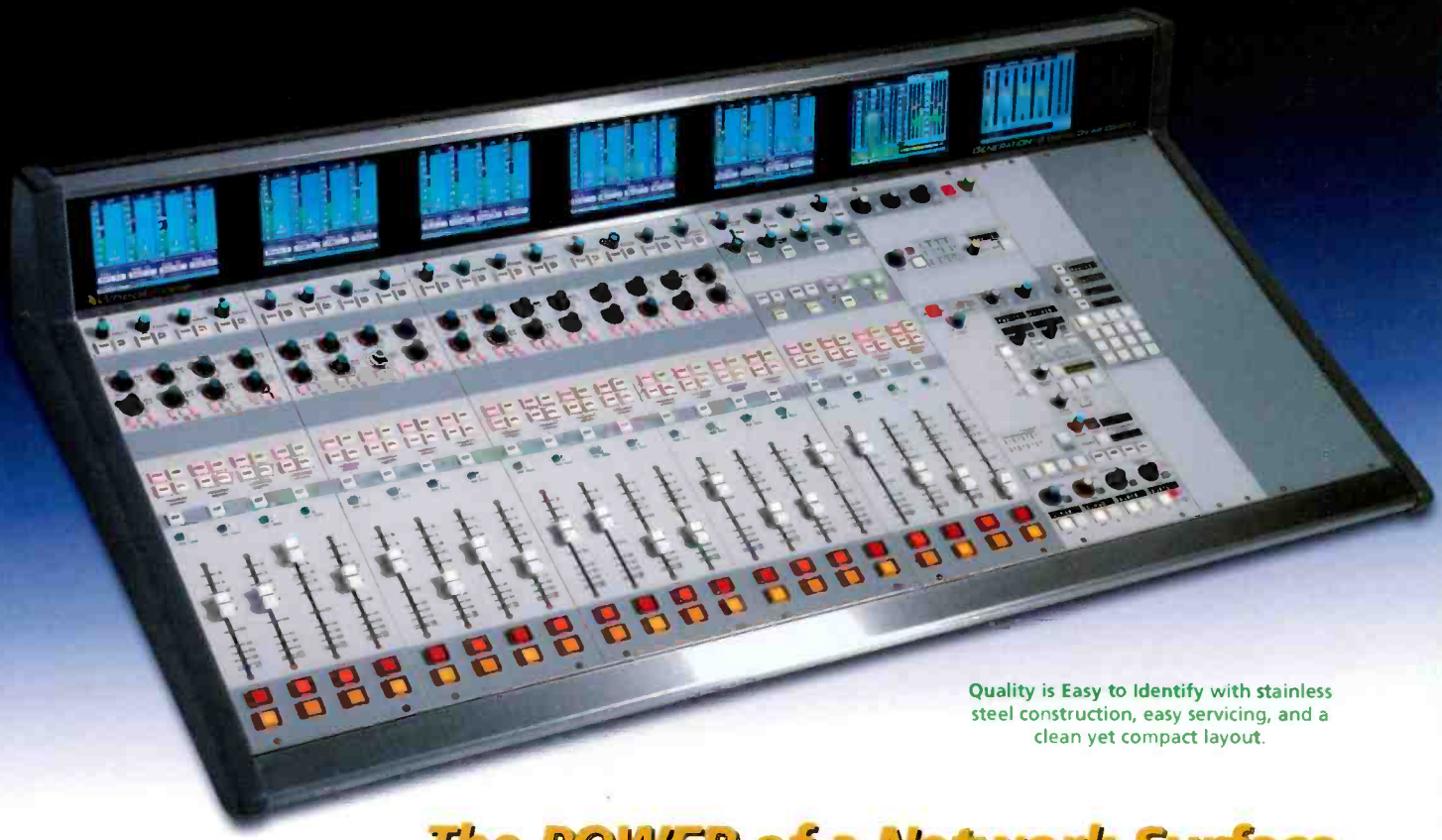

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