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SEPTEMBER 2002

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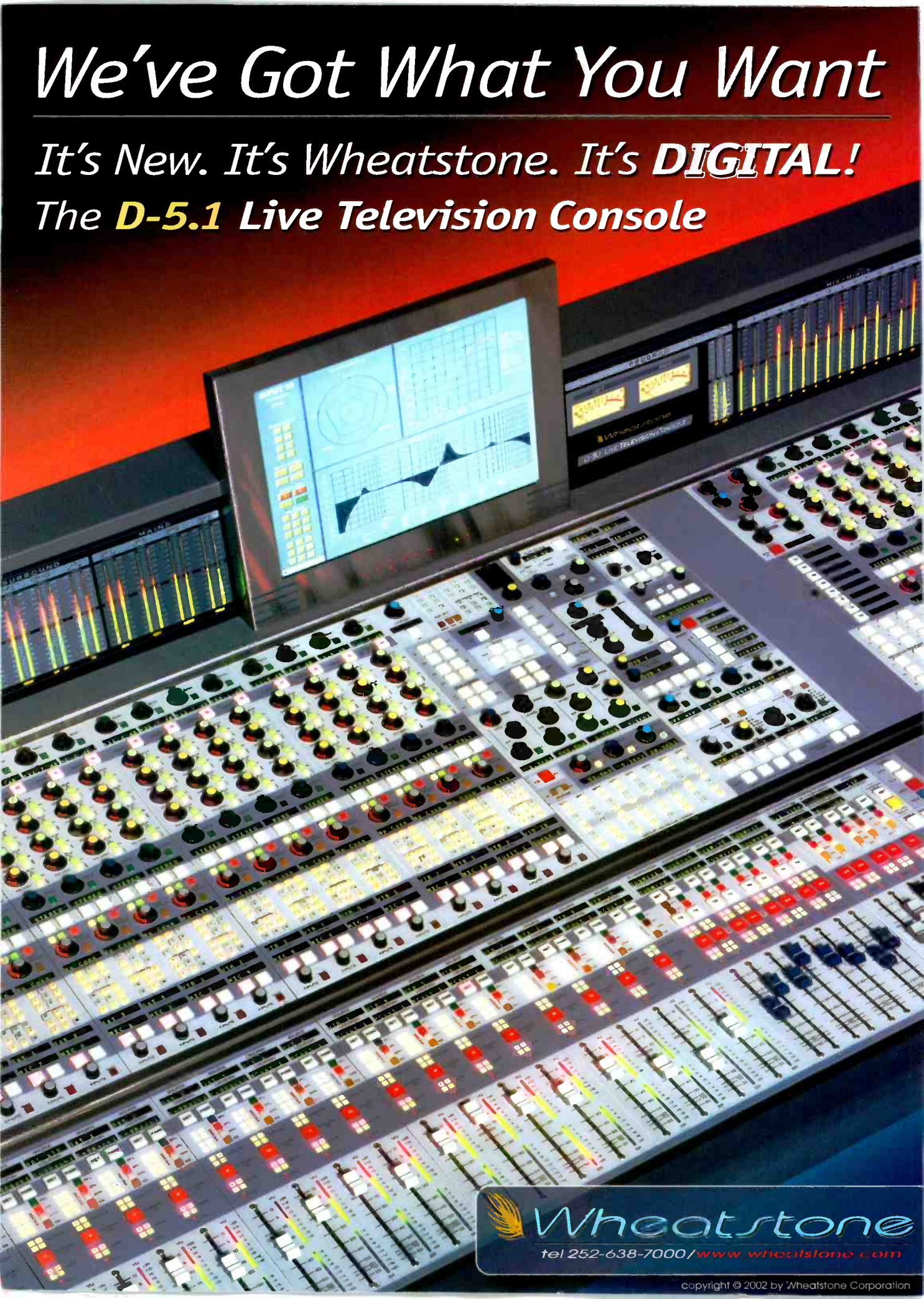
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CASE STUDY

Communications Corporation of America, Lafayette, Louisiana

Company Name:
Communications Corporation of America

Headquarters:
Lafayette, Louisiana

Stations:
KADN – Lafayette
KLAF – Lafayette
WNTZ – Natchez, Mississippi

Critical Needs:
Simplified multi-channel operation
Integration with existing traffic system
System reliability
Centralcasting capabilities

Lou Strowger
Chief Engineer for Communications Corporation of America

Even with 20 to 22 hours of syndicated content played out daily, Lou Strowger, Chief Engineer for Communications Corporation of America, felt that operator errors were costing his Lafayette broadcast center too much money.

"We knew there had to be a better way to run things," said Strowger, who is responsible for engineering operations at 22 middle market stations throughout Texas, Louisiana and western Mississippi. Strowger was ready to make the move to station automation.

Before installing the Odetics AIRO™ Automation System, co-located stations KADN, KLAF and WNTZ required 3 master control operators – one for each station – as well as a prep operator. "Each station was operated independently, with no common server, and no machine control," explained Strowger.

After evaluating different products, Strowger decided to upgrade to the AIRO system. He felt Odetics offered the reliability his operations demanded, and his past experience working with the company had been positive.

Most of the programming for the three stations is bartered – syndicated shows with commercials included and a few local ad avails. Programs are taped daily, logged for in and out points, and played on the scheduled air date. The broadcast team's first task was to integrate AIRO with an existing traffic system to create compatible logs, build as-run reports and reconcile daily schedules.

Odetics worked with Strowger's team to create a new interface to the traffic system. Despite these obstacles, the AIRO system was up and running within a week after installation. "There were no surprises with Odetics," added Strowger.

Learning to operate AIRO is quick as well. "Many of our operators have little or no experience in a control room, but training on AIRO is pretty easy," said Strowger. "It takes only a few days to get an operator up and running with the system. We probably spend more time teaching them about station procedures or using Windows than automation."

From a familiar Windows interface, AIRO allows a master control operator to simply prepare the play list to match the log from the station's traffic department. The AIRO system automatically cues each tape and inserts local spots according to the schedule. "We now use a single master control operator and one prep operator to manage all three channels," commented Strowger. "Certainly, cost was a factor, but our focus is more on reliability."

Worry-free AIRO has provided Strowger, a 25-year industry veteran, with the opportunity to completely dispense with the headaches and responsibility incumbent with managing independently operated stations. He feels he receives excellent engineering support from Odetics. "Every little problem we encounter, they're right on top of it. I trust Odetics. I know they're going to do what they promise and they're going to do it right."

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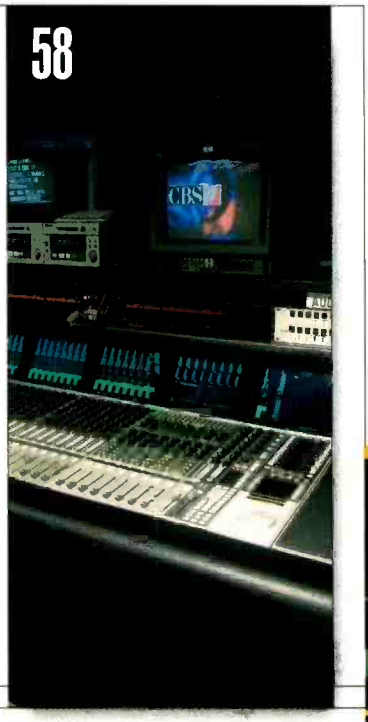
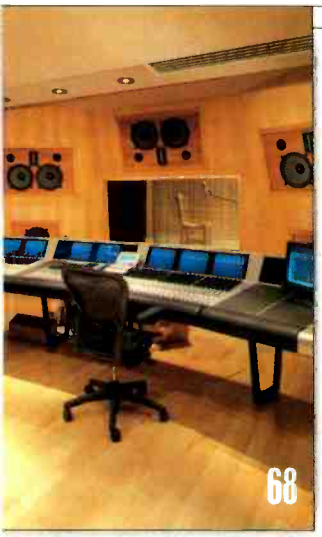
FEATURES



ON THE COVER: KTVT's audio console controls 88 processing channels, 24 mix busses, 24 group busses and 16 aux busses. The Fort Worth, TX, station interfaces this processing with 24 microphone preamplifiers and 48 AES digital inputs and outputs. Photo courtesy Euphonix. Photo by Edward Colver.



BEYOND THE HEADLINES

DIGITAL HANDBOOK

(continued on page 8)

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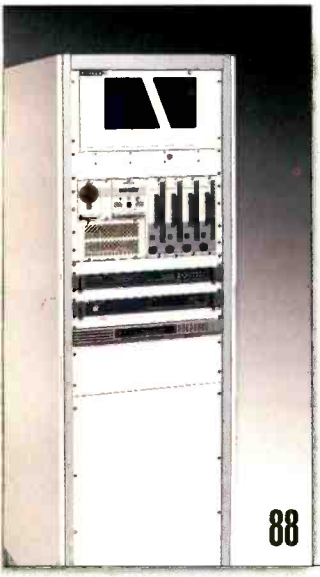
NEW PRODUCTS & REVIEWS

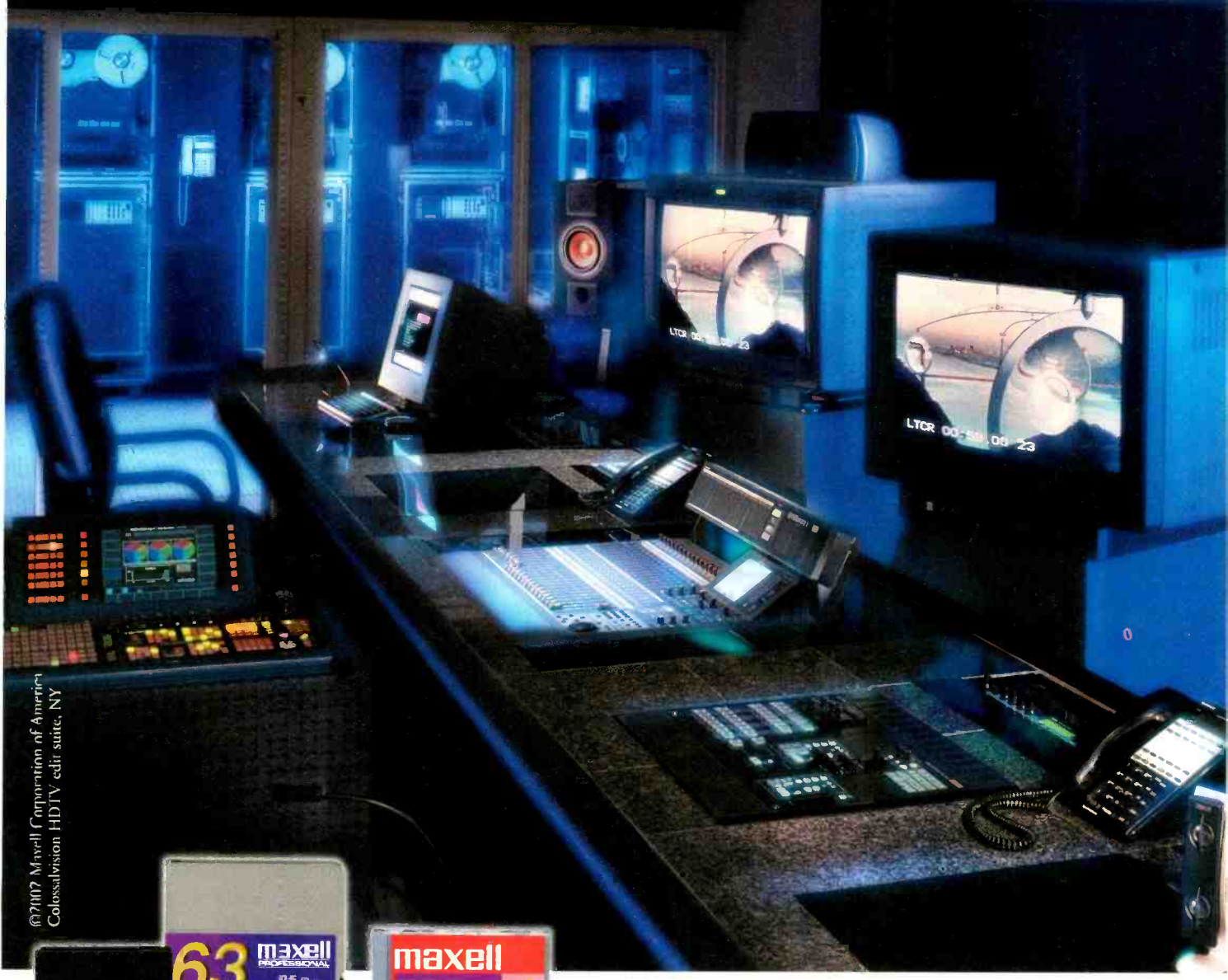


DEPARTMENTS

Name this company

What company often used this critter in their advertisement, saying "One less alligator"? Correct entries will be eligible for a drawing of *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-September" in the subject field and send it to: bdick@primediabusiness.com. Correct answers received by Nov. 1, 2002, are eligible to win.

What company creates advanced media for the new and emerging technologies?



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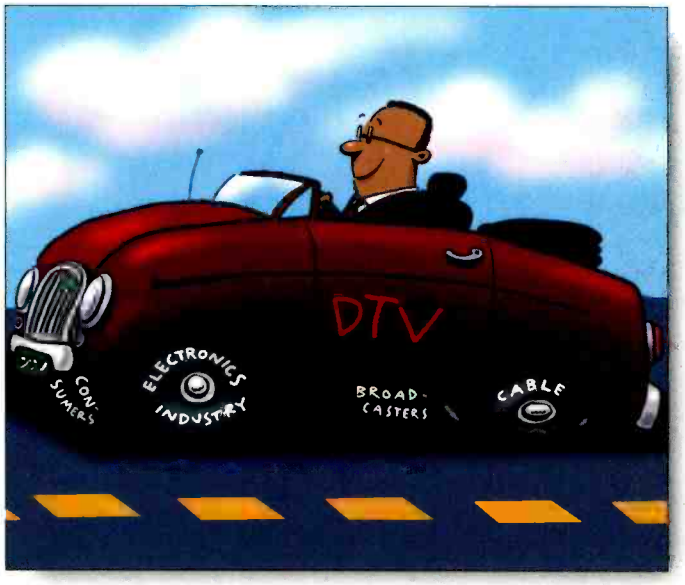
Powell's folly

Our fearless FCC chairman, like his two predecessors, has fallen into the bad habit of blaming the wrong guys for the DTV "problem."

First, broadcasters were blamed for DTV's failure. Now, Powell and his FCC minions have decided the problem with DTV is that TV sets don't have digital tuners. The "solution" is therefore to just require that all new sets made have digital tuners.

Let's check the math. There are about 99 million TV homes and maybe one million DTV sets out there (and that's optimistic). Suppose we sell another three million sets next year and that those sets can receive a DTV signal. Why, that brings the DTV penetration up to a whopping 4 percent! Wow! Some TV stations have higher audience ratings when they're off the air!



This means that with Mr. Powell's mandated DTV tuner plan, maybe in 10 years, when most of the current sets have been retired, we might have 30 percent DTV penetration. Ask yourself how this bureaucrat can justify forcing expensive DTV tuners into new sets when 70 percent of the audience will never use them. The only thing I can figure out is that maybe he owns Zenith stock.

The solution to the DTV dilemma, Mr. Powell, as my readers well know, is for you and your fellow commissioners to develop spines and require the cable industry to become a partner to DTV. Without that action, DTV is DOA and everyone knows it.

I find it very interesting how Mr. Powell can respond when he smells a real political opportunity. Two shock jocks, Opie and Anthony, from WNEW-FM recently urged listeners to have sex in unusual places. The jocks might have gotten away with the broadcast if Brian Florence and Loretta Lynn-Harper hadn't been arrested for allegedly having sex in St. Patrick's Cathedral as a part of the show. A station employee broadcasting their act was also arrested.

Upon hearing of the broadcast, Chairman Powell immediately ordered an investigation. Another commissioner suggested the FCC consider revoking the station's license. All this FCC activity was based on one teeny, albeit objectionable, event. However, when it comes to providing leadership to resolve a decade-old issue, apparently Chairman Powell has yet to pick up on the correct political scent.

Mr. Chairman, mandate DTV cable must-carry on the same schedule as broadcasters and you'll solve the DTV dilemma almost overnight. The result of such action will be consumers flocking to DTV. Broadcasters will more quickly build their new DTV systems. The TV set makers will sell more products, creating new investment and more viewers. And you will become a hero to Congress – and the consumer.

So, Mr. Powell, pretend you're like your dad. Stand up and kick some (cable) butt.

Brad Dick

editorial director

Send comments to: • direct: editor@primediabusiness.com • web site: www.broadcastengineering.com

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Apathetic GMs

Bravo, bravo! I applaud your [July] editorial because it is right with regard to the general attitude of TV station management concerning the DTV transition. There are some exceptions to your characterization, but unfortunately, only a few.

For example, we DTV early adopters in Dallas/Fort Worth only hear from the engineering staffs at TV stations with regard to our HDTV and DTV viewing experiences. Many of these engineers are extremely helpful. They offer recommendations regarding antenna reception (which is quite good) and provide other useful information on DTV.

To my knowledge, however, none of the GMs of the local TV stations has made any attempt to talk to or communicate with any DTV viewers. Why? Don't you managers think our direct feedback might be helpful? I guess it would, if you were really interested in, or cared about, DTV.

Access any of these TV stations' Web sites, and there is hardly any information promoting DTV and the great high-definition broadcasts readily available in our market. It's as though DTV and high-definition programs are some deep, dark secret known only to the small but growing number of assertive DTV purchasers/viewers.

Those assertive DTV purchasers, by the way, can readily find great new HDTVs for a lot less than $3,000. With a little time and patience, a smart consumer can find a good, fully integrated (ATSC tuner included) HDTV set for less than $2,000.

None of the sales and marketing staffs of the local TV stations here have any clue regarding the size of the local DTV viewing audience, and they aren't making any attempt to find out. What's the matter, folks? Are you afraid that if you went to any effort to actually investigate you might discover that there might really be a large enough audience to make it worth your while to develop DTV advertising targeting early adopters?

Having a GM take the time to initiate any effort to canvass local electronics stores to get an idea of how many DTVs have been sold, and initiate cooperative marketing efforts with local television retailers, would require enthusiasm for DTV, and forward thinking. One never knows the dangers involved with such an exercise. Someone just might eventually make money or discover a real business plan for DTV! And that would require too many station managers to take their heads out of the sand and become real leaders in the transition to DTV.

TIM WERNER
DTV OWNER AND FREELANCE SDTV/HDTV VIDEOTAPE EDITOR

NBC and miniDV

I wonder what your reaction is to NBC's recent move to miniDV for much of their network news field production. In case you haven't heard, the NBC News Dallas Bureau has been designated as the test bureau for the consumer-grade format, and they have told freelance camera crews in the Southwest that they will now accept only miniDV pieces for *Nightly News* and *Today*. The bureau has been issued Sony VX-2000s for staff use. NBC's *Dateline* has also begun to occasionally use miniDV as an acquisition format for entire segments. I'll certainly admit that Betacam's days are numbered, but I never expected that one of the broadcast networks would choose to replace it with miniDV! I had expected (hoped) that when the network news divisions changed to a digital format for field production, it would be HD, or barring that, DigiBeta or DVCPRO50.

NAME WITHHELD BY REQUEST

More on PAL

Dear Michael Robin:

I work for the CNBC channel in India, and I read your column regularly. I have a question about your June article on digital composite signals. Could you suggest a Web site or another article where I could get information about PAL digital signals?

Thanks and regards,

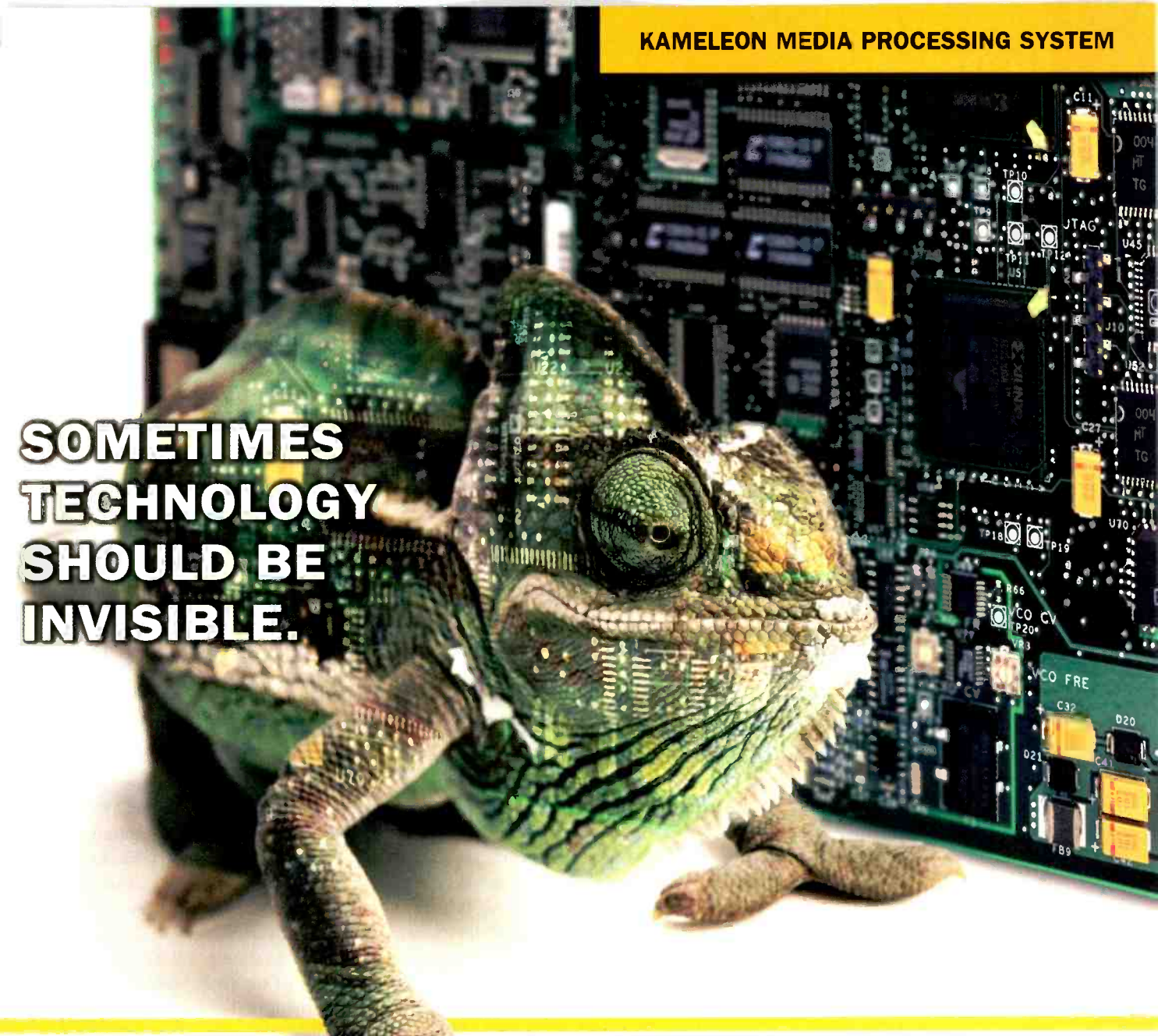
RAJESH POTPHODE
CNBC CHANNEL, INDIA

Michael Robin responds:

Dear Rajesh:

Here are some suggestions concerning the PAL documentation that you are looking for. First, I would suggest consulting EBU Technical documents 3280 (Digital PAL Interface) and 3267 (Interface for Component Digital for 625-line 4:2:2 Signals). These documents are easily accessible on the EBU Web site, www.ebu.ch. Second, my book, *Digital Television Fundamentals*, covers analog PAL (pages 62 to 77) and digital PAL (pages 151 to 162). Component digital signals (both 525/60 and 625/50) are covered on pages 169 to 211.

REGARDS,
MICHAEL ROBIN



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By combining extensive signal conversion, synchronization, and processing capabilities onto one module, the Kameleon system is a perfect fit for multi-channel operations—from digital cable and satellite uplink facilities, network hubs, and broadcaster centers to OB vans, and production trucks.

For instance, one Kameleon multifunction module can automatically detect an incoming analog composite or SDI signal, open the appropriate processing path, then quickly convert the video to your preferred format—as well as process up to eight audio channels and synchronize them to your video and house timing.

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The most watched worldwide

Internet broadcasting: R.I.P.

BY CRAIG BIRKMAIER

Just a few years ago, a bunch of irrational people were running around, claiming that the future of broadcasting could be found in a place known as cyberspace. That's where the digital revolution was taking place, thanks to a disruptive technology known as the Internet.

Who knew that cyberspace would turn into a war zone? That well-entrenched media companies would gain the upper hand – at least for now – after the Internet bubble burst? Who knew that the Internet would be a hostile environment for broadcasting?

In retrospect, it sure looks like Mark Cuban knew. If not, he's just an incredibly lucky Internet billionaire.

Cuban was the entrepreneurial spirit behind Broadcast.com. In 1990, Cuban became a computer industry millionaire after selling his company, MicroSolutions, to Compuserve. In 1995, Cuban came out of retirement to bring "broadcasting" to the Internet.

Soon, half a million people were listening to radio and TV stations carried live on the Broadcast.com Web site. Cuban's employees worked for ten dollars an hour, but with stock options as an incentive, and they were coming up with fresh ideas — like streaming President Clinton's grand jury testimony and a Victoria's Secret fashion show.

Never mind that the underlying technology of the Internet, IP, does not support broadcasting (we'll get back to that in a moment). Never mind that the Victoria's Secret fashion show exposed this reality, as hundreds of thousands of people tried and failed to watch the "broadcast."

Not to worry, these technical glitches could be solved. Internet broadcasting sure looked like the next big thing.

Cuban's gamble paid off spectacularly, first when Broadcast.com went public, and then when Yahoo purchased the company in April of 1999. Three hundred employees became millionaires and Cuban himself was left with approximately $2 billion.

The timing could not have been better, given the domino effect of the dot.com bubble bursting; the looting of companies that invested in fiber optic networks to handle the deluge of bits (that are still bottlenecked by the high cost of first- and last-mile broadband connections); and the resulting meltdown of high tech.

It is relatively easy to build a private network today that supports IP multicast, and to link this network to the Internet backbone.

What did Cuban do? Well he created HDNet, the first all-HDTV network – currently available as Channel 199 on DirecTV. Recently, Cuban announced he is planning to expand HDNet to include three more networks showing high-def sports, movies and entertainment by the end of this year. It is likely that these channels will become the backbone of the recent cable industry commitment to the "Powell Plan," one of the FCC chairman's latest attempts to get the digital terrestrial television (DTTV) transition moving.

Never mind that the cable industry, with help from HDNet, HBO, Showtime and Discovery HD Theater, can meet their commitment to Powell – carriage of up to five channels of HDTV content – without delivering a single bit of DTTV content. Never mind that cable and DBS are well positioned to develop the niche market for delivery of HDTV content, while broadcasters continue to try to figure out how to make even one more dime with DTTV. Never mind that the FCC just imposed a huge receiver tax on consumers, mandating that they buy DTTV receivers, which most multichannel subscribers will never use.

FRAME GRAB A look at the issues driving today's technology

In broadband, Scandinavia leads the way

Sweden and Denmark are leading adopters in Europe

European Broadband Breakdown
August 2001

Country	Total broadband	Type of Broadband: Cable	Satellite	ADSL	T1/ leased line
Sweden	13.8%	3.3%	0.0%	5.5%	5.0%
Denmark	13.2%	6.6%	0.0%	6.6%	0.0%
Germany	7.8%	3.6%	0.0%	4.2%	0.0%
France	6.4%	3.2%	0.4%	2.8%	0.0%
Spain	6.2%	2.7%	0.0%	3.5%	0.0%
Norway	5.1%	3.5%	0.2%	1.4%	0.0%
UK	2.3%	1.7%	0.1%	0.5%	0.0%
Italy	0.9%	0.5%	0.1%	0.3%	0.0%

Source: NetValue www.netvalue.com

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"The Internet is broken"

We may never know if Cuban saw all of this coming. But several hundred people in the television industry were given ample warning about the impending Internet meltdown. I know. I delivered the warning in February of 1999, several months before Broadcast.com was sold.

The warning was delivered at the 33rd Advanced Imaging Conference of the Society of Motion Picture and Television Engineers. The paper addressed the opportunity for broadcasters to deliver new forms of digital media content to the masses using data broadcasts carried in the transport multiplex of their DTTV channels.

The Victoria's Secret fashion show Webcast served as an example of how broadcasters can become an important part of the fabric of the Internet. I related how a DTTV broadcaster could be delivering both the program and the entire E-commerce Web site to local cache (a.k.a. a PVR).

The audience wasn't buying it. In those days, the video industry considered the Internet to be a serious threat. To their relief, my next slide delivered some good news: The Internet is broken!

The crux of the problem is TCP/IP, the foundation upon which the Internet is built. TCP handles the negotiations between a source of data (a server) and a computer requesting this data, and keeps track of the routing of the payload (the IP packets). TCP/IP is a two-way transactional system.

The live broadcast of the first Victoria's Secret fashion show demonstrated the drawbacks of broadcasting over the Internet. Broadcast.com had to scale up the servers to meet the demand, and many potential viewers were still turned away.

In video industry terms you can think of it like video-on-demand. Every set of eyes (or ears for audio streaming) must be sent their own copy of the program. If the program is live, the same bits are sent to every computer requesting the program. If the program is stored on a server, every person can access the program independently and control the playback, just like the VOD systems that the cable industry keeps promising.

The term "Internet" is a contraction of inter-networking, the foundation upon which *the* Internet is built.

As more people request access to a program, the server(s) are forced to create more individual threads. This places huge demands on the server(s) and fills the Internet backbone networks with duplicated IP packets. This is the inverse of broadcasting, which is the epitome of efficiency – one program to many. The live broadcast of the first Victoria's Secret fashion show was swamped with requests – many potential viewers were turned away. And the servers that hosted the accompanying e-commerce site were

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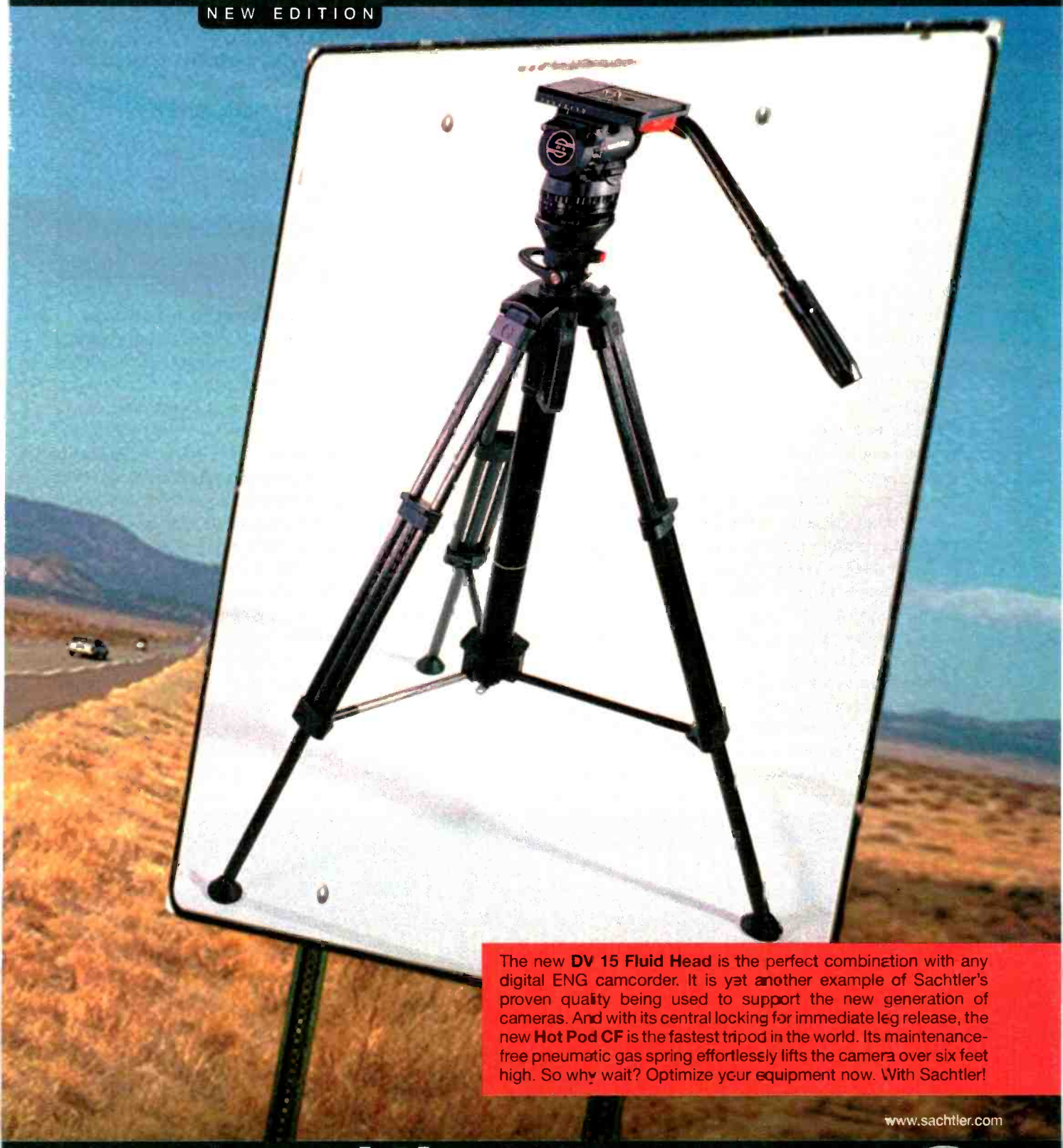

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set your ideas in motion!

swamped as well. Broadcast.com had to scramble to scale up the servers to meet the demand. The Achilles heel of Internet broadcasting had been exposed.

Broadcasters got the last laugh, as ABC delivered the 2001 Victoria's Secret fashion show.

IP multicast to the rescue

The logical solution to this problem is painfully evident. Send the IP packets for a live broadcast once and route them to everyone who wants to view or listen to the program. The folks who invented Internet protocols understood this and created a standard to do just that: IP multicast.

Two problems:

1. The vast majority of Internet routers installed during the explosive growth period of the late '90s do not support the IP multicast protocol.
2. Internet congestion frequently causes streaming media to pause or stutter if packets arrive too late and buffers designed to deal with this issue are emptied out.

It is relatively easy to build a private network today that supports IP multicast, and to link this network to the Internet backbone. Anyone on the private network can then take advantage of IP multicast services and still access all of the Internet servers sitting behind routers that do not support IP multicast.

Today, companies like Akamai deliver streaming media service both to Internet and intranet clients. The company uses private network bandwidth to get the copies of the streams out to "edge servers" located around the world. This gets the bits closer to the customer, improving performance.

For companies with private networks that support IP multicast, Internet broadcasting has become a reality. This is one example of why the focus of Internet streaming has moved away from business-to-consumer to business-to-business. Businesses have the bandwidth, the applications and the money to pay for it today.

I told the SMPTE audience that broadcasters could become part of the Internet too. The IP multicast protocol is ideal for digital broadcasters, with minor modifications. To join a multicast delivered via the Internet backbone or a private network, a two-way transaction is required to initiate the routing of bits to your computer. Since broadcasting is a one-way service there can be no such transaction; but none is needed. Broadcasters can just deliver an IP multicast with the proper packet headers, and any receiver that knows what it is looking for can tune in.

Asynchronous communication is the key to enabling broadcasters to enter many new markets, and it acts as a bandwidth multiplier.

The Internet is a concept

It is unfortunate, but many people still think of the Internet in terms of the TCP/IP backbone that delivers most of the global traffic today. The term "Internet" is a contraction of inter-networking, the foundation upon which *the* Internet is built. By tying many different networks together and using a few key concepts, it is possible to create a highly reliable fabric for digital communications.

The key is connections, the ability to share information with anyone, anywhere, anytime. Thus, we are seeing many new applications enabled as new and different kinds of networks and devices are interconnected. For example, it is now easy to use a Web browser to send a text message to a pager or PDA equipped with wireless connections.

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to route data through multiple paths, bypassing congestion and networks that are temporarily disabled. Equally important, private networks can be used to augment the public networks, making it possible to guarantee the quality of service needed for specific applications like Internet broadcasting.

Another key inter-networking concept is isochronous communications, the ability to broadcast real-time events. This is where IP multicast comes in, allowing events to be streamed in real time to many recipients. Television is an isochronous medium today.

Perhaps a more important inter-networking concept is the ability to enable asynchronous communication; for instance, I put information up on a Web site that you can consume on demand.

The personal video recorder (PVR) is an extension of this concept. Marking programs in the EPG causes the PVR to tune to and capture the information that is being broadcast. It is also possible to teach the PVR to look for and capture certain kinds of information.

Asynchronous communication is the key to enabling broadcasters to enter many new markets, and it acts as a bandwidth multiplier. As indicated with the Victoria's Secret example, ancillary data can be cached while a viewer is watching a program for asynchronous consumption, or programs with complex interactivity can be cached. The program can then be navigated through based on the viewer's interests. And a wide range of data services can be continuously updated in cache; for example, the latest weather, sports scores and news headlines could be available on demand.

The ability to deliver programs to cache would allow broadcasters to use off-peak hours to deliver a wide range of free-to-air and premium content to viewers. HDTV movies could be delivered to cache and consumed on demand with full control like a DVD.

And all of this can be linked with the two-way networks that more and more homes are installing. Thus, the two-way network can be used for the kind of transactions that the Internet is good for, while the one-way broadcast network can do the heavy lifting, delivering a tidal wave of IP multicast bits to the masses. BE

Craig Birkmaier is a technology consultant at Pcube Labs, and hosts and moderates the OpenDTV Forum.

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BEYOND THE HEADLINES

Need for
EEO rules explored

BY HARRY C. MARTIN

In June, the Commission held an en banc hearing on the need for new broadcast and cable equal employment opportunity (EEO) rules.

There were opening statements by Chairman Michael K. Powell and the other three commissioners. Former FCC commissioner Henry Rivera then provided a description of the history of the Commission's EEO rules and policies. The meeting then turned to two panel discussions, each followed by a question-and-answer period. The first panel focused on the challenges of EEO outreach. The panel was weighted towards minority and women's organizations, including the National Urban League, American Women in Radio and Television, the National Organization for Women, and Hispanic Americans for Fairness in Media. These groups said that there historically has been employment discrimination in the broadcast industry. They also said that previous broadcast EEO rules helped reduce the problem, but that more work still needs to be done. These panelists endorsed the return of EEO regulation by the Commission.

Also included on the panel were the American Federation of Radio and Television Artists, Midwest Family Broadcast Group, and the executive director of the Texas Association of Broadcasters, Ann Arnold. Arnold questioned the need for new EEO regulations. She pointed out that the broadcast industry, for over three years, has not been subject to any EEO rules, but that there is no evidence of any new discrimination in employment. She also informed the commissioners, none of whom was a sitting commissioner during the last license renewal cycle, of the abuses that had occurred under the former EEO system.

The second panel addressed methods of achieving broad and inclusive outreach. Included on the panel were Cathy Hughes, the founder and chairman of Radio One, and other broadcast industry managers involved in outreach. These panelists recounted a number of anecdotes based on their experiences and described recruitment programs that they found to be successful in attracting diverse applicant pools. Hughes remarked on the difficulty she has had in recruiting Caucasian applicants for her minority-oriented stations. The panelists provided few other examples of negative experiences in attracting minority and female job applicants.

The goal of the meeting appears to have been to provide the Commission with evidence to support the adoption of new EEO rules. While neither of the panels produced evidence of any particular need for FCC regulation, the sympathetic ear given by the commissioners to the panelists suggests that the commissioners may likely view the hearing testimony as supportive of new rules.

[Minority and women's] groups said that there historically has been employment discrimination in the broadcast industry.

Processing fees increased

Effective Sept. 10, the Commission amended its schedule of application filing fees to reflect changes in the Consumer Price Index – Urban ("CPI-U") as of Oct. 1, 2001. Copies of the Fee Filing Guide listing the new fees are available at the Commission's Web site, (www.fcc.gov/formpage.html), or through its Forms Distribution Center at 1-800-418-FORM [3676]. For those keeping track, the CPI-U has undergone a net change of 40 percent since October 1989.

Author's Note:

As a clarification for the reader, the June FCC Update article on emergency information requirements for TV stations incorrectly referred to closed captioning. BE

Harry C. Martin is an attorney with Fletcher, Heald & Hildreth PLC, Arlington, VA.

SEND Send questions and comments to: harry_martin@primediabusiness.com

Dateline

TV Annual Regulatory Fees

TV VHF Commercial	
Markets 1 – 10	$47,050
Markets 11 – 25	$34,700
Markets 26 – 50	$23,625
Markets 51 – 100	$15,150
Remaining markets	$3,525
Construction permits	$2,750
TV UHF Commercial	
Markets 1 – 10	$12,800
Markets 11 – 25	$10,300
Markets 26 – 50	$6,600
Markets 51 – 100	$3,875
Remaining markets	$1,075
Construction permits	$5,175

Annual regulatory fees must be paid by Sept. 25, 2002. The fees for commercial television stations are shown in the table above.

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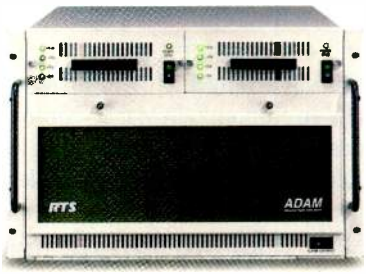

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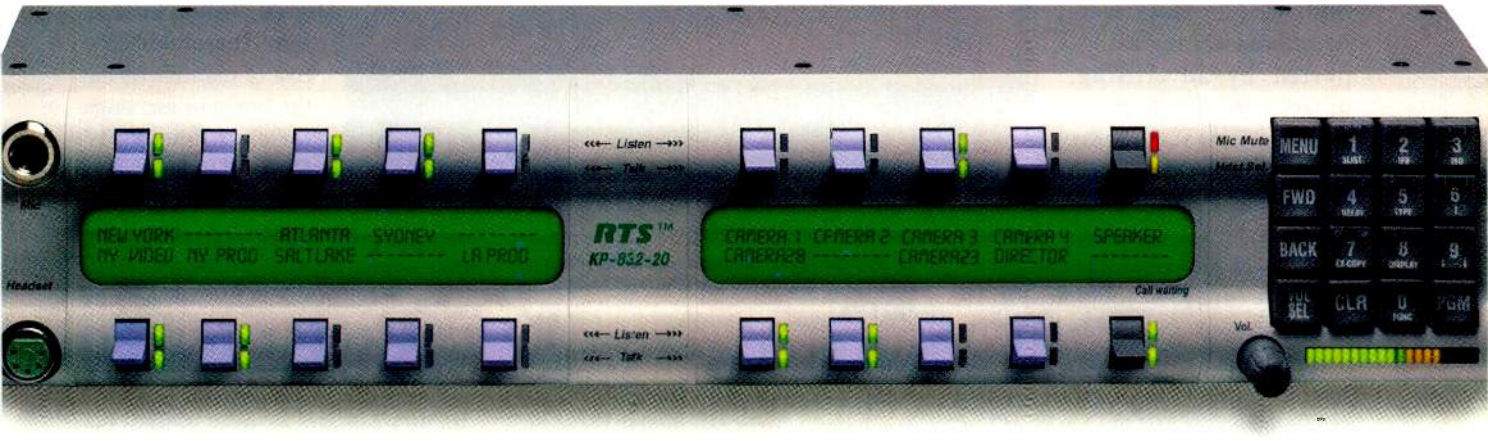

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Jumpstarting digital/interactive TV

BY DON KELLER

Digital/interactive TV is just around the corner. That's what consumers have been told. The problem is, they've been hearing that promise for years, and it's beginning to ring hollow. When the subject comes up in casual conversation with friends and acquaintances, most say that it's too expensive right now, and they'll wait for prices to come down before they buy into it. Ironically, this is part of the reason that digital/interactive TV is floundering. Other, more cynical consumers think that digital/interactive TV is just another government screwup and a waste of taxpayer money. But it's not the taxpayers' money that's on the line; it's the broadcasters'.

Catch 22

Broadcasters, of course, are all too familiar with the difficulties they face in implementing digital/interactive TV. It's the old chicken-and-egg conundrum, also known as the Catch-22 scenario. Most consumers won't buy the equipment — mostly because it's too expensive, but also because there isn't much DTV/iTV programming available anyway. So very few consumers own digital TVs. For advertisers, this makes for a small market. And, since the vast majority of broadcasting is supported by advertising, broadcasters can't attract the advertising revenue they need to support DTV/iTV. Meanwhile, the FCC is forcing broadcasters to spend huge amounts of money to buy and install DTV broadcast equipment and prodding them to provide DTV/iTV programming and services. It's a sure bet that many broadcasters, especially the smaller ones, feel like beasts of burden being herded onto barren pastures by a cattleprod-wielding rancher.

But there are signs of hope. Some broadcasters are banding together with producers, advertisers, set-top box vendors, software providers, billing vendors and others to form complex revenue-sharing arrangements to make DTV/iTV an economically viable venture. One company may have even found a way to solve the chicken-and-egg problem by making DTV/iTV affordable to consumers.

Many broadcasters feel like beasts of burden being herded onto barren pastures by a cattleprod-wielding rancher.

WOW's solution

Utah-based WOW Digital TV plans to make DTV/iTV available to the masses by marketing a set-top box for about $200. The box will pick up over-the-air DTV/iTV broadcasts in all of the 18 allowable ATSC formats. When connected to a conventional NTSC television receiver, the box converts the ATSC signals to analog 480i and produces a DVD-quality picture. When connected to one of the new digital-ready TVs, it displays the ATSC signal in whatever form the digital TV is capable of displaying.

WOW Digital TV's $200 set-top box is compatible with conventional analog TVs, as well as digital TVs and HDTVs.

Currently, most ATSC STBs cost well over $500, which is more money than most consumers pay for a TV set. And most of these boxes cannot be used with a conventional analog TV set. WOW Digital TV is counting on its STB's low cost and compatibility with conventional TVs to break the ice — to attract consumers to DTV/iTV and open up the market for broadcasters and advertisers.

Howdy, pardner

To do this, WOW Digital TV has come up with a strategy that involves several technology partners and broadcast partners.

Hardware partner Advanced Digital Broadcast manufactures the box while STMicroelectronics supplies the semiconductor chips used in the boxes. STMicroelectronics says its chips are two generations ahead of those in competing cable boxes, and are therefore less expensive. In addition, Advanced Digital Broadcast has agreed to subsidize the cost of manufacturing the boxes in exchange for equity in WOW Digital TV. Even with these concessions, WOW doesn't expect to make a profit on the boxes — at best, it expects to break even. To stay in business, WOW will help its broadcast partners provide enhanced and interactive services, and share in the profits these services generate.

WOW's software partners develop the STB middleware and the enhanced and

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interactive services used by the broadcast partners. OpenTV, which is WOW's largest investor, developed the middleware that allows multicasting and interactivity. Intellocity works closely with WOW's broadcast partners to develop interactivity tools and applications geared toward the broadcaster's needs. Enhanced and interactive services are available to the user through the STB's remote control, and appear as a second window on the TV screen so that the viewer never leaves the on-air program — a key feature for both viewer and advertiser. Enhanced services offer viewers features such as downloadable arcade-style video games and movie soundtracks, electronic program guides (EPGs), on-demand sports statistics, alternate camera angles during sports events, enhanced news or weather information, traffic cameras, etc. Interactive services, which would make use of a telephone-line back channel connected to the STB, will allow viewers to respond to a poll, order a pizza or perform other so-called T-commerce functions.

WOW's broadcast partners develop and design specific programs that use WOW's enhanced and interactive services. They also advertise the WOW box during their programs.

Finally, WOW itself finances the box, recruits broadcasters and negotiates agreements with them, and aggregates national programming content for local broadcasters.

Birth of a notion

WOW Digital TV was co-founded in 1999 by Kevin Doman, Steven Lindsley and Louis Libin.

Doman and Lindsley had grown up together in Salt Lake City. Before co-founding WOW, Lindsley had been president of Salt Lake City's NBC affiliate KSL, and was involved with forming a combined DTV facility with KSL and seven other stations from other networks. He became acquainted with Libin when he hired him to help build the combined DTV facility.

Lindsley said that, after completing the combined facility, it dawned on him that neither he nor the other seven stations had an audience. He says that broadcasters continue to find themselves in the tenuous position of being mandated by law to build out their digital transmission facilities and send the signals out into the marketplace — an essentially empty marketplace. In response, he co-founded WOW Digital TV with the fundamental premise that WOW will carry certain burdens and the broadcasters will carry certain burdens, and then both sides will share revenues. Specifically, WOW will create the technical platform and take the risks of building the boxes and the backend systems. In return, participating broadcasters will create iTV programs using tools supplied by WOW and promote the service.

After completing the combined facility, it dawned on Lindsley that neither he nor the other seven stations had an audience.

Drum roll, please

But the big question is, will it succeed? Will WOW be able to jumpstart DTV/iTV? Will it become the model that others emulate? To a large degree, that depends on how many broadcast partners WOW can recruit, and whether or not consumers buy the STBs. So far WOW is negotiating agreements with about 50 stations.

As for the STBs, WOW conducted tests on its STBs during the 2002 Winter Olympic Games and over the summer months with several broadcast partners.

The company expects to begin rolling out fully-fledged STBs and DTV/iTV services sometime this fall. Stay tuned. BE

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Video resolution:
The analog concept

BY MICHAEL ROBIN

The extent to which a picture medium such as television can reproduce fine detail is expressed in terms of resolution. The early development of television resulted in the two dominant SDTV scanning formats, the 525/60 and the 625/50. The aim was to achieve a satisfactory picture, taking as a reference the visual acuity of the eye. The human visual system (HVS) has two main resolution characteristics: namely, the spatial resolution and the temporal resolution.

The visual acuity of the human eye is on the order of one minute (1/60 of a degree) of arc.

The spatial resolution

Television system design takes as a reference the visual acuity of the eye, which is of the order of one minute of arc. Picture details that subtend an angle of less than one minute of arc are not perceived by the eye. The assumption was made that the picture would be viewed at distance of approximately six times the screen height. So a decision had to be made as to the number of lines should make up a picture. Too many lines would be a waste and too few lines would make the raster line structure visible. North America chose 525 lines and Europe chose 625 lines. The number of visible (active) lines (N_{AL}) is smaller to allow for the vertical retrace of the scanning spot. So in North America we have $N_{AL} \approx 485$ and in the rest of the world $N_{AL} = 575$. A complete picture (frame) is made up of two consecutive fields, each containing half of the total number of lines (262.5 and 312.5). The lines in two consecutive fields are interlaced, resulting in a frame made up of the total amount of lines (525 or 625).

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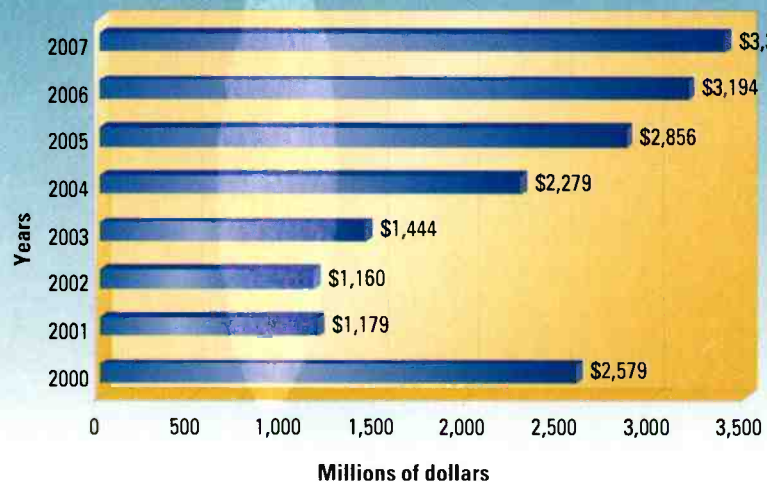

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The vertical resolution. The vertical resolution is independent of the video bandwidth and equals the number of alternately white and black horizontal lines (N_V) that can be resolved vertically over the full height of the picture. It is expressed in lines per picture height (LPH). The early developers of television in the 1930s determined that the vertical resolution is statistically equal to 70 percent of the number of active lines. The so-called "Kell Factor" of 0.7 is at the origin of all conventional television systems.

In the 525/60 scanning standard

$$N_V = 0.7 \times N_{AL} = 339.5\text{LPH},$$

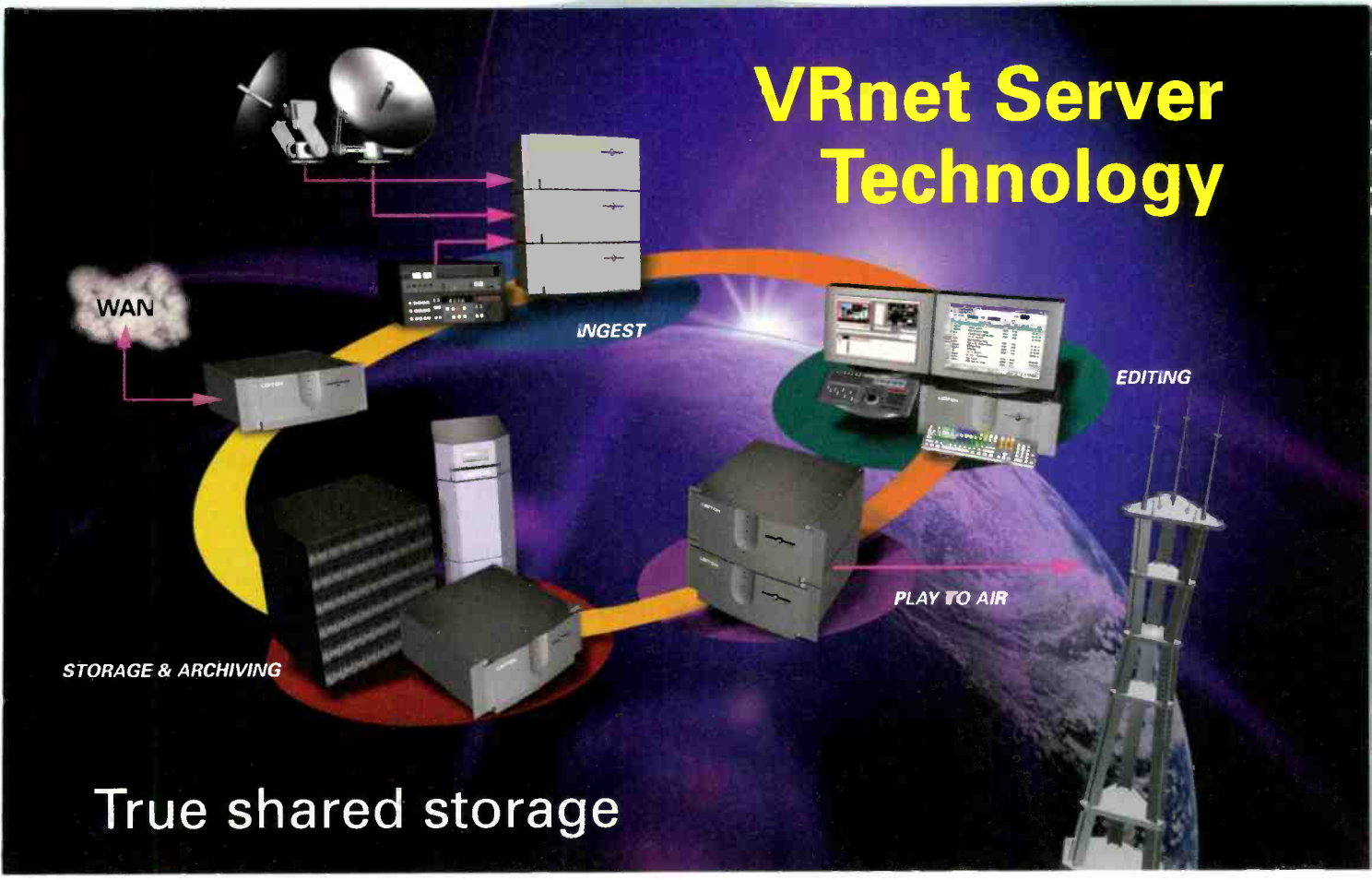
so let's round it down to 339LPH.

If the vertical details in the picture exceed 339LPH they are blurred. In the 625/50 scanning standard

$$N_V = 0.7 \times N_{AL} \approx 402\text{LPH}.$$

Figure 1 shows the case of scanning lines straddling picture details. The result is a loss of vertical resolution.

The horizontal resolution. The aim is to achieve an equal number of picture elements per unit of distance, i.e the picture height, horizontally as



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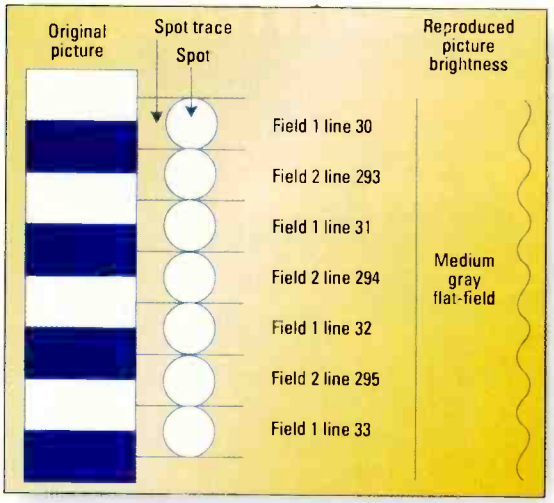

Figure 1. When scanning lines straddle picture details, vertical resolution is diminished.

well as vertically. Figure 2 shows the formation of a sine wave resulting from scanning horizontally aligned picture elements, in this case alternately white and black. The system must allow for a number of horizontal picture elements (Hpix) that is equal to the N_V multiplied by the image aspect ratio (IAR). In the 525/60 SDTV format IAR = 4/3 and N_V = 339 so:

Hpix = 339LPH x (4/3) = 452 pixels.

This results in 452/2 = 226 complete cycles during the active horizontal scanning line.

Given an active line duration of 52.5µs, this results in a cycle duration of:

T = 52.85µs/262 = 0.2338µs.

The associated frequency is:

F = 1/T = 1/0.2338µs ≈ 4.28MHz.

This is the bandwidth required to achieve equal horizontal and vertical resolution. The horizontal resolution factor for a 4.28MHz bandwidth is

339LPH/4.28MHz = 79.2 lines/MHz

Given that the transmitted bandwidth is 4.2MHz, the transmitted horizontal resolution is reduced to:

N_H = 4.2MHz x 79.2 lines/MHz ≈ 333LPH

In the 625/50 scanning standard the minimum video bandwidth for equal horizontal and vertical resolution is 5.15MHz, and the resulting horizontal resolution factor is 78 lines/MHz. Various countries have adopted different maximum transmitted baseband video frequency values, resulting in different horizontal resolutions. In the dominant 625/50 transmission standard (CCIR B,G) the maximum transmitted baseband video frequency is 5MHz, resulting in a transmitted horizontal resolution of:

N_H = 5MHz x 78 lines/MHz = 390LPH.

Reducing this bandwidth reduces the horizontal resolution. A 2MHz luminance bandwidth, typical of VHS, would result in a horizontal resolution of about 160LPH without affecting the vertical resolution.

NTSC and PAL composite signal encoding formats have a typical color difference (B-Y ad R-Y) bandwidth on the order of 600kHz with a resulting horizontal resolution of around 48LPH. The chrominance vertical resolution is unaffected in NTSC but is reduced to half that of the luminance component in PAL due to the line-sequential V subcarrier phase alternation.

Using the same analog approach as above, let's calculate the parameters of the HDTV 1125/60 format. In this format the number of interlaced lines per frame is 1125/60 and the number of active lines per frame is 1080. Given a Kell factor of 0.7, the effective vertical resolution is:

N_V = 0.7 x 1080 = 756LPH.

In the 1125/60 HDTV format, N_V = 756 and IAR = 16/9, so

Hpix = 756 x (16/9) = 1344.

This results in 1344/2 = 672 complete cycles during the active horizontal scanning line. In the 1125/60 scanning standard the total line duration is 29.6µs and the active line duration is 25.83µs. This results in a single cycle duration of:

T = 25.83µs/672 = 38.43ns.

The associated frequency is:

F = 1/T = 1/38.43ns = 26MHz.

The early developers of television determined that the vertical resolution is statistically equal to 70 percent of the number of active lines.

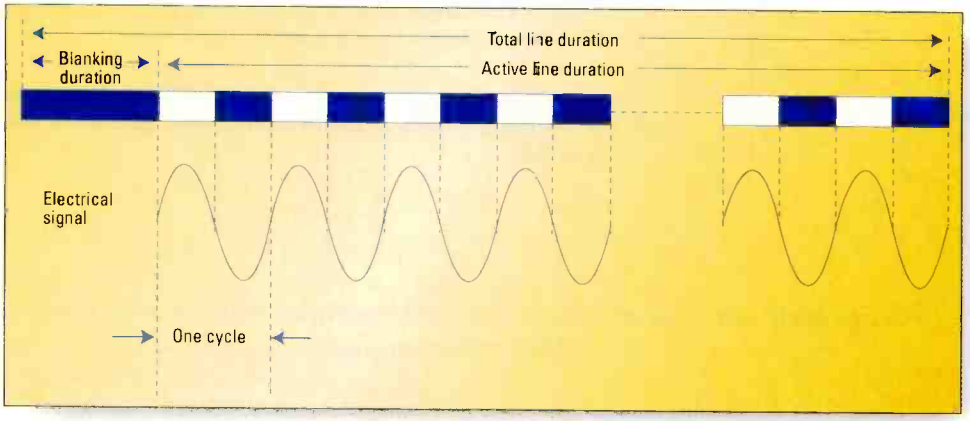

Figure 2. This diagram shows the relationship between horizontal pixels and the corresponding electrical signal in a TV system.

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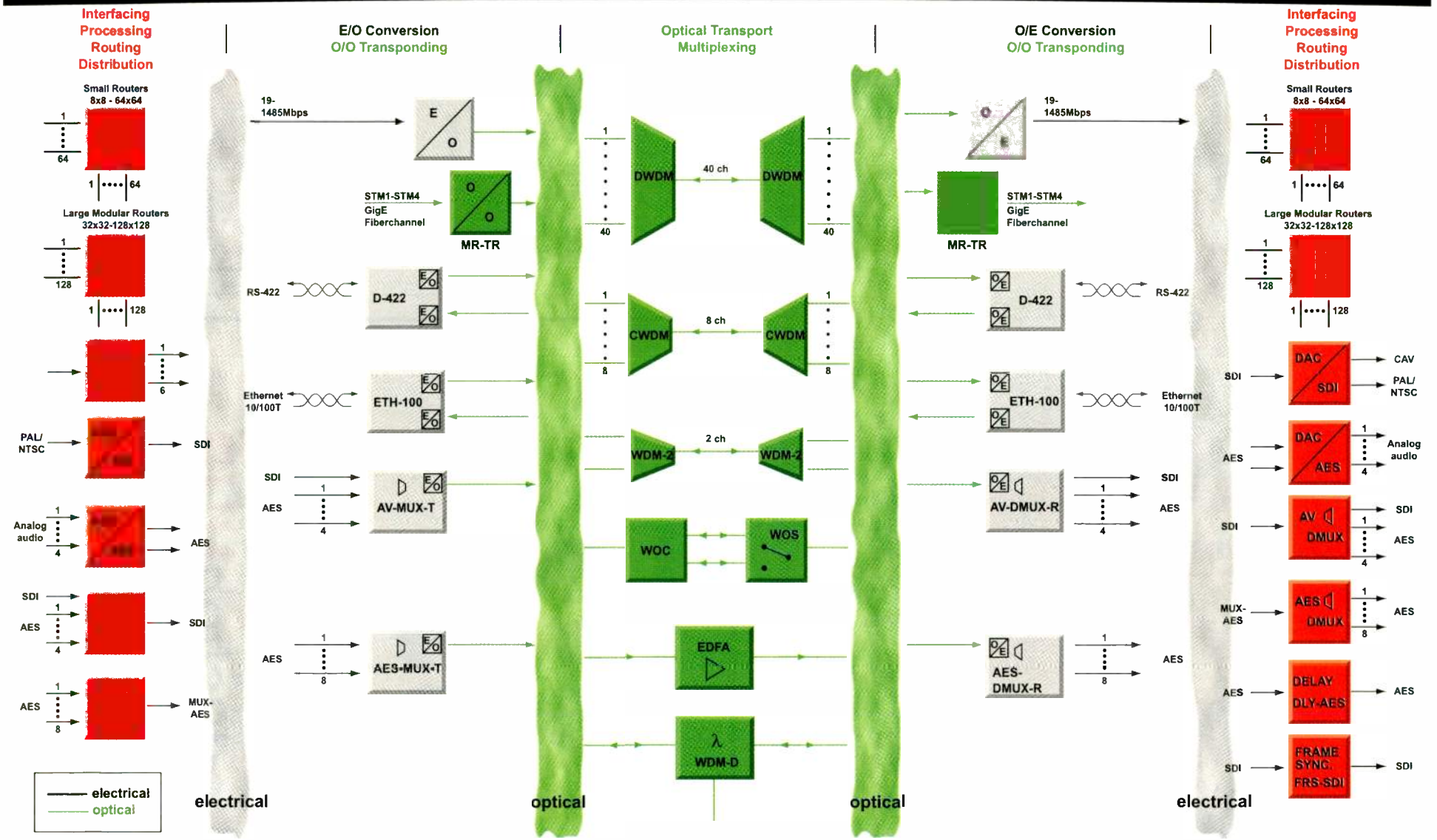

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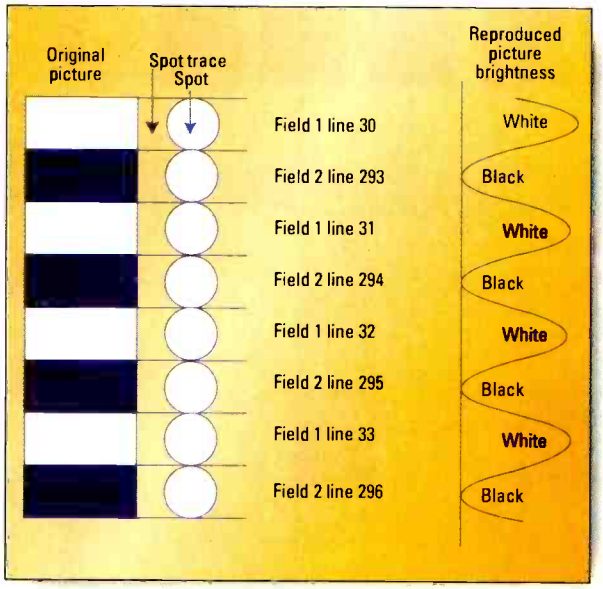

Figure 3. Vertical resolution equals number of active lines when the raster lines are centered on the picture details.

This is the transmission bandwidth required for equal horizontal and vertical resolution of the Y component of the 1125/60 interlaced HDTV system. The horizontal resolution factor for a 26MHz bandwidth is:

756LPH/(26MHz) = 29 lines/MHz.

The temporal resolution

An important property of the eye is the persistence of vision, or the ability of the viewer to retain or in some manner remember the impression of an image after it has been withdrawn from view. When light entering the eye is shut off, the impression of light persists for about 0.1 sec. Ten still pictures per second is an adequate rate to convey the illusion of motion. Reducing flicker, however, requires still higher picture rates. Given the transmission spectrum conservation requirements that imposed a 6MHz channel bandwidth (7- or 8MHz in Europe), the early television developers adopted the interlaced scanning concept, where a picture is divided in two consecutive fields transmitted at a frequency of (nominally) 60Hz (50Hz in Europe). This allowed for the reduction of the transmission bandwidth requirements. The result is that large areas of uniform color and brightness flicker at the field rate (60Hz or 50Hz large area flicker), and this is acceptable. If two adjacent lines in two consecutive fields are not identical, as shown in Figure 3, the result is interline flicker at the frame rate (30Hz or 25Hz). Interline flicker is tolerable because the eye is relatively insensitive to flicker when the variation of brightness is confined to a small part of the field of view. The method works well when the picture is stationary. When there is movement, the two consecutive fields may not be equal and "movement judder" results. Progressive scanning requires a wider bandwidth but does not suffer from small area flicker and judder. In the October issue we will discuss the digital resolution concept. BE

Michael Robin, former engineer with the Canadian Broadcasting Corp.'s engineering headquarters, is an independent broadcast consultant located in Montreal, Canada. He is co-author of Digital Television Fundamentals, *published by McGraw-Hill.*

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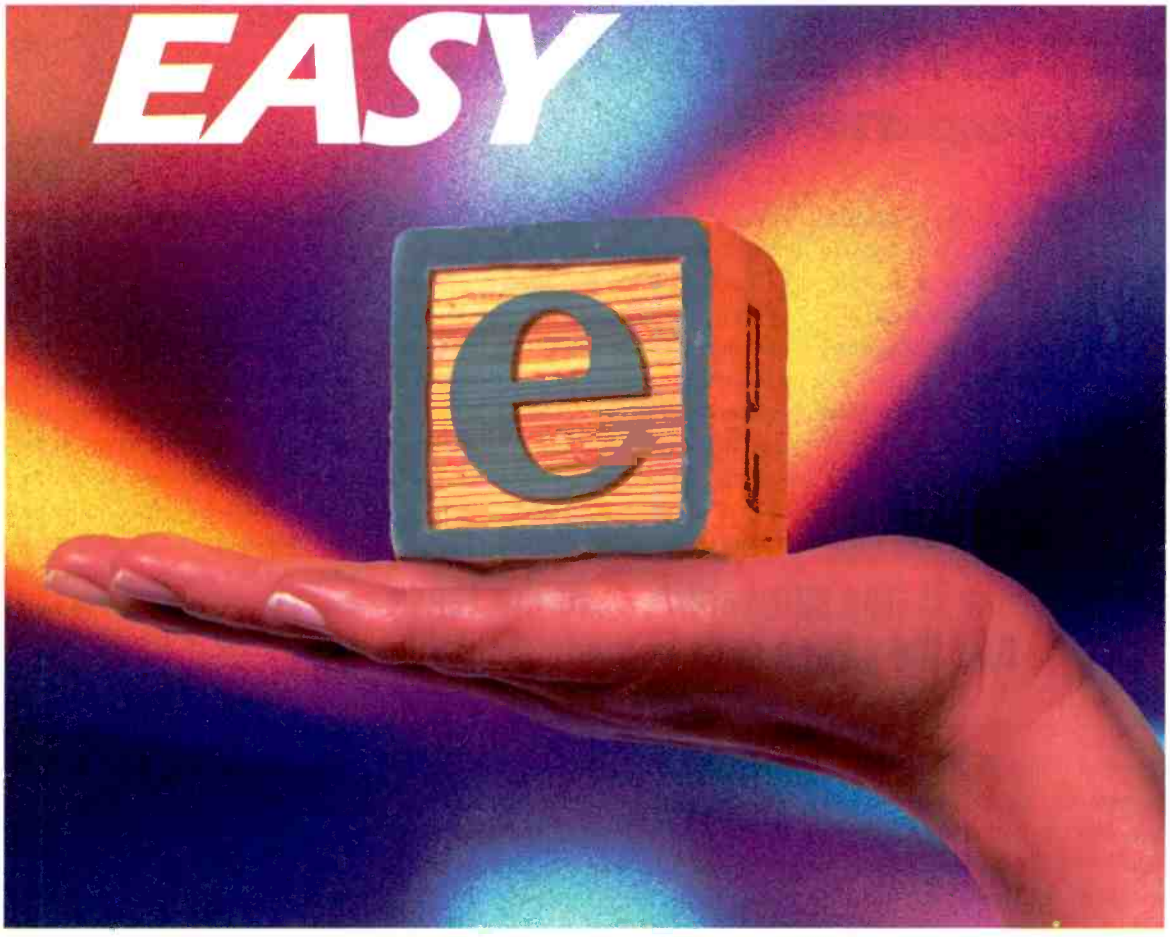

Moving 5.1-channel surround sound through your DTV station is hardly child's play. Dolby E, however, offers an easy solution to automate your multichannel audio delivery. Along with eight channels of audio, Dolby E carries metadata, which automatically changes the channel configuration between stereo and 5.1, and controls the loudness at the local affiliate station.

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Open Source development

BY BRAD GILMER

What is Open Source, and why is it a powerful force in the software development environment today? How does it relate to television? Does it have a viable future?

Let's start with a definition. Open Source is free software. Not just free as in "freeware" distributed at no cost, but free in the sense that the source code is made available to anyone who wants it. There are a number of other things that characterize Open Source code, so let's go down the list, as provided by the Open Source Initiative (OSI).

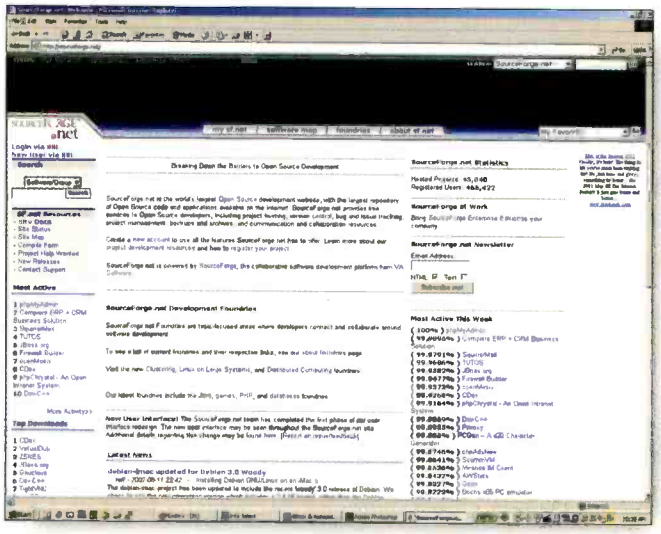
Open Source is free software . . . . in the sense that the source code is made available to anyone who wants it.

To be considered Open Source, software must meet several requirements. It must allow for free redistribution — people who get the software from you must be able to give it to others. In addition, source code must be included in the software distribution. Source code is human-readable code that is compiled into machine-readable code (sometimes called executable code). It is the executable code that actually runs on the computer. Another requirement is that the license must allow others to modify the source code and then be able to distribute this modified code for free. To preserve the integrity of the author's source code, it is okay for the original author to require anyone who modifies the code to call it something else so that other users can tell which code came from the original author. Another requirement is that there be no discrimination against persons or groups. The license must give everyone the same free access to the code. Also, there must be no discrimination against fields of endeavor. For example, the license must not keep people from using the software if they are a business, or an educational institution. The license must be included with the software. A vendor cannot require that you sign a separate license. The software must not be only part of a larger product. Finally, the license must not restrict other software.

The Open Source community

Open Source is more than free software. It is a community of people working together. In any given Open Source project, there is usually a central core of developers who get the ball rolling. In the case of Linux, the core developer was Linus Torvalds, a programmer from Finland. He posted his first version on the Internet in a newsgroup and said, "Here is something I have been working on." Others soon took an interest in his code and added functionality. Before long, a fully functional UNIX look-alike was available to the world at large. By this time, many people had contributed to the code, and many others had spent hours testing and verifying the software. Newsgroups for specific areas of interest within the Linux community arose, and newsgroups specifically for support were added.

At this point, several non-profit organizations have been created to support the Open Source community. Among these are SourceForge (www.sourceforge.net), the Open Source Development Network (www.osdn.org) and the Open Source Initiative (www.opensource.org). SourceForge provides just about anything you would need to start an Open Source project, including development tools, project tracking systems, test environments, discussion forums and more. OSDN is one of the best sources of news and information relating to Open Source projects. Finally, OSI is *the* definitive place for Open Source licensing.



SourceForge is the largest Open Source development site on the Web, with over 40,000 projects.

Open Source development works on the premise of member contributions, and "many eyeballs." The work is done by project members who are affiliated by their interest in solving the problem. Testing and

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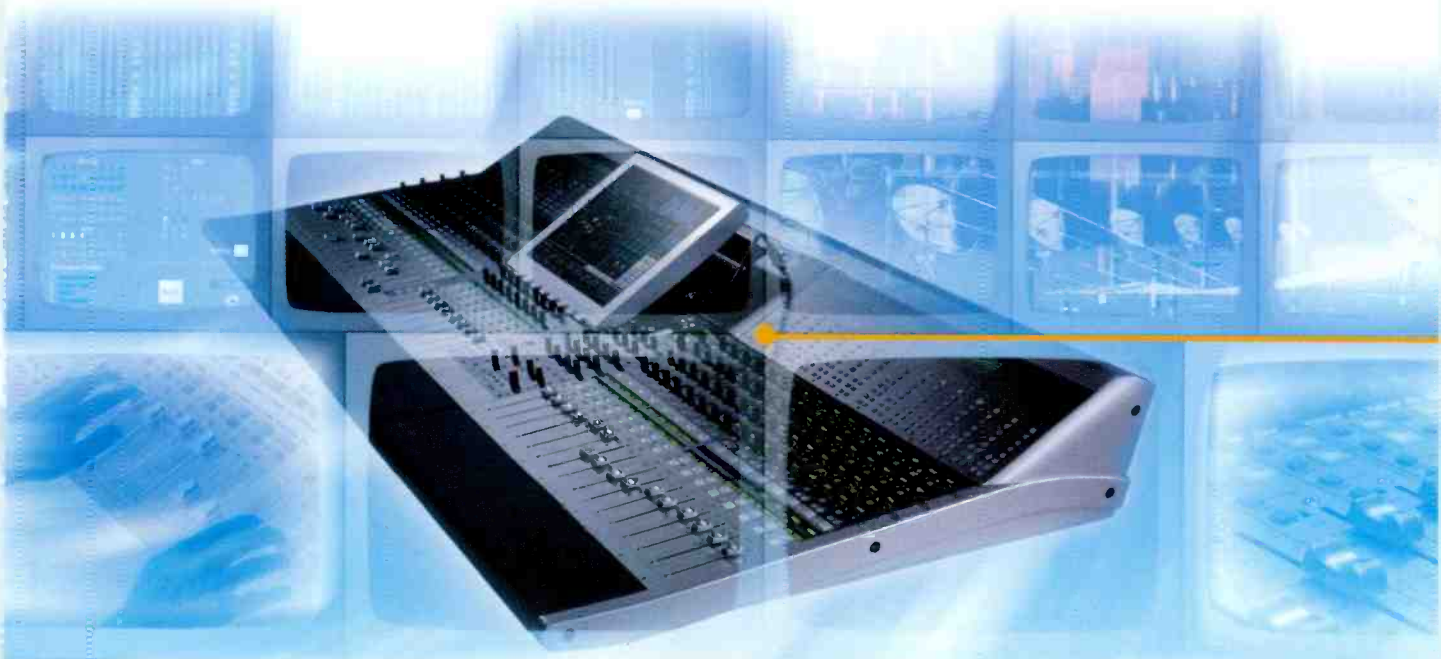

Max Air

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KVEA Telemundo, Los Angeles:

Euphonix System 5-B Console On-Air for News

In April 2002 KVEA, the Spanish language station at the Los Angeles Telemundo studios, installed a Euphonix System 5-B broadcast console for their Channel 52 live news segment. Telemundo is one of the largest providers of Spanish language television in the United States and Puerto Rico.

"We researched upgrading to a digital console very carefully, Euphonix had the best offering. It's great to finally have the Euphonix System 5-B on-air," said Richard Lahti, Director of Operations at Telemundo. "The install went very smoothly. Everything worked as specified and the first news broadcast went on without a hitch. The System 5-B's design and integration with our video systems is definitely going to make our jobs easier."

KVEA has a wide range of programming including news and sports, movies, comedy, talk shows, variety entertainment and "Novelas," the Spanish version of the American 'soap opera.' Telemundo has production offices in Los Angeles, Puerto Rico and Mexico City, along with business offices in Chicago, Dallas, Houston, Irvine, Los Angeles, Miami, New York, San Antonio and San Francisco. KVEA was founded in 1986 and began broadcasting Spanish language television throughout the greater Los Angeles area in 1988. Telemundo was recently purchased by NBC.

The System 5-B all-digital broadcast console at Telemundo features a 24 fader surface controlling 70 processing channels, 12 mix busses, 24 group busses, and 16 aux busses. The processing interfaces with 24 microphone preamplifiers, and 48 AES digital inputs and outputs.

Paul-Henri Wagner, General Manager of 44.1, the Euphonix French distributor commented, "The choices of audio equipment that Canal+ makes is well respected among all the French broadcasters. This first System 5-B console install for Canal + is a very important step for us."

Canal+ Paris

Canal+ recently installed a Euphonix System 5-B digital broadcast console in their Paris studio. The console will be used for various sports broadcasts as well as some of their main live shows. Canal+ is the largest private broadcaster for pay-per-view television in France for news, movies and other entertainment broadcasts. The 56 fader, 154 channel configuration is the first System 5-B console to be installed in Paris.

KNBC, Los Angeles

KNBC Los Angeles has ordered a Euphonix System 5-B digital audio broadcast console for their Burbank studio location. The new console will be used for the live Channel 4 news broadcast to the Los Angeles area. KNBC is an owned and operated facility of network leader NBC. The System 5 for KNBC has been specified with 40 faders and over 80 channel signal paths. The console includes redundant power supplies, 72 mic inputs, 12 analog inputs, 196 digital inputs, 78 analog outputs, and 112 digital outputs, all directly connected to the router. KNBC plans to install the new Euphonix System 5-B console in the fall of 2002. Euphonix also has two CS3000 consoles on the Burbank NBC lot at the 'NBC Tonight Show' and the Network news studios.

Euphonix Max Air:

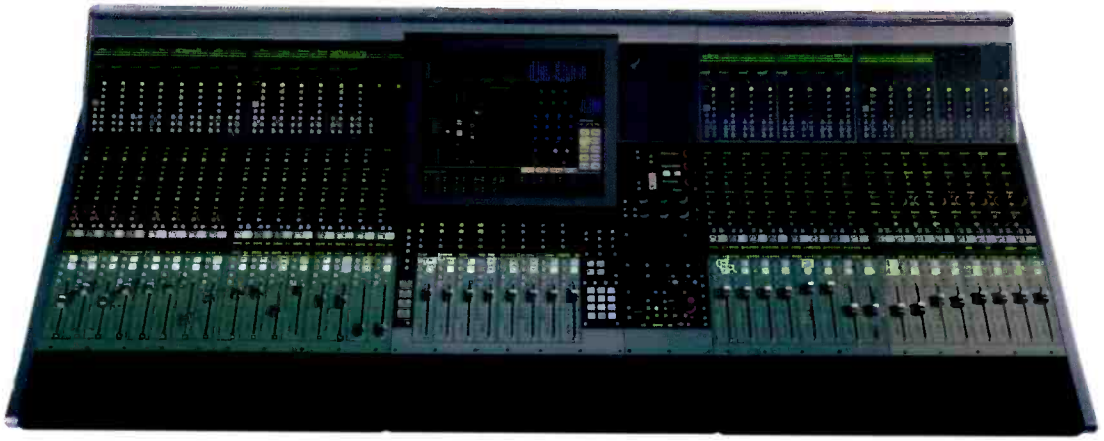
An Affordable Audio Console Solution for the Transition to Digital

The whole broadcast chain is moving rapidly to a fully digital world. Converting to an all-digital audio system such as Max Air increases the features available to the operator and simplifies the technical installation of the system.

Max Air is a new digital audio mixing console specifically designed for on-air and live-to-tape broadcast production applications for the local TV market and smaller network facilities.

Euphonix has built upon years of experience in digital control surface design to provide a compact, and cost effective digital mixing solution that includes all the high performance features and quality that our customers have come to rely on. Max Air is based on the proven Euphonix System 5 core technology. Over 100 System 5 consoles have been sold across the world during the past two and a half years.

New From Euphonix!



Max Air Features:

- Size:
  - 96 channels
  - 32 mix buses
  - 24 clean feed/group matrix buses
  - 12 aux sends
  - 24 external inputs
- Based on proven System 5-B console technology
- High reliability with built-in redundancy
- Central touch screen interface
- SnapShot Recall™ of all console settings
- 48 layouts for different surface configurations
- PatchNet—MADI digital router/patchbay
- Surround panning and monitoring as standard
- Dedicated mix minus and insert per channel
- Easy to use and learn—intuitive interface
- Modular surface and I/O
- Small footprint
- High quality audio

FOX 25 WFXT · BOSTON

WFXT, Boston

Two System 5-B broadcast consoles have been installed at FOX Network's new WFXT Boston facility. FOX has dramatically expanded their buildings in Boston and has targeted the two System 5-B consoles for both their primary control rooms. Beck Associates (www.becktv.com), a system integrator based in Austin Texas, did the installation. FOX has purchased several other Euphonix consoles for their facilities across the US including stations in New York, Los Angeles, Philadelphia, Chicago, Boston and San Francisco.

Digital Broadcast Consoles: FAQ's

Q: How can a digital console save me money?
A: One of the most expensive areas in console installation is the wiring. With AES standard MADI (Multichannel Audio Digital Interface) cabling, wiring is immensely simplified. Each coaxial cable carries up to 56 channels of digital audio at 24-bit 48K and can handle runs of up to 50 meters. MADI-based microphone pre-amps and other converters can easily be routed where needed in the digital system. Euphonix provides these MADI systems. MADI also easily converts to fiber and runs of up to 1000 meters are supported.

Q: How is redundancy handled in a distributed digital console system?
A: Each component of the Max Air console has redundant power supplies and all other components can be duplicated or have back up components quickly available. For example, redundant DSP cards for the core processing automatically switch over in the event of a failure keeping all audio processing online instantly.

Q: Analog consoles are straightforward to operate. Will a digital console be too difficult to operate without a lot of training?
A: Max Air was designed with the help of broadcast engineers and is laid out with simplicity in mind. All the main functions that broadcast engineers need to access and monitor are at the top level of the control surface. Ease of use was a primary concern for Max Air.

Q: Digital consoles can be so large and complex, does Max Air fit in a mobile truck?
A: Max Air was designed specifically to fit a 48-fader configuration across a standard 102" wide mobile truck.

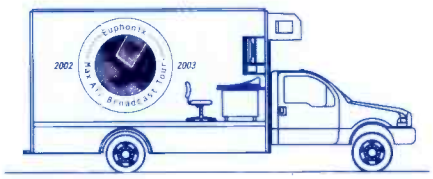
learn more at: www.euphonix.com

Max Air Broadcast Tour

The Euphonix Max Air Broadcast Tour demonstration vehicle hits the road for a 37 city trip that will include the Las Vegas NAB convention in April 2003. This specially commissioned truck is outfitted with a 96 channel Max Air mixing system and simulates a local TV station digital audio control room.

Society of Broadcast Engineers (SBE) Local Meetings

The Max Air Broadcast Tour vehicle will be present at local SBE chapter meetings for hands-on demos of the audio and video systems. Euphonix, and in some cases our sponsors, will give a short presentation on the transition to digital.



US Tour Dates

Arrival Date	Last Day	Location	SBE Local Chapter Meeting Dates
2002			
Wed Sep 25	Fri Sep 27	Minneapolis	Wed Sep 25
Mon Sep 30	Fri Oct 04	Chicago	Tue Oct 01
Mon Oct 07	Fri Oct 11	Detroit	
Mon Oct 14	Fri Oct 18	Indianapolis	Tue Oct 15
Mon Oct 21	Fri Oct 25	Cleveland	Mon Oct 22
Mon Oct 28	Fri Nov 01	Pittsburgh	
Mon Nov 04	Fri Nov 08	Boston	
Mon Nov 11	Fri Nov 15	Philadelphia	
Mon Nov 18	Tue Nov 19	Wash. D.C.	Tue Nov 19
Wed Nov 20	Fri Nov 22	Baltimore	Wed Nov 20
Mon Nov 25	Fri Nov 29	Holiday	
Mon Dec 02	Tue Dec 03	Miami	Tue Dec 03
Wed Dec 04	Fri Dec 06	Tampa	Thu Dec 05
Mon Dec 09	Fri Dec 13	Atlanta	Mon Dec 09
Mon Dec 16	Fri Dec 20	Birmingham, Montgomery & Huntsville	Wed Dec 18
Mon. Dec 23	Wed Jan 01	Holiday	

Arrival Date	Last Day	Location	SBE Local Chapter Meeting Dates
2003			
Thu Jan 02	Fri Jan 03	Nashville	Thu Jan 02
Mon Jan 06	Thu Jan 09	New Orleans, Baton Rouge & Shreveport	Mon Jan 06
Fri Jan 10	Tue Jan 14	Houston	Tue Jan 14
Wed Jan 15	Wed Jan 15	San Antonio	Wed Jan 15
Thu Jan 16	Fri Jan 17	Austin	Thu Jan 16
Mon Jan 20	Tue Jan 21	Tulsa	Tue Jan 21
Wed Jan 22	Fri Jan 24	Oklahoma City	
Mon Jan 27	Fri Jan 31	Dallas Ft. Worth	Thu Jan 30
Mon Feb 03	Fri Feb 07	Phoenix	
Mon Feb 10	Wed Feb 12	San Diego	Mon Feb 10
Thu Feb 13	Fri Feb 21	Los Angeles	Mon Feb 17
Mon Feb 24	Tue Feb 25	Sacramento	Tue Feb 25
Wed Feb 26	Fri Feb 28	San Francisco	Wed Feb 26
Mon Mar 03	Thu Mar 06	Vancouver	
Fri Mar 07	Tue Mar 11	Portland	Tue Mar 11
Wed Mar 12	Tue Mar 18	Seattle	Thu Mar 13
Thu Mar 20	Fri Mar 21	Salt Lake City	Fri Mar 21
Wed Mar 26	Fri Apr 04	Las Vegas	Thu Mar 27
Mon Apr 07	Fri Apr 11	NAB Exhibition Las Vegas	

For the most up-to-date tour news, meeting times and web links for the SBE meetings, and international tour listings please see our website at: www.euphonix.com/tour/

more info at: www.euphonix.com

US Tour Sponsors

The companies listed below have provided audio and video equipment that interface with Max Air to help create a realistic state-of-the-art digital broadcast environment.

Main Sponsors: Accom - Abekas® 6000 Video Production Server • Miranda - Kaleido-K2 Monitor Wall Processor • Pioneer - PDP-433CMX 43" plasma display

Co-Sponsors: 360 Systems • Clear-Com • DK-Audio America • Dolby Laboratories • Genelec • NVISION • TC Electronic • TerraSonde • Wohler Technologies

If your station is located in one of the 37 cities and you would like the Max Air Broadcast Tour to stop by your facility please contact Euphonix Sales Coordinator Jonathan McDonell at (650) 846-1114 [jmcdonell@euphonix.com]

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Boxx Technologies' *3D*BOXX workstations and *Render*BOXX rendering notes are available with the Linux Open Source operating system.

validation is performed by having "many eyeballs" looking at the source code, testing functionality and running the software on different platforms. Open Source software development is truly decentralized. This new development environment was made possible by the Internet.

What's good about Open Source?

Well, there is the obvious end-user benefit that it's free. But people who support Open Source believe that the benefits reach much further than that. They say that the Open Source community provides a wide base of support for software. With thousands of developers all over the world, questions posted to newsgroups get answered sometimes within minutes. Open Source software evolves quickly, and they say that by its very nature it incorporates "best of breed" technologies. Word of new innovations spreads quickly, and Open Source licensing terms encourage others to "borrow" good ideas for their own projects. Open Source provides a way for people to contribute back to the community – to see the benefits of their hard work. People who make changes to a program are encouraged (and sometimes compelled) to distribute that work so that others may also benefit. Open Source seems to fit well with the rebel image of programmers. Many programmers are anti-corporate and anti-big business. The Open Source community is still one area of the Internet that seems to remain somewhat free of large commercial influence.

Open Source and television

You may have also heard about the Advanced Authoring Format (AAF), the file format for exchange of video, audio and metadata in the post-production environment. The AAF Software Developers Kit (SDK) is Open Source, and is licensed under the AAF Public Source License (PSL). In addition to the base SDK, the BBC has contributed an MPEG codec to the AAF project under the AAF PSL, and Quantel has contributed an EDL-to-AAF converter, also under the AAF PSL. The EBU has produced sample software for the Material Exchange Format (MXF), which is licensed under Open Source.

Open Source is more than free software — it is a community of people working together.

The TiVo digital video recorder, the device that allows people to record television programs and play them back at a later time, runs on Linux, the popular Open Source UNIX-like operating system (for more information see www.tivo.com/linux). Also on the Linux front, Disney Feature Animation recently announced that it would be purchasing HP Linux-based workstations and servers as components in its next-generation animation production pipeline. And Boxx Technologies offers both its 3DBOXX workstations and RenderBoxx rendering notes op-

erating under Linux (see www.boxxtech.com).

What's bad about Open Source?

Open Source detractors say that Open Source software is often unstable, untested and unreliable. Critics also point out that, while some programs in the Open Source community are well supported, other programs have relatively small followings and support is at the whim of the developers. Finally, they say that the Open Source financial model is not sustainable. Open Source supporters reply that the same arguments can be applied to commercially available software but, in the commercial environment, users do not typically have direct access to programmers who can fix their problems quickly. They also say that, as programs become very big, the risk of introducing bugs goes up not exponentially, but by the power of four. They argue that monolithic programs from commercial developers are likely to be buggy purely because of their large size.

Is Open Source sustainable?

One question critical to developers and users alike is whether the Open Source concept will survive. After all, how do people work on Open Source projects without getting paid? While it is fine for people to contribute their hard-won personal time to programming, are they willing to continue to do that indefinitely? Once a product matures and programmers are no longer interested in continuing to develop it, who will provide support? As the economy continues to head south, and people try to put their lives together after the dot-bomb era, will programmers go to work for large software companies, thus reducing the number of people available to the Open Source community?

The jury is out on these questions. It certainly seems that the Open Source movement is growing. SourceForge reports 44,446 open projects, 459,456 registered developers, and 110 million page views per month. Obviously something is going on. BE

Brad Gilmer is president of Gilmer & Associates, executive director of the AAF Association and executive director of the Video Services Forum.

Send questions and comments to:
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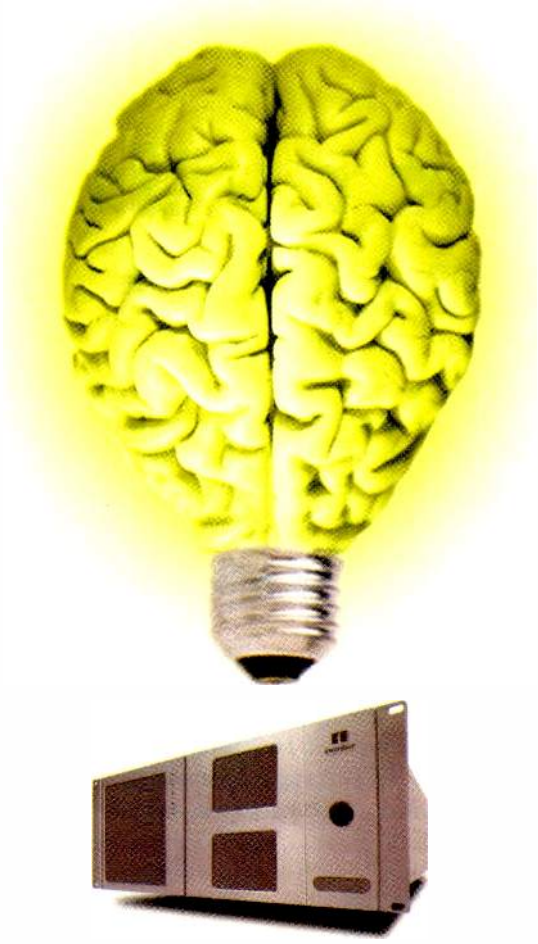

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DIGITAL HANDBOOK

Aspect ratio conversion

BY RICHARD SCHILLER, GORDON SCOTT AND DAN BURGESS

As the transition to digital television continues in the United States, aspect ratio conversion has become one of the most confusing and critically important production issues facing television program producers and broadcasters.

In the early years of cinema, the aspect ratio, or the ratio of picture width to height, was fixed to about 4:3 by technologies of the era. It was logical to adopt this ratio for television, since it allowed films to become a ready source of program material.

Over the years, film technologies were developed to give directors the freedom to shoot in ever-wider aspect ratios, which were not immediately compatible with television. With the increasing adoption of 16:9 format widescreen television, program material shot for 4:3 will not suit widescreen, and vice versa.

The widescreen experience is being driven by exposure to DVD and high-definition television in the home.

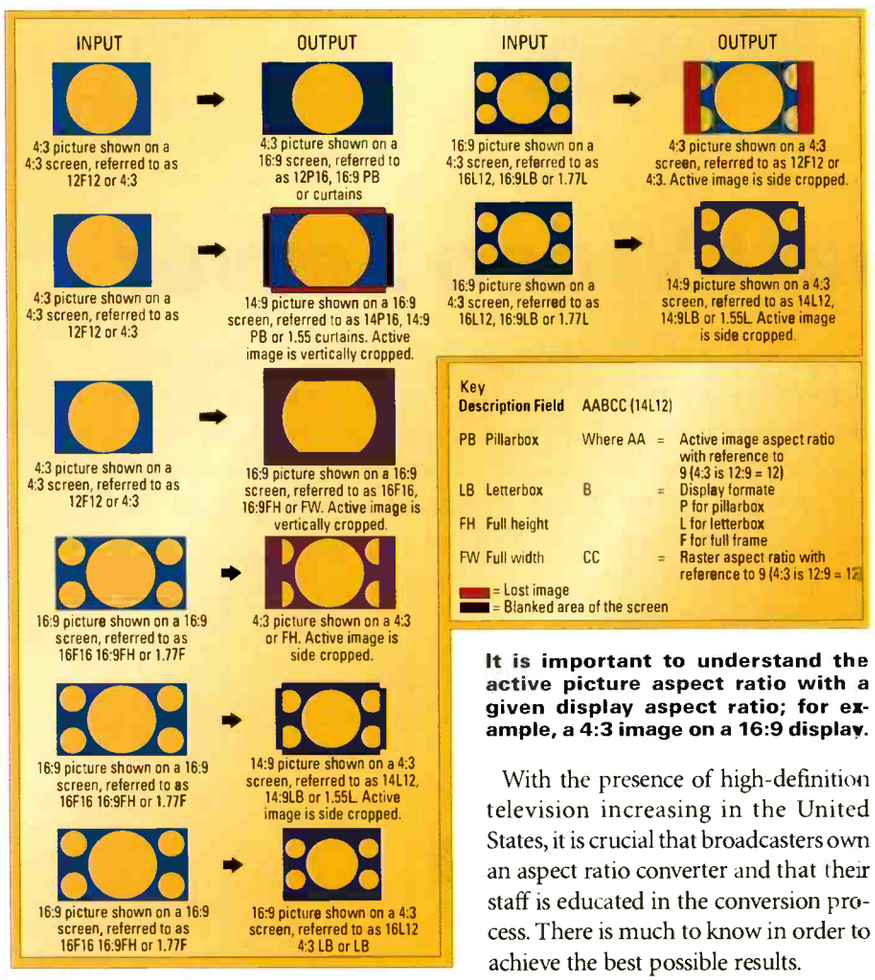
Converters vary in quality, with noticeable differences in effectiveness. A quality product provides better images and should somewhat simplify the process.

While technical tools to change aspect ratio are advanced and simple to use, the creative choices facing producers are just the opposite. Difficult decisions on picture shape involve variables ranging from program genre to cultural tastes of viewers.

Ultimately, when creating a non-live program, it is not known whether what aspect ratio will be implemented. Therefore, it is necessary to understand the role of the safe area, the portion of the image that will be viewable regardless of aspect ratio. A producer filming in 16:9 often cuts the sides of an image to keep the action within the narrow 4:3 middle section. This ensures that the important parts of the image will be seen on both 16:9 and 4:3 screens. This could be referred to as the active picture aspect ratio within the display aspect ratio. (See Figure 1.)

Aspect ratio conversion has made this safe area smaller and more significant. Everyone in the chain has to be clear as to when a 16:9 program features a 4:3 safe area, or vice versa, so it is established which portion of the image will be preserved regardless of the aspect ratio at the output.

To create an original television program that will play well on both 4:3 and 16:9 sets, the master tape should contain as much information as possible. The simplest approach is to shoot in 16:9 and protect the sides of the image



It is important to understand the active picture aspect ratio with a given display aspect ratio; for example, a 4:3 image on a 16:9 display.

With the presence of high-definition television increasing in the United States, it is crucial that broadcasters own an aspect ratio converter and that their staff is educated in the conversion process. There is much to know in order to achieve the best possible results.

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to allow the center of that image to be removed without a significant degree of loss. Decisions of final aspect ratio can be made following the post-production process.

A growing trend in aspect ratio conversion in areas of Europe is 14:9, which could also be considered in the United States. In the UK particularly, it has become common to shoot in 16:9 but confine the action to a 14:9 shoot and protect graticule, which provides the room to convert to either 4:3 or 16:9.

With 14:9, the aspect ratio on the tape is no different than 16:9. The 14:9 area is actually a masking as opposed to a new aspect ratio. This compromise provides the viewer with small black bars at the top and bottom of the screen, and a small bit of image loss on the sides. This loss is minimal and generally acceptable to viewers.

Another option is to shoot in 4:3 using a 14:9 display and protect graticule. Although portions at the top and bottom of the image are lost, a good aspect ratio converter can successfully tighten the image.

What sets a quality unit apart from one of lesser value is generally found in the design of the filters used in the conversion process. Additional functions within an aspect ratio converter can also raise the quality level of conversions. On some units the ratio format is fixed, while on others it is variable, allowing the user to select special formats such as 14:9. Some units on the market can process audio and provide an audio delay to match the video delay. Other extra capabilities allow the user to pan, tilt and zoom the image, or execute smooth transitions from one aspect ratio to another, rather than an instant switch.

Of course, the traditional, purely technical method of testing the signal and viewing the results is always recommended. An easy way to do this is to perform a test of rolling credits. Credits are hard-edged and filled with motion, easily the two most difficult areas of aspect ratio conversion.

For live coverage, particularly of sporting events, addressing motion during the conversion process becomes even more important. This is the big reason why converters should never be tested using only still images.

Aspect ratio issues essentially require a new approach to shooting sports. A tight shot of a motion-filled image in 16:9 is going to pack a lot more information into an image than what would appear in 4:3. The producer needs to determine what the viewer's mind can register. In widescreen sports, the camera operator may follow the central action, but the viewer may be looking at other information within the frame, usually details and action that were not noticed in 4:3. It needs to be determined how much additional information will be delivered to the viewer.

When shooting a live presentation that includes mixed aspect ratios, the timing of the aspect ratio change is paramount.

Adding high-definition television into the equation adds a new layer of complexity. A single fixed camera can provide quality sports coverage on a large home HD display, though it would be inappropriate for the smaller 4:3 sets. Widescreen may also require the use of new, creative camera angles that may not be appropriate for 4:3 service. This means that certain events will require both 4:3 and 16:9 shots.

Live high-definition programming is also more complex for the producer on the mobile truck. As the very wide shots that work in high definition are incompatible on small 4:3 screens, it comes down to a shot-by-shot decision. High-definition 16:9 shots interspersed with tighter shots showing details of the action for 4:3 viewers is a plausible solution, though it won't be perfect.

Furthermore, when shooting a live presentation that includes mixed aspect ratios, the timing of the aspect ratio change is paramount. A live presentation may bring in material as 4:3 with portions as 16:9, which requires frame-accurate switching between the ratios. If a non-frame-accurate converter is used, the change in the feed happens a few frames later than the change in the aspect ratio converter took place. As a result, the viewer sees the image cut and suddenly change shape — obviously not what was intended.

This also requires a frame-accurate control system. This could be a switcher that will accurately drive the converter while cutting between 4:3 and 16:9 sources, or a frame-accurate aspect ratio converter with Video Index signaling.

Control of the aspect ratio converter's functions, especially to vary the aspect ratio on the fly, can be accomplished directly from the front panel. Control can also be external, as in remote control from a network. In Europe, converters are typically driven from signaling standards inserted within the video signal. Widescreen signaling line 23 (WSSL23) or Video Index can be used to change the aspect ratio converter's mode as the incoming signal is altered.

The aspect ratio converter can also be combined with another unit, such as an upconverter or standards converter. Aspect ratio conversion from 4:3 to 16:9 is part of the upconversion process, so one advantage is that the filtering needed for upconversion and aspect ratio conversion can be combined. If designed correctly, this can provide a quality advantage. This combination can also minimize the delay because the unit has one less filter stage.

Broadcasters in the United States will find the aspect ratio conversion process easiest if they combine knowledge of what's available on the market and of the process itself. This includes simultaneously supporting 4:3 and 16:9 for widescreen television, while also applying the process to high-definition television. BE

Richard Schiller is product manager, Gordon Scott is principal design engineer and Dan Burgess is design engineer for Snell & Wilcox.

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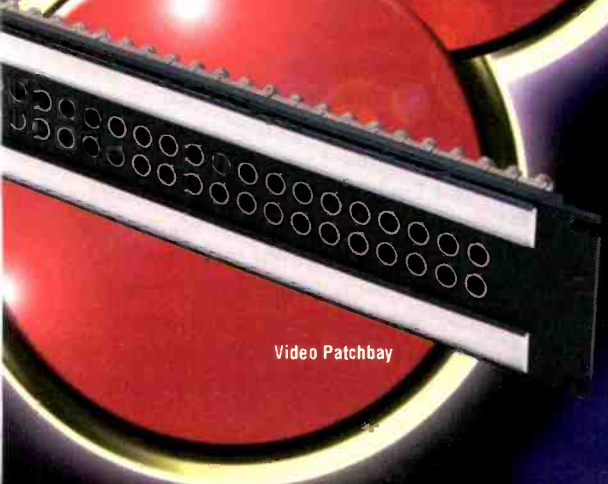

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Some facilities build control rooms with acoustic ceilings and wall panels to reduce the impact of production equipment noise.

Acoustic issues for studio design

BY STEPHEN G. LINDSEY

Sound generated by building users and services – in particular, mechanical, electrical and power systems – are key sources of noise intruding upon television studios. Successful design and construction of a quiet, intrusion-free television studio requires close cooperation among the owner, design architect/engineer, acoustical engineer and construction manager from the earliest planning phase through the final construction.

The purposes of a TV studio and its location within the building have significant effects on acoustical design. A formal studio used for live recording of shows with an audience and/or music is subject to high heat loads generated by studio lighting, as well as the presence of a large number of people. This setting requires high air volumes to achieve adequate cooling.

A newsroom studio requires less specialized acoustical and air handling equipment than a formal studio.

At the same time, the use of boom microphones requires that the studio have both an NC rating of 25 or lower and the absence of intrusive noise from building services and occupant activity, a particularly acute issue in a multi-tenant commercial building. In fact, this type of studio presents the greatest acoustical challenges.

In contrast, a news/sports/weather studio featuring anchors and reporters using lapel microphones is much less sensitive to intrusive noise. The heat loads generated by studio lighting will require a higher capacity air handling system, but this can usually be met using conventional systems. Likewise, sound separation can be adequately addressed using conventional construction. NC 30-35 is acceptable

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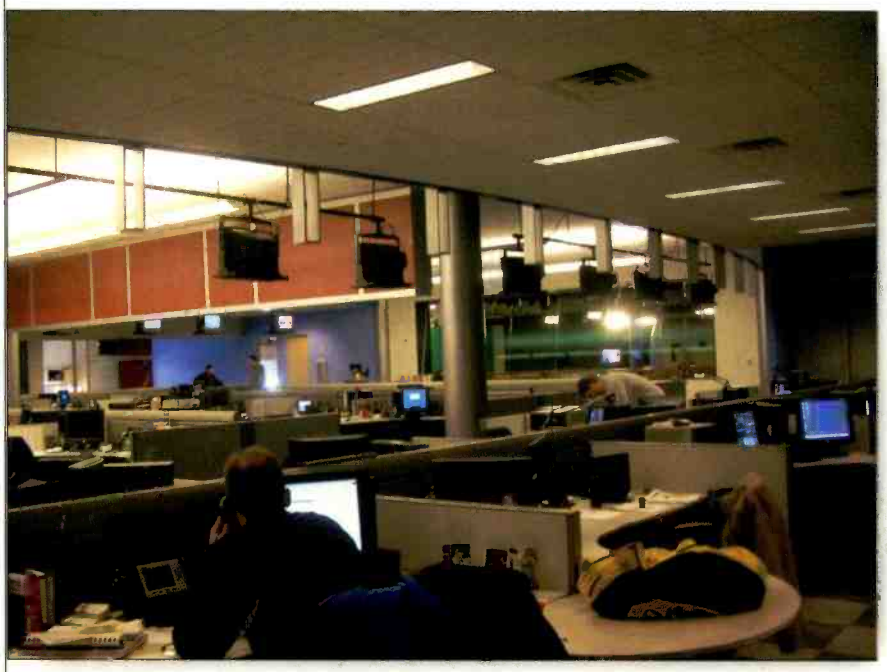
in this application.

Similarly, a newsroom studio requires less specialized acoustical and air handling equipment than a formal studio. Typically the newsroom studio is designed as a large open office with high ceilings. The additional lighting required for broadcasting does not generally add significantly to the overall heat load. Anchors and reporters wear lapel microphones and are separated from the rest of the newsroom either by a glass partition or open space. Whatever small amount of newsroom sound is audible to viewers (e.g., ringing telephones) actually contributes to the desirable effect of a working local news staff. Since the acoustic and cooling issues are less critical than in a studio for live recording of shows using boom microphones, construction costs also are lower. NC 30-35 (the standard for most offices) is acceptable in this application and generally can be met with a standard office air handling system.



High ceilings and absorptive finishes can be used to create a quiet, comfortable working environment in facility newsrooms.

A room within a room

The acoustical requirements of an NC 25 live-audience studio in a multi-tenant building generally are best met using room-within-a-room construction. A floating six-inch concrete floor is supported by springs with a two-inch air space between it and the building slab. The springs provide vibration isolation, preventing transmission of sound from the building slab, while the air space increases airborne sound transmission loss. The studio's walls are built on top of this floating slab and attached to its ceiling, which is suspended from the building slab above by sound isolation hangers.

Specialty doors with acoustical values similar to the double walls must be installed to accommodate people and sets. These double doors, often up to 10 feet high and eight feet wide, are very heavy, requiring special goalpost framing made of structural steel tubes with isolated male/female restraints at the top of the structure.

Specialty products are manufactured for floating floors, acoustic doors, acoustic windows, floating wall restraints and supports, enabling construction without field-built items. Use of prefabricated materials enables better quality control and reduces errors while speeding construction.

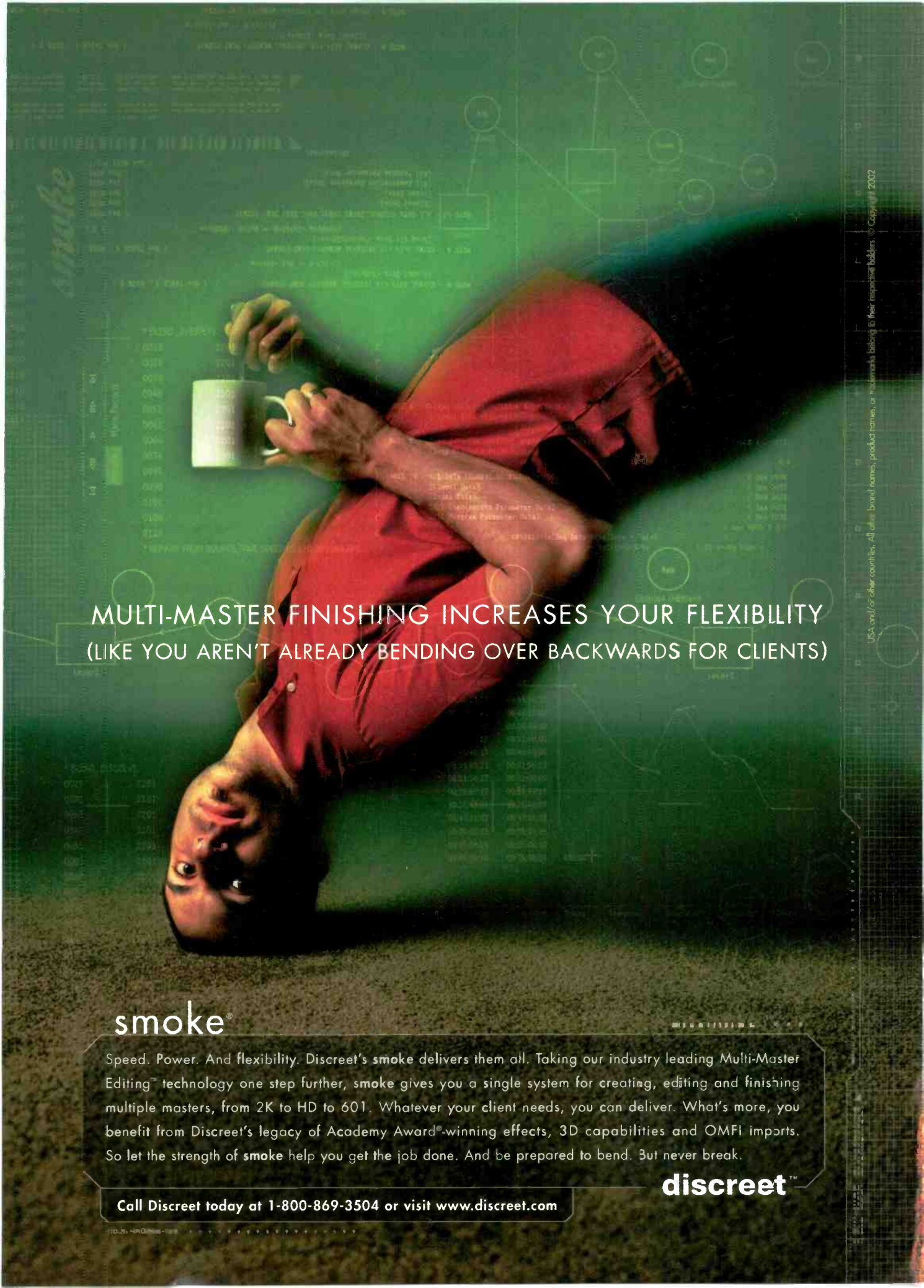
The acoustical requirements of an NC 25 live-audience studio . . . generally are best met using room-within-a-room construction.

Similarly, drywall construction is preferable to concrete block construction for ease and cost of construction, as well as acoustical control. In fact, several layers of drywall with air spaces between yields better acoustical control with far less weight than masonry construction.

Often the most sensitive room is the voice-over room, which must be very quiet (i.e., NC 15-20) and free of intrusive nose. Typically, these are designed as floating rooms measuring six feet by six feet, with all surfaces finished with sound-absorbing material to create a "dead room" that avoids coloration of voice.

For the formal NC 25 studio, the ideal is a box that is free from contact with the base building except through acoustical elements. The need to run utilities (air supply and returns, cables, etc.) into the room compromises this ideal, requiring additional acoustical controls. This is particularly true of the air handling system, which needs large sheet metal ducts for supply and return air.

Meeting the NC 25 requirement of a formal TV studio usually requires an air handling system dedicated to that studio, a separate system dedicated to serve areas such as technical areas, audio and video control rooms, editing rooms, and master control rooms. And another system is needed to serve the offices. This enables the systems to be run at full capacity only as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needed, saving money on operation.

Good noise control starts with effective design at the core of the system. Low-frequency noise can be a problem in contemporary buildings, which utilize variable air volume systems and smaller floor fan rooms. Because noise is generated by sound radiating from HVAC equipment, proper selection and positioning of this equipment in machine rooms is essential for effective noise control. Careful orientation of the fan units with respect to the main supply ducts optimizes acoustic conditions.

Theoretically, equipment in a machine room can be positioned in any configuration and supply ducts can run in several different ways. In practice, however, machine rooms and plenum space have shrunk in size as rental space has become more valuable, placing constraints on the installation. Still, optimal positioning and cost-effective source noise control can be achieved. Careful orchestration of the mechanical system with the architectural design is essential to achieving acoustic goals.

Noise also can be controlled downstream of the air handling units through various duct acoustic treatments, most commonly, duct lining or duct sound attenuators. Duct lining and duct sound attenuators are a series of baffles constructed using perforated metal and a fill of fiberglass. Each sound attenuator carries a pressure drop penalty that varies based on performance and air velocity. A three- to five-foot silencer can be incorporated in lieu of lining the entire section downstream of the fan-powered and variable air volume (VAV) boxes.

Treating the exterior of the duct is an additional tool to further reduce radiated noise. One solution uses heavier gauge metal for the ducts themselves, another requires attachment of an exterior soffit with a sandwich of insulation between it and the duct or a drywall casing directly attached to the duct. The exterior soffit costs more and uses more space than drywall, but it affords better noise control. Each of these methods is effective; the choice involves trade-offs between noise control, cost and space.

Efficient system design will minimize the need for noise control. This involves fan/air handling unit selection for low noise rather than low cost and careful location of the unit to maximize duct lengths. For example, variable speed drives (VSDs) are now used to control air volume since they reduce noise and energy consumption at part load conditions. Older systems of control, such as variable inlet vanes (VIV), actually increase noise generation and provide no energy savings for part load conditions.

Air velocities must be kept as low as possible or the system will generate unacceptable noise levels, yet velocities of 400 to 500 feet per minute are common at diffusers. Generating high air volume at low velocity requires use of large air ducts, which need a lot of space. Again, early planning is crucial to ensure that studio height will accommodate air supply ducts and diffusers, which usually are right above the lights.

Conventional air diffusers cannot properly diffuse air at these lower volumes. To avoid air "dumping" and cold spots, site-constructed "plaques" — flat plates with sound-absorptive material on top — can be installed under the supply duct openings to stop dumping.

Stations can fulfill the NC 25 requirement of aTV studio by using glass to separate the studio from newsrooms and other technical areas.

Careful orchestration of the mechanical system with the architectural design is essential to achieving acoustic goals.

Common mistakes

There are a number of common mistakes in designing and constructing broadcast facilities. Mechanical, electrical and plumbing (MEP) equipment are located adjacent to studios without careful thought to noise control. MEP services are frequently allocated inadequate space, making noise more prominent and leading to nosier conditions in directly adjacent spaces. Or a dining room is located near the studio, but without properly treating it for acoustical control of impact noise.

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The heavy concentration of computers in TV equipment rooms creates an additional source of noise from the large volume of HVAC equipment required to cool it, yet for operational reasons these are sometimes located close to control rooms and studios rather than separated, perhaps, by a video control room. Corridors around the TV studios are used to carry typical traffic around the facility, and storage rooms are placed nearby, rather than isolating these sources of activity-related intrusive noise.

Lack of effective construction management can defeat an otherwise effective acoustical design. For example, an electrical contractor may lay cable conduit in a straight line, even though it was designed to be run offset in wall cavity space. Another contractor may knock a hole in the wall rather than cutting it, leaving debris in the wall cavity that bridges the sound isolation. Another contractor may adjust the layout of MEP equipment to suit "efficient" or fast installation, adding elbows or shortening ducts, or locating it dangerously close to outlets. The result often is the generation of noise that will be difficult to trace to the source and attenuate.

Early planning and teamwork are keys

The goal of a quiet, intrusion-free television studio can be achieved cost-effectively only through close cooperation between the owner, design architect/engineer, acoustical engineers and construction manager at every step from the earliest planning phase through the completion of construction. Indeed, acoustical engineers should be proactive members of the design team and should be utilized from the planning stages of the project. While acoustical problems can be remedied, it is infinitely more effective when good acoustics are properly designed into a television studio project.

The acoustical engineer's objective is to work with the architect, designer and/or mechanical engineer from the earliest stages to present design alternatives that ensure precise acoustical performance and acute vibration control. Establishing a baseline as a starting point, the acoustical engineer can help the owner define goals and then work with the architect to apply appropriate solutions for achieving them. This kind of teamwork has a substantial positive effect not only on the acoustical solutions, but also on the bottom line. BE

Stephen G. Lindsey is a principal with Cerami Associates, a New York City-based acoustics and audiovisual consulting firm.

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Two or more aren't a crowd

BY DON MARKLEY

Traditionally, each television station in the United States had its own antenna and transmission line. To a significant degree, each station also had its own tower. Years ago, stations started sharing towers. In fact, stations started going to multiple antennas on a major structure as long ago as the 1960s, when a candelabra was built in Maryland.

The driving forces that caused stations to start sharing towers were the scarcity of good sites in congested areas, the opposition of zoning boards and citizen groups t towers (even then), as well as the significant cost of a tall tower. Still, on structures like the Mt. Sutro tower and many candelabra or "T" top towers, everyone had their own antenna and transmission line. There was no real technical reason for this – just that that was the way it had always been done.

At the same time, multiple-station antennas were the rule in Europe and Asia. Granted, these were mostly government-controlled stations and the allocation schemes were somewhat tailored to help get everyone at one location on the same antenna. Still, the technology was good, the antennas worked well and there was no real reason why that type of operation was not accepted in the United States. Multichannel operation was dismissed with statements ranging from "no one is going to tell me what kind of antenna to use" to "it may work in Europe but not over here." One would almost think that the laws of physics are altered by the Atlantic Ocean.

Stations started sharing towers due in part to the scarcity of good sites in congested areas and the opposition of zoning boards and citizen groups.

The advent of DTV has caused a lot of stations to rethink this whole thing. Suddenly the stigma has been almost totally eliminated by the specter of either the cost of a new tower or the unavailability of space for a new tower. So, stations have started to share in a big way.

On the manufacturing side, the antenna makers have responded with a host of new products, as well as the updating of existing products to meet the new need. The first was probably the panel antenna from Allan Dick. They had been providing panel antennas for years in the European, Asian and African markets. A good part of their line came from EMI when that firm was into broadcasting. Some of the first multistation antennas in the United States came from that background. Then domestic manufacturers started handling European antennas to augment their product lines. In particular, Dielectric and Shively were offering panels under their own brand name or as agents for the originating company. Dielectric went on to develop its own antenna that is now in the product line. Shively continues to market the RYMSA product line of multichannel panel antennas. Andrew now handles the Allan Dick line of antennas in the United States, giving them a broader range of VHF and panel antennas.

Harris already had panel antennas in its product line. The cavity backed radiator (CBR) antenna has been used for many years for FM systems, as well as for both VHF and UHF applications where circular polarization was desired. Harris also had a line of panels that worked well in situations where they could be wrapped around the tower. Of

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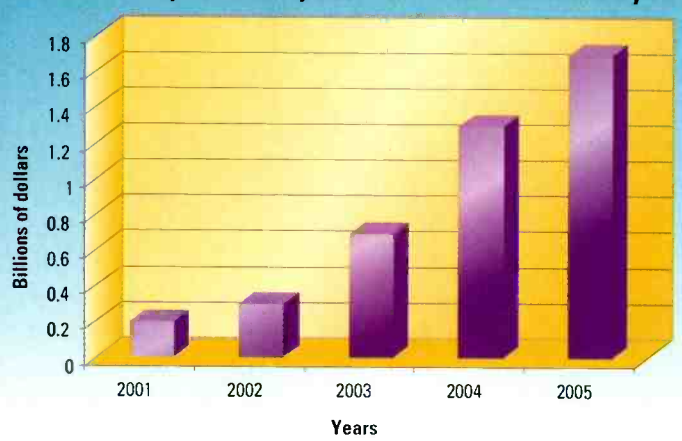

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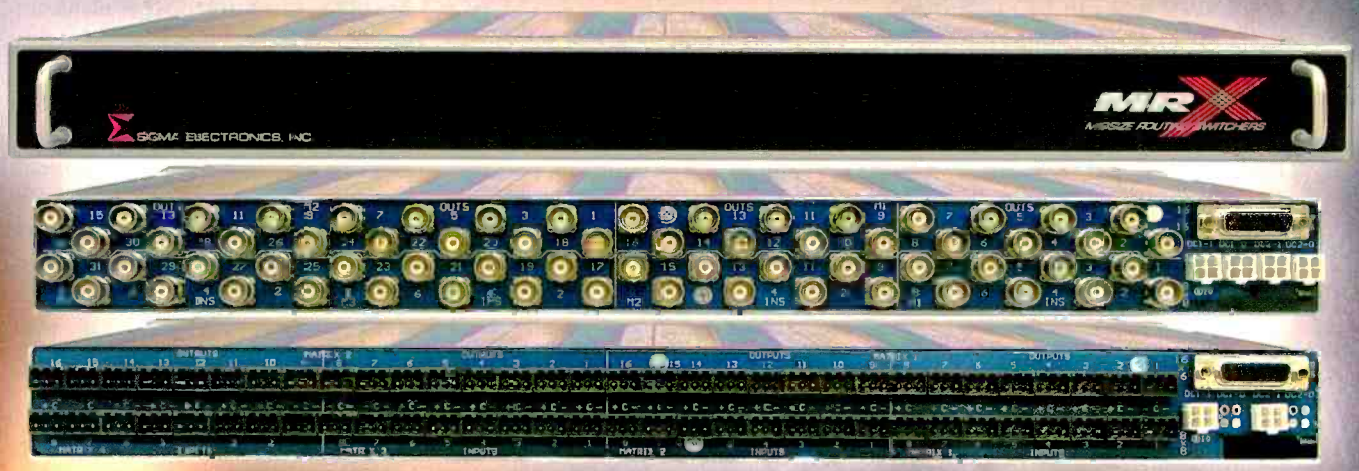

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course, that entire antenna product line has since been sold to Dielectric.

Panel antennas that would handle multiple channels also are available from RFS Americas, Jampro, MCI, ERI and SWR. RFS, Jampro and SWR have both VHF and UHF versions. Many broadband antenna products have evolved from the low-power world, where multistation operation has been widely used for years. RFS' line now includes the old but much modified Bogner line. The old Bogner low-power antennas have a bandwidth of around 15 percent of center frequency, permitting their use over a fairly large group of frequencies.

RFS also has their RD series of slot antennas that cover up to eight channels in bandwidth in either omnidirectional or directional patterns. Through their experience in Australia and Asia, RFS has developed a wide range of panel configurations for small to high power levels. Their larger panel antennas, like the biggest RYMSA, have an interior ladder so engineers can go up inside the antenna for maintenance. However, no panel antenna is yet large enough for this author to climb inside, nor is there anyone with a big enough whip to force this author to climb the tower to the antenna.

TCI, a firm long experienced in HF antennas, developed a panel array consisting of stacked cavity radiators. The antenna has full UHF bandwidth with low VSWR and can be made directional. TCI has since joined the Dielectric/SPX corporate family. Dielectric is offering the slot panel antenna under new model numbers as part of their multichannel line. Dielectric also has two-channel slot antennas that have been widely used in situations where a station has first adjacent analog and digital channels. Andrew and Jampro also have two-channel slot antennas.

The primary application of multichannel antennas has been where the channels are in a single group, i.e. low-band VHF, high-band VHF or UHF. The problem is that many stations have VHF analog channels and UHF digital channels, with a few instances where that situation is reversed. To meet that situation, Dielectric has developed their TUV-M and TUV-L antennas. While a bit simplified, they can be described as a super-turnstile antenna mounted on a slot. That is, the cylinder for the slot becomes the mounting structure for the super turnstile. These can be massaged into a number of omni- and directional configurations. One neat feature is that the UHF and VHF portions can have different directional characteristics.

Some facts apply to essentially all of the multichannel single-band antennas. The gain is going to vary somewhat across the band, based on the simple laws of physics concerning the size of the aperture in wavelengths. In a similar fashion, the beam tilt, null fill and directional characteristics will vary slightly across the band. Due to some really good design work by the manufacturers, these changes are small and usually don't cause any significant problems. However, these are the big drawback for multichannel users. The stations have to agree on a commonly acceptable pattern. One station cannot have an omnidirectional antenna with another having a single large lobe. The stations must also agree to accept the slight variations in beam tilt – again, not usually a problem. These are all problems that can be worked out by stations working with their consulting engineers. Any good firm has all of the information from at least the majority of the manufacturers to help their clients pick an antenna system that will properly serve their market while accommodating other users.

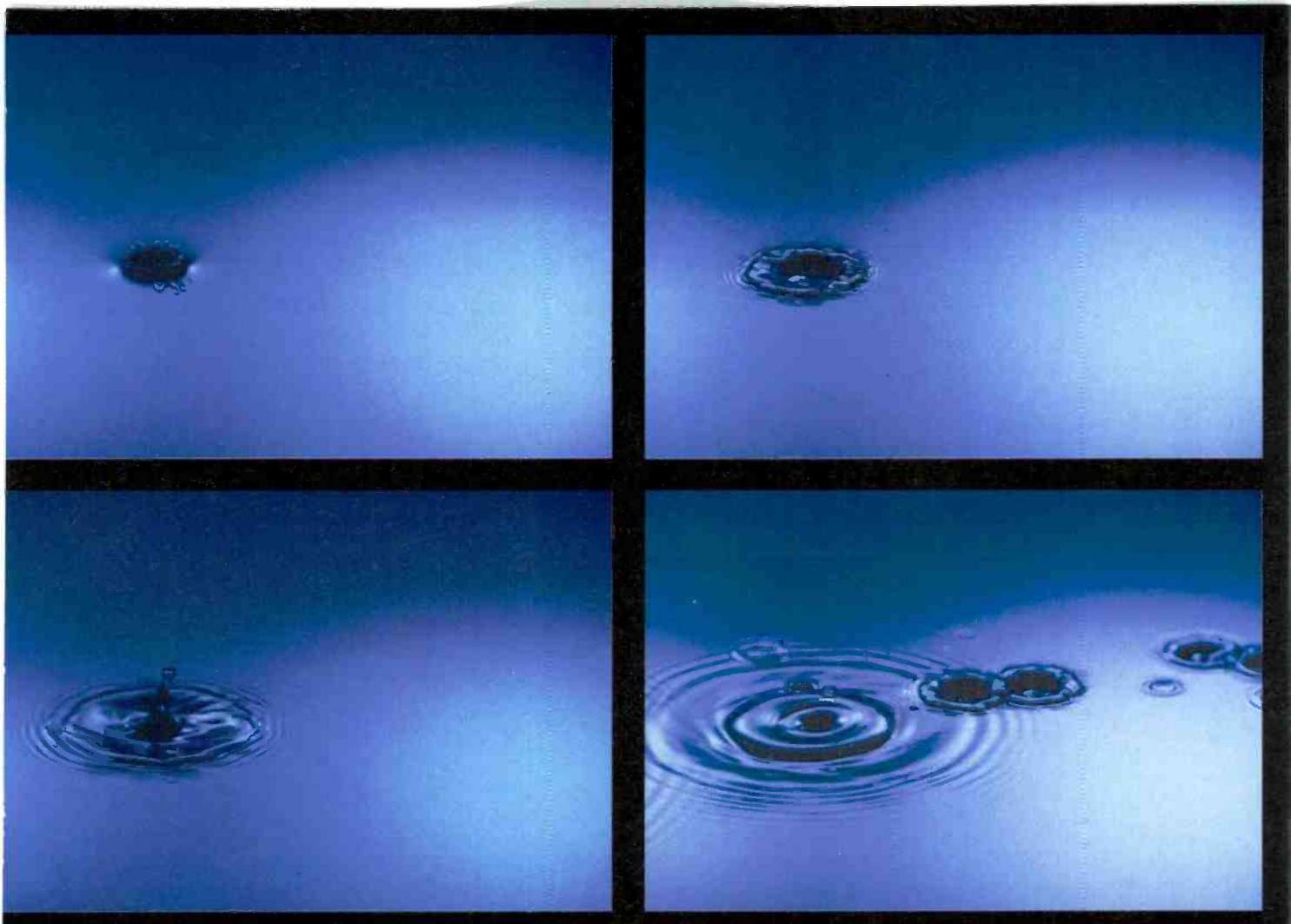
The DielectricTUV-M dualband antenna combines both VHF and UHF signals into a common antenna design. The TUV-M is for mid-band VHF (channels 4-6) combined with a UHF channel.

There is a limitation involved in how many stations can combine into a single panel – power. If there are several stations all seeking an ERP of 5MW, the power-handling capability of individual panels, as well as the interior feed lines and power dividers, can be exceeded. The power divider and feed line problem can be handled if sufficient space is available. For the panels, the solution is to add more panels. That means going to five or six panels around rather than three or four. It is also possible to add layers of panels vertically. With good designs, it is possible to do this without the vertical beam width becoming prohibitively narrow.

The main point here is that these multiple-channel antennas work very well. There are dozens of multiple-channel operations running today to support that statement. Those antennas must be a compromise between the preferred designs for any of the individual stations. However, it is usually possible to reach an acceptable compromise through careful selection of one of the many antennas available on the market today. Finally, look at it this way. While you may not end up with coverage that you can brag about as being superior to any other station, they won't be able to make that statement concerning you. Now, the ratings fight goes back to programming, where it belongs, as you, the chief engineer, confidently tell the suits that the numbers aren't your fault – it's the lousy PD who must take the heat. BE

Don Markley is president of D.L. Markley and Associates, Peoria, IL.

Send questions and comments to: don_markley@primediabusiness.com



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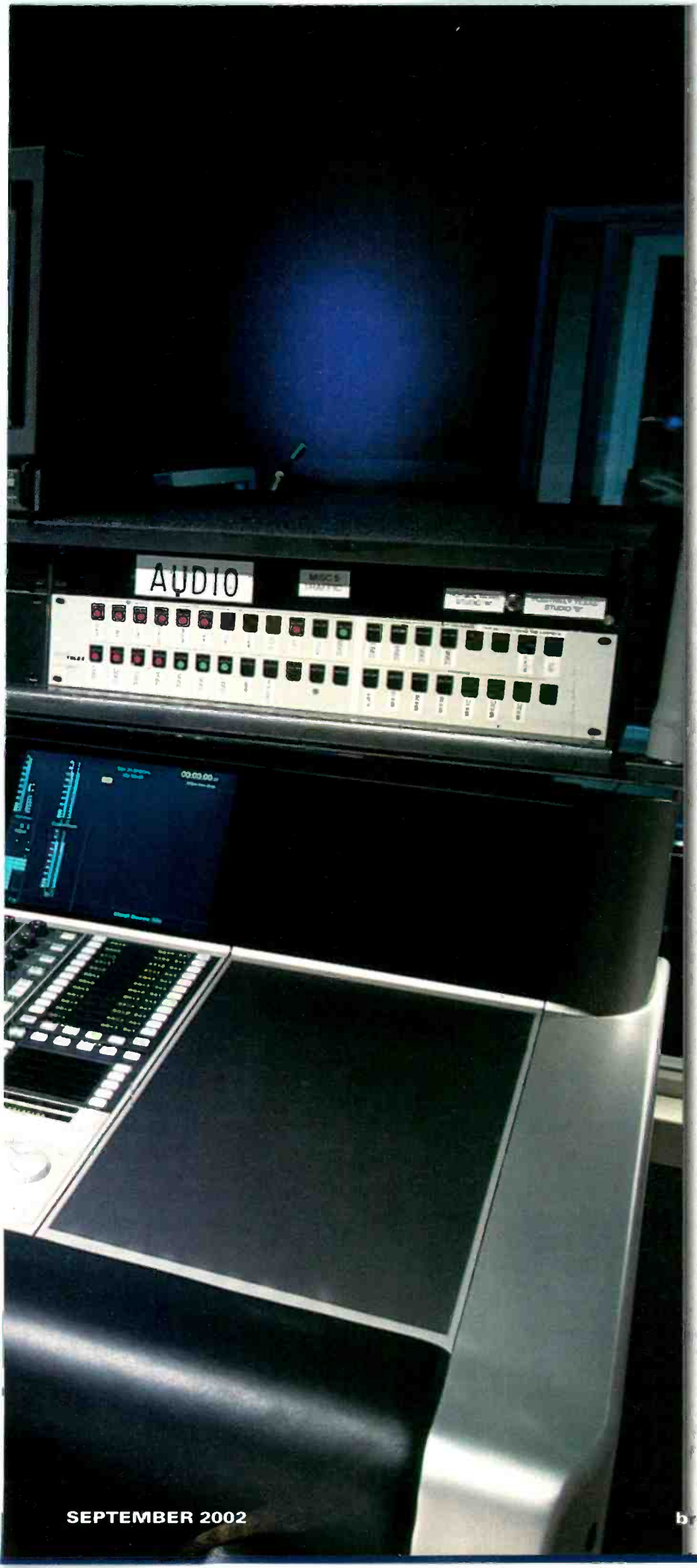
Broadcast and production audio consoles



BY DAVE HANSEN

This year, the U.S. government heightened pressure on the broadcast industry to get DTV online or pay the consequences by instituting a "graduated system of penalties" for those stations that did not meet the deadlines. Despite this pressure, only 413 of the 1240 U.S. television stations are currently transmitting digital signals, according to a recent article in *USA Today* (July 19, 2002). There are thousands of other facilities in the United States and worldwide that provide content (such as entertainment and sports programming, live or live-to-tape) that will benefit from working in a digital environment, but they are not yet doing so.

Facilities must undergo three stages to transition from analog to digital broadcast. First, they must install digital transmitters and antennas. Second, they must upgrade the master control infrastructure to accommodate digital signals. Finally, they must convert the production environment, which creates the facility's content, to all-digital audio and video equipment to realize the full benefit of digital broadcast technology. This third stage includes updating the audio console, which is the focus of this article.

Audio console manufacturers have been working furiously to provide products for digital audio applications in broadcast, and have been making viable products available for over five years. Initially, digital consoles for broadcast production were fiercely expensive — upwards of $600,000. Such costly products were installed mostly by large networks at facilities in major cities. But the diversity and accessibility of digital consoles has improved markedly. Today,

Left: At KTVT in Fort Worth, TX, the Euphonix System 5-B audio console features a 32-fader surface controlling 88 processing channels, 24 mix busses, 24 group busses and 16 aux busses. The station interfaces this processing with 24 microphone preamplifiers, and 48 AES digital inputs and outputs. Photos of System 5-B consoles courtesy of Euphonix.

on-air around the clock.

Facilities should a have staff that is familiar with basic concepts and components of digital systems and computer technology. A proficient IT team, which is readily available at most facilities, is essential for employing today's digital computer-based marvels. Onboard diagnostic software routines can help staff maintain the system. The facility technicians can learn the diagnostic routines and help locate and pinpoint problems if they arise.

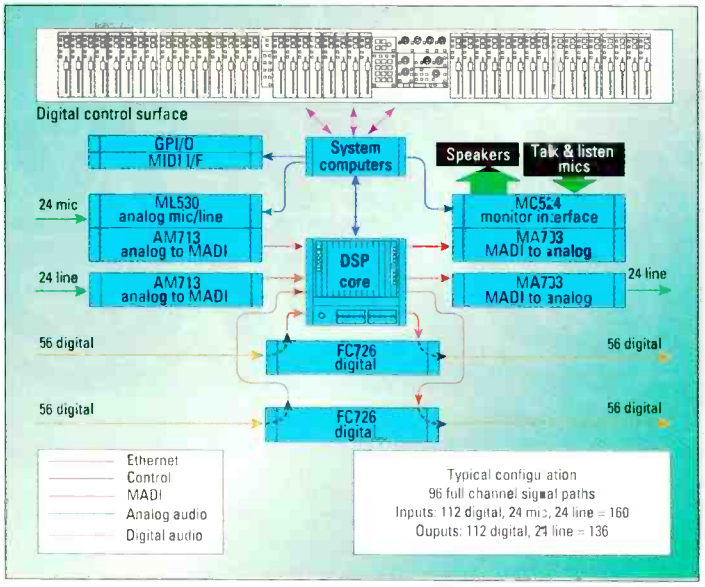


Figure 1. A typical digital console interconnection diagram showing the control surface (faders, etc), connected to the DSP processing and I/O units.

Planning the transition

The most difficult aspect of upgrading from an analog console to a digital one is to keep the show running while the new equipment comes online. Conscientious console companies will help plan transitions, but even so, facilities should have a concrete plan of action before embarking on an upgrade. Manufacturers should provide complete technical documentation online for facility staff to reference during planning, construction and installation.

Getting help

As with any new technology, there will be knowledge gaps. Most facilities are part of a larger corporation whose personnel have experience in digital technology. If so, you can draw on this resource. If such expertise is not available within your company, find someone with experience and, if necessary, buy a few hours of expertise during the planning and installation process. In addition, the larger console manufacturers have product specialists with experience in successfully implementing their consoles into a wide variety of facilities. Technology consultants are also available. With the right help, transitions can be smooth.

Extensive research into digital audio consoles before a purchase is of paramount importance. Avail yourself of the extensive technical documents, client information, news and other resources available on the manufacturers' Web sites, or just give them a call. Browse the Web and collect information. Join or browse some discussion groups ("rec.audio.pro" link from Google/groups at www.google.com/ or groups.yahoo.com/group/Broadcast), meet some new people and find out what's going on. One thing is sure: It's a digital world and digital consoles have arrived to serve it. BE

Dave Hansen is vice president of product marketing at Euphonix.

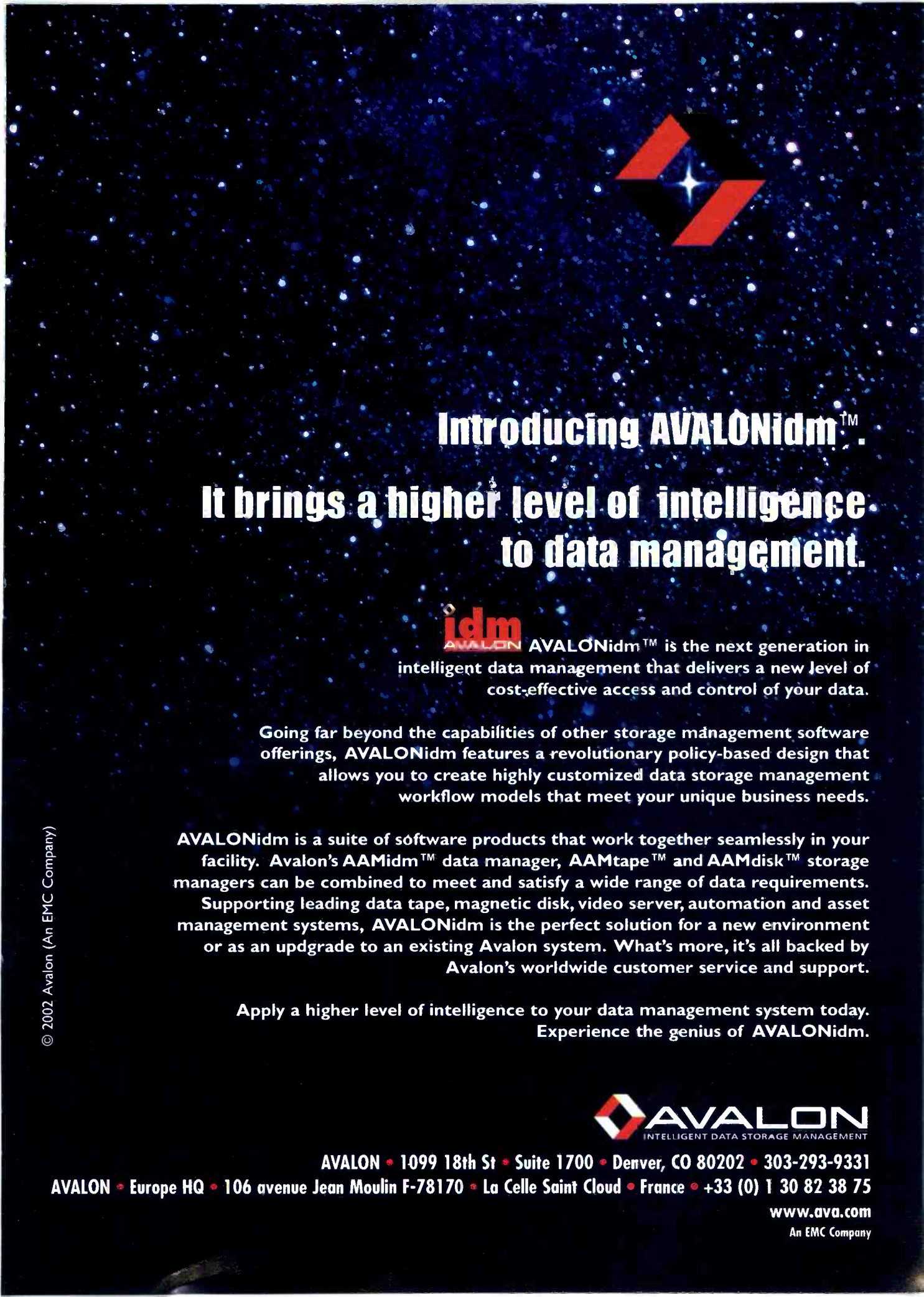
Selecting a digital console

Whether upgrading a current analog console to digital, or putting in a complete new studio with a digital audio console, there are three primary considerations: control surface, signal processing, and inputs and outputs (I/O). A few of the most important considerations are outlined below.

Control surface must be ergonomic. Stated rather obviously, features that are most frequently used by operators should be at their fingertips. A programmable control surface is a big plus, as it can be customized to the operator and application. For broadcast, consider talk-back to busses, backstop pre-fade listen (PFL), after-fader listen (AFL) solo, general-purpose inputs (GPI) control, and redundant power supplies. For production, consider dynamic automation and machine control.

With regard to signal processing, there should be enough digital processing capability to handle the required application, with room for expansion. Look for the ability to program the digital processing unit to suit your application, and note that this capability is not available on all consoles. Programmable items should include signal routing, equalization (EQ), filtering, bussing and monitoring. For broadcast applications, look for mix-minus, redundant PSU and RAID array for system computer. In production, multitrack busses, full dynamics processing are important. Make sure the system is 5.1 surround capable.

I/O should be modular and expandable and shouldn't require purchase of additional equipment for mixing and matching digital and analog I/O hardware. For broadcast, consider redundant PSU, 75Ω AES interface and integrated routing. Some considerations for production include support of all digital formats such as SDIF, TDIF, AES/EBU, etc.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The Euphonix room at Glenwood Place Studios is equipped with a Euphonix System 5 130-input recording/mix console, RADAR II and Pro Tools HD hard disk recorders, and Wavespace custom monitors. Photo courtesy Glenwood Place Studios.

Surround-audio production and facility design

BY JOHN HOLT

While the average home surround-sound system may be easy to operate, few home viewers understand the complex processing required to bring such dynamic audio program into their living room. In the professional broadcast community, things can be quite complicated.

As broadcasters make progress in their FCC-mandated transition to DTV, adding AC-3 audio to program streams is proving to be one of the more daunting challenges.

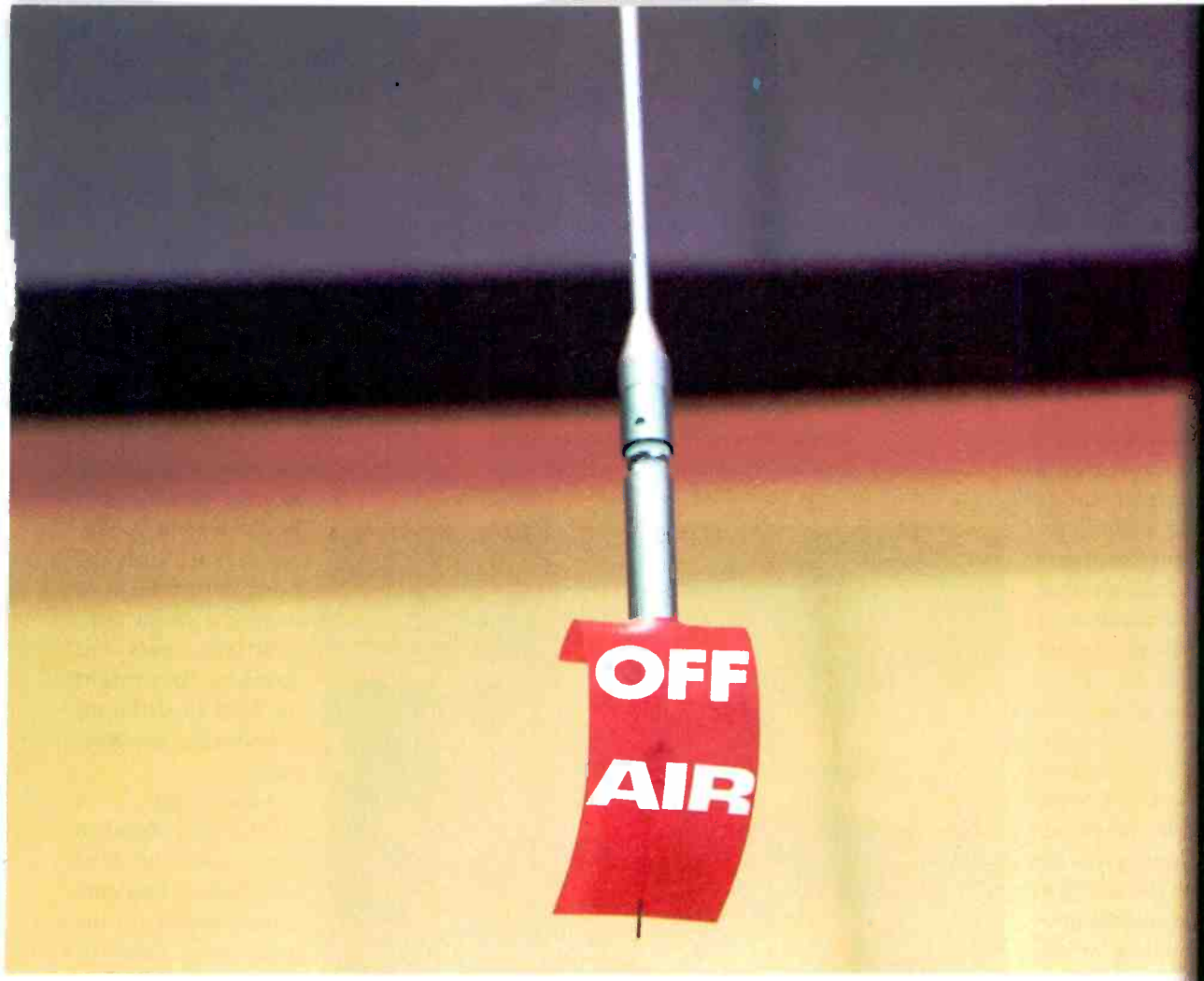
Surround audio requires a new type of audio-production room, and the buildout of rooms with full multichannel surround audio capabilities will greatly impact facility cost and design. Facilities will need multichannel production tools, encoders, decoders, surround-capable mix consoles and multichannel audio monitoring and amplification. Adding these devices greatly increases the overall complexity of newly designed audio rooms. But making the transition successfully isn't just about buying new gear and implementing technical changes. It also means that facilities must change the way they approach their operations. One of the biggest changes they face is adapting to the new processes required to create multichannel surround-audio content.

Making the transition successfully isn't just about buying new gear and implementing technical changes.

Increased flexibility

Since an audio mixing room might be used for multiple shows, mix rooms need to be more flexible. In the past, a mix room that would be used for a variety of show content would effectively operate in a similar manner regardless of the program content being created. The future DTV model, however, requires rooms that can operate as mono or stereo channel rooms for news, and stereo or surround for other program content.

There are many different multichannel



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surround-audio formats in the film community with which to contend, including Dolby Digital, Dolby Digital Surround EX, DTS, DTS ES and Sony SDDS. In the broadcast community, this issue has been somewhat alleviated by the ATSC's adoption of the AC-3 standard for creating and distributing multichannel surround audio.

The issues currently facing broadcasters in implementing surround audio in the DTV transport stream present challenges that, in many circumstances, require them to apply new types of tools. Two such tools are available from Dolby Labs. The DP570 multichannel audio tool, is a device that, during the encoding process, gives the operator the ability to generate and manipulate metadata values, which have begun to play a larger role in the DTV world. The unit also functions as a monitoring decoder, allowing operators to monitor the effects that the metadata values will have on the signal when decoded by the consumer. This allows the operator to evaluate, in real time, how downmixing or metadata changes the signal.

The DM100 is another tool available to engineers who install and/or troubleshoot a system. This device monitors the PCM, Dolby Digital and Dolby E bit streams, and allows engineers to analyze bit stream errors in real time. It also allows the user to generate PCM, Dolby Digital and Dolby E test bit streams.

Control Room A at Egan Media Productions features a 64-input D&R Cinemix 5.1 console with moving fader automation, onboard dynamics, and 24-input STEMS film mixing module. Photo courtesy Egan Media.

Monitoring the surround mix

One of the biggest changes to which broadcasters must adapt is the process of creating multichannel surround-audio content. They must monitor the encode process in real time so that the mix maintains compatibility when the signal is decoded. The mixer must decode the surround signal prior to routing the signals to amplifiers and speakers.

Creating a surround mix for a theatrical presentation is, in some ways, a simpler task than that facing the broadcast mixers. This is because theatrical production requires several mix operators, each concerned specifically with one aspect of the surround mix — whether it is music, effects or dialogue. And theatrical presentations are always decoded to a multichannel surround listening environment. But this is not necessarily true for broadcast production. It is conceivable that additional mix operators could be added, but, in most cases, this is not a very likely scenario. Since, potentially, the signal is delivered to the consumer in a wide range of listening environments — from mono to full 5.1 surround — the operator must monitor the mix in these different listening environments to assure signal compatibility.

Downmixing is the process of taking a multichannel program signal and reproducing it in listening environments that have fewer speaker channels than that for which the original surround program material was created. This process assures compatibility of the program material when it is decoded in the consumer's home system speakers. But it raises the potential problem of having a room with multiple sets of speakers that might be used in different monitoring environments.

Monitoring a downmixed signal in stereo could be done two ways: using surround speakers or the main stereo speakers. But, what further complicates this issue is the fact that a program that sounds correct in a surround format may not sound correct when monitored as a stereo or mono signal. Phase cancellations or other phasing issues could arise when the surround signal is downmixed to stereo or mono. One way to alleviate this problem is to downmix all the program content that will ultimately be delivered as mono to a left only/right only (LO/RO) stereo pair and not a left total/right total (LT/RT) stereo pair. The operator must then decide which mix should be optimized for surround, stereo or mono. Of course, it would make the operator's

A program that sounds correct in a surround format may not sound correct when monitored as a stereo or mono signal.

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life easier if every consumer had 5.1 surround audio. But that is not the case — at least not yet.

As content becomes more varied, audio production rooms will become more specialized than in the past. It will be up to individual stations to decide if they want to opt for full surround capabilities in each audio production room.

Processing delays

Processing delays, which in the past had been almost exclusively a video issue, will soon become an audio issue as well. In the past, delay to the audio operator meant that an audio-delay device was needed to bring the audio back in lip sync with the video after some video effect was rendered.

The Dolby E and Dolby Digital encoders and decoders all have processing delay through them. One of the menu options in the encoding process of the DP569 Dolby Digital encoder allows the unit to multiplex SMPTE timecode with the bit stream, thus effectively "time-stamping" the bit stream. This time-stamping of each Dolby Digital audio frame allows the audio bit stream to be synced back up to the video signal. The current revision of the firmware on the Dolby Digital encoder supports the optional delay word, word 8, in the SMPTE 339M standard. By enabling this feature, the encoder can input the exact value for the processing delay into this delay word. Any downstream devices that support the SMPTE 339M standard, and this feature in particular, can read this word and know the exact value of the audio delay.

The Dolby E encoder and decoder each have a one-frame delay. To distribute the Dolby E signal within the facility, the facility must somehow compensate for this delay. A video-delay unit inserted after either the encoder or decoder may be the quickest and most straightforward method. It is also possible to advance-time the PCM audio by two frames prior to the Dolby E encode and decode process, thus synchronizing the decoded Dolby E signal and PCM audio. The downside to this is that if the signal is left as an encoded Dolby E signal, it will be advanced one frame, and will have to be delayed. There are HD VTRs currently on the market that have video-processing delays of one frame while the signal undergoes encoding or decoding to the SDI SMPTE 259M signal standard. Examples of such VTRs are the Panasonic HD D5 and the Sony HDCAM VTRs.

The Dolby Digital encoder has a variable delay that is dependent on the operating mode, bit rates and other user-definable parameters. The minimum delay on the unit is 187 ms (about 5.5 frames), to a maximum delay of 450 ms (about 13.5 frames). As with the Dolby E delay, there are a few ways to compensate for this processing delay. Some MPEG encoders used to deliver the final program transport stream can compensate for the processing delay of the Dolby Digital encoder. The Digicipher II (DC II) from GI/Motorola can compensate for the delay as long as both the Dolby Digital and DC II encoders are fed VITC or LTC timecode. Future implementations of the DC II encoder will support the delay-word option of the SMPTE 339M standard. This will allow the encoder to look directly at the value of the delay word and know how much the delay value is. Manufacturers of other MPEG encoder compensate for the audio processing delay through the user interface to the encoder. For example, Scientific Atlanta's Powervu encoders allow the user to manually set the static value for the amount of audio processing delay compensation that the encoder must accommodate. All encoders can compensate for the audio processing delays if the encoder is fed with PCM audio and the AC-3 audio signal is encoded within the encoder. To monitor the Dolby Digital decoder in a master control operation, the room requires a one-frame video delay to compensate for the audio processing delay.

As it pertains to surround-audio encoding, there are many metadata parameters that require attention.

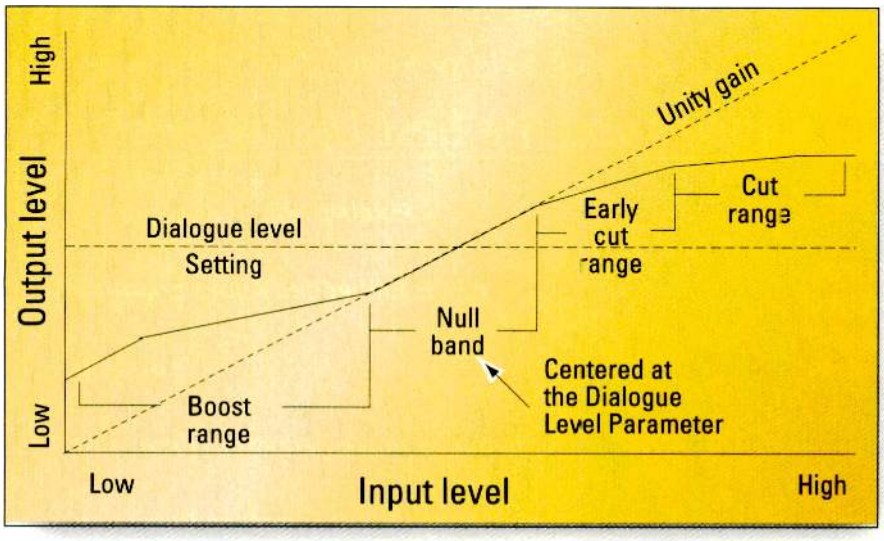


Figure 1. This diagram shows the response of the compression control on Dolby's DP570 multichannel audio tool. The feature allows the listener to adjust the extremes of the program audio.

Managing the metadata

Metadata has become another hot issue of the DTV standard. As it pertains

to surround-audio encoding, there are many parameters that require attention, including dialogue level, channel modes, data rates, dynamic range control, downmix modes and various other bit stream parameters. Three metadata parameters in particular are of interest in either the Dolby E or Dolby Digital signal: dialogue normalization, dynamic-range compression and downmixing.

The metadata values can either be generated from the Dolby Digital or Dolby E encoders, or the values can be preset from the DP570 multichannel audio tool. The DP570 has several features that offer the operator more control over generating and manipulating the metadata, and it allows the operator to monitor the effect of the metadata on the signal in real time.

Since it has a decoder and monitor matrix, it allows the operator to monitor the effects of metadata and downmix changes prior to encoding in either Dolby Digital or Dolby E formats.

Dialogue normalization, or "dialnorm," allows the operator to set up this parameter so that all program material maintains a consistent relative volume level upon delivery to the consumer. For television post production, this level matching allows varied program content (commercials, news, sitcoms, sports, movies) to maintain the same level when decoded in the consumer's home. This sets the null level for the consumer's decoder, giving a pseudo limiting effect that minimizes clipping.

The dynamic range control, or "dynrng," allows the consumer to reduce a program's dynamic range as needed. This is an optional mode that can be disabled on most consumer decoders if so desired. It allows the viewer to adjust the extremes of the program audio and listen to it at a reduced dynamic range. (See Figure 1.)

Other considerations

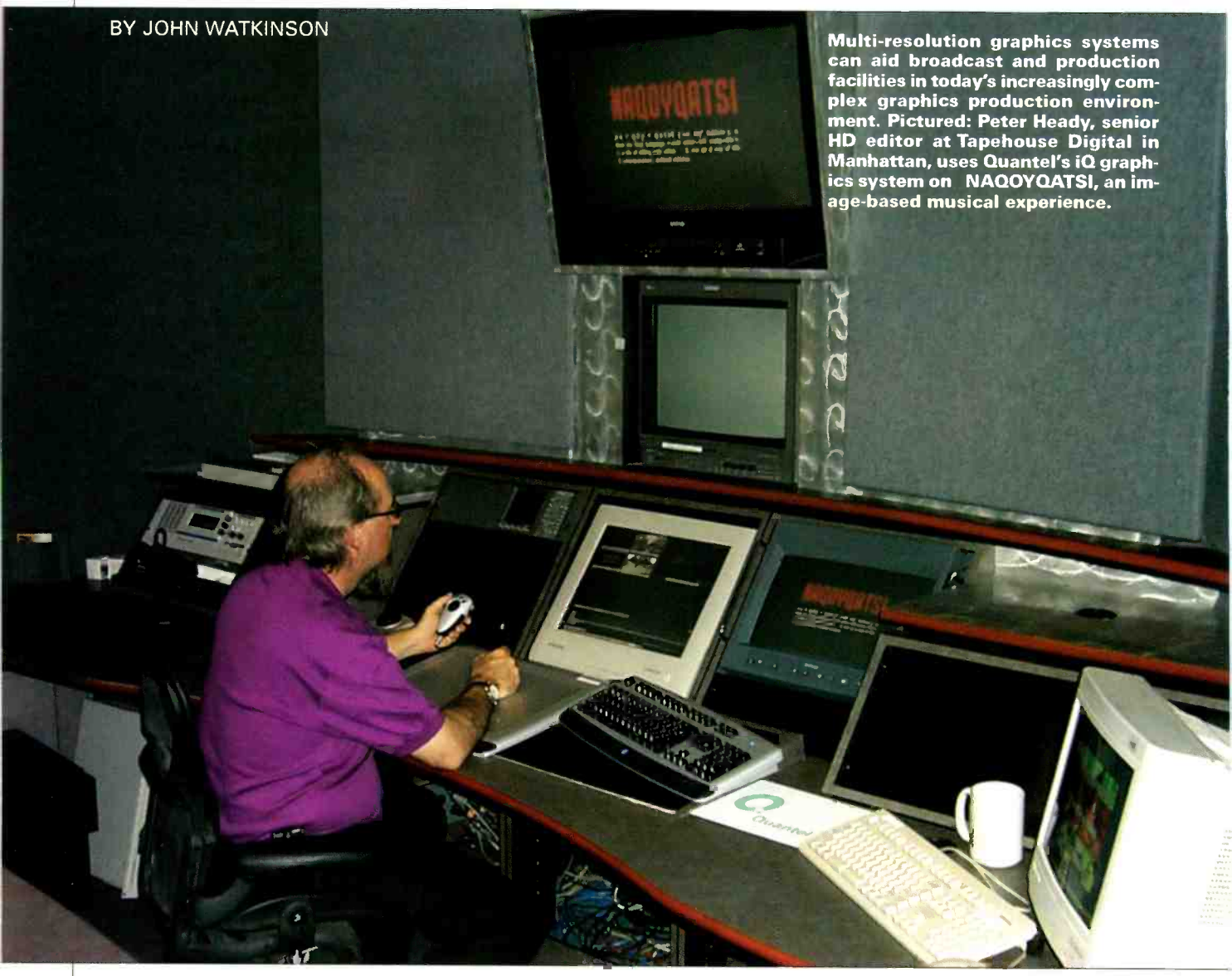
Having a facility that is designed to support the Dolby Digital and/or Dolby E format is not just a matter of technical or engineering issues. The facility must change operational procedures to be fully compliant. As with any new standards or implementations, more often than not the full nature of the issues or problems are not discovered until the actual implementation is under way. Over the next few years, as this standard becomes the norm and not the exception, the transition from an analog or PCM audio facility to a multichannel surround facility should become easier. BE

John Holt is a senior systems engineer with The Systems Group.

Resolution coexistence:

The way forward for graphics

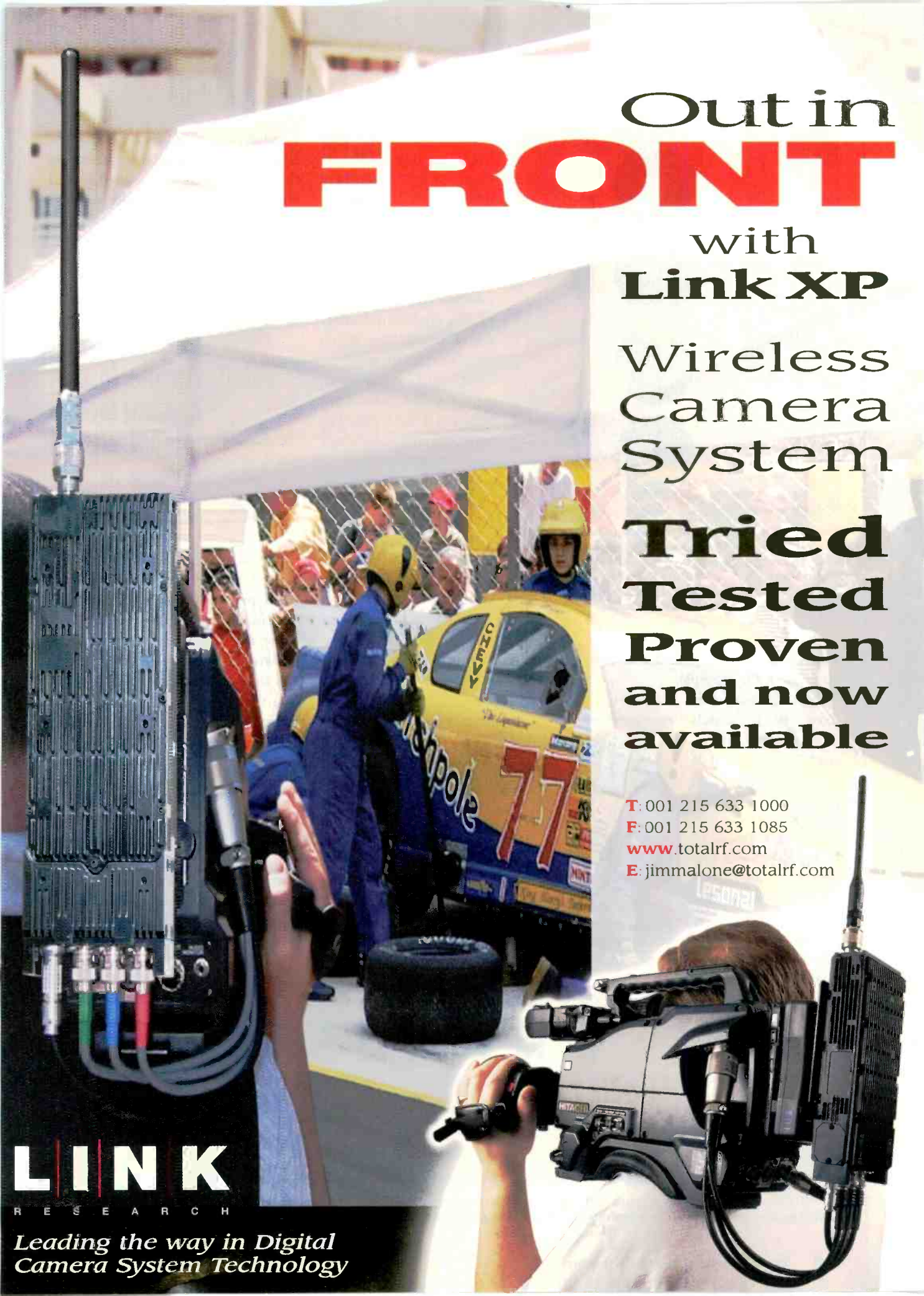
BY JOHN WATKINSON



Multi-resolution graphics systems can aid broadcast and production facilities in today's increasingly complex graphics production environment. Pictured: Peter Heady, senior HD editor at Tapehouse Digital in Manhattan, uses Quantel's iQ graphics system on NAQOYQATSI, an image-based musical experience.

Some years ago, when life was simpler, there were only two scanning standards to cater for: 525 line and 625 line. Computers were too slow to work on images in real time, and special hardware had to be built. But things change. Today there is a veritable morass of scanning standards, not only in television, but also in other areas where digital technology has been ap-

Clearly the single-format or 525/625 switchable graphics unit is dead.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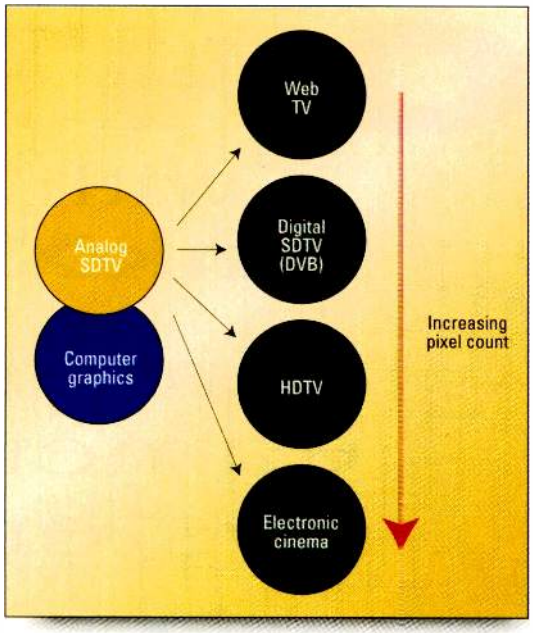

Figure 1. Digital image technology has resulted in a number of different scanning standards. This diversity encompasses two opposing trends. First, an increasing pixel count is being used for increased quality. The second is the use of compression and low bit rates to lower costs.

plied to images — digital cinema and computers, for example.

Figure 1 shows this diversity, in which there are two opposing trends. The first of these is an increasing pixel count intended for increased quality; the other is the use of compression and low bit rates to allow low-cost or hitherto impractical services.

Figure 2 shows how standards can vary in a large number of technical parameters. One irritating incompatibility is that computer display formats use square pixels whereas Rec. 601 SDTV doesn't. There are few different aspect ratios in video and computers, whereas in film one loses count.

Gamma is universal and standardized in TV, whereas computers may use linear light coding or even a nonstandard gamma.

Given that the eye sees less detail in color, some different approaches to color coding are to be expected. The RGB output of the traditional computer needs too much bandwidth for production and broadcast, where color difference working is the norm. The color difference data may be downsampled in a variety of ways. Production equipment uses 4:2:2, whereas DVB and DVD use 4:2:0, which has to be interpolated vertically to allow use with interlaced systems.

Clearly the single-format or 525/625 switchable graphics unit is dead. The question is, what should replace it? Fortunately, given the massive flexibility and speed of modern processors, the answer is straightforward. Stated simply, equipment should be built that is so flexible that it really doesn't care what the format is. Whatever the format coming in, the equipment should work at that standard.

While digital recording and transmission can be completely lossless, this is not true when processing is carried out. When processing takes place, pixel values will be multiplied and added in various ways. Figure 3 shows a common processing tool, the transversal filter used in most DVEs and re-sizers. Another common process is conversion from RGB to color-difference signals. A matrix like the one shown in Figure 4 is used for this process.

Whatever the format coming in, the equipment should work at that standard.

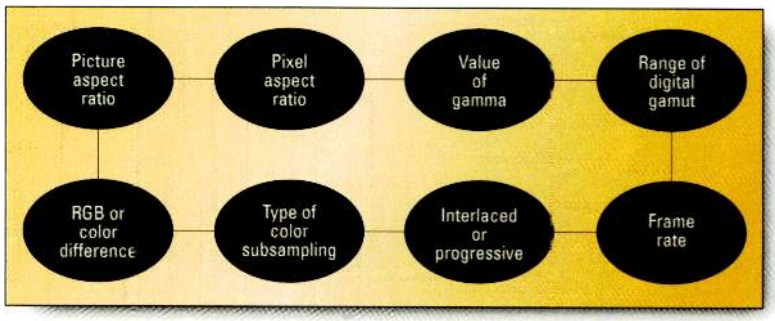

Figure 2. Digital imaging standards can vary in a number of technical parameters, including aspect ratio and gamma.

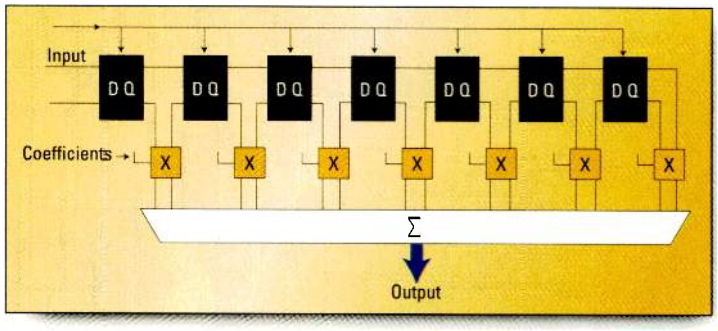

Figure 3. Digital processing consists mostly of multiplication and adding, as when a digital transversal filter is used.

The finite precision of digital systems makes some quality loss inevitable. Some code values require extra bits to carry the full resolution. These extra bits are easily carried inside processors, but are lost when a standard word length output is needed. For the best results, the rounding off to the standard word length should be done only once. Anything else will cause generation loss.

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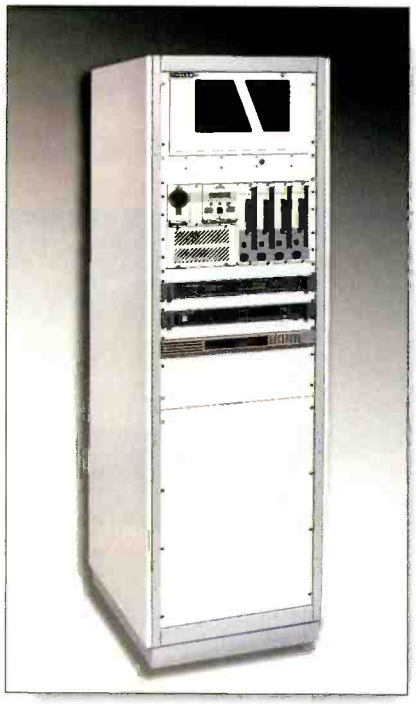
Thales' Affinity
low-power DTV transmitter

BY JOE TURBOLSKI

Since the FCC's decision last fall to allow U.S. broadcasters the option to install low-power digital transmitter facilities, a plethora of solutions have been introduced. Which solution is right depends on each broadcaster's goal of using low-power solutions.

The goal of Thales Broadcast & Multimedia Affinity family of low-power solid-state DTV transmitters was to allow broadcasters to get on-air at a low power (≤1000W) cost-effectively, while meeting impending deadlines.

The transmitters are rack-mounted and self-contained. High level out-of-band filtering, required to comply with FCC spectral mask specifications, is provided by a bandpass filter, which can be mounted internal to the cabinet (depending on power level). The most basic transmitter configuration can also include a "Starter Pak," which consists of a standard-definition encoder and a multiplexer with static PSIP, all mounted in the same rack with the transmitter.



Low-power transmitters likeThales' Affinity may provide broadcasters with a cost-effective option for delivering digital programming to the consumer.

The final power amplifier architecture of the transmitters uses multiple high gain full-band LDMOS modules in parallel to achieve the desired power levels (50, 100, 200, 500 or 1000W). This self-redundant power amplifier configuration provides up to 1000W average output power. The final power amplifiers also feature a hot-swappable design, enabling the replacement of any power amplifier while the transmitter is on-air.

The UHF version of this architecture has evolved from an earlier design that has been used in fixed wireless systems for years. Power amplifiers are self-contained, intelligent modules that provide roughly 70W RMS output power capability. Each power amplifier module includes the RF amplifier PC board, in addition to a DC-to-DC converter and a microcontroller circuit.

Each plug-in amplifier module is broadband (470- to 860MHz) for the full UHF band and is gain and phase matched for consistent performance from module to module. This process allows for direct interchangeability between models and hot-swap capability.

The high-gain RF amplifier module uses LDMOS high reliability transistors that are biased for class AB operation. The inherent linearity of these amplifiers and the quality of the associated correction circuits combine to produce excellent linearity performance. Each final power amplifier module has protection systems for high temperature, over-current and excessive VSWR conditions.

Advanced exciter/modulator technology

The company's low-power product line incorporates an 8-VSB exciter that is common to high-power IOT transmitters. The exciter's robust functionality allows the modulation and broadcast of ATSC-compliant digital signals. It provides frequency tolerance to within 1Hz and is broadband-tunable across the entire UHF band. The exciter used in the low-power solution is frequency agile and features a straight digital-to-RF conversion, eliminating the IF stage and associated distortions. The exciter integrates digital adaptive pre-correction (DAP) to increase performance accuracy. The DAP system provides digital correction of nonlinear distortions, including amplitude and phase distortion, and linear distortions including group delay and frequency response.

Low-power solutions are a great way for broadcasters to get their DTV signal on the air cost-effectively and reliably.

Low-power solutions are a great way for broadcasters to get their DTV signal on the air cost-effectively and reliably. This allows the marketplace to catch up with DTV receiver penetration, while still meeting FCC timetable guidelines. Low-power solutions even have a place in the future of DTV since they can be upgraded, used as a future backup transmitter, or transitioned to low-power digital translators, depending on the broadcaster's needs. BE

Joe Turbolski is director of marketing for Thales Broadcast & Multimedia.

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Preserving
a facility's routing investment

BY ROBERT MCALPINE

There are many areas in a video facility where brands and formats don't matter. However, when it comes to a facility router, the formats it supports and the strength of the router manufacturer matter a great deal. Generally, once you buy a router, you're locked into that company's future new products and upgrade path because of the requirement to maintain compatibility with the existing equipment. The difficulty is that not all router manufacturers support all the formats required for today's rapidly changing digital state. Also, because some manufacturers have ceased business, a facility can even find itself with no upgrade path at all. These conditions mean that, short of purchasing an entire new routing system, owners of older technology routers may find themselves with few options.

The desire to support TV stations and video facilities finding themselves in this situation led PESA Switching Systems to develop a conversion product called the UCI-2000. The device provides interface compatibility between major brands of routing systems and, most importantly, allows legacy routers to be updated and expanded as needed.

Not all router manufacturers support all the formats required for today's rapidly changing digital state.

Ultimate flexibility

The UCI-2000 is a versatile controller card designed to handle a wide range of router protocol conversions. It is available as a stand-alone unit or in a fully redundant configuration with automatic changeover, which eliminates the chance of single point failures. It can operate as either a master or slave within an existing router control system.

When in the *Master* mode, the facility would use a PESA router to control some or all of that facility's legacy matrix frames. All switch commands are made from standard PESA control panels. This enables third-party routers to be used as though they were native PESA frames.

When the controller operates in the *Slave* mode, it provides the opposite functionality. This allows PESA routers to easily be added to existing third-party routing systems. The UCI-2000 controller currently supports Ditech, Sony and Philips routing systems.

The controller interfaces directly with Sony's S-Bus, providing support for Sony 7000 and 8000 series production switchers. This allows the production switcher to control a PESA house router using standard PESA control system mnemonics.

Connection to the Philips matrices and control system is accomplished using either the native crosspoint bus or the ES-Bus port on the Philips VM3000 controller. Support for additional manufacturers' routing systems are currently under development.

While there have been plenty of advances in routing technology, today's facilities still need cost-effective solutions. Add to this requirement the desire for a variety of router configurations and signal handling capability, and it's clear that any one manufacturer may not have all the answers. That's especially the case if the solution would mean replacing a backbone routing system. The UCI-2000 allows a facility to preserve its current investment in router technology while providing an efficient and cost-effective upgrade path to newer technology, features and formats. BE

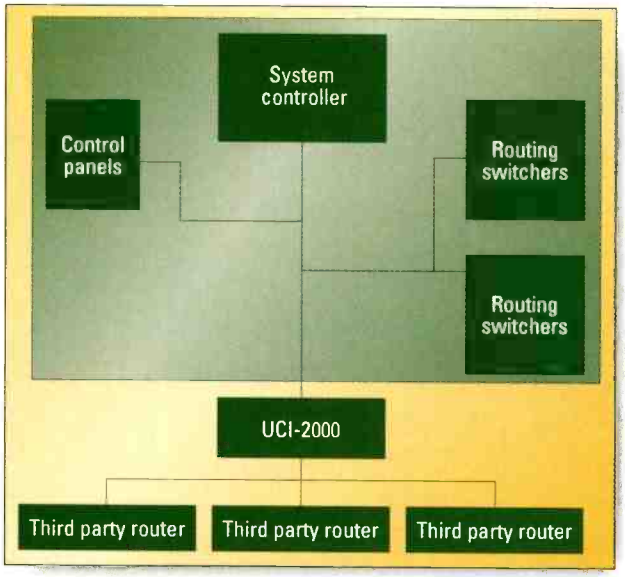

Figure 1. PESA's UCI-2000 controller can allow a facility to leverage legacy router technology (whether PESA or third-party) by providing an upgrade path to new formats and configurations by acting as a master or slave controller to PESA and other brands of routers.

Robert McAlpine is senior vice president of sales and marketing for PESA Switching Systems.

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16 Years in Business!

Picture monitors

and multi-image displays

BY JOHN LUFF

Television is not much good if it can't be seen. Our industry is littered with cameras, switchers, DAs, converters, aspect ratio converters, and hosts of processing, control and imaging devices from lenses to recorders. The journey begins with photons creating an image in a camera (or software simulating the result). But at the end of every imaging chain is ultimately a device to convert the electrons back into light to recreate the impression of reality on our retina. In a very real way, monitors are among a small number of devices that will always have an analog component, for generating a time-varying light flux results in an analog output no matter how the input is derived.

Monitors are among a small number of devices that will always have an analog component.

If you look around any television station or production facility, you will see tons of monitors, usually inexpensive monochrome monitors for less demanding applications, and color monitors of a number of types. Until the last few years, the final output of any television process was viewed on a CRT monitor. Today a host of other display types are quite practical, though none can match a CRT for critical viewing and accurate colorimetry. Monochrome CRT monitors evolved to a high state of refinement prior to the introduction of color. Color could be displayed only from a CRT until the introduction of alternative physics in the last few years.

Alternative display devices

The Texas Instruments' digital micromirror device (DMD) is a reflective device that uses an array of electrostatically controlled mirrors (read VERY small). The fact that it is reflective means that interesting possibilities exist for colorimetry without the narrow line emissive structure of phosphors in CRTs (or other devices).

Of course, every opportunity comes with a curse. Our industry has loads of experience in controlling the colorimetry of CRTs, and a reflective device requires some new primary science to get the precisely controlled final output that high quality monitoring requires.

Also, DMDs are a sampled structure with a relatively small number of potential pixels to illuminate. The highest resolution chip produced by TI and its licensees is 1280x1024. This is certainly better than the 720x486 of ITU-R BT601 standard (SMPTE 259M), but about the same as the number of active elements in a moderately sized CRT. The sampled nature of the display creates a visually different type of image than the gausian distribution the electron beam spreads on the face of a tube (before the effect of the shadow mask). The light is not actually constant either, as each pixel is modulated in time so that the eye integrates the total light and perceives an analog change in intensity.

High quality displays (rear screen and front projection) using DMD technology are in regular use in film transfer suites, edit suites and consumer display systems. Many of us have seen DMD projectors used for computer "slide shows," with remarkable quality, high image brightness and good contrast, though not equal to a high quality CRT monitor.

Plasma displays have steadily improved as well in the last few years and now are generally accepted for many uses. Their colorimetry is still not the equal of a good CRT, and they suffer from varying levels of deficiency in gamma performance in the dark regions of the picture. Plasmas long have held promise to scale well into very large monitors when the manufacturing

The virtual monitor wall in Core Digital/SWTV's new all-digital hybrid mobile television truck uses Avitech's Video Command Center (VCC) line of processors for monitoring up to 96 SDI sources on six Christie Digital 50-inch DLP cubes.

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yields get high enough to make them price-competitive with similarly sized CRT or projection sets. For practical purposes they are often considered now for general monitoring uses.

LCD monitors have erupted in popular usage this year. One production trailer at NAB used a combination of LCD flat-panel displays and DMD projection cubes for the entire monitor wall and much of the utility monitoring throughout the system. Two years ago, our company experimented with flat-panel monitor walls (combination of LCD and plasma displays) when it built the Panasonic 720p production unit that was used for *Monday Night Football* in HDTV (now owned by Ackerley Broadcasting in Seattle). LCD technology has improved significantly and dropped in price a lot since that 1999 effort.

Multi-image displays

Many people in our industry have seen multi-image display multiplexers at trade shows, most commonly using plasma monitors or projection displays. It is reasonable to consider building a monitor wall today using a combination of these two technologies. The result is a monitor wall that is perhaps five inches thick and can be reconfigured very quickly.

These multi-image display processors (available from Miranda, Evertz, Avitel, Barco and perhaps others I have missed) allow a combination of 4:3 and 16:9 images on the screen at one time. They can combine picture monitors, waveform monitors, VGA-based test instruments, automation computer display outputs, audio monitors and vector displays on one monitoring "surface," often in a dizzying array of display configurations. Some allow you to "map" the inputs to adjustable-size virtual monitors on the display plane.

It is especially interesting to see that video displays are embracing a wide variety of input formats including composite analog; SDI; HD-SDI; VGA, SVGA and XGA computer outputs; digital visual interface (DVI); and S-video. The output is formatted as a computer output compatible with a wide range of display types and formats as well. These devices have gone from offering low-resolution picture-in-picture to offering well-filtered and accurately scaled images of reasonable quality.

Some processors are controllable via special-purpose control panels, and most can be modified from a bundled configuration program. Many parameters can be changed, including the individual image sizes, aspect ratio, surround signal, tally lights and text displays, audio meters, clocks (internally generated), and the placement of individual images on the canvas of the screen.

The genre has become quite mature. Most systems are quite robust and some feature front panel replaceable (hot-swappable) modules. In some cases, the combined output is available even in the face of the failure of the underlying computer. This is particularly important when you consider that you might not just lose one monitor when the display fails, but perhaps every monitor.

Today a host of other display types are quite practical, though none can match a CRT for critical viewing and accurate colorimetry.

Without space cards you might be relegated to an unpleasantly small range of options, none of which is acceptable to a producer who can't see his cameras!

As time goes on, it appears likely that this kind of technology might migrate literally into the display device itself. A monitor with 16 inputs that could all be displayed simultaneously would be a very cool thing. At today's prices that is not a practical option, but it is an interesting possibility, and might well be practical for large displays where the tight integration and optimization of the interface yields increased functionality and high performance. BE

John Luff is senior vice president of business development for AZCAR. To reach him, visit www.azcar.com.

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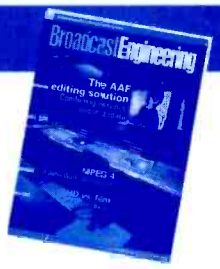

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5 Which of the following types of equipment will you be evaluating for purchase in the next 12 months? (Check ALL that apply.)

1. Audio Products
- 1A ❑ Audio consoles/mixers
- 1B ❑ Digital audio workstations
- 1C ❑ Distribution amplifiers
- 1D ❑ Headphones, headsets, intercoms
- 1E ❑ Telephone interface systems
- 1F ❑ Magnetic tape, audio
- 1G ❑ Microphones
- 1L ❑ Monitors (speakers)
- 1J ❑ Recorders, players
- 1K ❑ Switchers, routing
- 1N ❑ Audio Processing

2. Video Products
- 2A ❑ Camera heads, tripods, pedestals, booms, dollies
- 2B ❑ Cameras; lenses
- 2C ❑ Graphics, titling, effects
- 2D ❑ Nonlinear editing systems
- 2F ❑ Editing controllers, systems
- 2G ❑ Frame synchronizers, time base correctors
- 2H ❑ Lighting systems
- 2T ❑ Magnetic tape, video
- 2J ❑ Monitors (picture, studio quality)
- 2K ❑ Recorders, players
- 2L ❑ Robotic camera controls
- 2M ❑ Signal processing
- 2N ❑ Signal routing, distribution
- 2W ❑ Standards, format & scan converters
- 2P ❑ Still store systems
- 2Q ❑ Switchers, production/ master control
- 2R ❑ Storage/video servers
- 2S ❑ HDTV Equipment
- 2V ❑ Virtual Sets
- 2X ❑ MPEG compression/ encoding systems
- 2Y ❑ Projection systems
- 2Z ❑ DVD systems

3. Test & Measurement Products
- 3A ❑ Analyzers, audio, video, RF
- 3B ❑ Audio, video signal generators
- 3C ❑ Waveform, vectorscope monitors
- 3D ❑ Digital signal testing

4. Miscellaneous Products
- 4A ❑ Battery packs, chargers
- 4B ❑ Cabinets, racks, consoles
- 4C ❑ Cables, connectors
- 4D ❑ Carts, cases (equipment, shipping), tools

5. RF Products
- 5B ❑ Exciters
- 5C ❑ Fiber optics
- 5E ❑ Power amplifiers, cavities
- 5F ❑ Receivers
- 5G ❑ Remote production vehicles, program relays
- 5H ❑ Satellite T/R components, electronics
- 5P ❑ STL/ENG components, electronics
- 5J ❑ Switches, RF coaxial
- 5K ❑ Transmitters
- 5L ❑ Antenna systems, towers
- 5M ❑ Transmitter, remote controls
- 5N ❑ Tubes
- 5Q ❑ Weather, radar RF products
- 5R ❑ Cable/set top/CA systems

6. Automation & Computer Products
- 6A ❑ Accessories/peripherals
- 6E ❑ Automation systems
- 6H ❑ Business automation
- 6T ❑ Commercial insertion systems
- 6K ❑ Machine control
- 6L ❑ Newsroom automation
- 6P ❑ Record/playback automation
- 6Q ❑ Software, engineering
- 6R ❑ Software, production, planning
- 6X ❑ Video interface cards
- 6Y ❑ Networking products
- 6Z ❑ Digital asset management

7. New Media/Internet
- 7A ❑ Encoding products
- 7B ❑ Internet service providers
- 7C ❑ ecommerce technology
- 7D ❑ Content creation systems

8. ❑ System integration/ engineering services

9. ❑ None of the Above

6 What is the budget for equipment and services you are evaluating for purchase in the next 12 months? (Check only ONE box.)

- 1 ☐ Less than $24,999
- 3 ☐ $25,000 - $99,999
- 5 ☐ $100,000 - $299,999
- 6 ☐ $300,000 - $499,999
- 7 ☐ $500,000 - $999,999
- 8 ☐ $1,000,000 - $1,999,999
- 9 ☐ $2,000,000 and up

14 ☐ Station Manager
15 ☐ Production Manager
16 ☐ Program Manager
17 ☐ News Director
18 ☐ Other Operations Title

D. Other (please specify): _____

4 Which statement best describes your role in the purchase of equipment, components and accessories? (Check only ONE box.)

- A ☐ Make **final decision** to buy specific makes, models, services or programs
- B ☐ **Specify** or **make recommendations** on makes, models, services or programs
- C ☐ Have **no part** in specifying or buying

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Sr. VP, Integrated Sales: Dan Lovinger, dlovinger@primediabusiness.com

Primedia Business to Business Group - 745 Fifth Ave., NY, NY 10151
President & CEO: David Ferm, dferm@primedia.com
Chief Creative Officer: Craig Reiss, creiss@primedia.com
Creative Director: Alan Alpanian, aalpanian@primediabusiness.com

Primedia Inc.
Chairman & CEO: Tom Rogers, trogers@primedia.com
Vice Chairman & General Counsel: Beverly Chell, bchell@primedia.com
President: Charles McCurdy, cmccurdy@primedia.com

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The market has spoken

BY PAUL MCGOLDRICK

Great ideas from many companies emerged as what we know as the ATSC's DTV standards. But, like all standards allowing too much flexibility, this one has been doomed to failure. To begin, we have no consistent agreement on which of the toolbox elements will be used; then, we have spotty implementation; and we still have limited terrestrial transmissions. And there is absolutely no agreement on whether an HDTV standard is an industry goal.

HDTV has found some niches. The HDTV production of Lucas' *Attack of the Clones* clearly showed that Hollywood can and will use the 24 frame rate standards despite the fact that the motion artifacts continue to be as bad as film. The savings in being able to view work immediately will reduce takes and eliminate most of the retakes that have been previously required after rushes were reviewed.

The clear lesson from most of the rest of the world is that our drive should have been, and should continue to be, to push for DTV as a whole rather than HDTV in particular. Mr. and Mrs. Joe Public are still confused about DTV and HDTV, as are newspaper review writers, consumers' associations and the majority of sales associates at most consumer stores.

The BBC's R&D department published a white paper early in August 2002 entitled "Spectrum Matters in the All-Digital Future," the written version of a paper presented at BroadcastAsia2002 by Thomas Everest. One of the fascinating things to come out of this look at the future includes the results of a survey conducted by the BBC to help get ready for frequency re-planning conferences in 2004 and 2005.

Twenty-one countries responded to the survey with opinions from governments, broadcasters, manufacturers and others. In the types of service that were predicted, a medium to high priority was returned by over 80 percent for traditional TV, 95 percent for widescreen TV, 45 percent for audio only, about 90 percent for data, 80 percent for text, over 90 percent for IP-based services and just under 80 percent for Internet TV. But the real showstopper is that the medium and high priority for HDTV was under 35 percent, with less than 10 percent in the high grouping.

The mantra for proponents of voluntary standards has been that "the market will decide."

These results are close to the expectations of the Joe Public family – which recently connected its new DVD player using the RF output: traditional TV and widescreen first, please. And the other results are very much like those of the broadcasters looking to use their "free" spectrum for other purposes with IP, text and data repeatedly being mentioned as possible business models.

These results may be why the BBC recently announced that its spectrum would be used in the future for five services that would be aimed at smaller, more focused demographics than the current two general-interest services. That decision effectively kills HDTV for the long-term future, and if you ask European broadcasters where HDTV fits into their world they will, in general, respond that they don't see it as a service to be delivered with a terrestrial system.

Another interesting fact to emanate from this 21-country viewpoint is the importance that is attached to portable and mobile operation. "Portable," in the European sense, is a receiver that has its own simple antenna, as compared to a fixed antenna (always considered to be at a height of 33 feet) with a feeder down to the receiver. All the respondents considered it a high or medium priority to have successful portable reception, while fewer, about 80 percent, took the same position on both fixed antenna reception and mobile reception (defined as a simple antenna at 5 feet above the ground). If those numbers are reflected back to the United States as to what consumers here really want in their viewing habits, then 8-VSB transmission would seem to be in real trouble.

Whenever the great jumps in broadcasting have taken place, the standards were imposed by the FCC, before it lost its nerve in the face of lawsuits. NTSC, 525-line monochrome and FM were all fixed standards not to be played with by the individual provider. Voluntary standards like AM stereo were a disaster – as IBOC may be unless someone gets tough – and Table 3 (sorry, Table A3) is such a voluntary mishmash that we have become a laughingstock to countries – and large groups of countries at that – who can sit down in civilized discussions to come up with standards that fit all, but with tiny variables (like 2k or 8k FFT size), to suit each territory. The mantra for proponents of voluntary standards has been that "the market will decide." Wake up, guys. It has. The question is whether we're honest enough to listen. BE

Paul McGoldrick is an industry consultant based on the West Coast.

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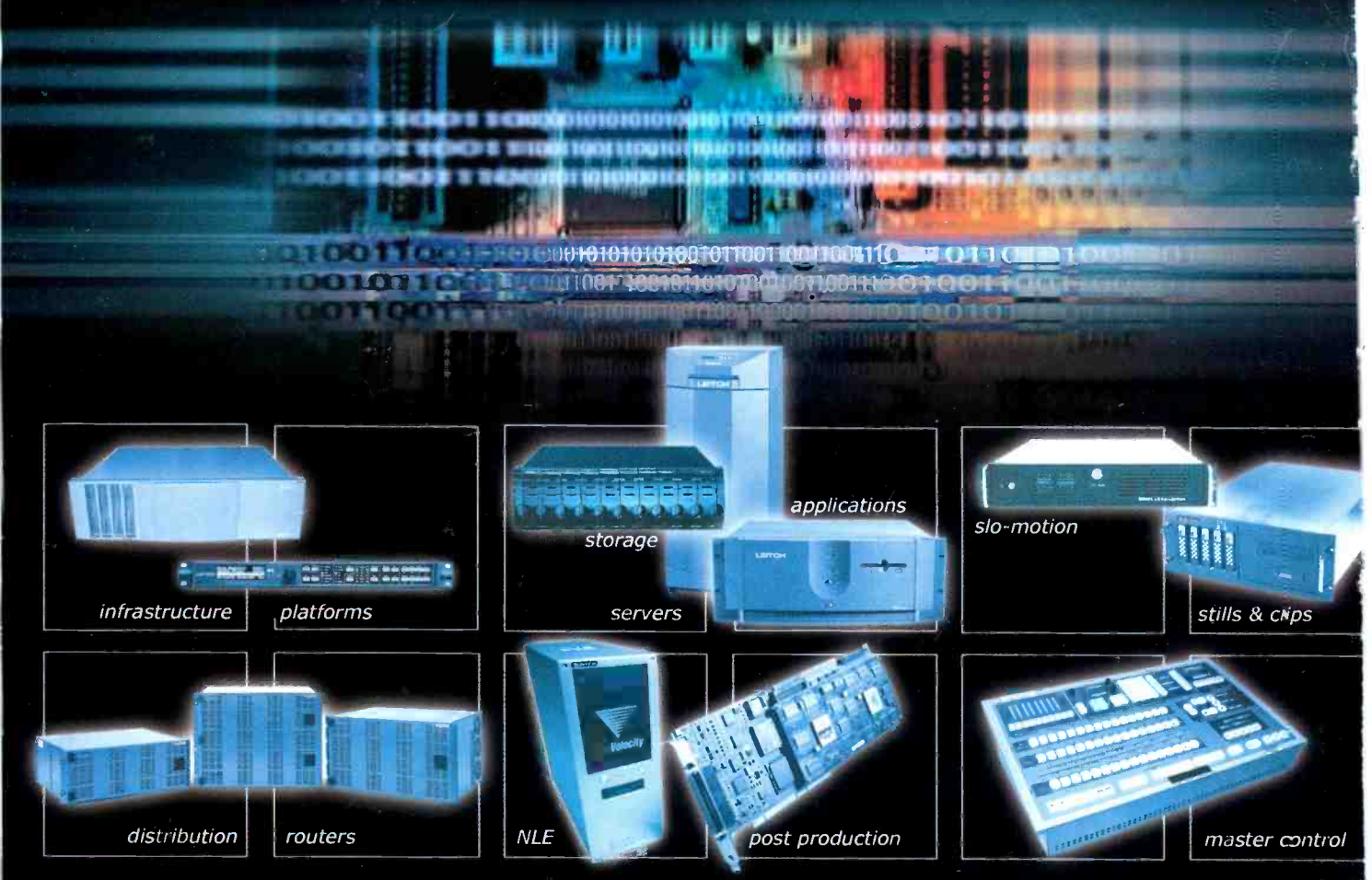

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