www.beradio.com January 2005

Radio®

THE RADIO TECHNOLOGY LEADER

Time for a CHANGE

Michigan Radio rebuilds

The codec connection

Trends in Technology

The Radio Factor

Net Works

A PRIMEDIA Publication

CHECK OUT OUR LATEST!

The NEW AUDIOARTS D-75 DIGITAL RADIO CONSOLE

A CLEAN, CLEAR on-air design: straightforward layout, easy tabletop installation, and best of all—*completely modular.*

A TRUE plug-and-play radio board from the Wheatstone digital design team!

AUDIOARTS ENGINEERING

sales@wheatstone.com / tel 252-638-7000 / www.audioarts.net

We're Reshaping The Future Of Radio From A Solid Foundation Of Leadership.

The newest force in radio was forged from a rich heritage of leadership that is decades strong. We're bringing a breath of fresh air and a re-energized spirit to an industry we helped to build. At Team Harris Radio, we've brought together the industry's largest and most comprehensive range of products, services and people dedicated to advancing radio. All working together in perfect harmony and focused on the success of your business. From our innovative products to our forward-looking services, management tools and expert support teams, we're dedicated to our mutual future of pioneering and growth. So whether you're audience is around the corner or around the world, Harris Radio is on the air with the resources you need to succeed.

To learn more about the new Harris Radio Team, call us at **800-622-0022** or visit us at **www.broadcast.harris.com.**

THE NEW HARRIS RADIO TEAM IS ON THE AIR


AM/FM


AUDIO CONSOLES


DIGITAL RADIO


BROADCAST STUDIO


HIGH POWER AM


SYSTEMS & SERVICE

www.broadcast.harris.com

HARRIS

Contents

Radio
THE RADIO TECHNOLOGY LEADER
Radio Magazine
www.beradio.com
January 2005 • Volume 11, Number 1

www.beradio.com

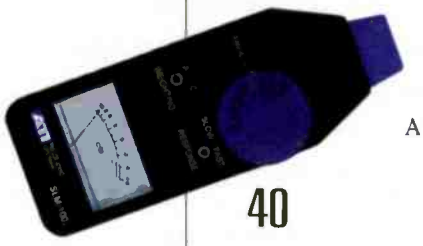
Features


16


18

Departments


36


40


50

Columns

ON THE COVER:
After 55 years, Michigan Radio has built new studios in a historic building. The mix of old meets new provides a functional, showcase studio. Photo courtesy of Designcraft. Cover design by Michael J. Knust.

Juice up your Remotes

i-Mix G3

The new Tieline i-Mix G3 codec mixer combines 6 valuable remote broadcast tools into one 16x9" compact box.

- Your choice of powerful POTS, ISDN and GSM codecs
- A configurable 16x11 cross point digital audio router. (optional)
- A configurable live communications facility for local and back-to-studio communications.
- A 7 input and 3 output configurable digital audio mixing facility.
- A built-in telephone talkback facility for taking live callers in the field
- On-board relay and RS-232 control system for local and remote control of equipment at either end of your codec link.

Contact your favorite dealer or Tieline Technology to order your free demonstration i-Mix G3 and see www.tieline.com for a complete functionality and specification list.

800-950-0750

www.tieline.com/be

Tieline® TECHNOLOGY

www.beradio.com

DEMO ROOM

Currents Online

Highlights of news items from the past month

Arbitron Recruits for Houston PPM Trial

Ratings trial has about half of the desired 2,100 participants.

NRSC Intros RBDS Open Data Application

Two system proposals have already been submitted, and the NRSC is accepting additional proposals into January.

Berenics Joins Wheatstone

Sandy Berenics' career includes work for Harris and PR&E.

BE Provides Audiovault Upgrade for Content Depot

All Audiovault users will be able to interconnect their system with Content Depot at no charge.

First Broadcasting Names VP of Engineering, Software Systems

Alastair B. Westgarth will direct all of First Broadcasting's engineering and software initiatives.

DSPX V2 now available

V2 software of the UK designed and built FM - DAB - NET digital audio broadcast processor is now available

- 18 24-bit DSP's provide over 1 GIGA-MIPS of processing power
- Comprehensive BLUE LED audio metering and screen
- Digital and analogue IO
- Wide and multi-band AGC's with intelligent gating
- Multi-band programme dependent limiting
- Multi-band look ahead limiting and distortion cancelled clipping
- High performance DSP stereo encoder with composite clipping control
- Back panel and rackroom (front-panel) RS232 control
- LAN (TCP/IP) port for remote monitoring and control
- Real time clock for preset scheduling
- Remote trigger port
- Silence/fallback switching
- Password access and control
- Full Range of user presets with A/B switching
- Software upgradeable

www.dsp-x.com

broadcast warehouse

Digital alternatives

Do you think that Ibiquity's HD Radio is the only digital transmission system in development? Think again.

While Ibiquity has the biggest presence, there are other players.

Digital Radio Mondiale (DRM) is a system being deployed internationally on frequencies below 30MHz. Similar to the Ibiquity system in some ways, the DRM Consortium is considering expanding its use up to 120MHz. This decision will be discussed during the group's next general meeting in March. The change would allow the DRM technology to be used in the FM band.

Leonard Kahn has been touting his Cam-D system for some time. While the theoretical system has been promoted, empirical results have yet to be shown. The system is designed for use only on AM.

There is now a third system that has appeared. Digital Radio Express (DRE) has been quietly developing a system since it licensed its technology patents to Ibiquity in 1999. While DRM and Kahn use the baseband spectrum to transmit a digital signal, DRE is moving above the baseband and into the subcarrier region. By using the subcarrier region of an FM station, a data stream up to 160kb/s can be transmitted. According to DRE, this subcarrier does not create any interference to the baseband signal, whether it is analog or IBOC.

My first reaction was to note that subcarriers are typically not the most robust signals, particularly with multipath. DRE states that this is has been overcome. I'll have to wait for a live demonstration to see for myself.

The system, called FM Extra, uses AAC Plus to encode the audio. DRE also has a partnership with ST Microelectronics to build the chipset, and Rikei to manufacture the receivers.

Does all this subcarrier talk sound familiar? You might remember the test conducted at WCRB in 1995 that placed a digital stream on a wideband subcarrier. The DRE system appears to be a similar approach. The main differences are the modulation technique and the coding algorithm.

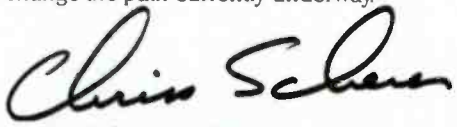
This immediately made me wonder why a technology that began development nearly 10 years ago would resurface. After reviewing the history, I learned that the WCRB project, which was in partnership with Lockheed, was terminated for two main reasons. First, there were changes at Lockheed, and in the end there was no project champion to continue the push. The other is that in the early days of digital radio development, the desire to implement a single standard for AM and FM was strong. A digital subcarrier only applies to FM.

Times and technology change. While a single standard for both services may still be desirable in some ways, we are more accepting of the best technology for a given application.

This work has been a well-guarded secret. My first step was to visit the website of DRE to learn more, but the website provides little practical information. The material presented is vague, with general claims about the costs and benefits of the system. When I called the company to learn more I was given the same general information. Some specifics need to be revealed soon for the system to show any promise of being accepted. One item that was revealed is that some on-air tests have been conducted in Los Angeles, San Francisco and Minnesota. DRE expects to make several announcements during the first quarter of this year.

While the transition to IBOC could take several years and cost stations thousands of dollars to implement, DRE notes that its system could be implemented today. In most cases, a station will not have to make any changes to its transmission system. While this may be true, consumers will still have to purchase a new receiver, assuming DRE can even make them available. The system also ignores AM altogether, but it could be argued that another system—DRM, for example—could be used for that spectrum.

While a single digital transmission standard has not yet been adopted by the FCC, the industry has already begun moving to IBOC. Regardless of any advances or innovations that DRE may have made, they may be too late to change the path currently underway.



Chriss Scherer, editor
cscherer@primediabusiness.com

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

GET IN ON THE ACTION... ON OR OFF THE FIELD.

Matrix Portable:
Delivering the sound of the coin toss to listeners around the world is as simple as pressing a button. Only the advanced Comrex Matrix POTS codec delivers the highest quality audio and superior connection reliability over both standard wired and GSM wireless phone connections. Our road-proven design and construction, plus ease of operation and real-world features, make Matrix your best choice for all your POTS and ISDN remotes. The results? Your listeners hear the collision, the grunting, the exhale... and the sound of victory.

Matrix Rack:
Sure all the action is in the field, but a great remote needs a great home base. And there's nothing better than the Matrix Rack. It's compatible via POTS and ISDN with ALL Comrex codecs as well as those from nearly everyone else. Perfect for receiving those calls from the field. Make the Matrix Rack the center of communications for ALL your remotes.

Grab your audience by the ears and give them the full experience—not just a story.

Doing a remote? Put Comrex on the line.

COMREX

Toll Free: 800-237-1776 • www.comrex.com • e-mail: info@comrex.com
19 Pine Road, Devens, MA 01434 USA • Tel: 978-784-1776 • Fax: 978-784-1717

Maintaining directional antennas

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

It is unfortunate that the most important link in any AM radio station' s system is frequently ignored for years at a time. The directional antenna is the last link in the chain between the studio and the listener. If the DA system is not properly maintained and its operating parameters fail to comply with the terms of the license, the losses can include lost income and FCC fines for failure to comply with the rules. The most important thing is to be systematic in one's maintenance plans. On joining a new station, the latest proof of performance of the antenna system should be examined. This is what the FCC will demand to see during an inspection. The operating parameters and this document must agree with the license on display. If there is no license on display, get one immediately. If the latest proof of performance is not available, get one from the consulting engineer who tuned the antenna system.

Physical changes in the antenna system can affect a directional array, but it is equally important to inspect tower fences and clear ground vegetation.

Basic operation

The common point is the input to the phasor, which is the heart of the DA system. The current and input resistance through the system measured at this point determines the power of the station, and their product must agree with the license.

As time passes, components age, connections loosen and corrode, coil taps tend to fail, gas and vacuum capacitors leak and transmission lines leak and sustain damage, or may have their lengths changed. Sampling lines suffer similar problems. In addition, ground systems deteriorate and are lost through chemical action, vandalism or theft of the copper wire and insulators crack. A common problem is caused by improper guy wire maintenance so that the wire becomes part of the radiator and changes its electrical length. Outside the electronic system, vegetation can grow around the base of the tower and change the base operating impedance. This is just a small list of the items that can, do and will change in the average DA system.

Before the days of 24-hour operation, it was possible to perform a daily heat check. Now that most station transmitter sites are not inspected daily, this is not possible, however, the heat check is a great way to find potential problems before they becomes significant failures. Whenever visiting the station, feel the transmission lines, capacitors cabinets and anything else that should not get hot. Keep in mind that this quick check should not replace a regular maintenance schedule.

Every station has different requirements, but if the following list is checked monthly you should be able to catch any major catastrophes before they occur.

- Confirm that all meter readings agree with licensed values
- Confirm that the antenna monitor readings are correct
- Examine the base insulator for cracks, lightning carbon tracks; check ball gap
- Check the transmitter operating log
- Check dog houses for rodents, insects, dirt, hot components and signs of heating.
- Examine the switch contacts, RF line and connection to tower. Be sure there is at least one turn 18" to 24" in diameter between the tower and the doghouse
- Inspect lighting chokes and static drains
- Check the tower lights and photocell operation
- Check all monitor points if required; look for trends, take any required action
- Check the guy anchors and turnbuckles to ensure that lock wires are in place, the turnbuckle is secure and the anchors are sound.

The common point current should be checked and the calculated RF power should be compared to the calculated efficiency of the final stage to confirm that it is reasonably correct. In the event of doubt, the common point impedance must be checked with an operating bridge with power adjusted for the power capacity of the bridge. If the array operating parameters are correct but the common point power (the product of the impedance of the

AEON

breaking down barriers

DIGITAL RADIO ON-AIR CONSOLE

- Full Audio Networking
- Any signal anywhere
- Complete format store, name and recall system
- Dynamic control matrix
- Dynamics and EQ control
- Powerful Mix-Minus capabilities

AEON

- ✚Level meters for all buses and selected inputs
- ✚Talkback
- ✚Macro programming
- ✚Voice processing presets
- ✚16-character channel name displays
- ✚Ultra slim low profile design - only 1" thick!
- ✚Table-top mounting, no furniture cutouts required
- ✚Split or straight console options
- ✚GUI based Autoconfig Setup Tool

Starting at $10K!
Including surface, audio engine and audio platform

AEON - the latest innovation from the market leader

actual height
mm inch
25 1
20
15 1/2
10
5

For more information
visit **www. klotzdigital.com** or call **678-966-9900**

KLOTZ DIGITAL

It is important to check the tower base insulator, spark gaps and tower feedline regularly.

common point multiplied by the square of the common point) is incorrect necessary adjustments must be made. The common point impedance is controlled by the shunt arm of the common point tee network. The common point impedance should be set to the licensed value and transmitter power adjusted accordingly.

The tower environment

Don't neglect the tower environment, that is the area around the transmitter site. If your DA sites are visited only rarely, check for new tower construction on each visit. If any is found, locate the licensee and check records to see if the FCC required a pre-construction pattern interference check. Then follow through to ensure that your pattern is protected. Once these towers are up and running, it is often much harder to get compensation and correction.

When checking monitor points, look for new towers or construction in the vicinity of points that are out of limits. If there is nothing in the area to account for the monitor point change, don't touch the phasor controls. Look at the adjacent points in the proof. If the entire radial is up (it's not usual for them to be down) recheck the transmitter power output. Check the points on each side of the monitor points in question and compare the power and other monitor points on other radials. If only one radial is high, check the operating parameters carefully—especially base operating currents. Look for potential reradiators in the vicinity of the DA, such as a small towers and metal buildings. Use a field intensity meter to determine the azimuth of the maximum signal to see if it is coming directly from the transmitter.

Resist the temptation to adjust the phasor. If you feel you absolutely must twiddle a knob be completely sure that you have written down every phasor dial setting in several places before turning any knob. Never move more than one at a time or you won't know what caused the change. Sometimes a combination of several parameters at maximum limits in the same direction can raise a radial by shifting a null slightly.

E-mail Battison at batcom@bright.net.

BCM 104 High Resolution Broadcast Microphone

Think Of It As A Stealth Fighter For Your Voice

Introducing the BCM 104 Broadcast Mic from Neumann

Neumann has been doing a lot of listening lately. We've been listening to the radio, and what we've heard is that the world really does need a better broadcast mic. A much better one. Introducing the first Neumann mic built expressly for broadcast applications. Our new BCM 104 is a condenser mic that can handle any talent that's thrown at it, and make it shine. And best of all, it does it at a price that's "broadcaster friendly."

Gain the clear advantage – grab the new Neumann BCM 104, and discover what a difference Neumann can make for your voice

Neumann|USA

www.neumannusa.com

The Choice of Those Who Can Hear The Difference

Distributed by Sennheiser
USA: One Enterprise Drive, Old Lyme, CT 06371 • Tel: 860 434 5220 • Fax: 860 434 3148
Canada: Tel: 514 426 3013 • Fax: 514 426 3953 • Latin America Tel: 52 55 5639 0956 • Fax: 52 55 5639 9482

Denver Waiver policy rescinded

By Harry Martin

In a recent and unexpected move, the Media Bureau reversed course on the so-called "Denver Waiver."

The Denver Waiver reflects an effort by the FCC to adjust its general FM allotment standards—developed for universal application to all situations across the country—in acknowledgment of the fact that some circumstances don't fit conveniently into a universal mold. Under the Denver Waiver, the FCC waived Section 73.313(d) of its rules for a number of stations in the Denver area allowing them to exclude from their antenna HAAT calculations the four radials extending over the Rocky Mountains. The problem was that those pesky mountains messed up the validity of the FCC's standard contour prediction method and, without the waiver, would have rendered the affected stations ineligible for full class C protection. The obvious answer: ignore the mountains.

Since the mid-1980s, the bureau has granted a half-dozen or so waivers under this policy, citing the unique conditions around Denver—the Rocky Mountains to the west and flat terrain toward the population centers to the east—as justification for providing full class C protection to stations whose antenna heights above average terrain are below class maxima.

Change in plans

However, when three Denver stations recently requested waivers in connection with minor modification applications they filed, the bureau denied the waivers and dismissed the applications.

The bureau based the about-face on the increased demand for FM spectrum since 1986, demand amply demonstrated by the number of parties objecting to the proposed modifications. Some of those objectors sought to provide new or improved service that would otherwise be precluded by grant of the requested waivers. Noting recent population growth in areas west of Denver, the bureau deemed new service to such population centers more important than continuing protection to Denver Waiver stations. According to the bureau, continuation of the Denver Waivers would frustrate Commission policy favoring additional service over protection of existing stations in excess of actual licensed station parameters.

A couple of other aspects of the decision are worth noting. First, the bureau's decision was largely unanticipated, even, apparently, by the bureau itself; indeed, all three modification applications and waiver requests were originally granted by the bureau. These grants were rescinded when the bureau discovered that last minute informal objections had been filed to the applications by an environmental group and a competing broadcaster. After rescission of the grants, a slew of objections from other broadcasters with competing interests followed, objections that the bureau ultimately endorsed.

Second, while the bureau rejected most of the objections raised by the environmental group, it agreed with the group's claim that the location of the subject towers near the historic Lariat Trail and the National Register-listed Buffalo Bill's grave implicated the National Historic Preservation Act (NHPA). Via footnote, the bureau indicated that replacement of an existing structure constitutes an undertaking for purposes of the NHPA. However, reinforcing the view that size matters, the bureau further noted that construction of a replacement tower that does not "substantially increase the size of the existing tower" within stated parameters would not fall under the purview of the NHPA.

If there is a lesson to be learned here, it is that the FCC abhors waivers of its technical rules. The intricate system of rules, in this case affecting FM broadcast allocations, doesn't work for everyone, but it provides a reliable and consistent means to deal with the thousands of applications the FCC is asked to process each year. Any variation is treated with hostility by the staff because it threatens to open the floodgates for other non-complying proposals. The Commission, which has a small staff of engineers and lawyers to begin with, simply doesn't have the resources to review individual waiver requests. This may have had something to do with the demise of the Denver Waiver.

Martin is president of the Federal Communications Bar Association and a member of Fletcher, Heald & Hildreth, Arlington, VA. E-mail martin@fhhlaw.com.

Dateline:

Radio stations in Kansas, Nebraska and Oklahoma must file their renewal applications, biennial ownership reports and EEO program reports on or before Feb. 1, 2005. Feb. 1 also is the start date for pre-filing renewal announcements for stations in Texas.

LIVE AUDIO OVER IP NETWORKS... WITH 24/7/365 RELIABILITY AND AS LITTLE AS 5 ms DELAY!

AudioTX STL-IP: for STL, Distribution of Live & Shared Programming, and both permanent and ad-hoc Broadcast Quality Audio Connectivity between sites.

- Professional grade Balanced Stereo Analogue and AES/EBU Digital inputs/outputs
- Linear, uncompressed audio at up to 24 bit, 96kHz sample rate
- MPEG Layer 2, J.41 or ADPCM compressed audio from 64kbps
- Uses LAN/WAN, Telco, Private/Dedicated circuits, Satellite, Wireless, ATM, T1/E1, Internet/ADSL
- Flexible Network configuration for UDP, TCP/IP and UDP Multicast
- Transmit your audio to up to 6 different destinations
- Ancillary Serial Data and 4 GPIO (end to end contact closures) in perfect sync with your audio
- Selectable FEC (Forward Error Correction) and Jitter Buffer
- 1U rackmount unit. Price £1,600 GBP, €2,400 Euro

www.stl-ip.com

MDOUK Tel. +44 (0)121 256 0200 email: sales@stl-ip.com

Fox News

Bill O'Reilly and Alan Colmes Studio

By Allen Singer

Bill O'Reilly enjoys benefits like a refrigerator and coffee maker in the Fox News studio he shares with talk show host Alan Colmes. They each have their own dedicated—but not identical—mic positions for their separate shows. The hands-on Colmes prefers to operate his own computer, his Enco workstation and the Telos interface. The hosts and guests use a mix of Shure SM7B and EV RE-20 mics. Engineers have found the RE-20s work better for the hosts and can handle more transient spikes before distortion.

The O'Reilly Radio Factor originates from 1211 Avenue of the Americas in Manhattan in the Fox News building. Harris built the studios on the eighth floor for the O'Reilly show in 2002, and the show went live May 8 that year. Inside, the engineer, research assistant, executive producer, call screener and nearly all the equipment are in his control room. Down an adjacent hall is the main studio. It is unique with its 240 square-foot size and its four guest positions of which only two are usually used. A studio-quality camera also has been recently installed so live television shots can be produced with Fox News Channel.

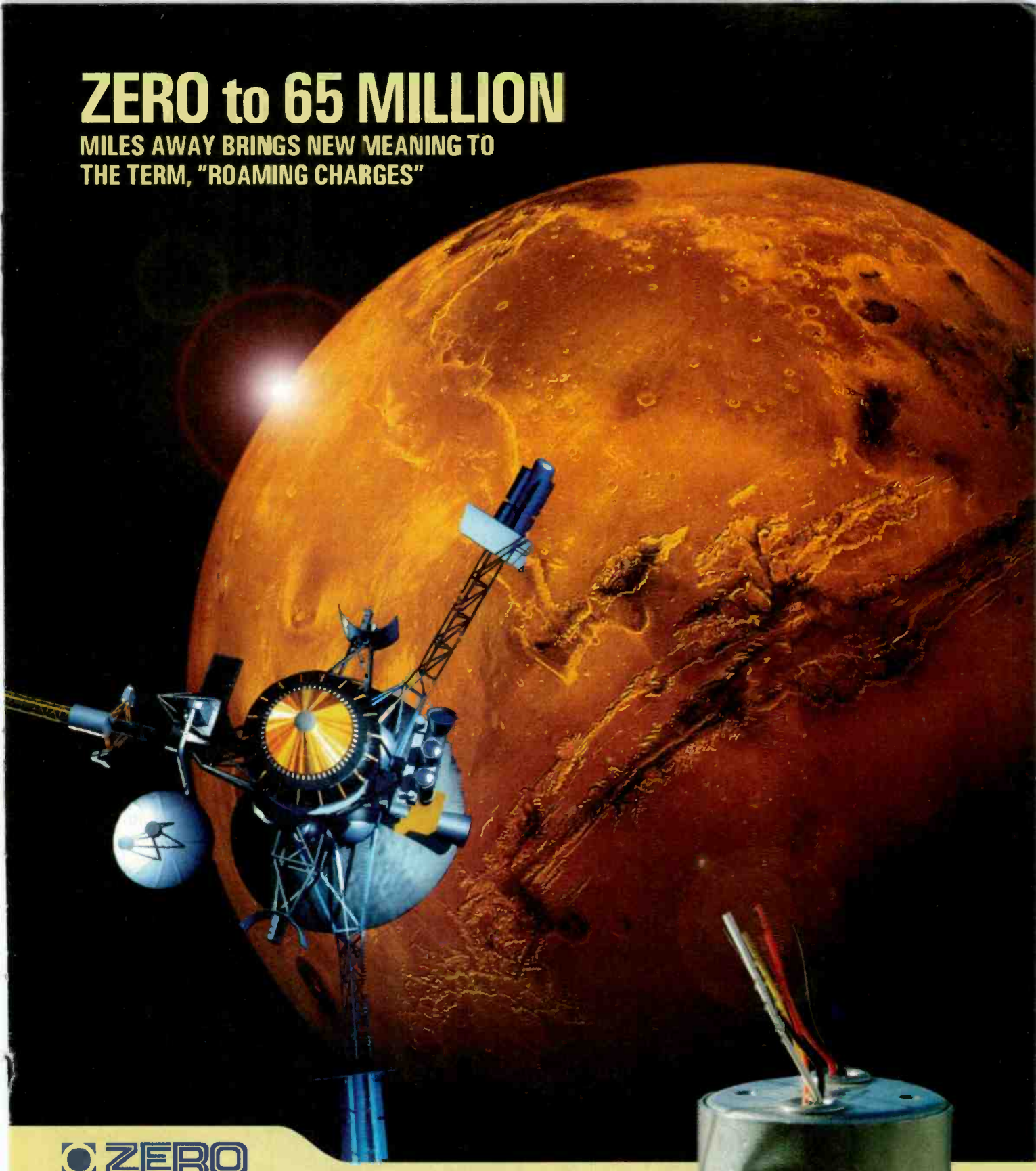
O'Reilly's show is on an eight-second delay and the audio, including bumpers and liners, are sent via 15kHz phone loops to Westwood One at CBS on 57 Street. Twenty-five hertz tones trigger the network commercials, and the finished program is uplinked to the satellite and beamed to the 408 affiliates nationwide.

Equipment list:

Harris Pacific Legacy
Enco DadPro32
360 Systems Digicart II Plus
360 Systems Instant Replay
Denon DN-C630 CD player
Tascam CD-RW2000
Tascam 122MKIII cassette deck
Sony PCM-R500 DAT
Telos 2x12 phone hybrid + 3 desktop control surfaces
Macintosh G4 with Digidesign Pro Tools Digi001 system
DBX 1046 Quad Compressor
Telos Xstream
Philips audio router
Kanguru CD stand-alone CD duplicator
Eventide BD500 broadcast delay
Rane equalizer
Telex Matrix Intercom system
Conex 25Hz/35Hz/combo tone generator
ELO Touch System monitors
Fostex powered speakers
Tannoy System 800 monitors
Leitch clock
Leitch Distribution amps
Bryston Headphone amps

ZERO to 65 MILLION

MILES AWAY BRINGS NEW MEANING TO THE TERM, "ROAMING CHARGES"



ZERO

When our clients say they need our cases to withstand the extreme conditions of the "Final Frontier"-they mean it. Customized enclosures from Zero Manufacturing protect the delicate solar arrays of communication satellites deployed into space. Zero Manufacturing -unparalleled protection-to the edge of the earth and beyond

ZERO. Unparalleled Protection.

www.zerocases.com 1-800-500-ZERO (9376)

Reliable Connections

By Chriss Scherer, editor

The right choice in POTS and ISDN codecs

Using telephone codecs is so easy, it's hard to imagine station operations without them. They are flexible and provide reliable communications and data paths from almost anywhere. With the increase in clutter in the RPU spectrum, and greater challenges in securing tower space for a wide coverage area, the humble codec proves its value many times over every day.

While remotes and live events are the primary use, many stations are using POTS and ISDN codecs for back-up STLs and other itinerant applications. This is facilitated by the availability POTS lines as well as the proliferation of ISDN service. In many cases it's cheap insurance to maintain an additional POTS or ISDN line at a transmitter or off-site studio for use as a back-up STL when needed.

When first introduced, codecs were single-purpose units designed for either ISDN or POTS use. This is still true for some models, while newer designs have become modular in their approach, providing a variety of options depending on the added modules. This evolution has also affected their connection capabilities. Most ISDN codecs offer connectivity to various data interfaces and IP connections. Many can serve as hardware encoders for streaming applications. Both ISDN and POTS are available with enhanced audio features as well.

Getting more with less

While ISDN service provides the highest data connectivity rates, ISDN lines are not always available without advance planning. In some areas, ISDN is still not offered or it may already be discontinued. Once touted as the next major step in telephony, ISDN never saw the widespread use that was so heavily anticipated.

POTS lines, on the other hand, are everywhere. On short notice, you can probably borrow a POTS line for the last-minute remote or unexpected news event. When direct connection to a POTS line is not possible all is not lost. If the only choice is a line from an office PBX, the phone can be adapted for POTS codec use. Devices such as the Mobile Konnector from Konexx can be inserted between the telephone handset and the phone base to emulate a tip/ring POTS connection. The data rate will likely be less than directly accessing the POTS line, but may suffice if there are no other options.

POTS codecs are also evolving to uses with wireless telephony. The low bit-rate challenges of POTS lines have provided valuable lessons for GSM use. Right now GSM provides the most reliable wireless communications path, but it is limited to 9.6kb/s. Significant data reduction is required to transmit audio through this path, but it is possible with satisfactory results. High-speed circuit-switched data (HSCSD) offers a path that is up to four times as wide as GSM, but it is not yet available in North America.

Resource Guide

A sample of available POTS and ISDN codecs

The Resource Guide continues on page 22.

Audio Processing Technology (APT)

The **Worldnet Milano** is designed for fixed-link and ISDN connections. It incorporates Standard Apt-x and Enhanced Apt-x. It communicates via fixed links from 56kb/s to 576kb/s or from one to four ISDN links from 128kb/s to 512kb/s. An S interface is standard and a U interface is optional.

Worldnet Tokyo

The Worldnet Tokyo supports Standard Apt-x, Enhanced Apt-x, MPEG 1 and 2 Layer II/Layer III, G.711, G.722 and MPEG 2 AAC. It also provides MUCAS and J.52 inverse multiplexing bonding algorithms. Simultaneous connections can be made to different destinations. The unit can connect to four ISDN lines. An RS-32 ancillary data path is provided, as are four TTL inputs and outputs for remote control. It can be controlled via RS-232 or TCP/IP.

www.aptx.com

ATA Audio

The **Scoop EZ** can be used with POTS, ISDN, wireless and Inmarsat connections. It includes a two-channel audio mixer with phantom power, a selectable compressor/limiter, and auto answer and configuration of incoming call type (ISDN/POTS). At 9" x 6" x 3" it weighs less than 4lbs. The unit is now available for use with GSM networks by inserting a SIM card into the unit. Audio bandwidth via GSM is 300Hz to 3.4kHz.

Scoop EZ

The Scoop Studio is a 1RU version of the Scoop EZ without the battery backup and mixer functions.

The Hifi Scoop 3 ISDN offers Layer II, Layer III, G.722 and ADPCM. It also incorporates the ITU-T J52-compliant algorithm to automatically negotiate different algorithms. The unit is available in two, four or six B channel configurations. It occupies 2RU.

www.ataaudio.com

a NEW way to do Radio Automation...

a business AND technology 'Solution'

$100 per month

Xtreme 'SOFTWARE'
powerful Windows PC software for live air, automation, scheduling, and production

- No down payment
- Return at any time
- Free Factory training
- Free Hardware support
- Free Telephone support
- Free Software upgrades
- Free Hardware upgrades
- Free PC and Network setup

(just add a PC, we do the rest)

FREE System configuration...

send us your approved PCs and we will load software, configure, and network test your PCs. This is a free service in the Xtreme 'Solutions' program.

FREE Factory training...

Arrakis maintains training studios in its corporate headquarters in Fort Collins, Colorado. The Arrakis Xtreme 'Solutions' program provides free training at its studios in Fort Collins. Come visit our beautiful facility nestled in the foothills of the Rocky Mountains and enjoy the area's hiking, biking, skiing, canoeing and other recreational activities.

FREE Telephone support ...

the Xtreme 'Solution' provides sophisticated support for station personnel by phone, email, web, and other electronic means. Training, maintenance, repairs, and routine support are provided free of charge within the Xtreme 'Solutions' program during business days and hours.

FREE Hardware replacement...

If the Arrakis 'Bridge' hardware should fail for any reason, Arrakis will replace it under our monthly 'Solutions' program at no charge.

FREE Software Upgrades...

one absolute certainty is that PC technology evolves at a furious rate. Operating systems are only one example... Windows 95, 98, Me, NT, 2000, and now XP. Automation software is no exception. Each year sees a new version costing hundreds or even thousands of dollars. With the Xtreme 'Solutions' program, you receive the new versions at no charge.

Xtreme 'BRIDGE'
a 16 x 3 stereo routing switcher, dual PC sound cards, & control logic

the XTREME 'Solutions' program

live on air, hard disk automation, satellite automation, scheduling, & production

Xtreme is a complete solution for live & automated On Air Radio systems. Pay one very low monthly fee, and we do the rest. We supply the audio hardware, software, and support, while all that you supply is the PC. Without a large initial equipment investment there is no financial risk or capital expense: the old automation system can be upgraded out of current operating costs. With free system configuration and training you receive the help you need to make a smooth transition to the new system. With free hardware replacement, ongoing repairs are worry free. Free telephone support helps train new staff, and free software upgrades means you have the latest product features at no cost. The only hardware that is not included is the PC computer and we can help you with that too... also for free. The 'Bridge' hardware supplied by Arrakis contains the audio sound cards, routing switchers, and control logic so that the PC requires NO special hardware or setup. This means that the PC can be off-the-shelf, and unmodified so that it is easily serviced locally. The Xtreme 'Solutions' program is per workstation for complete redundancy and backup. Imagine an AM/FM combo with production room for only $300 per month. With more than 15 years of automation experience and thousands of Arrakis automation systems in the field around the world, Arrakis can provide you with the solution that meets BOTH your business AND technology needs.

...the risk free automation system

XTREME~digilink

Download a demo from our website.

970-461-0730 www.arrakis-systems.com

Arrakis

Reliable Connections

TDMA service provides up to 14.4kb/s, but its data-burst nature makes real-time audio unstable.

Another way to obtain a portable wireless connection is a satellite phone. With a 64kb/s service, most ISDN codecs can be configured to tie into a satellite phone system. The airtime is not cheap, costing several dollars per minute, but it is another way to create a wireless connection.

Decisions, decisions

Deciding between a POTS or ISDN codec can be determined by the needs of the user and the availability of service. As mentioned earlier, if ISDN service is available, it will provide the highest quality connection. The availability of POTS lines makes them attractive if short lead times are the normal routine. In most cases and with a good connection, a POTS codec will provide satisfactory results with a voice transmission.

Compatibility between various codecs is another concern. Most ISDN codecs share some common coding algorithms. G.722, Layer II and usually Layer III are the most common. These algorithms allow codecs from different manufacturers to communicate. Some ISDN codecs provide AAC or Apt-x as well, but because they are not common to all codecs, their use may be limited to a reduced set of codecs and possibly only those from the same manufacturer.

POTS codecs do not share the same widespread compatibility. Except for the claim from Tieline that it will communicate with Comrex units, each manufacturers' POTS codecs will only work with units from that same manufacturer.

The Mobile Konnector from Konexx provides a tip/ring interface through a telephone handset connection.

The delays in an encoding system must be considered when making a connection. Some encoders offer shorter delay times than others. When separate algorithms can be used for each side of the bidirectional path, a high-quality algorithm is commonly used to send audio to the station and a lower-quality algorithm to receive IFB and cueing information back at the remote site. This tradeoff in quality takes advantage of the coding delays used. Layer III and Layer II have longer delays than G.722, Apt-x and AAC-LD.

Whatever algorithm is chosen, keep multiple encoding passes to a minimum. This topic has been greatly debated since audio encoders were first introduced. To reduce the data-rate needs, perceptual encoders discard inaudible audio data. After a few passes, the multiple encoding passes may become audible.

ISDN basics

In North America, the U interface is the most common, but several other interfaces exist. Among these, S, T, U, V.35 and X.21 are more commonly seen, although there are others. Most codec manufacturers will support more than one interface.

The U interface is the connection between the raw ISDN network and the NT1 (Network Termination, type 1). It is almost always a two-wire interface, but this is not an international standard. Outside the United States and Canada, it is completely the domain of the telephone company, and because the telephone company provides the NT1 the lack of a standard does not matter to the user.

In the United States and Canada, the U interface is standardized by the American National Standards Institute (ANSI) and uses 2B1Q line coding. It has a range of 18,000 on copper lines from the telephone company connection. Telephone companies sometimes use other transport technologies, either to provide service over T-1 or fiber or to extend the range beyond 18,000 feet. However, it must always be converted back to the 2B1Q coding. 2B1Q specifies two-bits per quaternary (quat). A quat is a signal that can take one of four states: 00, 01, 11 or 10.

The raw bit-rate on the 2B1Q U interface is 160kb/s. This path comprises two 64kb/s channels, referred to as B channels and a single 16kb/s channel, referred to as a D channel. The B stands for bearer and D stands for data. The D channel carries the call setup and teardown information. The remaining 16kb/s of data are used for data framing and synchronization, and an embedded operations channel to convey information on block errors to the far end.

Only the center two pins nector are used on the RJ-11 or RJ-45 jack with the U interface.

The V interface is the two-wire interface at the telephone company's central office. This is rarely encountered because it is used exclusively by the phone company.

The S interface uses a modified form of alternate mark inversion (AMI) framing similar to a T-1. It is a four-wire interface defined by international standards, with a raw bit-rate of 192kb/s. In addition to the two B channels (at 64kb/s each) and the D channel (at 16kb/s), there are bits for framing, synchronization and two embedded operations channels. In some parts of the world this is referred to as the S0 (S zero) interface.

The S interface is a bus architecture that supports as many as eight terminals and a single NT1. An S interface is provided with an RJ-45 jack, and it uses the four center pins. The remaining pins are sometimes used to power the terminal or NT1. When power is provided, it is usually placed on pins seven and eight.

The T interface is a subset of the S interface. Unlike the S interface, only a single terminal can be used on the T interface.

X.21 and V.35 are standards for serial data ports, not unlike RS-232. RS-232 can be used for synchronous or asynchronous data, although it is typically used for asynchronous data. V.35 and X.21 are used solely for synchronous data. The usual application is to connect data terminal equipment (DTE), such as a computer terminal or codec, to data communications equipment (DCE), such as a CSU/DSU on a T-1 or dedicated digital line. In addition to the transmit-data and receive-data and handshake pins, these interfaces include pins for clocking, as required by synchronous data applications. V.35 is most common in the United States and Canada, while X.21 is commonly used in other parts of the world.

Hit the road

One of the most important features to consider is the operation of the codec. A dedicated remote engineer may not always be on hand to establish the link and troubleshoot problems. The ability to store presets that can be easily recalled by logical names will make this easier. Having a non-technical user select a preset called "City Hall" or "Riverfront Stadium" is much simpler than specifying a sampling rate, data rate, coding algorithm and configuration settings.

Information on the various ISDN interface standards was provided by Rolf Taylor of Telos. Wireless network info was provided by Tom Harnett of Comrex.

Harris Intraplex

Intralink

The **Harris Intraplex Intralink** ISDN monitor can control as many as six BRI ISDN lines in a 3RU shelf. It handles any combination of program audio, voice and data using standard Intraplex channel modules. Five shelves can be linked for a maximum capacity of 30 BRI, and it is compatible with most industry codecs using Layer II, Layer III or G.722. The unit delivers MPEG program audio up to 128kb/s and delivers LAN data at 128kb/s. It is Telex and Clearcom voice- and data-compatible for remote intercom use and is field-configurable via a Windows-based user interface.

www.broadcast.harris.com

I-mix G3

Tieline Technology

The **Commander G3** two expansion slots accept 15kHz mono POTS, dual mono POTS, stereo POTS, mono/stereo ISDN, GSM wireless to landline and telephone coupler modules. Stereo POTS connections can send audio to two destinations or be used for an IFB. The optional Digital Matrix Router can route audio input to any audio output. The three-input mixer features two mic/line inputs, an RCA auxiliary in/out, two headphones, independent channel on/off cue-talkback and send-return audio mix functionality. Two POTS lines can be bonded for phase-matched stereo operation. The ISDN module supports G.711, G.722 and Layer II. An additional 15kHz mono POTS module and optional failover software can be installed for automatic backup. The GSM Module provides 7.5kHz wireless connections.

The **I-mix G3** has the same features as the Commander G3, but adds a six-input mixer with five XLR connections and one RCA connection. Remote audio levels can be controlled from the receive end. Both models can be controlled via USB, Ethernet or RS-232.

www.tieline.com

Comrex

The **Matrix** is a POTS and ISDN codec. It delivers 15kHz full-duplex audio on a POTS line via an integrated V.34 modem, and it is compatible with the Bluebox, Hotline and Vector. With the ISDN module, it provides Layer III or G.722 encoding. It can also be used with the GSM Module to provide a wireless 7kHz audio path. The software can be flash upgraded through the multi-purpose dataport. The Telcell option allows connection to a telephone line or to the hands-free port on most mobile phones. A battery kit is available including a rechargeable NiMH battery that will run the unit for seven hours in POTS/ISDN, or four hours with GSM Module. It is also available in a 1RU version.

The **Nexus** ISDN codec is available in a portable package or a 2RU studio unit. It includes a built-in terminal adapter. It provides a full-duplex, 15kHz audio path of two B channels using Turbo G.722 encoding. It can store multiple ISDN line configurations and provides an ancillary data channel.

Matrix

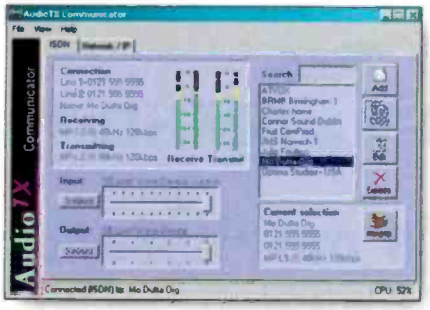
The **Envoy** ISDN codec builds on the features of the Nexus portable unit by providing a four-channel mixer (two mic inputs and two mic/line inputs) and three headphone outputs.

The **Bluebox** delivers 15kHz full-duplex audio on a POTS line. It provides two contact closures at each end of the Bluebox. One is enabled on connection, the other is a momentary contact closure that is initiated by a push button on the keypad. Calls can be answered manually or automatically. As many as 44 digits can be entered into the units' dialer. The unit's software can be flash upgraded through a computer port. It includes a cell phone jack, which connects to the hands-free port on most mobile phones to act as a phone coupler.

www.comrex.com

MDO

The **AudioTX Communicator** runs on Windows 98 and above and uses any standard sound card. The unit can be used with a laptop and connects to all major ISDN audio codecs. The software will automatically detect the codec on the other end and reconfigure itself. The system can communicate via IP or over private leased lines. The software supports a single BRI and communicates via Layer II, Layer III, G.722 and G.711.



AudioTX Communicator

The **AudioTX POTS** is a software-based POTS codec. Operating on Windows 98 and above, the software works with the computer's soundcard and modem. The software automatically detects and adjusts for line quality to provide up to 7.5kHz of audio bandwidth. The software also works with high-speed GSM/data-enabled mobile phones.

www.audiotx.com

Reliable Connections

AEQ

The Eagle is an ISDN codec that features AES/EBU digital inputs and outputs, dual display and multiplexing capability between the two ISDN B channels in 1RU. It transmits via G.711, G.722, Layer II, Layer III or AEQ-LD-2, a low-delay algorithm. The auxiliary data channel can be configured separately for transmitting and receiving. All AEQ products can be controlled via RS-232, RS-422 or through the AEQ Easy control system.

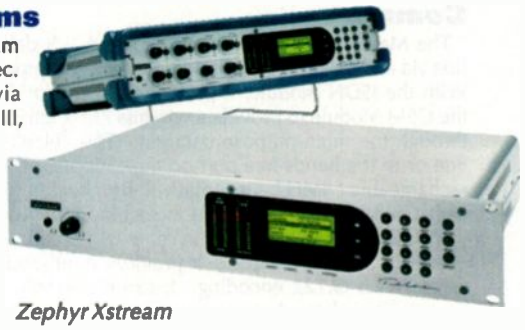
Eagle

The Swing is a portable audio codec with a built-in ISDN terminal adapter and a double-port interface compatible with U.S. and Euro-ISDN. An internal digital POTS hybrid can be used simultaneously, and it can connect to a cell phone. The three-input mixer has two mic inputs and a selectable mic/line input. ISDN coding is available via G.711, G.722, Layer II and AEQ-LD-2.

The Course is a 4RU frame that can hold 10 one- or two-channel multiformat audio ISDN codec boards. Coding is via G.711, G.722, Layer II and AEQ-LD2.

www.aeqbroadcast.com

Telos Systems



Zephyr Xstream

The Zephyr Xstream is a 2RU ISDN codec. It encodes audio via G.722, G.711 Layer III, Layer II, MPEG-2 AAC and MPEG-4 AAC-LD. The ISDN terminal adapter is built in. A 10Base-T Ethernet port allows remote control and streaming of MP3-coded audio over a LAN, WAN or the Internet. TCP/IP network connectivity also allows upgrade of system software via FTP. It includes a front-panel headphone jack with level control.

The Zephyr Xstream MXP is a portable version that adds a four-channel stereo mixer in a portable chassis or in a rack-mount version such as the Zephyr Xstream MX. The four inputs are switchable as mic or line, with phantom power on the first two. The selectable AGC/limiter processing has presets designed by Omnia. Two separate local headphone mixes can monitor send audio, receive audio or both.

The Zephyr Xport can transmit via POTS or ISDN to a Zephyr Xstream ISDN codec. It transmits audio via AAC Plus over POTS, or AAC-LD or G.722 over ISDN. It has a built-in mixer with mic and line inputs, and selectable dynamics processing by Omnia. The controls and menus were designed for non-technical users. The unit can be controlled via Ethernet and RS-232.

www.telos-systems.com

Musicam USA

Netstar 500

The **Netstar** is available in two models, which are identical in features. The model 500 has full controls on the front panel, while the model 300 has no front panel controls and is designed for unattended use. Both can be controlled via the built-in Web server or RS-232. The unit can send and receive real-time stereo audio, contact closures and ancillary data via ISDN, dedicated data lines and IP. Audio can be encoded using G.711, G.722, Layer II, Layer III, MPEG 2 AAC or MPEG 4 AAC-Low Delay. Stereo audio is available through an Ethernet port. ISDN is standard, and V.35, X.21 and RS422 interfaces are available. The **Roadstar** is the portable version and is housed in a rugged case with a four-channel mixer, phantom power and a headphone monitoring system.

Available in five models, the **CDQ Prima** ISDN codecs transmit audio via Musicam Layer II, Layer III and G.722 with bit-rates from 24kb/s to 384kb/s. It can be set to dial on audio and hang up on silence, and automatically configure itself to connect to the appropriate encoding algorithm, sampling frequency and connection rate. A plug-in module provides connection directly to an ISDN line or to a V.35, X.21 or RS-422A interface. An intelligent headphone circuit can monitor local and return audio on models 120, 220 and 230.

The **Prima LT** ISDN codec offers the same audio specifications as the CDQ Prima line of codecs, with functions designed for easier setup and use. An optional Windows remote control program is available for easy point-and-click operation. The **Prima LT Plus** adds enhanced audio metering, digital audio I/O standard, the ability to bond to three ISDN lines for a maximum connectivity rate of 384kb/s and two ancillary data channels.

The **Liberty** POTS codec provides a bidirectional 15kHz audio path at rates as low as 24kb/s. It includes one mic/line XLR input, input leveler, a line input, 1/8" mini jack for most cell phones and a headphone monitor jack. Audio levels from the far end can be controlled via the POTS link.

The **Roadrunner** is a portable ISDN codec and three-channel mixer. It transmits mono audio over a single ISDN line. Two independent headphone circuits provide individually adjustable send and receive levels. It includes an internal ISDN terminal adapter and integrated NT-1 where required. It transmits audio via G.722, Musciam Layer II and Layer III.

www.musicamusa.com

Orban

Opticodec

The **Opticodec 7400** connects via ISDN or IP and encodes audio via Layer II, Layer III, G.722 and G.711. Up to 94 speed-dial entries can be stored in the directory. It can connect at data rates from 56kb/s to 384kb/s. Eight remote control inputs and outputs are transmitted, as well as a 9.6kb/s ancillary data channel. Remote control and administration is possible with the included software for Windows 98 and above. The **Opticodec 7000** is the portable version that adds an audio recorder in a compact case.

www.orban.com

The world's best* IP-Audio

*Okay, you caught us. It's also the world's *only* IP-Au

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.

Axia SmartSurface provides the perfect blend of flexible features and intuitive control. Easy to learn and easy to use, it's tailor-made for talent-intensive formats.

Programmable soft keys and recording device transport control buttons give instant control of all audio functions.

Ergonomically designed channel start and stop buttons, with guards that prevent accidental activation.

Each channel's main, special-purpose, phone and preview assignments are quickly accessible. Automatic mix-minus for each fader!

Available Telos Console Director panel with Status Symbols® provides easy, intuitive control of phone-based segments.

"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

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.

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.

ENCO

PSI

radio•

Scott Studios

WALLY

We're already working with some great companies. Check AxiaAudio.com to find out who's next.

Broadcasters General Store BGW *Axia products are available in the USA from Broadcasters General Store and Broadcast Supply Worldwide. See www.AxiaAudio.com/buy/ for more information*

broadcast studio system.

dio broadcast studio system. Damned marketers.

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.

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.

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.

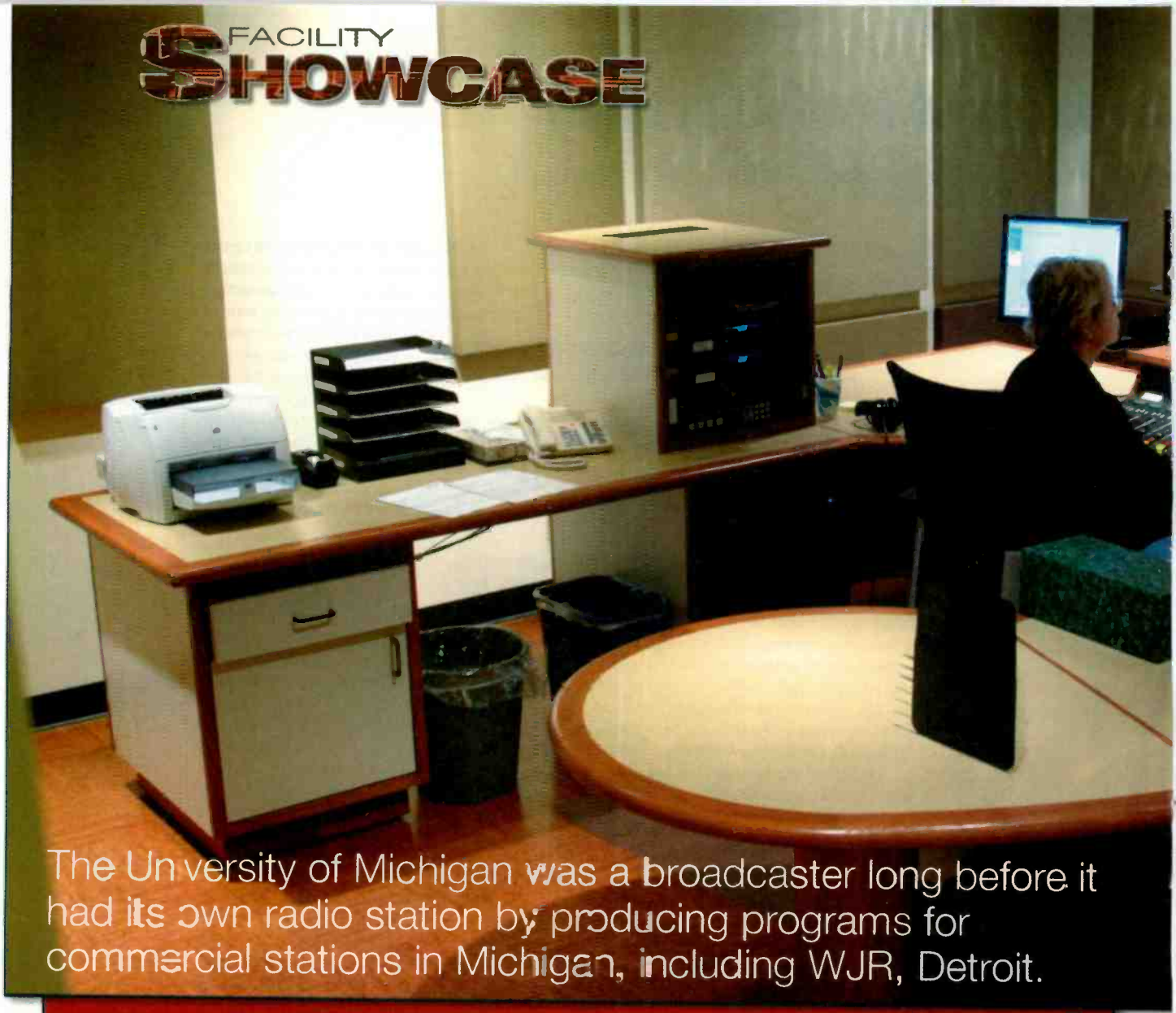
AXIA
A TELOS COMPANY

There's a better way to get audio out of your PC. No more 1/8" connectors – with Axia your digital audio stays clean and pristine.

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...

Control freaks, rejoice: PathFinderPC software for Windows® gives you systemwide control of all routing functions with just a click of your mouse.

FACILITY SHOWCASE



The University of Michigan was a broadcaster long before it had its own radio station by producing programs for commercial stations in Michigan, including WJR, Detroit.

A New Michigan Radio

By Bob Skon and Todd Mundt

In 1944, the University of Michigan applied for a license for a station of its own. In a statement to faculty, the broadcasting staff defended the university's broadcasting service as an extension of its mission: "Radio should be employed in the building of a more intelligent and informed public."

Soon after WUOM began broadcasting in 1948, new studios opened on the fifth floor of a brand new campus building. The university spared little expense to build a complex of four large studios and five control rooms, to handle the load of programs produced for WUOM and others offered in syndication. Michigan engineers had visited NBC Radio in New York and WGR in Schenectady, NY. The studio complex allowed for maximum flexibility and large-scale productions.

The 1950s and 60s were heady days for broadcasting at Michigan. The university became a nationally recognized center for educational broadcasting. The ancestors of PBS and NPR, the National Educational Television Association and National Educational Radio were headquartered in Ann Arbor, MI, for many years.

WUOM, now Michigan Radio, went through a revitalization in 1996, launching an NPR news/talk format that has led to a near quadrupling in audience since then.

The growth had its consequences. By the mid-to-late 1990s, the studios built to produce plays and concert recitals had outlived their usefulness. One of the large performance studios had been

Photo courtesy of Designcraft

Equipment List

360 Systems AM16/B
Apple Xserve RAIDs
Avocent Longview
Belden Media Twist Cable
Benchmark HPA2
Black Box 110Ω punch blocks
Broadcast Tools 8.1 DAS
Comrex Vector and Matrix
Dell Monitors
Denon DN-M1050R minidisks
Designcraft furniture
Enco Dadpro32
ESE clocks
Focusrite Octopres
Furman PL8
Gentner TS 612
Harris Intraplex STL Plus
Henry Engineering Super Relays
HP Prolient DL360 servers
Logitek Audio Engines
Logitek ROC10
Mackie 1402-VLZ
Mackie HR824
Marantz PMD 520
Marantz PMD321
Middle Atlantic racks, shelves, power strips
Mitsubishi City Multi HVAC
Neutrik audio connectors
OC White mic booms
Panasonic SV-3800
RDL ST-LCR1
Shure SM7B
Sony MDR-7506
Sound Anchors speaker stands
Spacedec Monitor Arms
Symetrix 304
Telos One hybrids
Telos Zephyrs
TFT EAS 911, 930A, 941A
Titus on air lights
Yamaha MSP5

converted to an office space. Another studio housed the station's priceless jazz record collection. The endless reconfigurations to accommodate new technologies had taken their toll on the physical plant and it was time to find a new home for Michigan Radio.

Remembering its roots

The organization, aware of its history as one of the nation's oldest FM broadcasters—and one of the founding stations of modern public broadcasting—chose a historic site for its new station. Michigan Radio is now located in the Argus building in Ann Arbor, named for the famous cameras once manufactured there. The building is more than a century old, and it's located next door to the university's television facility, where national educational radio and television were nurtured.

This historic station begins its second half-century of broadcasting in a new, old facility, with a state of the art production center tailor-made for the digital age.

To design its new studios, Michigan Radio turned to Russ Berger Design Group (RBDG). RBDG used the brick interior walls and exposed wood beam ceiling of the historic Argus Building as a pallet for the office areas of Michigan Radio. The result would be not only a warm and friendly space for the employees, but an eye-catching showcase for visitors.

The technical spaces were designed within a newer addition to the Argus building. Originally built as a warehouse for the camera company, this extension to the older brick structure was ideal for the studios because of the high ceilings, which could accommodate the raised floors and overhead mechanicals.

Four control rooms, two talk studios and three edit rooms were built as isolated units. Wiring conduits were installed under the floor of each room and spilled into the raised hallway floor where cabling could run to the machine room. The mechanicals were installed above each room. The HVAC system chosen for this project was Mitsubishi's City Multi R2 unit. Because of its design, the City Multi provides each room with independent heating and cooling. This system was one of the first installed in the United States.

The interior of each room was designed with cork tile floors and acoustic panels of various shades on the walls. To furnish these rooms, Designcraft of Grand Rapids, MI, was chosen to customize desks that would complement RBDG's choice of interior materials.

A New Michigan Radio

Photo courtesy of Designcraft

Studio West looking into Control West. Michigan Radio has a similar Control East/Studio East setup. West and East are used for producing local shows and live call-ins.

With construction of the new studios under way, a plan for the transition between buildings needed to be devised. The simplest way would be to purchase and install all new equipment so that the staff could simply turn on a light switch at the new facility and get to work. Budget considerations made this option impossible and impractical because Michigan Radio had upgraded most of its studio equipment in recent years, including two Logitek Audio Engines with four ROC 10 control surfaces. The staff determined that the best way to transition would be to prewire the new studios and move in phases.

Logistics planning

Because Michigan Radio was equipped with four control rooms, two rooms could be disassembled and reinstalled at the new location while the staff continued to work at the old building, though not without some inconvenience. This would require moving one of the Audio Engines with two control surfaces while the other remained in service. A new configuration for the Audio Engines was programmed ahead of time so that each engine would have an identical configuration. Once the relocation was complete, each Audio Engine would control two control rooms and one talk studio. Because the configurations were identical, cards could be easily swapped between engines for easy troubleshooting.

Before any equipment could be moved, STL shots needed to be established and the NPR satellite downlink needed to be moved to the new studios without interrupting service at the old location.

The location of the Argus Building itself introduced our first obstacle. Situated in a historic district in one of the lowest spots in Ann Arbor, there is no line-of-site path to the transmitter for an RF STL. In addition, the Historical Society was not keen on construction of a tower on the building. We abandoned the old microwave link and installed a Harris Intraplex STL HD system. This has also

Control West: A typical setup for all four control rooms. The back panel under the Logitek ROC 10 is removable to access cabling and the punch block.

provided us with uncompressed 44.1kHz-sampled audio to the transmitter sites, which would be useful for future IBOC installations.

The solution to the NPR downlink, which provides 90 percent of Michigan Radio's daily content, came as a result of the timing of the move. While Michigan Radio was in the planning stages of the move, NPR announced its Earth Terminal Refurbishment Project. NPR provided a new satellite dish and L-band interconnection as a replacement for the old dish. Having it installed at the new facility and borrowing a satellite demodulator from NPR made it possible to receive NPR programming at both locations.

With all the pieces falling into place, the task of prewiring began. Bob Skon, WUOM chief engineer, decided that the entire studio complex would be wired with Belden Media Twist, with the exception of the runs from the mics to their preamps, where Canare L-4E6S was used. Skon had previously used Media Twist with great success for the digital equipment at the old studios, and had run a few tests with it on balanced analog equipment. The tightly twisted pairs proved to work well even

Cable conduits under the floating floor terminate at the hallway. Cabling runs under raised, removable hallway panels on the way to the machine room.

A New Michigan Radio

though the wire was unshielded. The real trick was to make sure that all the equipment was truly balanced. When the first phase of the move was complete, an all-faders-up test resulted in nothing but clean audio.

The second phase of the move was planned for a Friday evening at 10 p.m. The Enco automation would run from a local workstation in the new on-air control room, and the switch to the new STL would take place at the transmitter sites. This would give the engineers 10 hours to tear down, move and reinstall the satellite demodulator rack, audio and business servers, and AP News downlink in time for an 8 a.m. newscast. The remainder of the weekend would be used to move the newsroom so the news staff could begin work at the new studios on Monday morning.

The night of Aug. 15, 2003, was chosen to begin phase two. Unfortunately, on Aug. 14 the entire northeast United States was hit by a blackout, sending Michigan Radio engineers into emergency mode. Once the lights returned and the clean-up was complete, the exhausted staff decided to postpone phase two until the following Friday.

On the evening of Aug. 22, Michigan Radio officially began broadcasting at its new studios in the Argus Building. On the following Monday morning, news personnel reported to their new desks while the rest of the Michigan Radio staff finished boxing up their work areas for the moving van.

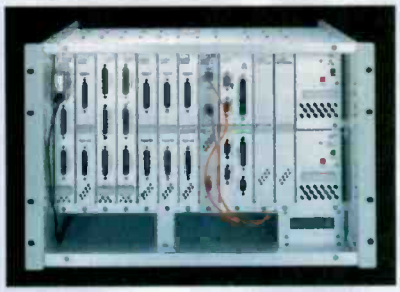
A view into the machine room. The glass panels were chosen for easy viewing as well as for "wowing" visitors.

Within a few weeks, the last remaining items were removed from the old studios and phase three was complete, closing another chapter and beginning a new one in the rich broadcast history at the University of Michigan and Michigan Radio.

Skon is the chief engineer of Michigan Radio (WUOM, WFUM-FM, WVGR). Mundt is the chief content officer of Michigan Public Media and local host of Morning Edition *for Michigan Radio.*

Facility Focus
the technology behind WUOM

Logitek Audio Engine and Consoles



Leveraging the flexibility of the Logitek Audio Engine, WUOM upgraded an existing system for its installation. The Audio Engine is a highly versatile router, handling both analog and digital I/O and providing mixing, up to 24 mix-minus busses, routing, intercoms, processing functions and more. For other customer installations, as many as 24 Audio Engines have been linked to handle complex audio routing requirements. Console control surfaces are modular and highly flexible as well. With as few as four and as many as 24 faders, Logitek can accommodate any studios' requirements while bringing an attractive touch to the facilities. Watch for an exciting new console design from Logitek, coming soon.

www.logitekaudio.com
800-231-5870

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

Harris Intraplex STL HD

This IBOC-ready T1 STL system features crystal clear, linear, uncompressed audio using the PT/PR-353 audio cards. The STL HD includes two T1 multiplexers, with RJ-45 T1 network interface connector and a 60W universal ac power supply. The PT-353 and PR-353 program audio modules provide digital transport of up to 22.5kHz CD quality stereo audio.

The PT/PR-353 cards feature:

- 48-, 44.1-, or 32ks/s sample rates for up to 22.5kHz frequency response
- Linear uncompressed transport for the best audio fidelity
- AES/EBU and analog inputs and outputs on each module
- Rate adaptation on digital input eliminates sample-rate conversion
- External AES/EBU timing syncs output to the facility clock
- Data channel at 9.6kb/s RS-232 built in for PAD
- Meets US IBOC sample rate standards
- Reed Solomon error correction

www.broadcast.harris.com
800-622-0022

Belden CDT MediaTwist

UTP cables are increasingly used by radio broadcasters because they are a cost-effective and well established medium for a variety of needs: for analog or digital audio transmissions, as an RS-422 machine control interface and for standard LAN applications. Because of the exceptional uniformity of this cable's design, MediaTwist cables exhibit superior electrical specifications—specifically in impedance and return loss, key specifications for these applications. Two patented design features make this unprecedented performance possible: the cable's bonded-pair design, which bonds the conductors of each pair together along the full length of the cable, and an overall crescent shape that locks each pair into place within the jacket. These unique design features minimize pair-to-pair movement—even after the cable's installation. This unique after-installation assurance is called Installable Performance.

www.belden.com
800-BELDEN-4

OMT Technologies Imedialogger

By Marshall Rice

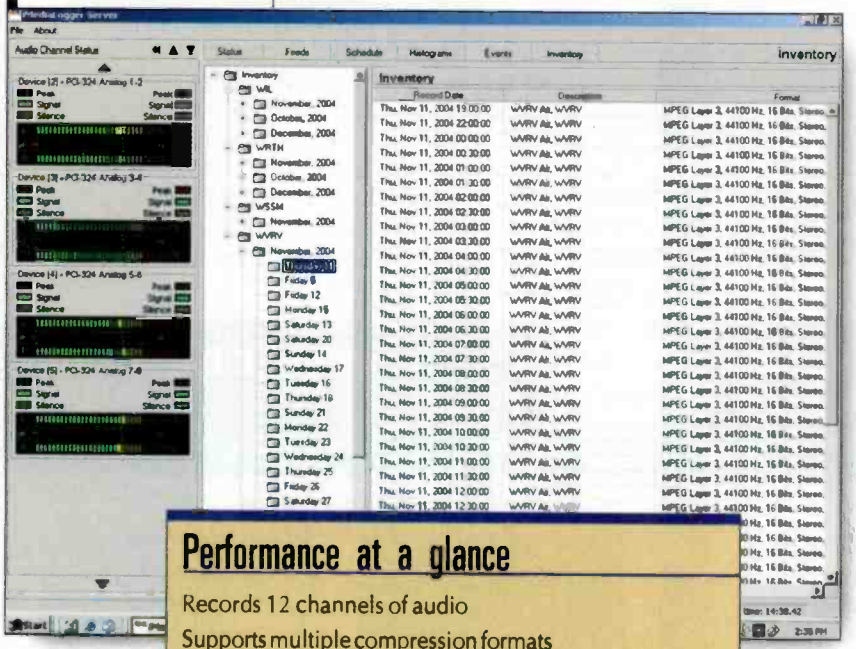
What did they say on the morning show? With the Imedialogger from OMT Technologies you can quickly find the answer from almost any computer on your network. We wanted a software-based logging system for Bonneville International's four St. Louis Radio Group stations, and it had to be versatile, easy to use and reliable. I was so satisfied with the Imedialogger that I purchased two: one to monitor our stations and one to monitor the competition.

The logger can be used for more than just 24/7 logging. It can also be used for time shift recording, mic skimming using external contact closures, or recording a scheduled event. The Imedialogger can record 12 audio sources and can play back and record simultaneously. The program does not use any special or proprietary hardware. The software for this application was installed on an off-the-shelf computer consisting of a P4 motherboard and processor, 256MB of RAM and a 220GB hard drive. I used a MOTU 2408mk3 audio interface for input to the machine from our audio sources.

Getting started

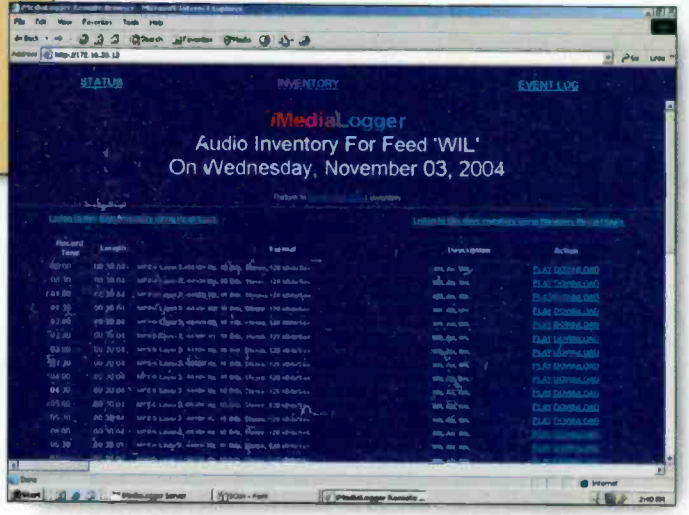
The software was easy to install, and the setup wizards do most of the initial configuration. The administration menu provides further customization such as the time to keep old files and whether to delete them or move them to another storage device. The program will also e-mail notices and alarms to any designated e-mail address. File length can be set up at any desired time interval from one to 120 minutes. I find that 30-minute segments are our preferred length. Another convenient feature is the ability to sync the server time with the U.S. Naval Observatory through the Time Services Menu. With the set-up wizards I had the logger running within 30 minutes of powering up the PC.

I was impressed by the choices of recording formats offered by the product. MPEG 1 Layer 1, 2 and 3, PCM, Windows Media Audio and Real Audio are all built in and users can choose any bit-rate to suit the desired quality and storage capacity. I record our sources to MP3 at either 64, 128 or 192 kb/s depending on the source and its intended use. By being able to choose among different sample rates and recording formats it is easy to maximize the hard drive space available. MP3 at 128kb/s



Performance at a glance

- Records 12 channels of audio
- Supports multiple compression formats
- Web browser access to audio files
- Fast audio retrieval
- Provides logging, time shifting and timed capture
- Uses standard audio cards
- Silence sensor saves disk space



Audio files are quickly and easily accessed from any desktop on the network.

stereo gives me almost 60 days of archived audio per station on the current hardware.

Friendly users

The most useful feature we found was the built-in Web server. With this application our sales assistants and programming staff can access archived audio from their desktops via any Web browser. The sales and traffic departments use the logger for airplay verification while the programming department uses it for air checking. Our morning shows use the logger to retrieve favorite bits and show archival for later compilation. Because the interface is so easy to use, engineering now gets few requests to pull something off the logger.

OMT Technologies has responsive support for this product. We have had two systems running now for over two years. Although they have not been completely trouble-free, they will run for months without being checked.

The problems we experienced have been minor, such as file management issues and an occasional needed reboot. All have been quickly addressed by the OMT support staff and none have impaired the operation of the logger. Suggestions for application enhancements or modifications are taken seriously. Upgrades can be downloaded from the OMT support site and are easy to install.

Overall I am happy with the reliability and ease of use of this product. The staff has come to rely on the easy availability of the audio archives and I don't have to be bothered with requests to pull a spot from the tape.

Rice is the engineering director for Bonneville International's St. Louis Radio Group.

OMT Technologies

P 888-665-0501
F 204-783-5805
W www.imediatouch.com
E sales@omt.net

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

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

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

SAS Rubicon, Riolink and 32KD

By Kent Kramer, CBRE

When I was hired by Radiovisa just over a year ago, the promise of building a brand new facility was too good to pass up.

Radiovisa is a Spanish Talk Radio Network based in Sherman Oaks, CA, that produces and distributes 24-hour talk programming nationally and is also the licensee of KMXE-AM, Orange, CA.

When the planning process started, one fact quickly became apparent: whatever I put in would be a facility-wide audio routing system. Everything would tie into the master router.

Performance at a glance

Integrates with the 32KD router
Traditional console layout
Modular design
Frame sizes from eight to 40 modules
Four bus assigns per module
Unlimited output busses

After spending several weeks looking at different systems and talking with different manufacturers, I chose the Sierra Automated Systems 32KD router with five Rubicon consoles and five Riolink remote I/O chassis for the five-room facility.

Overall, my choice was based on the reliability of the router, the customer support I have received from the company in the past and the overall look and feel of the system. I had shared brochures and information with the staff that would use the hardware and everyone liked the familiar look and feel of the consoles. Simple lines and nicely laid out input modules provide an easy to use interface.

The hardware list for the facility is fairly simple. Each room has a single, 2RU power supply, the Rubicon work surface and the Rio I/O package. The supply runs the Rubicon, meter bridge and the Rio. Power connections are made with Neutrik Speakon connectors, which provide a solid connection. The Rio and the Rubicon can also work with a redundant power supply.

The free-standing meter bridge is not overly complex and is easy to view. These are hard to ignore, even for an air staff that doesn't watch the meters. The Rubicon's built-in clock can be synced to a master clock system. On my version, each of the meters requires a digital input, which requires a digital output from the routing switcher or Rio for each meter. SAS is in the process of changing the meters to be driven directly from the system DSP to free all but one of those outputs, but I prefer using the system outputs. In the air studios, I use the fourth meter as an off-air meter fed by a return feed from the transmitter.

The ins and outs

The Riolink chassis is a 2RU package that has all the audio inputs and outputs and control inputs and outputs. I also purchased the pre-wire package for each room that breaks the Rio out to Krone blocks.

On the back of the Rio are four cards, two for inputs and two for outputs. The Rio is configured for all-analog, split-analog and digital or all-digital operation. I chose to go with a 50/50 split and in the end it has proved to be the best decision for us.

The Rio can handle 16 stereo inputs and 16 stereo outputs. There are 16 opto inputs and 16 relay outputs for machine control and input to the Rio, which are programmable. The Rio contains its own DSP and is now able to function as a stand-alone 32×32 mixer and router, providing additional redundancy to the 32KD.

Connection of inputs and outputs is simplified, because their final function can be programmed later. The Rio can be used without a work surface as just a straight input/output device. My only regret at this stage was that I did not purchase a Rio to stand alone in our network talk studio. We routed everything in and out of that room through the control room Rio, which is now full. Fortunately, I can easily change this later.

The Rubicon console surface itself is simple. Modules can be swapped without interrupting audio. Even the module on the air can be swapped without affecting the audio on the air at the time. This is because there is no audio in the control surface.

The 32KD is the heart of the mixing and routing system.

The Rubicon surfaces come in many different sizes. We have two 24-module frames in the on-air studios and three 16-module frames in the production studios. Module layout can be in any configuration. Control to the Rubicon is via RS-485 serial distributed to each module on a passive motherboard, with one serial channel addressing four modules. Connection is via CAT-5 cable, with each cable carrying four ports. For a 24-module frame, two CAT-5 cables are used.

The buttons on every module are programmable through the control software, which is easy to learn. Beyond the physical placement of the modules, there is no hardware set up on the Rubicon.

Console operation

At the top of each module is a pair of buttons that are normally programmed as A and B inputs. These provide a quick method to access the most common input devices, which also aid in fast input recall when an alternate source is selected. Directly below the A/B buttons are two banks of four buttons that are generally used as bus assignments. I say normally because the buttons can be assigned any function you like.

Below these buttons is the Multi Function Display (MFD). Each module can have as few or as many options accessible through this button. Source select, pan, mode, mix-minus and record bus layout are all modified here. Items can also be locked out.

Below the MFD is the fader and two buttons normally programmed as cue and IFB buttons. This allows for IFB to any device. IFB can be sent directly to a device independent of the bus that is feeding that device. The IFB assignment follows the device.

The control room and studio monitor modules also feature 12 programmable monitor selectors buttons that can be used for any system source. The control room monitor module has two faders, one for studio speaker levels and one for the operator's headphone level. The studio monitor module has rotary knobs for speaker level control but also features six ½" × ½" buttons for talkback to different studios or monitors. Again, all of these buttons are programmable through the control software.

The Console Control module provides timer control, meter control and show control. The meter buttons are programmable to select any meters or preset sources; users can also select any source on the multi-function display.

The heart of the system

The 32KD router occupies 6RU. Dual redundant power supplies, each with its own electrical input, allow for a split electrical input. I run one from UPS power and one on raw power. Dual cooling fans draw air through and exhaust it out the back. The connections on the back are high-density 96-pin Euro connectors for the analog inputs and outputs and RJ-21 telco-style connectors handle the digital inputs and outputs.

While the 32KD is a relatively small package, leave lots of room behind and below it. The amount of wiring that runs to the back can become unwieldy. Because of the amount of wire on each connector, SAS has provided a lacing bar across the top and bottom to tie the cables to for support. I strongly recommend a wire trough or additional lacing bars for additional support. The cable can be quite heavy once it is installed.

There are only a few basic types of cards for the router: analog and digital input and output cards that are 32 channels each, KRL cards that provide the link between the Rios and the 32KD, and the MCU and DRC cards. The analog and digital input and output cards provide for 16 stereo inputs and outputs respectively. Stereo channels can be split so there are no wasted channels for mono devices.

Kramer is director of radio engineering for Radiovisa, Sherman Oaks, CA.

Sierra Automated Systems

P	818-840-6749
F	818-840-6751
W	www.sasaudio.com
E	radio@sasaudio.com

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

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

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

NAB2005

THE WORLD'S LARGEST ELECTRONIC MEDIA SHOW

YOUR FUTURE STARTS HERE

The future of electronic media takes shape at the NAB show. Join thousands of future-focused professionals from more than 130 countries around the world as they gather to discover cutting-edge tools, discuss new ideas, and sharpen their competitive edge. NAB2005 will showcase the latest innovations from every facet of television, radio, film, video, audio and multimedia technology in an event unlike any other. If you work in the world of electronic media — Your future starts here.

NAB2005 • Conferences: April 16-21 • Exhibits: April 18-21
Las Vegas Convention Center
Las Vegas, Nevada USA

www.nabshow.com

New Products

By Kari Taylor, associate editor

Stereo audio meter
DK Technologies

MSD100C: Engineers have only three presets to choose from: two PPM analog input mode, two PPM digital input mode and four PPM both analog and digital mode. The meter features a color VGA screen and comes with two audio input pairs: one stereo analog and one AES-3 digital input channel. It accepts 96kHz on the digital input and offers 24-bit A/D. The meter also incorporates a Goniometer (audio vector oscilloscope) and a phasemeter. The meter supports multiple PPM standards. Other features include a level meter with user definable scales and reference levels and a wall plug power supply.

+45 4485 0255; fax +45 4485 0250
www.dk-technologies.com; info@dk-technologies.com

Short-form PCI audio cards
Digigram

PCX924v2, PCX22v2 and VX222v2: These stereo cards have been resized to the short-length PCI format. With a length of 6.875, the boards now fit in the most compact computers with 5V, 5V+3.3V or 3.3V PCI busses, as well as computers with PCI-X bus. The new sound cards are fully compatible with existing drivers for the longer versions of PCX924v2, PCX22v2, and VX222v2.

The PCX924v2 is a full-duplex stereo sound card for simultaneous and independent record and playback. The PCX924v2 features 24-bit converters, balanced analog and AES/EBU I/Os, an external AES/EBU synchronization input, a headphone jack, as well as Wave and Digigram np Runtime drivers. A playback-only card, Digigram PCX22v2 offers two analog or digital outputs only. The VX222v2 sound card includes balanced 2/2 analog inputs and outputs with 24-bit converters, as well as a stereo AES/EBU input/output.

703-875-9100; fax 703-875-9161
www.digigram.com; input@digigram.com

SPL meter
ATI

SLM-100: This device features a large analog meter for quick measurements. The frequency ranges from 32Hz to 10kHz, and it makes A and C weighted measurements with peak or averaging response. The meter includes a seven-range selector switch, calibration control and a test signal output via an RCA jack. A 9V battery supplies the power. SPL ranges from 50dB to 126dB, referenced to 0.0002mbar, are possible. A threaded insert allows the meter to be mounted on a camera tripod. The unit measures 6.25"× 2.5"× 1.75".

800-922-8001; fax 215-443-0331
www.atiaudio.com; sales@atiaudio.com

Surge suppressor
LEA International

Powervantage: Powervantage is designed for low clamp, ease of service and enhanced diagnostics. The system is field-upgradeable in terms of surge capacity. The surge suppressor features MOV modules built to meet industry standards for sensitive load applications. Color-coded, compact modules feature two simple attaching screws and redundant monitoring capability. Its modules deliver low clamp point while handling overvoltages by providing maximum sharing across MOV surface areas.

800-881-8506; fax 208-762-6099
www.leaintl.com; crassier@leaintl.com

Digital FM antenna
Dielectric

HD Plus: Integrated alongside existing analog FM antennas, this antenna provides an interleaved antenna solution for HD Radio broadcasts. Special design considerations between the analog and digital antenna bays provide for isolation that exceeds 40dB; 10 percent more than the 36dB required by the FCC.

800-341-9678; fax 207-655-7120
www.dielectric.com; dcsales@dielectric.com

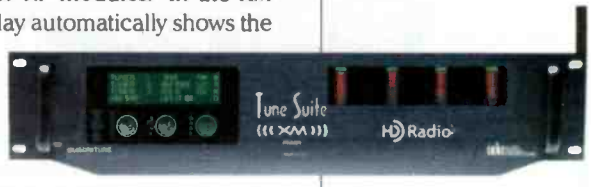
Portable mixer
Professional Sound

PSC M6 Mixer: Designed for extreme field operating conditions, the mixer uses rotary pot faders because of their immunity to dirt and dust. The mixer offers provisions for direct mounting of a recorder. This unit also offers six inputs with switchable mic powering, line or mic inputs, phase reversal, two-way EQ, pan pot and two aux sends. Its output section contains two large, easy to read LCD peak meters, slate microphone, private line to boom operators, full duplex boom communication, recorder remote rolls, reference oscillator, four selectable headphone feeds, two main outputs and two aux outputs. The mixer measures 14"W x 15"D x 2.25"H and it weighs 11lbs without batteries. Internal power is provided by 10 D alkaline cells and its external power is 10 to 18Vdc at 10W. The unit offers a 1KΩ input impedance with balanced XLR 600Ω outputs.

661-295-9395; fax 661-295-8398
www.professionalsound.com; sales@professionalsound.com

Modular tuner
Audio Design Associates

Tune Suite: This computer controlled modular tuner can be configured with any combination of FM, AM, WX (weather band) and XM Satellite Radio service. Users can listen to four radio stations simultaneously or cascade seven Tune Suite mainframes together for any combination of 27 AM, FM, WX or XM channels at once. Three front-panel knobs allow users to select as many as 30 RF preset stations, tune or seek radio frequencies and change the frequency band. The four line front panel displays information such as the station frequency, band, preset number and stereo/mono status for RF modules. In the XM mode, the display automatically shows the category, channel number and preset number. Each of the modules can be computer or infrared controlled while providing complete operational status.



800-HD-AUDIO; fax 914-946-9620
www.ada-usa.com; literature@ada-usa.com

www.beradio.com

www.beradio.com

Cobranet PCI audio adapter
Audio Science

ASI6400: The ASI6400 series is a broadcast specific line of PCI audio adapters to provide Cobranet audio networking. Using a Texas Instruments 32-bit floating point DSP together with Cirrus Logic's new CS18101 Cobranet interface allows the card to simultaneously record and play 16 mono or eight stereo streams of 24-bit audio over a 100Mb/s Ethernet network. All the features of other ASI6000 series adapters are available such as MPEG Layer 2 and Layer 3 compression, MRX multi-rate mixing, TSX time scaling and flexible mixing.

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

Upgrades and Updates

OMT has released Imedialogger version 2.5. Enhancements to this release include an enhanced graphical-user interface for greater ease of use; access to the built-in Web server through corporate firewalls and Internet routers; the ability to split stereo inputs to discrete left and right; greater compatibility with recorded files and third-party audio editors and improved functionality and performance.
www.omt.net

Audio Labs Vox Pro PC version 3.3 is now shipping. This update revises Vox Pro PC's internal database format, allowing for gain increase for selected audio for one or both tracks, and a resizable interface, from minimal to full screen. It is compatible with most sound cards. Mouse click and drag audio highlighting; MP3 import and export of multiple files; streamlined administrative features; and faster access to folders containing thousands of files are other added features.
www.audionlabs.com

The **Cedar** audio restoration tools have been updated for Cambridge v2. The update adds numerous new modules and features to earlier versions 1.0, 1.1 and 1.2 which are now obsolete.
www.cedar-audio.com

A new module, the **Audemat-Aztec** Manager Client Server, enables alarm reception on filtered stations, filtered geographical areas or filtered event types. Application of this option is to use the complete data offered by Manager software to propose specific services (specific alarms) to radio and TV stations.
www.audemat-aztec.com ■

Classified

For Sale

Professional Services

Radio
THE RADIO TECHNOLOGY LEADER

A PRIMEDIA Publication

www.beradio.com
radio@primediabusiness.com

Editor – Chriss Scherer, CSRE CBNT, *cscherer@primediabusiness.com*
Technical Editor, RF – John Battison, P.E., *batcom@bright.net*
Associate Editor – Kari Taylor, *ktaylor@primediabusiness.com*
Senior Art Director – Michael J. Knust, *mknust@primediabusiness.com*
Art Director – Robin Morsbach, *rmorsbach@primediabusiness.com*

Technical Consultants – Harry C. Martin, *Legal*
Kevin McNamara, CNE, *Computers and Networks*
Mark Krieger, CBT, *IBOC, Contract Engineering*
Russ Berger, *Broadcast Acoustics*
Donald L. Markley, P.E., *Transmission Facilities*

Senior Vice President – Peter L. May, *pmay@primediabusiness.com*
Publisher – Dennis Triola, *dtriola@primediabusiness.com*
Marketing Director – Christina Heil, *cheil@primediabusiness.com*
Vice President of Production – Lisa Parks, *lparks@primediabusiness.com*
Senior Director of Production – Curt Pordes, *cpordes@primediabusiness.com*
Group Production Mgr. – Julie Gilpin, *jgilpin@primediabusiness.com*
Production Coordinator – Dana Honn, *dhonn@primediabusiness.com*
Classified Ad Coordinator – Mary K. Corcoran, *mcorcoran@primediabusiness.com*
VP Audience Marketing – Jerry Okabe, *jokabe@primediabusiness.com*
Audience Marketing Dir. – Barbara Kummer, *bkummer@primediabusiness.com*
Audience Marketing Mgr. – Sonja Rader, *srader@primediabusiness.com*

MEMBER ORGANIZATIONS
Sustaining Member of:
- Acoustical Society of America
- Audio Engineering Society
- Society of Broadcast Engineers

Member, American Business Media

PRIMEDIA
Business Magazines & Media
COO – Jack Condon, *jcondon@primediabusiness.com*
Executive VP – John French, *jfrench@primediabusiness.com*
Sr. VP, Business Development – Eric Jacobson, *ejacobson@primediabusiness.com*

PRIMEDIA Inc.
745 Fifth Ave., NY, NY 10151
PRIMEDIA
Chairman – Dean Nelson, *dean.nelson@primedia.com*
President & CEO – Kelly Conlin, *kelly.conlin@primedia.com*
Vice Chairman & General Counsel – Beverly Chell, *beverly.chell@primedia.com*

SUBSCRIPTIONS: Free and controlled circulation to qualified subscribers. Non-qualified persons may subscribe at the following rates (prices subject to change): USA and Canada, 1 year, $50.00, 2 years, $95.00, 3 year, $140.00. Outside the USA and Canada, 1 year, $65.00, 2 years, $125.00, 3 years, $185.00 surface mail (1 year, $105.00, 2 years, $205.00, 3 years, $305.00 airmail delivery). For subscriber services or to order single copies, write to *Radio*, 2104 Harvell Circle, Bellevue, NE 68005 USA; call 866-505-7173 or 402-505-7173; or visit beradio.com.

ARCHIVES & MICROFORM: This magazine is available for research and retrieval of selected archived articles from leading electronic databases and online search services, including Factiva, LexisNexis, and Proquest. For microform availability, contact ProQuest at 800-521-0600 or 734-761-4700, or search the Serials in Microform listings at proquest.com.

REPRINTS: Contact Joel Banda at Wright's Reprints to purchase quality custom reprints or e-prints of articles appearing in this publication at 877-652-5295 or 218-419-5725. Instant reprints and permissions may be purchased directly from our website; look for the iCopyright tag appended to the end of each article.

PHOTOCOPIES: Authorization to photocopy articles for internal corporate, personal, or instructional use may be obtained from the Copyright Clearance Center (CCC) at 978-750-8400. Obtain further information at copyright.com.

PRIVACY POLICY: Your privacy is a priority to us. For a detailed policy statement about privacy and information dissemination practices related to Primedia Business magazines and Media products, please visit our website at primediabusiness.com.

EDITORIAL, BUSINESS and CORPORATE OFFICE: Primedia Business Magazines & Media, 9800 Metcalf, Overland Park, KS, 66212; 913-341-1300; beradio.com, primediabusiness.com.

LIST RENTAL SERVICES
Marie Briganti
Statlistics
Phone: (203) 778-8700 x146
Fax: (203) 778-4839
primedia@statlistics.com

EDITORIAL REPRINTS
FosteReprints
Phone: (866) 436-8366
(219) 879-8366

Sales Offices

REGIONAL SALES MANAGER EAST
Angie Connley
Phone: 913-967-7221 *Fax:* 913-514-6852
E-mail: aconnley@primediabusiness.com

REGIONAL SALES MANAGER WEST
Scott Slocum
Phone: 913-967-1358 *Fax:* 913-514-3789
E-mail: sslocum@primediabusiness.com

EUROPE/UK
Richard Woolley
Phone: +44 1295 278 407
Fax: +44 1295 278 408
E-mail: richardwoolley@btclick.com

CLASSIFIED ADVERTISING
Jennifer Shafer
Phone: 800-896-9939, 913-967-1732
Fax: 913-967-1735
E-mail: jshafer@primediabusiness.com

Online Sales & Marketing
Samantha Kahn
Phone: 212-462-3401 *Fax:* 913-514-7006
E-mail: skahn@primediabusiness.com

Contributor Pro-file

Meet the professionals who write for *Radio* magazine.
This month: Field Report, page 34.

Marchall Rice
Engineering Director
Bonneville International
St. Louis

Rice started his career in radio at KMNR-FM at the University of Missouri-Rolla in 1979. In 1986 he became the chief engineer at KORX-FM in Springfield, MO. From there he returned to Rolla, MO, and then moved to St. Louis to work for a few large owners before joining Bonneville in 2000, where he oversees four stations.

Radio
THE RADIO TECHNOLOGY LEADER

Written by radio professionals
Written for radio professionals

Radio, Volume 11, Number 1, ISSN 1542-0620 is published monthly and mailed free to qualified recipients by PRIMEDIA Business Magazines & Media Inc, 9800 Metcalf, Overland Park, KS 66212-2216 (primediabusiness.com). Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canadian Post Publications Mail Agreement No. 40597023. Canada return address: DHL Global Mail, 7496 Barh Road, Unit 2, Mississauga, ON LT4 1L2. Additional resources, including subscription request forms and an editorial calendar are available online at beradio.com. To order single copies call 866-505-7173 or 402-505-7173.

POSTMASTER: Send address changes to *Radio*, P.O. Box 2100, Skokie, IL 60076-7800 USA.

Advertiser Index

This index is a service to readers. Every effort is made to ensure accuracy, but Radio magazine cannot assume responsibility for errors or omissions.

www.beradio.com

Sign Off

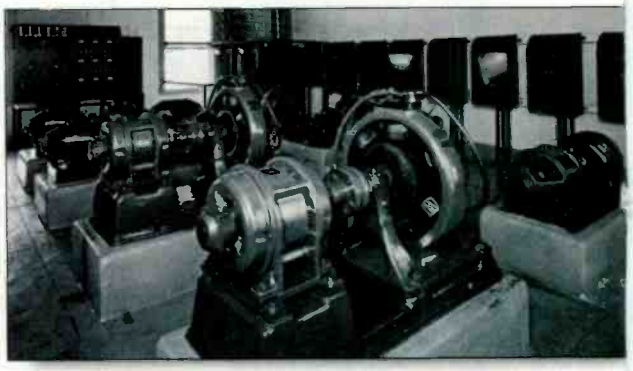
By Kari Taylor, associate editor

www.beradio.com

Do you remember?

The Tektronix Type 561A oscilloscope was used to check performance characteristics of FM stereo generators and 10W FM transmitters. Seventeen amplifier and time-based plug-in units could be used for different types of applications. The unit displayed single or multi-trace presentations. The upper trace displayed a composite left only signal, including the 19kHz pilot carrier. The lower trace presented the 38kHz L-R subcarrier. The oscilloscope provided an 8cm × 10cm viewing area. In 1964, this piece of equipment's retail price was $500, not including plug-in units.

That was then



The motor generator room of the General Electric station KGO in Oakland, CA, contained nine motor-generator sets. In 1924, these supplied current for heating the filaments of the tubes, plate potential for the power amplifiers, bias potential for the amplifier and modulator tubes, and excitation for the various generators. These machines were all in duplicate, thus ensuring a continuous program in the event of failure. Motor generators were required to create the dc power because high-voltage rectifiers were not yet available.

Source: John Schneider's Broadcast History at users.adams.net/~jfs.

Sample and Hold

Radio by the numbers

21	The average number of years respondents have worked in the broadcast engineering field.
4	The average number of individual stations (AM or FM) radio engineers are responsible for.
74	Percentage of station chief engineers that say computer/IS/IT functions are considered the engineering department's responsibility.
36	Percentage of radio stations that plan to implement or already have commenced IBOC transmission.

Source: 2004 *Radio* magazine Salary Survey.

Question of the Month:

What percentage of equipment in your on-air signal path is fully digital (using digital inputs and outputs)?

Vote at www.beradio.com

The Wheatstone GENERATION-5 has the POWER and FEATURES Stations Demand the MOST

LOTS More!

Our Generation-5 provides your operators with a straightforward traditional control surface coupled with all the benefits of digital technology. It gives you the flexibility of system-wide source, mix and destination control (any signal any*where*), a powerful mix-minus section and a complete event store, name and recall system. One wire from this surface can control THOUSANDS of wires in your technical operations center.

And while the G-5 *feels* like an analog console, its DSP-based mixing engine keeps your digital sources digital while converting analog sources to switched digital, eliminating crosstalk and noise. It can furnish remote and telcom functionality on any input fader without fear of feedback—a real plus in back-to-back daily operations. Its built-in graphic displays keep operators on top of things with just a glance. And since the entire system is software based, you can accommodate any format with a press of a button.

Like all our Generation Series consoles, the G-5 has complete failsafe options available, such as automatic fail-over DSP and CPU cards and redundant power supplies. We can even provide scheduling software and studio mounted satellite cages that can be configured to mix independently from your main routing system.

***At WHEATSTONE** we've built and sold over a thousand digital audio consoles.* The G-5 is a culmination of all that experience. *Benefit from our expertise — choose **WHEATSTONE**!*

Wheatstone

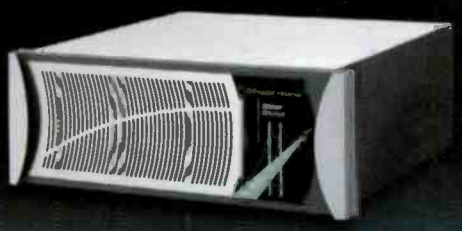
600 Industrial Drive, New Bern, North Carolina 28562
252-638-7000 / www.wheatstone.com / sales@wheatstone.com

Behind Every GOOD CONSOLE
There's an EVEN BETTER ROUTER

GENERATION 4

A Straightforward, Easy-to-Use Control Surface

There's no long learning curve required to immediately start using this traditional layout specifically envisioned for operators of all skill levels.



***BRIDGE TECHNOLOGY** enables the GEN-4 surface to operate far beyond the limits of its studio mainframe. Integration with the Bridge digital audio network router provides systemwide access to all station on-air and off-air audio resources via interlinked CAT-5 or fiberoptic cable. And of course, we all know **EXPERIENCE COUNTS**! With over eighty Wheatstone Generation control surfaces already operating in the field, you can be assured your installation will proceed smoothly and on time.*

the digital audio leaders

Wheatstone

www.wheatstone.com