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COMPUTERS & NETWORKS

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P2HD when reliability counts.

Panasonic ideas for life

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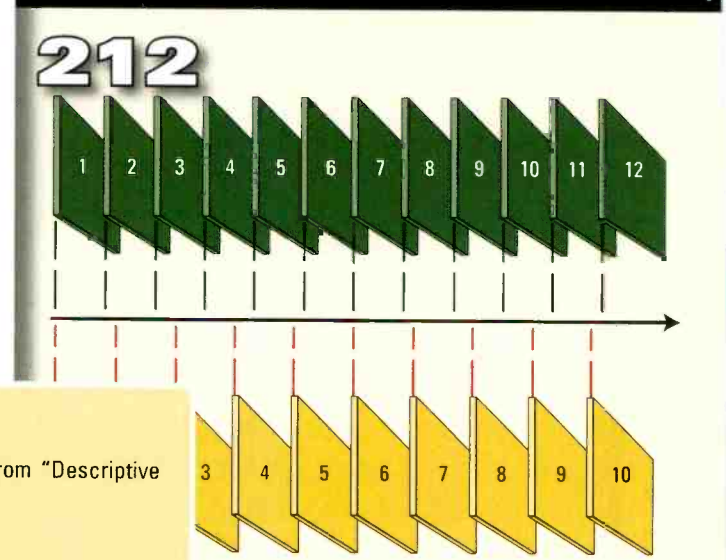
ON THE COVER:
WBZ overhauled its control room with a Sony MVS-8000 SD/HD switcher, Samsung flat-panel LCD monitors and an Avitech multiviewer.

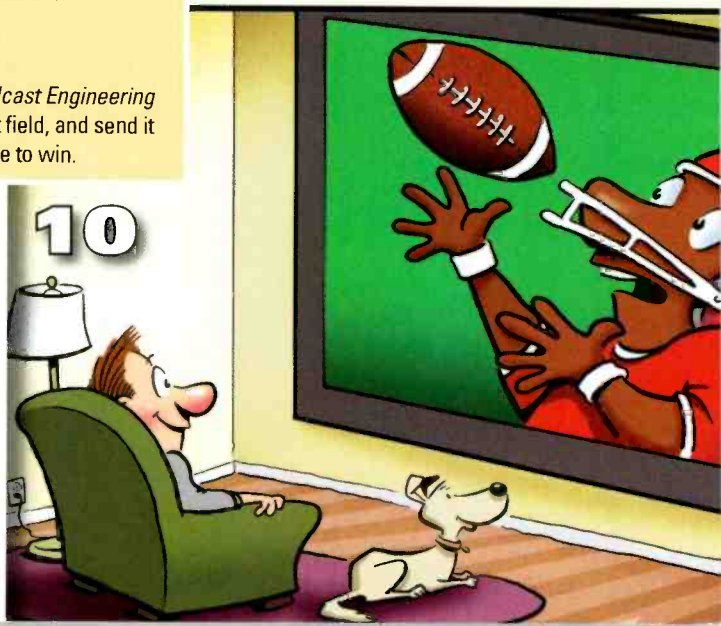


THIS MONTH'S FREEZEFRAME QUESTION

Connect the term to the correct definition. The question was taken from "Descriptive Metadata for Television," by Mike Cox, Linda Tadic and Ellen Mulder.

Term	Definition
Essence	The combination of material and metadata
Material	Information representing a single visual, audio or other sensory experience
Metadata	Any combination of picture, sound or data essences
Content	Data that conveys information about material

Readers submitting winning entries will be entered into a drawing for *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-March" in the subject field, and send it to: editor@penton.com. Correct answers received by May 1, 2007, are eligible to win.

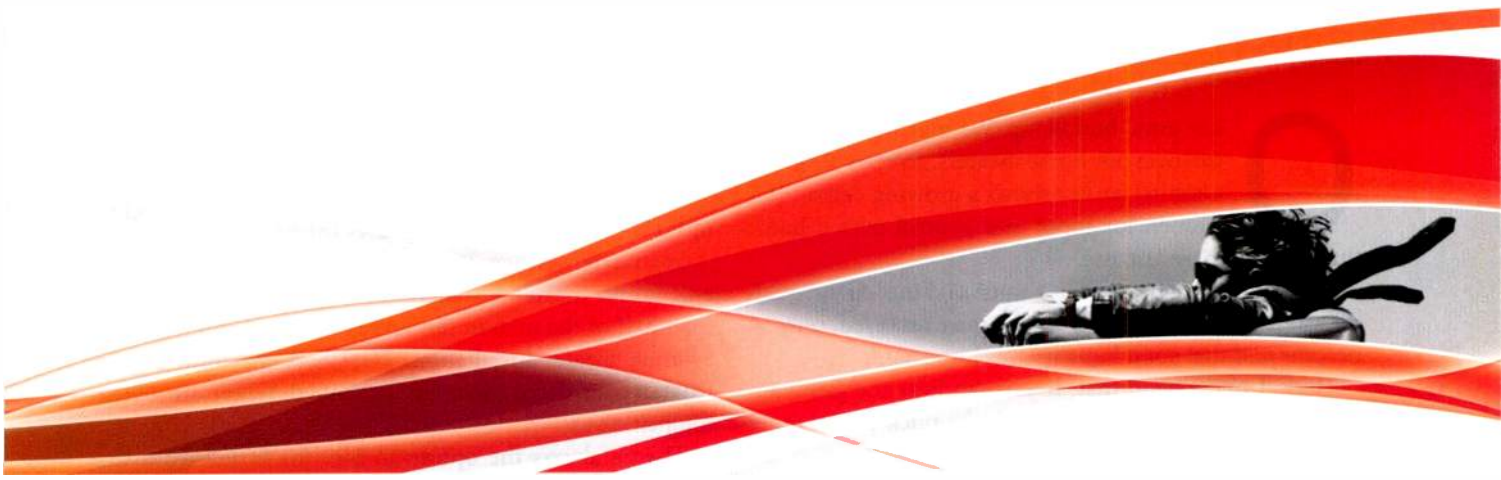


NOVEMBER'S FREEZEFRAME ANSWER

Q. Name the profiles and the key applications of the H.264 codec.

A. Baseline: Low-cost video conferencing
Main: Broadcast and storage applications
Extended: Streaming video

NOVEMBER WINNER:
Jim Barnes



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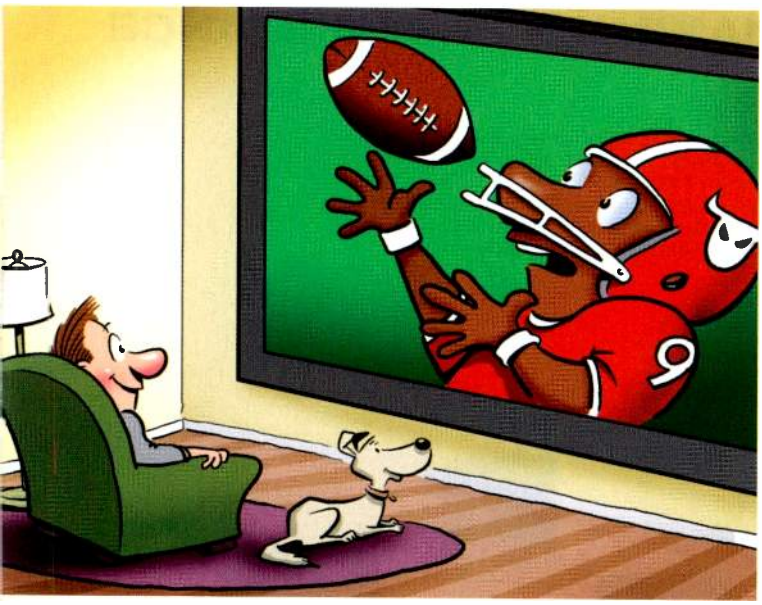
Bigger is always better

Okay guys, huddle up. We may be losing control over our home theaters. A recent Best Buy Omnitel survey shows a growing demand by women for input and control over a home theater's purchase and use.

For instance, 74 percent of women said that sound quality was important to them. Of the men surveyed, only 54 percent said that sound quality was important.

Heck, I understand that. If you can hear the game announcers, the hits against the ball, the puck or the other guy, the sound's good enough.



Also, beer commercials aren't symphonies. Typically they involve cars, dogs, horses, or other guys. That kind of audio doesn't require a speaker system capable of breaking a wine glass at 50ft.

Women are also more concerned when it comes to actually using the equipment. I attribute this to button overload.

It takes seven remotes to fully control my home theater. I have one remote for the cable STB, one for the TV, one for the home theater sound system, one for the DVD player, one for the lighting automation and one each for the CD and VCR players. The computer's PVR is hooked in too, but that remote is kept in the den.

Guys know that — for the most part — remote controls are just tools. You use the basic buttons and forget the rest. We don't let a remote control intimidate us just because it has 75 buttons. All but the on-off button are probably options — extras — and who uses them?

Fortunately, when it comes to high-definition video and home theater installation, we guys still rule. More than half of the men in the survey said they could handle a home theater installation. Less than one-third of the women considered themselves qualified. Where are all the toolbelt divas?

There's always the option to hire the install from the box store. Although, few of us "in the industry" would admit to choosing such an option. We'd feel like a wimp. Anyone who can't strip, twist and shove a No. 12 stranded wire into a speaker tab or spin on an F connector without help probably isn't reading this magazine.

While the survey revealed one technical parameter where women and men do agree — picture quality — that could be misleading. You see, women view a TV set in terms of its packaging and environment. Men just look at the picture. We'd happily take a 75in HD plasma framed in a wooden crate, at the right price.

Not so long ago, the most important aspect of a TV was not the video image at all, but the looks of the set's wooden cabinet. TV sets were considered first a piece of furniture and then a television. And, it was the woman who decided whether any particular TV set was acceptable with her home's décor — too bad for the guy who really wanted a 21in color set when the woman in his life had her heart set on a traditionally-styled, oak cabinet with spindle overlays and wood grained top. Men, doesn't that just make you want to cry?

When it comes to home theater, there's only one rule: Bigger is always better. Bring on the sports, hand me a beverage, and turn up the sound. It's game time! BE

Brad Dick

EDITORIAL DIRECTOR

Send comments to: editor@penton.com

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Baby boomers

Editor:

I can relate to your January 2007 editorial about how baby boomers can't find suitable programming and advertising. I am 60 years old and watch less than two hours of television a week.

I think the main reason for the lack of programming is because content producers want the largest possible audience. To accomplish this, they dumb down content so that the young audience is not lost in a barrage of polysyllabic words.

On several occasions, I have transcribed parts of scripts and run them through a word processor that indicates the age-level of the writing. The script written by the "oldest" person (14 to 16 years old) came from an A&E program. The "youngest" person (9 to 11 years old) to write a script was from "Designing Women." What 60-year-old wants to watch something like that unless he is suffering from amentia?

I attribute the lack of suitable advertising to the fact that successful TV advertising targets impulsive buyers. Let's face it: When people are my age, they aren't impulsive.

Jim Beck
EAGLE

An HDTV gripe

Editor:

My NTSC TV recently failed. Rather than opt for a DTV ($800) or an HDTV ($1500), I bought the cheapest 20in NTSC TV ($109) I could find. I did this for several reasons:

- I hate the aspect ratio of HDTV.
- Why spend a kilobuck to watch "I Love Lucy" reruns? No programming worth watching justifies the cost of an HDTV.
- Viewers can't receive HDTV broadcasts off the air — even with a pre-amped monster TV antenna. But they can receive eight acceptable quality analog stations.
- Cost. I'll be darned if I'm going to pay cable or satellite rates to see what I used to watch for free.

The December 2006 *Broadcast Engineering* article "Urban renewal" points out how HDTV has been bungled. Everybody's interests but the consumers' are being protected.

Nobody asked me what I wanted for an improved television. It was a political decision made by broadcasters and movie companies. I hope it languishes and never catches on.

Brian
Henderson, NC

The Fairness Doctrine

Paul McGoldrick:

I have a few comments in response to your November 2006 column about the Fairness Doctrine.

First, the Fairness Doctrine did not promise equal time, only reasonable time for responsible parties.

Second, the doctrine was based on the relatively small number of views available in the broadcast world and the fact that, unlike a newspaper, one couldn't just start up a radio station with his or her views.

Third, the doctrine became somewhat of a joke because several operations would air one point of view and then look for a nimrod with opposing views, making the original viewpoint look better. Johnny Carson used to parody this on the "Tonight Show."

Today, with the number of news outlets, would you agree that there are many diverse viewpoints presented on just about every important topic? Add in the Internet and the ability to self-publish, and any "doctrine" seems foolish.

Len Watson
Scope+Focus

Test Your Knowledge!

See the Freezeframe question of the month on page 8 and enter to win a *Broadcast Engineering* T-shirt.

Send answers to editor@penton.com

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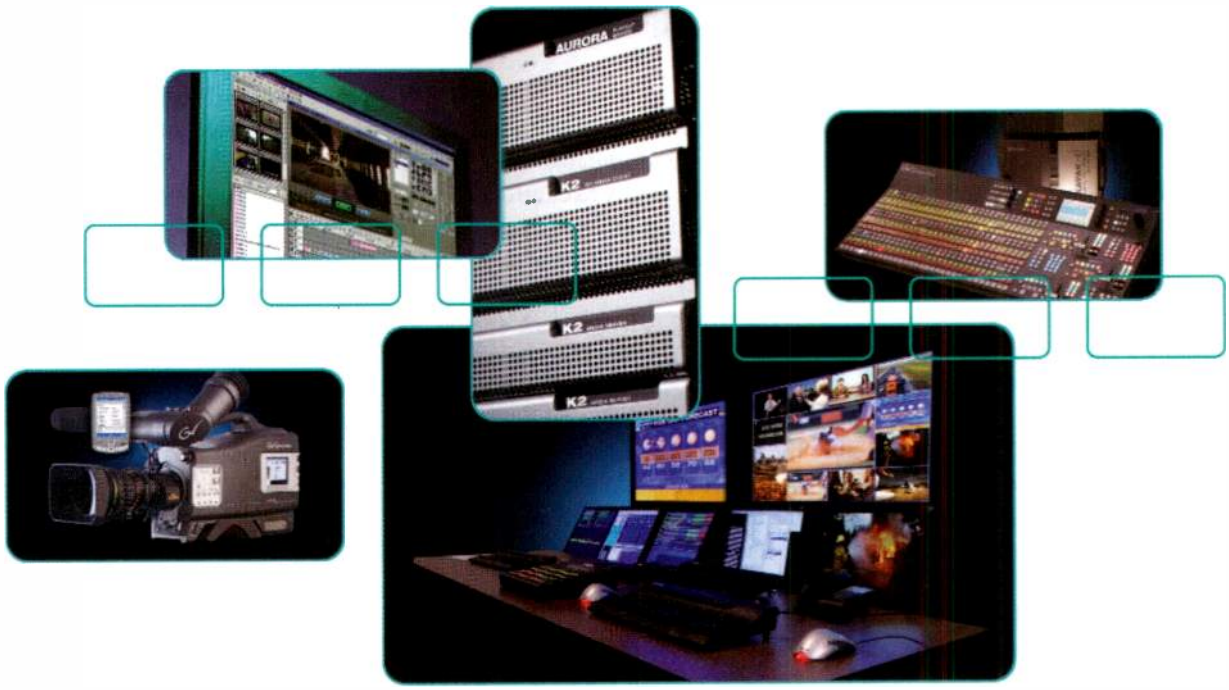

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Room for you?

Google and cable firms say the Internet can't scale up for Web TV.

BY CRAIG BIRKMAIER

In the television business, 2006 may well be remembered as the year of YouTube. Yet another in the long list of Internet phenomena, YouTube was founded in February 2005 and became *Time* magazine's Invention of the Year in 2006. Rounding out the year on a high note, YouTube was acquired by another Internet up-and-comer, Google, for $1.65 billion in October.

Along a similar thought line, *Time* magazine awarded its annual Person of the Year honors to — you — the masses who claimed the Internet as your own, putting the you in YouTube and the my in MySpace.

Time noted that the story of 2006 is one of community and collaboration on a scale never seen before: "It's about the cosmic compendium of knowledge Wikipedia and the million-channel people's network YouTube and the online metropolis MySpace. It's about the many wresting power from the few and helping one another for nothing and how that will not only change the world, but also change the way the world changes."

Controlling you

Unfortunately, some things seem to have the indomitable will to resist change. The ability to control the flow of information and entertainment in the United States appears to be one of them.

On Feb. 2, Viacom sent a letter to Google demanding that the company remove 100,000 video clips containing content from Viacom companies. By the end of the day, Google complied. These actions followed an attempt for the companies to reach terms on a redistribution agreement.

The following Wednesday, a story in Reuters set off a firestorm of controversy with a quote made by Google's head of TV technology Vincent Dureau during his speech to the Cable Europe Congress. "The Web infrastructure, and even Google's [infrastructure] doesn't scale. It's not going to offer the quality of service that consumers expect," he said.

The Reuters story went on to say that Google offered to work with cable operators to combine its technology for searching for video and TV footage and its tailored advertising with the cable networks' high-quality delivery of shows.

Seems like something is rotten in the state of Denmark, or more accurately, Amsterdam — the site of the Cable Europe Congress. Just when you thought the Internet may eventually become the bypass technology to resolve ever increasing subscriber fees for cable and DBS, one of the Internet's leaders seems to suggest that the Web infrastructure cannot scale to the task. (After all, despite the fact that you — the average Joe and Jane — created two of this year's Super Bowl commercials doesn't mean you are ready to redefine high-quality entertainment as watching a sitcom created by your neighbor's kids.) And, even worse, it seems that Google may be getting cozy with industries that now control more than 90 percent of all high-quality content creation and distribution.

Subsequent news reports suggest that the story was overblown. Several days later, a Google spokesperson responded, saying, "Some remarks from Vincent Dureau's well-received speech at the Cable Europe Congress were quoted out of context in news reports." The spokesperson claimed that Google's infrastructure scales are just fine, and there is no problem watching TV on the Web. You decide.

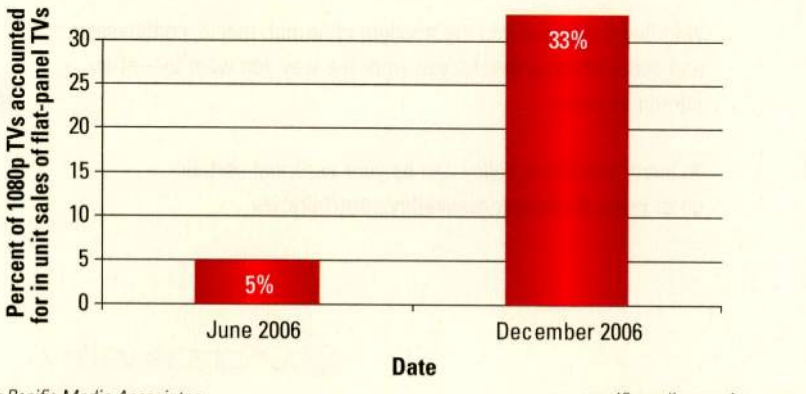
Super-scale me

The question of whether the Web can scale to deliver video is barely relevant. Experts have been claiming that one aspect or another of the

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

Flat-panel TV sales increasing

In December 2006, 33 percent of flat-panels sold were 1080p format



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Internet infrastructure, upon which the World Wide Web relies, cannot scale for more than a decade.

Somehow the infrastructure has scaled to meet each new challenge. The ability to watch low-quality streaming video via a broadband connection is now routine. We may not yet have HD-quality streaming; however, non-real-time HD downloads are not only feasible today, they are becoming commonplace.

The question of scalability as it relates to the delivery of IPTV is highly dependent on the kind of service that you envision. Any content delivered to any Web appliance on demand is the scenario that does not scale well.

Web links

- Google and cable firms warn of risks from Web TV
www.reuters.com/article/internetNews/idUSL076708720070207?src=020707_1729_FEATURES_technology&pageNumber=3
- "The IPTV buzz," *Broadcast Engineering*, September 2006
http://broadcastengineering.com/infrastructure/broadcasting_iptv_buzz/index.html

Cable systems have spent billions to provision their networks to offer VOD, complete with the ability to pause and rewind the content. The DBS systems cannot compete in this space due to bandwidth limitations. But they have been doing a pretty good business with near VOD, which provides access points every 15 or 30 minutes for popular movie titles. And Netflix has delivered more than 1 billion movies to consumers using — unbelievably— the U.S. mail. OK, so the bits are on a DVD, but you get the idea.

In September's column, I attempted to define the acronym IPTV. (See "Web links.") While many people use the term to describe the entire emerging landscape of television delivered via IP networks, others insist that IPTV refers only to the walled garden services now offered by the telcos competing against the well-entrenched cable and DBS systems.

There is a sound technical reason for this distinction. The ability to maintain the same level of image and service quality as cable and DBS is not easily achieved using traditional broadband services and the public Internet.

This is not an issue with non-real-time downloads. The hurdle is real-time streaming. However, the cable and telco networks are optimized for this application. The real-time streaming problem can be mitigated using IP multicast techniques. At the most simplistic level, rather than setting up individual sessions with each viewer, everyone tunes into the same stream of bits. This drastically reduces the bandwidth needed on the Internet backbones. The crunch then moves to the links between the local point of Internet access and the viewer.

Some of the telco IPTV systems use IP multicast techniques to deliver all of their streaming channels to your neighborhood. A router in the neighborhood that serves 25 to 50 homes then forwards the streams requested by each TV in each home. If more than one home is watching the same stream, it only needs to be routed once.

So it is not only possible to deliver your choice of several hundred channels to a TV; it is already being done. Scaling this up to support thousands of channels is certainly possible. The issue is investing in the necessary bandwidth in each segment of the network.

And this is the problem the Google representative was trying to address. Given the reality that the pipes into your home are controlled by a handful of companies that also want to sell you

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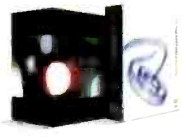

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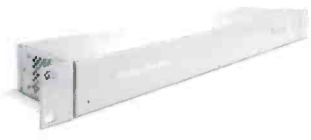

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The Drawn Together images are courtesy of Comedy Partners.

TV services, how realistic is it to believe that they will scale up their networks so you can bypass their TV services?

The network neutrality debate

Google is one of many companies lobbying for network neutrality. In case you are unfamiliar with this term, it boils down to this: The network makes its best effort to move everyone's IP packets without any preferential treatment.

This is how the Internet works today, basically. The one major caveat: Your Internet access level, or speed, is determined by what you need, can afford or can get. Dial-up is painfully slow. Broadband comes in many flavors with varying speeds for uploading and downloading IP packets. Internet routers typically negotiate a transfer rate between the server and your computer, based largely on the speed of your connection.

But what would happen if those routers started to negotiate the quality of your service based on what the server operator is willing to pay AT&T, for example, in addition to the basic Internet connection charges? What if AT&T went to Google and said, we need more money to deliver your bits? You can feel free to draw the conclusion that they would not charge more money to deliver bits from an AT&T IPTV system.

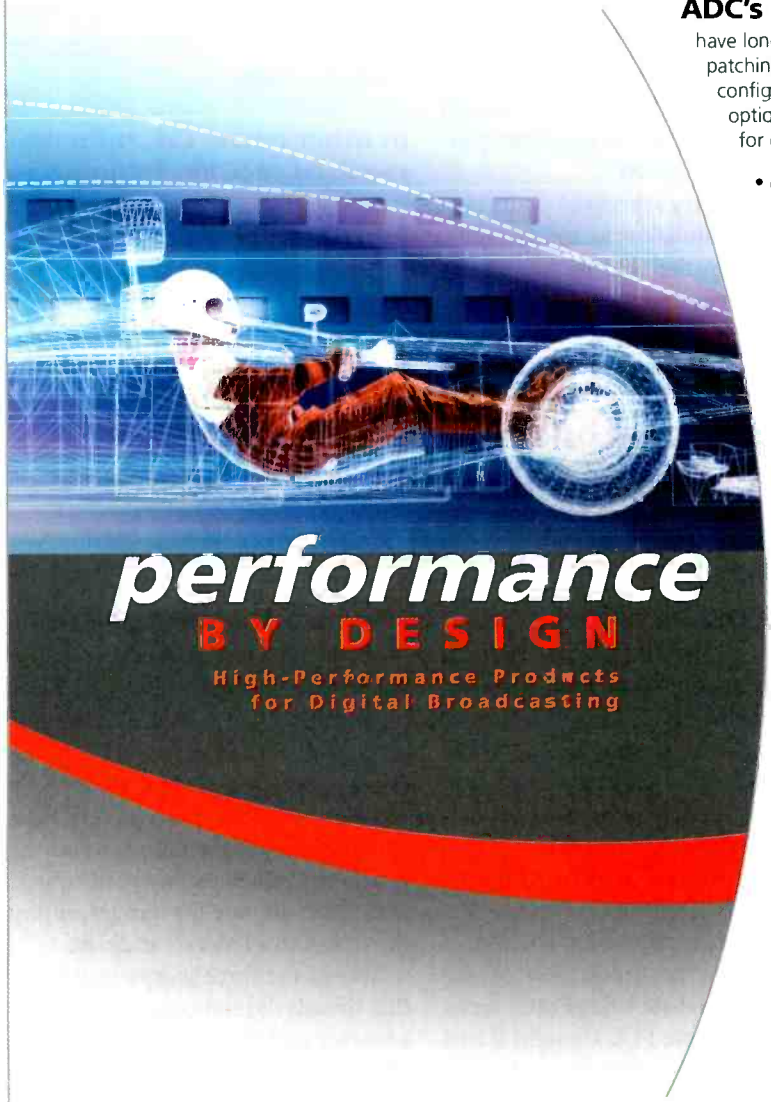
Or imagine what might happen if Google and AT&T decided to work together in the way that some reporters read into the comments of Google's Vincent Dureau. For a small premium per month, you can access YouTube with the same level of quality that you now expect from ESPN, HGTV or those pesky local broadcasters.

This may seem far-fetched, but here's my point: Powerful interests have their eyes on a very tasty pie — the global market for television entertainment. Some of these companies are doing everything in their power to protect their share of the pie. Some are trying to get a slice of the pie. And others are trying to get rich off of the crumbs the others leave behind.

If you are getting the impression that some companies are still hoping to build tollbooths on the information superhighway we call the Internet, you get it. BE

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

Send questions and comments to:
craig.birkmaier@penton.com



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TV white space

Current Senate bills push the FCC to focus on the issue.

BY HARRY C. MARTIN

Last year, the FCC released a rulemaking that included a timeline for the development of rules authorizing the unlicensed wireless use of unused TV spectrum. It was assumed that Congress would wait for the commission to review the issue. However, some legislators want to speed up the deployment process.

Senators John Kerry, D-MA, and John Sununu, R-NH, have introduced similar, yet separate, bills that would require the FCC to complete its rulemaking proceeding and issue a final order by Oct. 1, 2007, and permit unlicensed usage of the TV spectrum by Feb. 18, 2009, the date marking the end of the DTV transition.

The bills also would require the commission to establish technical requirements to protect incumbent primary TV licensees and require the commission to initially accept applications for the certification of unlicensed devices by Dec. 1, 2007. The bills would permit the commission to conduct field testing in a "limited number of markets," with the testing to be completed before the initiation of the equipment certification process, or by Dec. 1, 2007.

Senator Kerry's proposal would permit the commission to solicit public comment on the field testing results, but only if the comment period could be completed within 180 days of enactment, or by Oct. 1, 2007. Senator Sununu's version also leaves open the possibility that a portion of the spectrum could be licensed (instead of being dedicated to unlicensed devices), and, if so, would require that spectrum to be distributed via auction.

Neither bill has been voted out of the Senate Commerce Committee, and no hearings have been scheduled. However, the reintroduction of the white space debate brings up a series of issues that the FCC thought it had postponed by issuing the rulemaking. If one of the bills were to become law, the FCC would have to deal with several matters in the short term, including:

- conducting field tests in 180 days on equipment that has yet to be produced;
- determining what spectrum should be licensed and what should be unlicensed; and
- developing certification procedures for yet-to-be-produced products.

Also looming over the FCC is negotiating the overall threat of interference from unlicensed devices. The mixture ensures broadcasters and the FCC will be watching the pending legislation with interest during the coming months.

The reintroduction of the white space debate brings up a series of issues that the FCC thought it had postponed by issuing the rulemaking.

In other news: Court limits reach of McCain-Feingold

In December 2006, a three-judge federal court ruled that even though certain issue ads by an advocacy group mentioned a candidate for federal office by name, none of the ads violated the McCain-Feingold law. The law prohibits corporations and labor organizations from making electioneering communications during the 60 days before a general election or 30 days before a primary election. An electioneering communication is generally defined as any paid broadcast, cable or satellite programming that refers to a federal candidate.

Two of the three judges concluded that the ads did not constitute express advocacy and that a mere reference to a federal candidate does not transform a permissible issue ad into electioneering communication. The Supreme Court will review the case. If upheld, this ruling could open new advertising possibilities for issue advertisers during the weeks leading up to next year's primary and general elections. BE

Harry C. Martin is a past president of the Federal Communications Bar Association and a member of Fletcher, Heald and Hildreth PLC.

? Send questions and comments to: harry.martin@penton.com

Dateline

April 2 is the deadline for TV, Class A, LPTV and translator stations in Delaware and Pennsylvania to file their 2007 renewal applications. TV, Class A and LPTV stations that originate programs also must file EEO Program Reports (Form 396) along with their renewals.

TV stations in the following states must file biennial ownership reports by April 2: Delaware, Indiana, Kentucky, Pennsylvania and Tennessee.

Also by April 2, TV, Class A and LPTV stations originating programming must place annual EEO reports on their Web sites and/or in their public files. The public file requirement applies to full-power TV stations only.

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Codecs push the compression envelope

AVC, VC-1 and others offer max efficiency, for now.

BY ALDO CUGNINI

It seems as if we have just gotten used to MPEG-2 coding, and we are already facing a palette of new coding methods. Even the growing number of applications of MPEG-2 — terrestrial, cable and satellite broadcast, DVD, DV tape, and others — could not satiate the technical community's appetite for more efficient codecs. Primarily driven by the growing demands for more (and cheaper) bandwidth, this proliferation is an inevitable consequence of technological progress. This month, we'll look at the most prominent of these codecs.

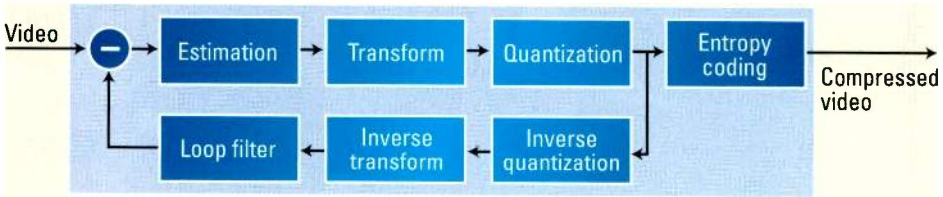

Figure 1. The AVC codec on the whole looks like an MPEG-2 codec.

MPEG-4

With the efficiency of MPEG-2 codecs reaching its asymptote, researchers look to new methods to increase compression efficiency. MPEG-4's impetus was a technique — object coding — that promised large improvements in efficiency. (An MPEG-3 codec was also under development but was abandoned when its primary focus — HDTV coding — was incorporated within MPEG-2.) Essentially, the MPEG-4 object-coding scheme works by identifying and isolating objects in the image, coding them separately and then coding instructions on how those objects translate through an image.

As with the preceding standards, MPEG-4 uses an organization of profiles and levels in order to provide varying capabilities for different applications. The desire to maximize this functionality resulted in 21 defined profiles for the standard known as MPEG-4 Part 2, MPEG-4 Visual or just MPEG-4. This complexity could be one reason for the limited deployment of MPEG-4 equipment in the professional market. However, much of MPEG-4 was developed for low-bit-rate applications; one growing market is 3G mobile-phone video.

MPEG-4/AVC/H.264

The MPEG committee, together with the ITU, proceeded to develop an essentially different codec for wider use. The resulting codec carries the dual designations MPEG-4 Part 10: Advanced Video Coding (AVC) and ITU H.264. For this reason, the codec is usually referred to as MPEG-4/H.264, MPEG-4/AVC or simply AVC. (AVC is backwards compatible with MPEG-2, so all AVC decoders can decode MPEG-2.) The AVC codec made it possible to double coding efficiency, which allows high-quality SDTV pictures to be transmitted with as little as 1Mb/s to 2Mb/s and HDTV with as little as 9Mb/s to 10Mb/s.

The AVC codec shares basic elements with MPEG-2. (See Figure 1.) In order to increase compression efficiency, AVC introduced several

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Projected increase for universal HD DVD player sales

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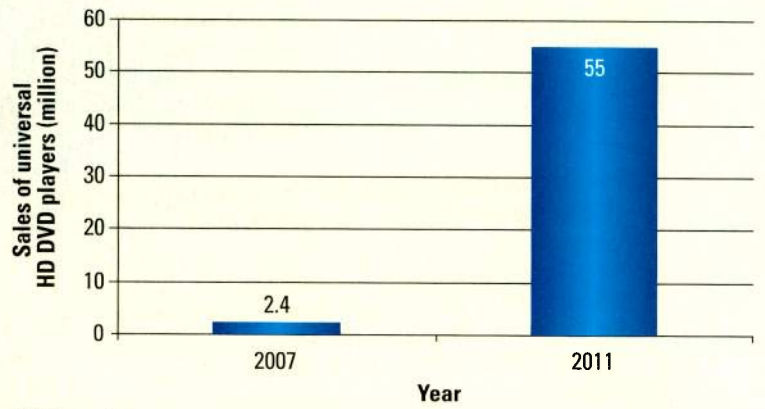

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MPEG-4/AVC FEATURES	MPEG-4 BENEFITS
Intra estimation	Improves I-frame compression
4 x 4 transform blocks, lossless macroblock coding, macroblock adaptive field-frame mode	Greater versatility when individually coding blocks
4 x 4 motion compensation blocks	Better selection of block matches
Quarter-pel motion vector precision	Lower residual (interframe) energy
Multiple-reference P- and B-frames	Ability to track rapid, repetitive scene changes
Deblocking filters	Reduces visibility of block-edge artifacts
Various entropy coding algorithms	Clever ways of reducing length of code words
Fidelity Range Extension	Supports more color spaces and bit depths

Table 1. New MPEG-4/AVC features and benefits

new elements to MPEG coding, as shown in Table 1.

For example, intra estimation is a new technique that predicts the current intra-coded block by extrapolating the neighboring pixels along a horizontal or vertical row. The difference between the predicted block and the actual block is then coded and forms a residual. (See Figure 2.)

In contrast with the 8 x 8 discrete cosine transform (DCT) used in MPEG-2, AVC uses a two-step 4 x 4 DCT-like operation to code 16 x 16 blocks. Loss-less block coding is an adaptive process that allows the encoder to bypass estimation and simply code actual values (i.e., luminance) of the pixels when it requires more bits to encode the blocks, the method results in high-quality video when the instantaneous bit rate is available. The Fidelity Range Extension (FREXt) amendment to AVC adds a toolset that supports additional color spaces, video formats and bit depths, and stereo-view video.

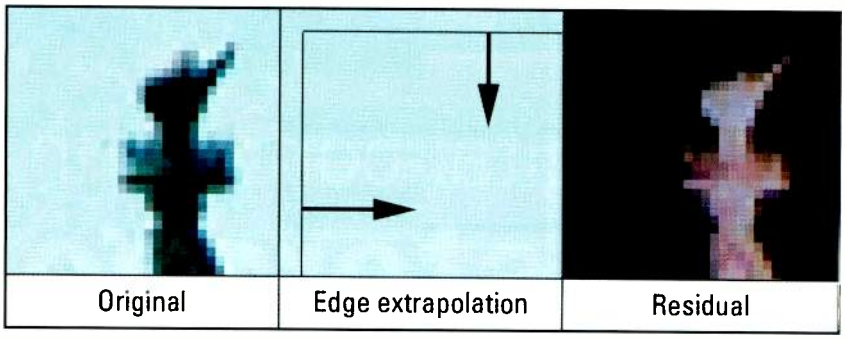


Figure 2. Intra estimation is used to form efficient prediction blocks.

AVC also adds multiple-reference P- and B-frames, which allow the encoder to readily process certain scene changes, such as repetitive music video or stroboscopic changes where two scenes are rapidly alternated. A new deblocking loop filter is also available that lessens the visibility of edges of blocks. In addition, while MPEG-2 uses 8 x 8 floating-point coefficients in the DCT, AVC uses smaller blocks with integer coefficients. This reduces blocking and ringing artifacts caused by rounding errors.

VC-1

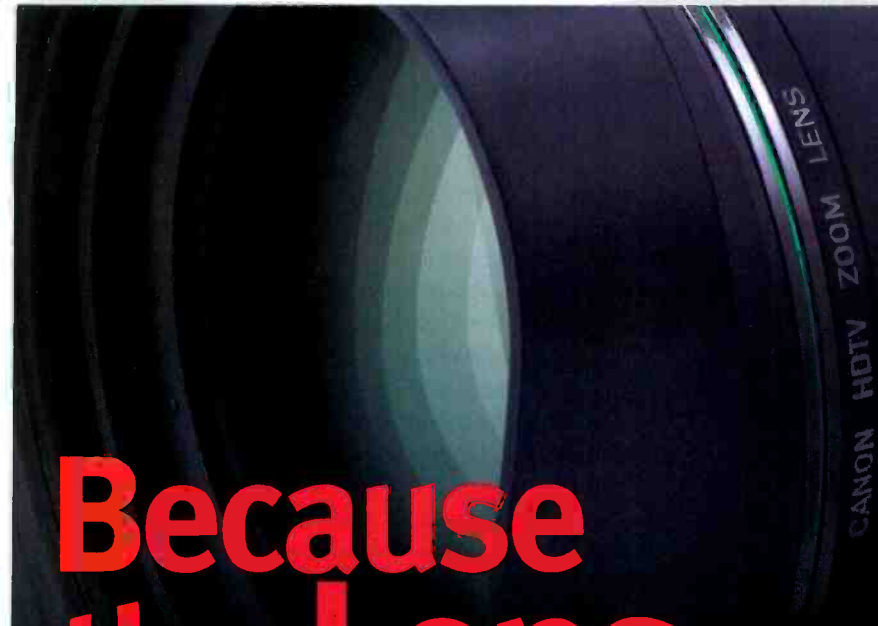
At the same time the work on AVC was proceeding, another similar codec was under development at Microsoft. First called Windows Media 9 (WM9), the codec was standardized as SMPTE 421M and is commonly known as VC-1. While an increase in compression efficiency was one motivation for developing this codec, an equally important factor was lower computational complexity. This means that software implementations of codecs (on PCs, for example) could provide high-quality compression at reasonable processor speeds.

Although generally attributed to Microsoft, the patent pool for VC-1 encompasses more than a dozen companies. The HD DVD and Blu-ray Disc specifications require support for AVC, VC-1 and MPEG-2 in all compliant decoders; however, content developers are free to encode using any of these. The primary unique features of VC-1 are listed in Table 2.

Although similar to AVC, VC-1 incorporates notable differences. VC-1 employs an adaptive block-size transform and a modified deblocking filter that can aid in compressing areas of high detail. VC-1 also has a special mode for handling interlaced video, where data from both fields is used to

VC-1 FEATURES	VC-1 BENEFITS
Adaptive block-size transform, modified deblocking filter	Improves detail
Less complex VLC	Speeds computation
Interlaced prediction modes	Aids motion vector search
Fading compensation	Improves scene fades

Table 2. New VC-1 features and benefits



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predict motion compensation in interpolated frames. Another unique feature of VC-1 is fading compensation, which improves compression efficiency for sequences with fades and other large-scale illumination changes.

AVC and VC-1 to displace MPEG-2?

Already, AVC is the preferred technology for ADSL-delivered IPTV. The low bandwidth requirements and server-side content provision make it well suited to the emerging business of video delivery over telco lines. Cable and satellite — entrenched with MPEG-2 technology — are slowly switching their plants to AVC. However, they have an additional burden: a vast deployment of legacy set-top boxes. Terrestrial DTV using ATSC is also firmly footed on MPEG-2 technology. At press time, however, the ATSC was considering the possibility of specifying AVC and VC-1 as amendments to the E-VSB specification of the ATSC Digital Television Standard.

The others

Other codecs that have garnered attention are DivX, RealVideo and Xvid. While all of these were developed primarily for Internet applications, one has picked up support in some DVD players. DivX (no relation to the similarly named, ill-fated pay-per-view DVD service) is a codec that has emerged as a viable technology for Internet video distribution and sharing. Based on the MPEG-4 Visual Advanced Simple Profile (ASP), the proprietary codec uses a non-standard set of profiles, with licensing managed through a certification process.

Little is known about the coding method employed in the proprietary RealVideo codec developed by RealNetworks. Perhaps this is why its application so far has been limited to Web-based video. Although company literature implies that the codec does not use block-based compression, other sources claim it does not use fractal or wavelet compression, either.

Xvid is an open-source codec that uses a specific set of MPEG-4 ASP features. It essentially competes with DivX for similar applications.

By keeping abreast of the latest developments in codec technology, we not only understand the best tools with which we can deliver content, but also we get an appreciation of what the competition is up to — and how quickly one must adapt. BE

Aldo Cugnini is a consultant in the digital television industry.

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Video transport

When errors occur, do you know how to fix them?

BY BRAD GILMER

As we move from a video-centric to a data-centric world, we are faced with a change in the underlying video transport technology. In the past, video was transported over dedicated video networks. Now it is moved across data networks. With some exceptions, packetized networks are designed to drop packets according to predefined rules if the network becomes congested. These lost packets can affect the video delivered at the end of the transport chain.

There are several ways to solve this problem. Two of the most common solutions are to prevent packet loss using QoS technology or to reconstruct the missing packets at the receiving end using FEC.

QoS technology

If you are building your own network, or if you are working with a service provider that controls its own network, it may be possible to use QoS technology to prevent video packets from being dropped. This will not protect you from a backhoe fade, but it will protect you from network congestion.

The first step is establishing a policy regarding the relative priority of different types of traffic on the network. For example, video might be the top priority, voice second and data third.

Once the policy is in place, the next step is to tightly control access to the network. All users must access the network at specific points. When data is first put on to the network, it is given a tag that marks the packet with a specific priority, per the policy established above.

As the traffic transits the network, it encounters QoS-aware routers. If congestion occurs, the routers will start dropping packets according to the QoS policy. If the network is properly engineered, ingress control is maintained and the policy is sound, QoS will ensure that video packets are never dropped at the routers.

In some scenarios, QoS may be difficult to implement. For example, you may not be able to control the entire network, or you may not be able to guarantee that someone won't access the network at an unauthorized point. For whatever reason, you may decide that it is best to rebuild lost packets at the receiving end rather than or in addition to enforcing a QoS policy on your network. This is a job for FEC.

Nothing is free; FEC requires extra bandwidth. If you are transporting a 10Mb video stream, FEC will require an additional 1Mb to 2Mb of bandwidth.

Forward Error Correction

FEC works by sending extra packets of information along with the original payload. The FEC packets can be used at the receive end to recreate data packets that have been lost during transport. The amount of data that can be recovered is directly related to the amount of FEC data sent. In fact, the logical extreme of FEC is to retransmit every data packet as a FEC packet.

This brings up a critical point about FEC. Nothing is free; FEC requires extra bandwidth. Typical numbers for FEC overhead on average packetized networks range from 10 percent to 20 percent, although overhead could be as high as 1000 percent in some specialized military applications. In other words, if you are transporting a 10Mb video stream, FEC will require an additional 1Mb to 2Mb of bandwidth.

Another factor to consider is latency — the time, in addition to transmission delay, for data to become available for a subsequent process. FEC introduces latency by requiring all data packets to be loaded into the FEC matrix whether they are errored or not. This introduces a fixed latency in the receive unit that adds to the total transit time for video sent across a protected connection.

Finally, there is one other thing to know about FEC. The technology discussed in this article is designed to reconstruct lost packets — not errored packets. One characteristic of the lower layer of the IP stack is that if it detects an errored packet, it will discard it rather than pass it up to the next layer. This means that no application layer FEC scheme will ever see an errored packet.

To sum up, QoS can eliminate certain types of errors created in a network if you have control over that network. FEC can fix errors introduced on a network, but it has a cost in terms of overhead and latency.

SMPTE 2022

The Pro-MPEG Forum began initial work on a FEC scheme for video transport. That work, added to by the Video Services Forum, was introduced to SMPTE. This proposed standard is known as SMPTE 2022, and it describes both a FEC scheme and a way to transport constant bit rate video over IP networks.

Figure 1 on page 30 shows how SMPTE 2022 FEC is constructed. At

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the sender, data is organized into columns and rows. The data blocks in the figure are populated from left to right and top to bottom. Once a matrix is filled, an exclusive or (XOR) function is executed on all of the data in one column. The FEC packet is the resulting value for that column. The same function is performed on subsequent columns. The calculated FEC packets are then interleaved with data packets and sent to the receiver.

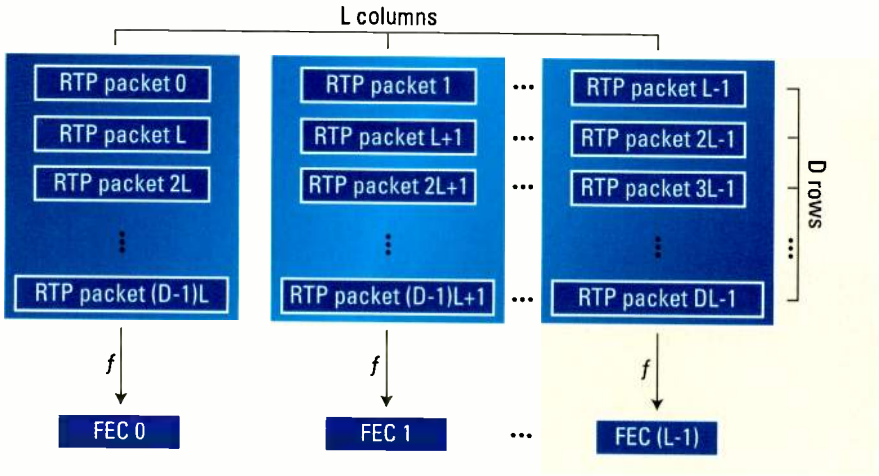

Figure 1. A depiction of how SMPTE 2022 1-D, column-only FEC is calculated

At the receiver, all packets are sent through the FEC mechanism. As packets are received, the matrix is filled. Next, a FEC calculation is made for any missing packets, and the reconstructed data is inserted into the matrix. (This is the source of the latency mentioned above.) Finally, the data is delivered to the video application.

The FEC described above is reasonably lightweight in terms of overhead and latency, but there are cases where certain errors cannot be corrected. (See Figure 2.) In this example, packets 14 and 26 — two packets in the same column — are lost. Column-only FEC cannot rebuild the missing packets. SMPTE 2022 allows for the addition of row FEC to provide increased protection against errors. This is known as 2-D FEC because FEC values are calculated for both columns and rows.

The DVB is developing a proposed standard that uses SMPTE 2022 1-D FEC, but then optionally augments this with fountain code FEC, which was developed by Digital Fountain. In cases where network losses are high, this approach is more efficient than 2-D FEC.

In addition, fountain codes have lower latency because repair packets for a particular block are sent immediately following the data. (See Figure 3.) This is accomplished by speeding up the overall data transmission rate so that the data block and repair packets are all sent in the same amount of time it would take to send the original data block without repair packets.

Thinking data-centric

As we move to a world where IT-based technology is employed to transport content, we are challenged to learn about QoS, FEC and other data-centric applications. If you are interested in learning more about these topics, attend sessions at NAB, IBC and other trade shows. Many vendors have prepared excellent tutorials on these subjects for broadcasters. BE

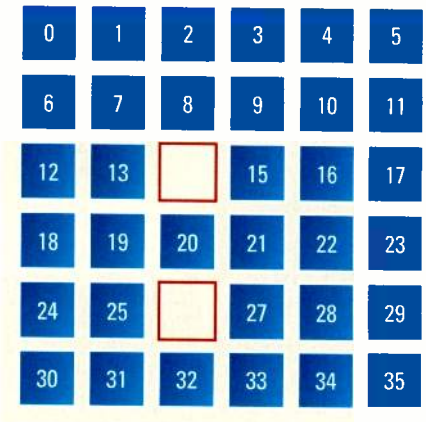

Figure 2. An example of a loss pattern that column-only FEC cannot repair. Figure courtesy Mary-Luc Champel, Thomson.

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

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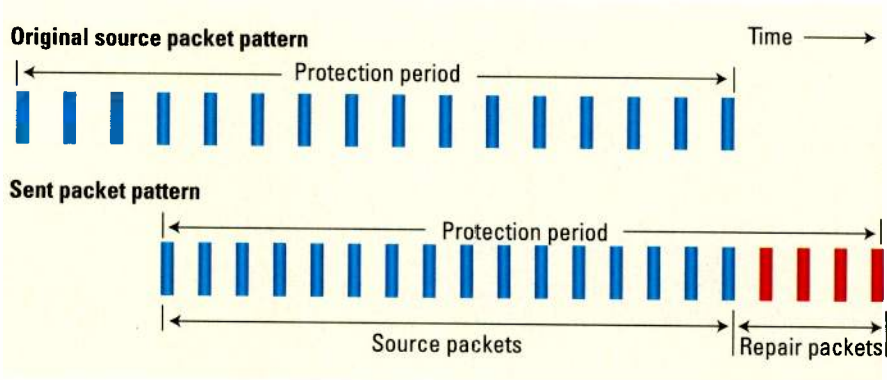

Figure 3. Latency for fountain code is exactly one block. Sending rate is constant and is increased so that source packets and repair packets are sent in the same interval as the original source packets. Figure courtesy Mark Watson, Digital Fountain.

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BY BOB HODAS

With more consumers looking for the HD experience, an increasing number of subwoofers are finding their way into home systems. Home systems primarily use the subs for LFE in a 5.1 configuration, but some send stereo information to the subs via bass management for SD broadcasts.

For proper translation, studios increasingly need to hear more deep bass when working on small, close or midfield monitors whose low-end response is limited. And because one cannot always place the monitors in the best position or properly trap in for a smooth low-end response, subwoofers are the answer.

For example, in many small rooms, the proper placement for mains may be bad for imaging or simply not achievable due to room dimensions or lack of symmetry. A subwoofer, on the other hand, can be placed just where it needs to go because you don't have to worry about imaging. This allows you to place the main monitors without a great deal of concern for their low end.

Sub wish list

I believe that a proper subwoofer should reproduce frequencies at least down to 20Hz. I'm a big fan of the self-powered varieties. There should be some sort of phase adjustment with the minimum being a simple 180-degree flip and the best being a continuously variable pot providing up to 270 degrees of shift. This can come in handy when there is limited space in which to move the subwoofer in relation to the mains.

There should be a continuously variable selection for low-pass/high-pass frequencies — a true crossover — not just a low pass for the sub. The amplifier needs to provide enough power so that distortion is low.

For those who want a sub to do the double duty of extension as well as LFE, then there should be a separate LFE input. I love to see some parametric equalizer bands on the sub as well, though this is still a rare commodity.

Sub integration

Set the crossover point so that you take some of the strain off the main system woofers. This point may vary a bit from system to system, depending on speaker location, main system low-end response and room size. For example, by sending everything below 80Hz to the subwoofer, you can relieve the main system from

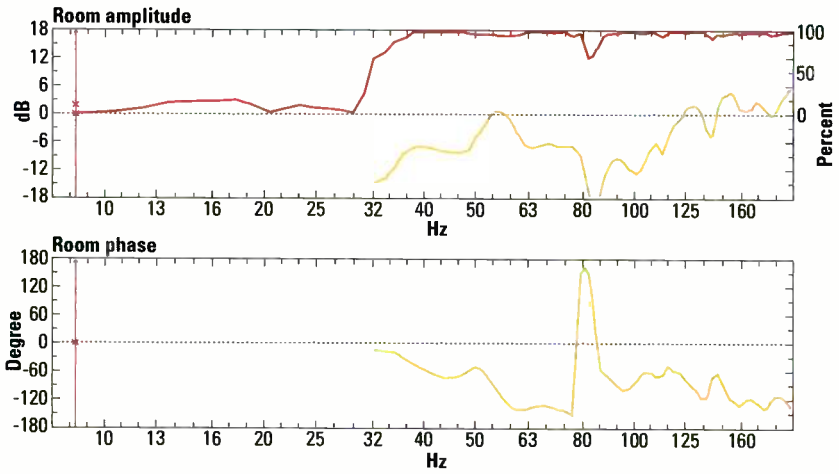

Figure 1. The top chart shows frequency and the bottom chart shows phase for a soffit-mounted speaker without a subwoofer.

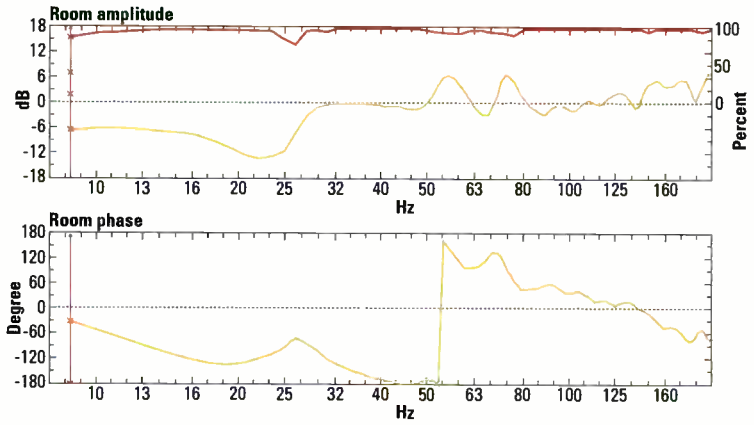

Figure 2. The frequency and phase of a soffit-mounted speaker with a subwoofer

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having to produce the deep bass. This often translates into better midbass definition.

These low frequencies are also the ones that can destroy your main's woofers, so the subwoofer addition should create less overall distortion and clipping, and more system power. Also, by selecting a lower subwoofer crossover point, you leave the bass and kick drum punch at 100Hz to 125Hz in the main system so that it feels connected to the upper and midbass.

In an ideal audiophile world, it would be great to simply add the subwoofer into your system. This would mean no crossover on the mains and adding in the sub with only a low-pass filter on it. I've had such luck on a few occasions when the winds blew in a favorable direction. Most of the time, though, whether because of room ergonomics or design oversight, the mains do not end up in an ideal position for good bass reproduction, and the sub needs to crossover at a higher frequency in order to make up for the poor mains response.

Figures 1 and 2 on page 32 show before and after shots of a speaker in a typical control room. All charts are 48th octave resolution shot with a Meyer SIM 3. In the upper chart of both figures, the red trace along the top shows coherence, while the yellow middle trace is frequency response. The bottom chart shows phase.

The speaker in Figure 1 shows a severe roll-off at about 53Hz and a large hole at 87Hz. Note the bass extension that is capable with the addition of a subwoofer. In Figure 2's phase chart, the subwoofer polarity and position is properly oriented. Phase integration of the subwoofer is important at the crossover.

However, simply adding a subwoofer to a system won't always correct bass issues. Figures 3 and 4 show a room with a mains and sub system. Note that even with the subwoofer, the same room response anomalies exist at 32Hz, 90Hz and 135Hz. You should be able to correct some of these problems if there is enough space to move the subwoofer to an ideal location in the room.

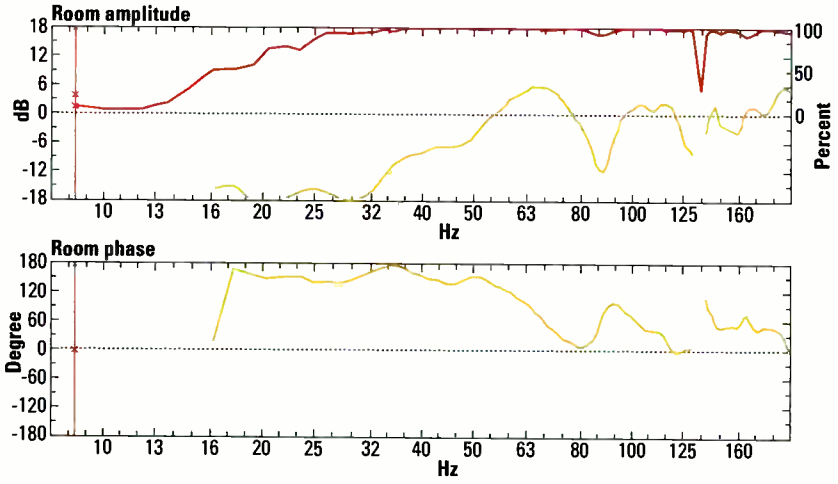

Figure 3. The frequency and phase of a soffit-mounted speaker without a subwoofer

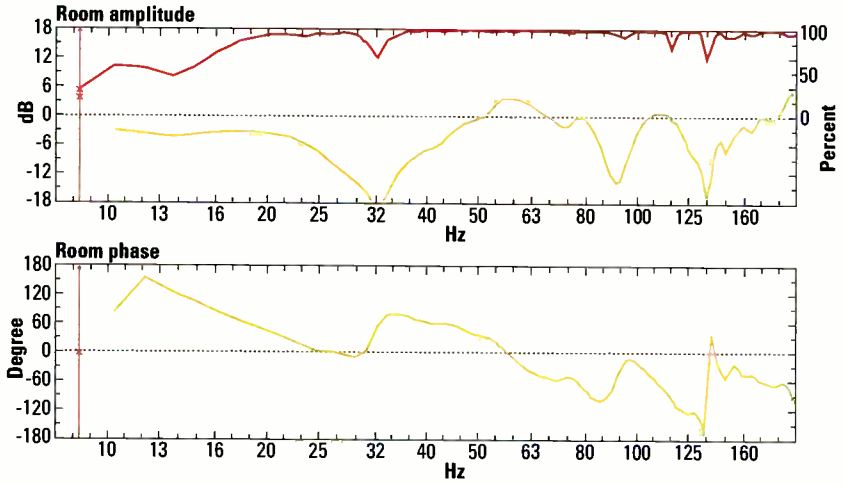

Figure 4. The frequency and phase of the soffit-mounted speaker with a subwoofer. Note: The same holes that exist in response in Figure 3, also exist in Figure 4.

Sub in stereo

I am a firm believer in stereo subwoofers. It is a common misconception that we cannot hear bass directionality. People often say that bass is omnidirectional and subwoofer room position is not important.

I believe this misconception developed because of the way bass is treated when cutting lacquer masters for records. Frequencies below 200Hz are combined to mono in case there are any low frequency phase problems. Out-of-phase bass would make the lathe cutting head jump off the lacquer. So for many years, we never had a chance to hear stereo bass.

In this digital age, this is no longer a problem. You can experiment by placing your subwoofer off to one side and see if you can hear its location. I'm sure you will.

If you only use a mono subwoofer, then you should consider placing the subwoofer symmetrically between your speakers. Placing the subwoofer off to one side may cause a nonsymmetrical response in the left and right speakers at the crossover point. This is based on the uneven distance of the left and right speakers

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to the subwoofer and could require equalization to balance the system. Note that the lower the crossover point, the less symmetrical the placement needs to be because of the long wavelengths at the crossover point.

Sub frequencies

For studios with close field monitors, the subwoofer application is often not about power but about the ability to hear the low frequencies that may make recordings sound unclear and muddy. (See Figures 5 and 6.) Some of the more popular, expensive, small monitors extend down to 40Hz, which is sufficient in many cases. But there are quite a few systems on the market with limited bass response. Film and television composers need to hear the low bass frequencies in order to get their music right as well.

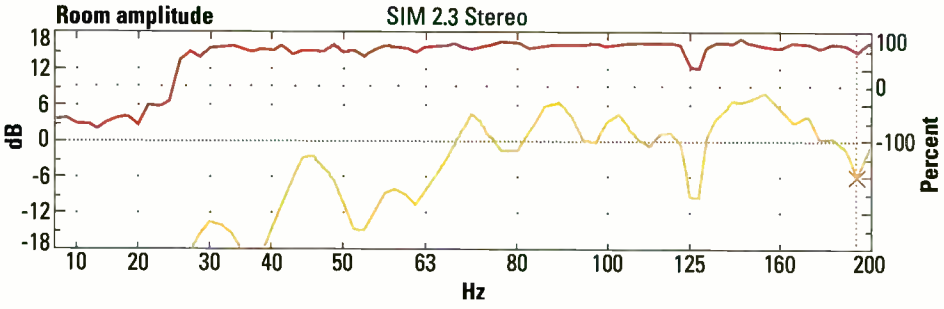

Figure 5. A close field speaker on stands without a subwoofer

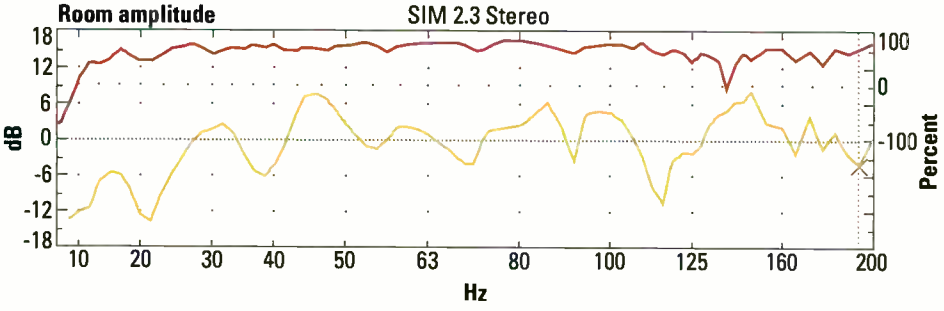

Figure 6. The close field speaker on stands with a subwoofer

Sub suggestions

Placement of any subwoofer system requires a good analyzer and someone who knows how to use it. Subwoofer manufacturers suggest using tones, but the results are crude. I have yet to see a room with subs properly set up without analysis.

I personally use a Meyer SIM 3, which allows me to see a 48th octave resolution linear display of both phase and frequency in real time. This gives me fast, accurate results.

You want to achieve a linear phase response at the crossover point in order to get the best frequency response. An analyzer that displays phase is a must for this process.

The process can be time consuming and requires trying placement in multiple locations and phase switch adjustments. Moving a subwoofer just 6in to 1ft can make a significant difference. If there is a rule of thumb, I haven't found it yet. BE

Bob Hodas is an acoustic consultant and owner of Bob Hodas Acoustic Analysis. He tunes studios around the world, from Sony in Tokyo to Abbey Road in London and all parts in between.

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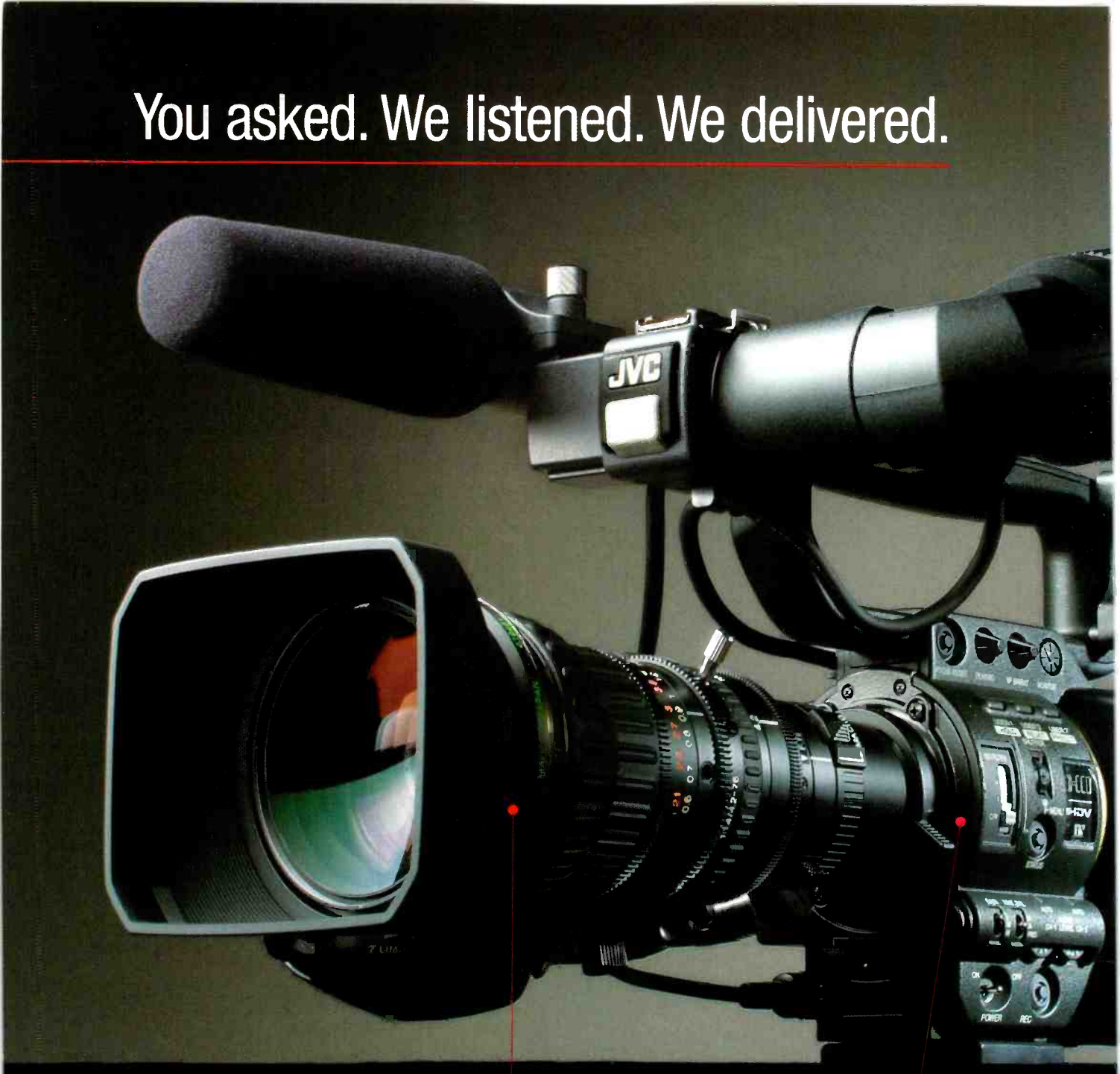

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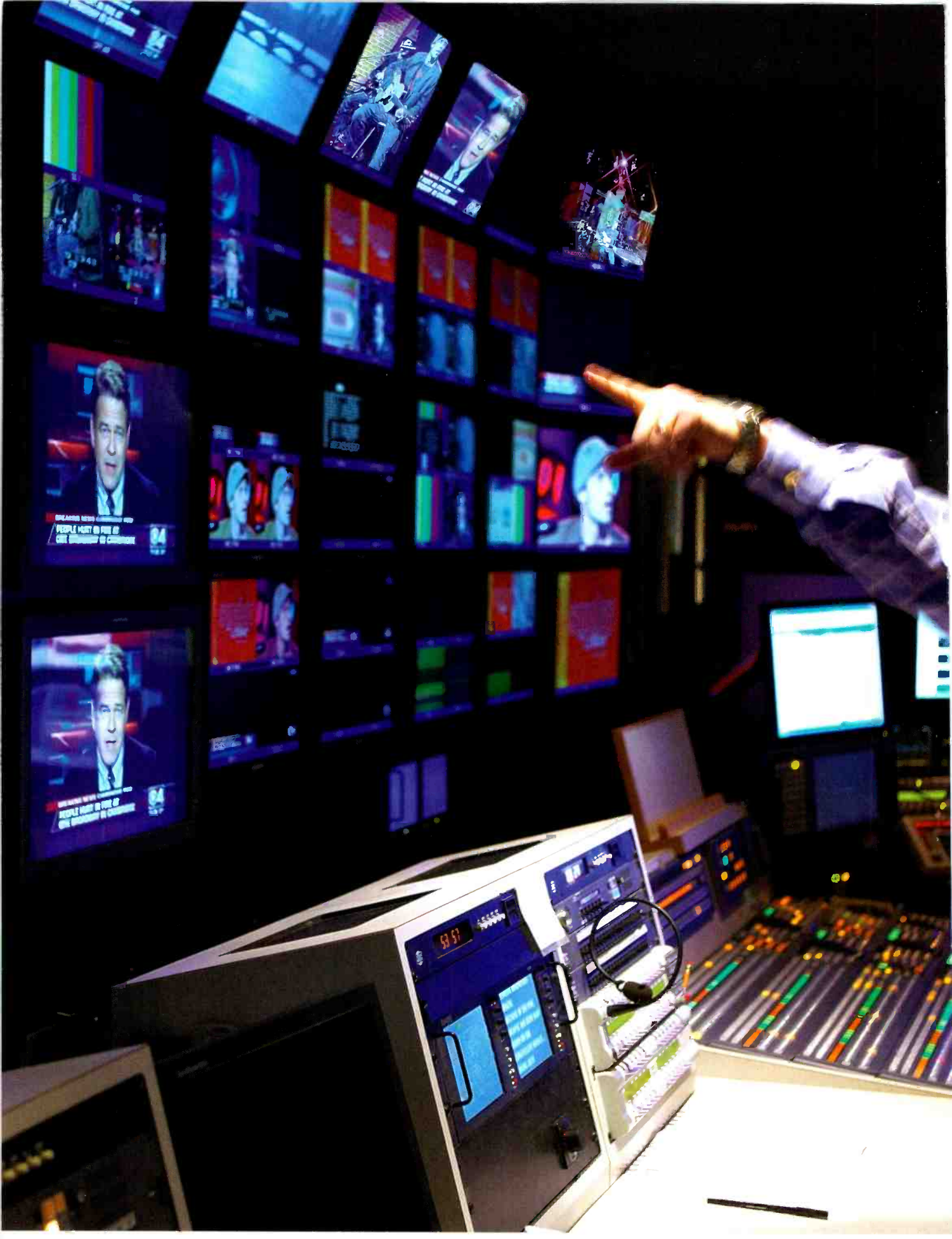
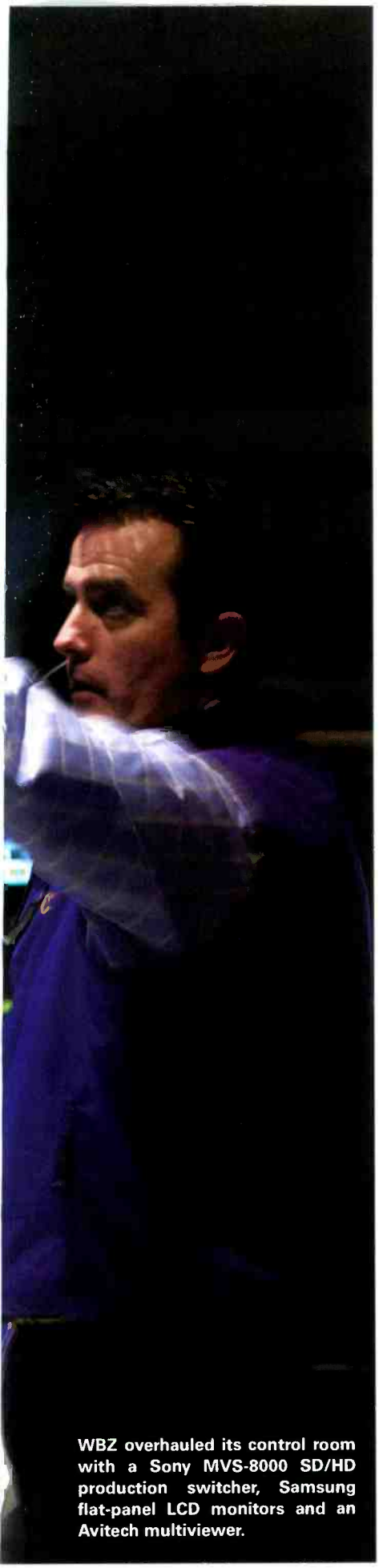




WBZ overhauled its control room with a Sony MVS-8000 SD/HD production switcher, Samsung flat-panel LCD monitors and an Avitech multiviewer.

TRIPLE PLAY

WBZ, WSBK and WLWC move to a tapeless workflow.

BY KEN KERSCHBAUMER

The Boston Red Sox aren't the only ones in Beantown offering up a triple play. Master control at WBZ-TV, Boston's CBS owned-and-operated station, also operates WSBK-TV in Boston and WLWC-TV in New Bedford, MA. In January, WBZ moved to a tapeless workflow, giving staffers the ability to get content on-air with greater speed and efficiency.

From the field to the station

Soon WBZ hopes to go tapeless in the field with Sony XDCAM HD units that will operate in SD mode. For the time being, material is shot on Panasonic DVCPRO portable cameras. Footage is then brought into the station on tape, or via satellite or microwave, and ingested into an Avid AirSpeed ingest system. From there, content is transferred into a 64TB Avid Unity ISIS shared storage solution, which is capable of storing 2200 hours of fully protected video content.

Within 20 seconds of ingest, the content is available for use by all producers, reporters and editors working on the station's nine Avid NewsCutter Adrenaline editing systems, five Media Composer editing suites and 10 iNEWS Instinct journalist editing systems. Forty Avid Interplay Assist systems allow reporters and members of the production staff to log and mark shots for projects that will be edited on the other systems.

Any video asset can be pushed from the shared storage to the ingest system for immediate playback to air, even while the file is transferring. Transfers are faster-than-real-time as files are pushed across a dedicated gigabit network. Video content is also repurposed to support the WBZ and WSBK Web sites.

Telestream FlipFactory exchanges content seamlessly between the shared storage and other formats such as Discreet-, Mac- and Omneon-based graphic systems. Five Media Composer Adrenaline systems flip promotions for the three stations seamlessly into the Omneon Spectrum servers for on-air playback.

Building a more efficient newsroom

According to Jack Barry, WBZ's director of broadcast operations and engineering, the implementation of the new nonlinear workflow is an ongoing process that began in September 2006, when the station first expanded its use of the Adrenaline systems into the newsroom. Previously, these systems were used only for promotional and long-form editing projects.

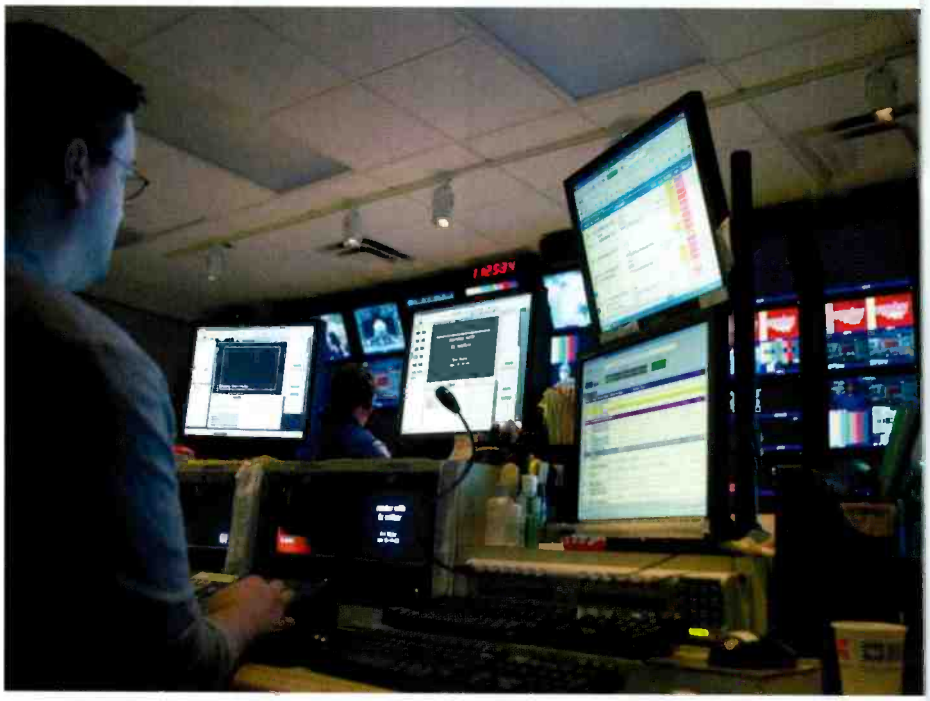
The planning for a tapeless news workflow system began three years ago. Internally, the station segmented its LAN structure to add fiber and GigE interconnects for an iNEWS system. The station's bureaus in Worcester, MA, and New Hampshire are connected via fiber and telco.

Both bureau locations now use NewsCutter editing systems. The move was prompted by potential workflow improvements and reduced risks of tape-based editing and on-air playback.

Now, with all editorial content

stored on a centralized server, producers, reporters and editors can access all media assets at any time. Graphics created on Adobe After Effects and Photoshop can also reside on the server, without the need to run a CD or tape with a graphic or animation from one suite to another. Currently, editors retrieve graphics from an Apple Xserve server.

The end result is a quicker, more efficient pace of work where many people across various departments can access material at the same time, without having to wait for another person or a tape. This is an invaluable feature that allows, for example, reporters and producers to write and view a story, while the promotions department builds teasers for the newscast at the same time. With the need to generate news content for WBZ and WSBK simultaneously, as well as promotional spots for WLWC,



Programming is played to air with automation-assisted playback using iNEWS ControlAir.

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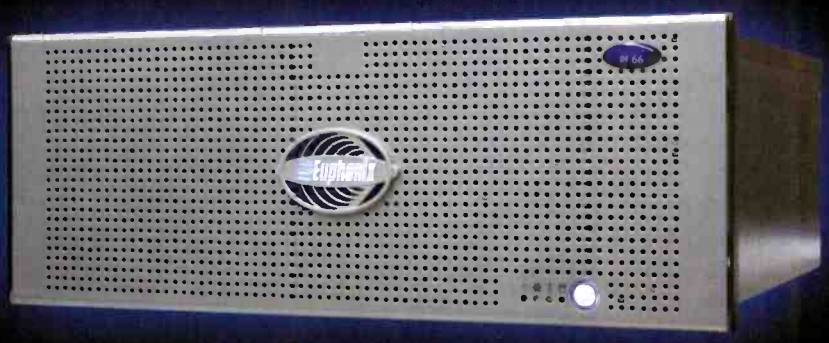

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flexibility and easy access to footage across the enterprise is important.

In addition, stories can be easily updated. Video included in a package for the 5 p.m. newscast is quickly swapped out and replaced with unused shots to freshen the story for a later newscast.

Managing workflow, managing change

With so many users and so many video, graphic, animation and Web-based files, Interplay provides a single management layer across the Unity ISIS system and all applications in the newsroom. The system supports more than 100 file types, both media and non-media, SD and HD, allowing the station to move multiresolution video, Microsoft Office documents, After Effects and Photoshop layered files, MPEGs, TIFFs, spreadsheets and other content. For end users, that

Within seconds of ingest, footage is available to editors, producers and reporters working on the station's networked editing systems.

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means a single application can be seen as a control point.

An iNEWS Instinct journalist editing system is fully integrated with the Interplay engine. The system was designed to allow journalists and other nontechnical newsroom staff to contribute to the production process. Reporters and producers can easily select video and link it to portions of a script as they write, bridging the gap between text and video and between the newsroom and production workflows. The newsroom staff creates rough cuts at their desktops, lessening the amount of time needed for editors to finish the story at their workstations.

Both new staffers and newsroom veterans are adjusting to working without videotapes and to using the new tools to continue producing high-quality daily newscasts. Each employee is given a slice of server space. It takes time to adopt a new mindset, as employees had to learn, for example, that a mirrored backup server means there is no need to dual-record incoming feeds.

The nonlinear production system has ended the days of inserting and ejecting videotapes in multiple VTRs. Once content is aired, the file is then moved over to a StorageTek robotic data tape archive system managed by redundant SGL FlashNet and Interplay archive servers.

But, videotape is not in the past at WBZ — yet. At least for the foreseeable future, Sony Betacam decks and DVCPRO decks will be available in the edit suites for accessing older material that isn't archived in the StorageTek system.

While it may be impossible to archive the hundreds of thousands of hours of videotaped material already on premise, the goal is to move as

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much future content as possible to a tapeless production and archive system. All on-air news material is archived on a daily basis, making it easily available for the future.

WBZ's IT manager, Greg Raso, was heavily involved in the tapeless transition, providing expertise for integrating the broadcast equipment into the IT infrastructure and also enforcing corporate IT policies. Raso ensured that the network topology of the tapeless production solution was able to sustain the necessary bandwidth to all users while maintaining a secure and fault-tolerant environment.

The next step: Full-scale HD news acquisition

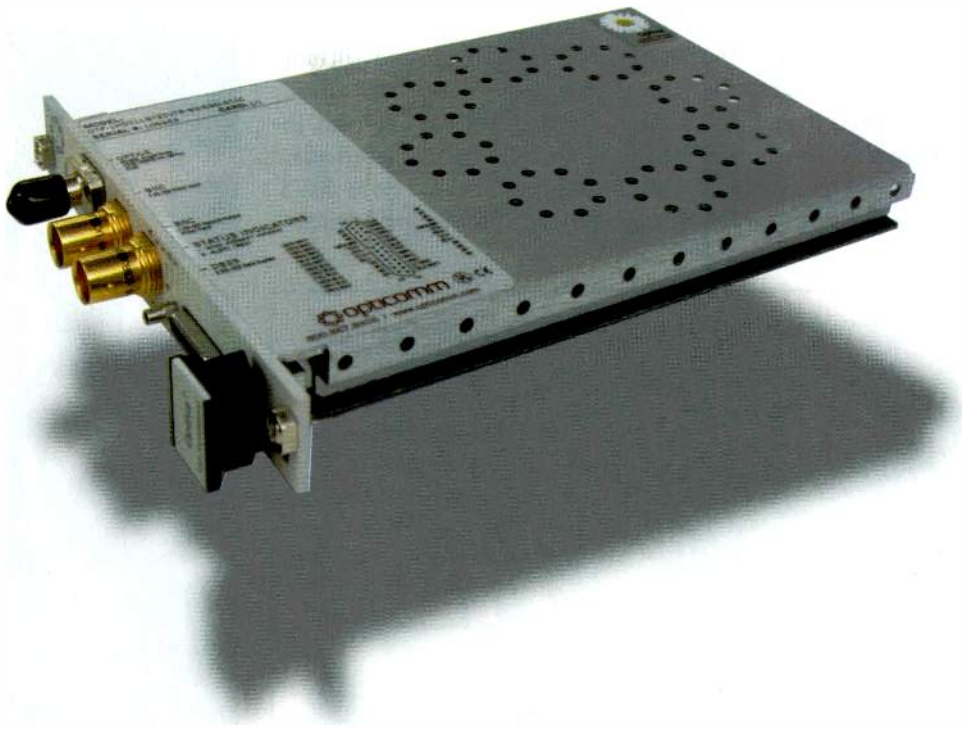
The evolution toward a tapeless newsroom will continue in 2007 when WBZ moves to an HD tapeless acquisition. Sony XDCAM Blu-ray

Design team

WBZ
- Jack Barry, director of broadcast operations and engineering
- Manny Ferreira, engineering crew chief
- Greg Raso, IT manager
- Robert Yankowitz, RF systems manager

Technology at work

- Adobe
  - After Effects graphics software
  - Photoshop graphics software
- Apple Xserve server
- Avid
  - AirSpeed ingest system
  - iNEWS Instinct editing system, ControlAir and Command
  - Interplay Assist archive
  - Media Composer editing suites
  - NewsCutter Adrenaline NLE
  - Unity ISIS storage
- Avitech multiviewer
- Omneon Spectrum media servers
- Panasonic DVCPRO cameras
- Samsung flat-panel LCD monitors
- SGL FlashNet archive
- StorageTek robotic data tape archive system
- Sony
  - HDC-910 HD cameras
  - MVS-8000 production switcher
  - XDCAM Blu-ray camera systems
- Telestream FlipFactory automation



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disc-based camera systems will be put in place as part of a corporate move to transition the stations over to the XDCAM system. Within a year of the move, the station expects to embrace HD throughout the news production process. Avid's DNxHD codec allows the Adrenaline systems to transition to HD with a simple addition of a DNxcel board.

The eventual move to HD will build on the steps the station has already taken. In late 2005, WBZ, with the help of Beck Associates, overhauled its control room with a Sony MVS-8000 SD/HD production switcher,

Footage coming into the station is ingested into an Avid AirSpeed ingest server and is then recorded into the Unity ISIS workgroup.

Samsung flat-panel LCD monitors and an Avitech multiviewer. The station also added five Sony HDC-910 HD cameras.

The impact of the transition to HD is small, however, when compared with the move to an all-digital nonlinear workflow. The successful switchover, in terms of impact on the news production efficiency and the way staffers go about creating multiple newscasts as well as promotional spots for three stations daily, has meant a remarkable transformation for WBZ and its sister stations.

More importantly, it has transformed the way viewers consume the news, as they receive more timely and informative reports that can make the difference in a morning commute or emergency situation. BE

Ken Kerschbaumer is an industry consultant for the professional video and broadcast technology industries.

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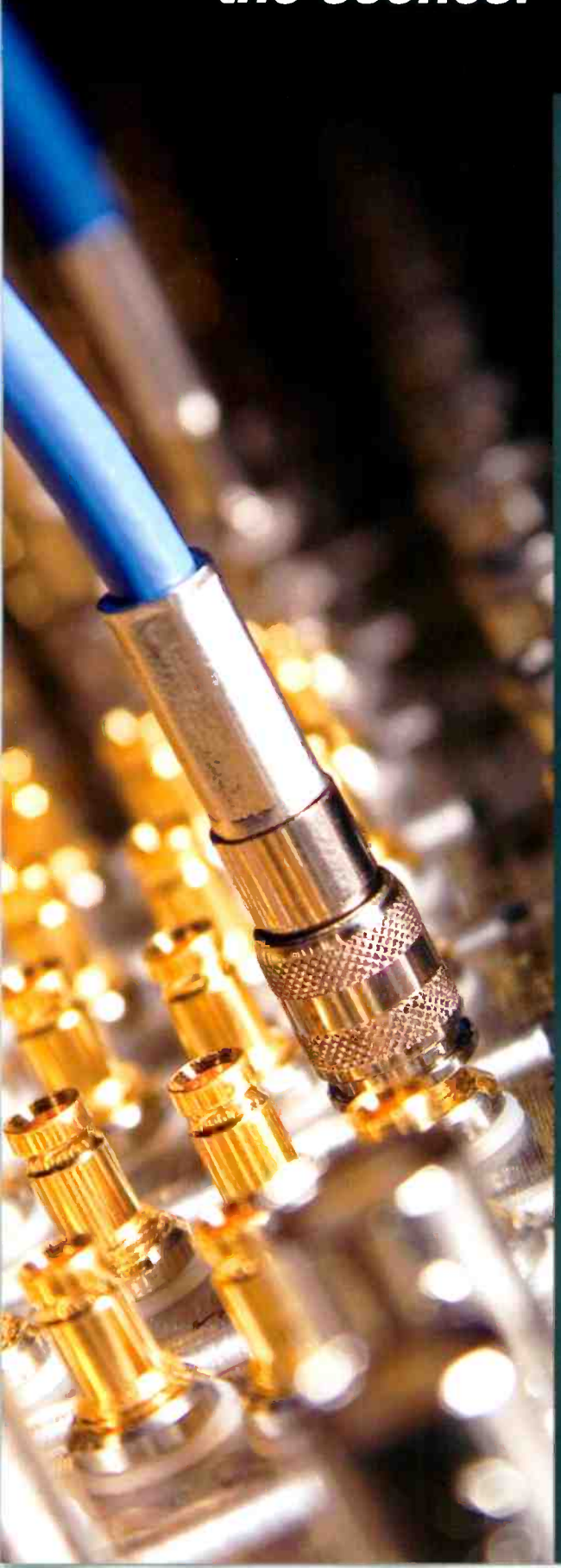

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- ***FIRST*** *large-scale digital video router small enough for mobile trucks, 2005*
- ***FIRST*** *integrated multi-channel master control switcher and multiformat router, 2003*
- ***FIRST*** *large-scale HD-SDI router (US patent awarded),1998*
- ***FIRST*** *bi-directional machine control router with dynamic port management (US patent awarded),1996*
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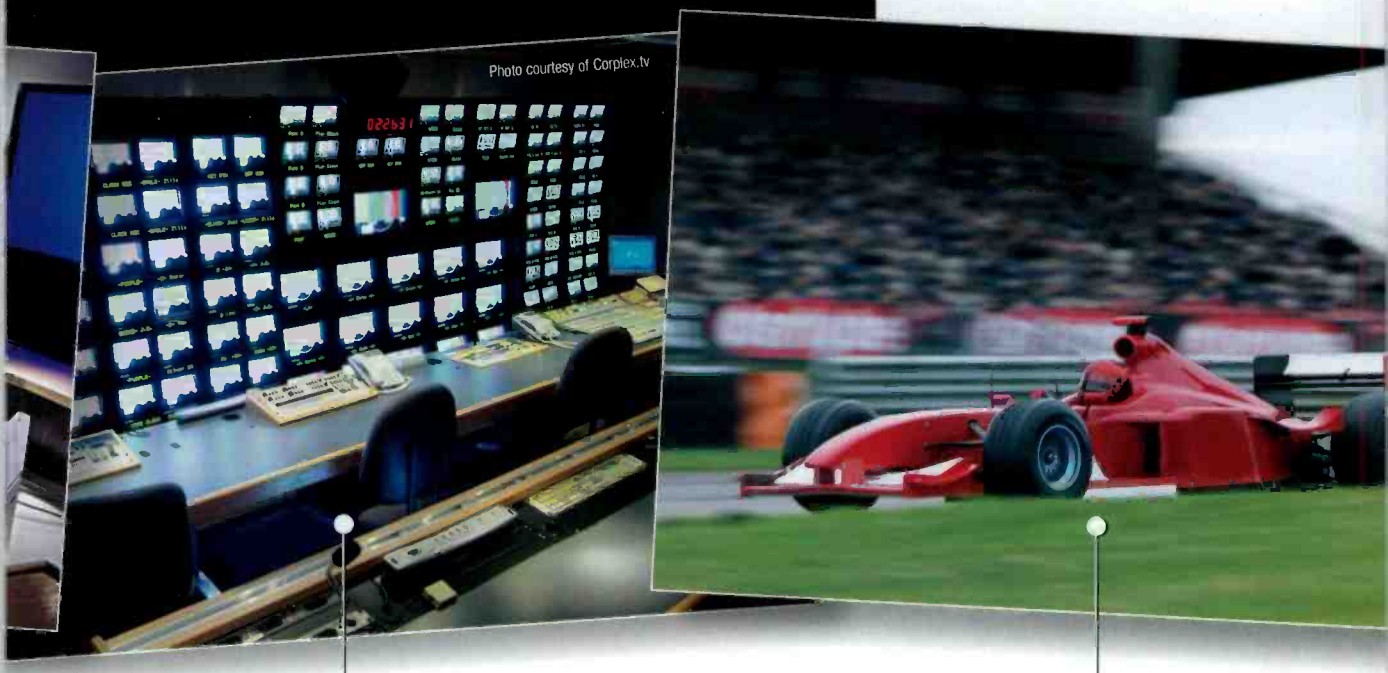

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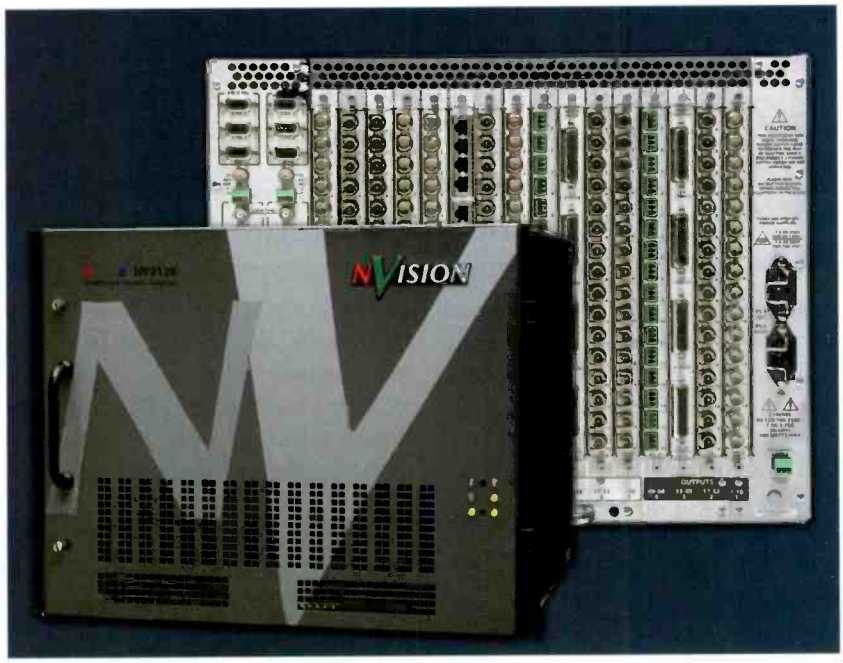
Modern routing systems

As TV facilities become more complex, so does routing.

BY JOHN LUFF

From traditional broadcast facilities and production operations to IPTV headends and network operations centers, the level of technical complexity and variety of technology and formats installed has markedly changed in the last two decades. Routing systems mirror this change.



NVISION's NV5128 multiformat router allows facilities to address the future. It supports all current digital and analog formats, and comes in a 128 x 128 frame.

Why are new systems so complex?

The increased complexity of routing systems is in part due to a general increase in physical size and in the number of formats that they support. For example, most broadcast facilities today support at least the 525-line format and one of the HD formats. Many facilities also support SDI and NTSC and have both analog and digital audio — and perhaps Dolby E or Dolby AC3. This material change first affects routing, which is, in most cases, the sole method of delivering signals to production and air.

Routing systems have evolved from single-format frames to mixed format systems that can accommodate analog and digital audio and video, as well as time code, machine control and HDTV signals in one monolithic structure. This is particularly useful to facilities undergoing continuous change during the DTV transition and need systems that will accommodate new formats without requiring an expensive, new routing system on top of existing installed hardware.

This can be done either by adding modules of a newly needed format to an existing frame, or by adding a frame with new cards to an existing control infrastructure. Several companies offer frames that can combine signals from mixed formats.

Making the right connection

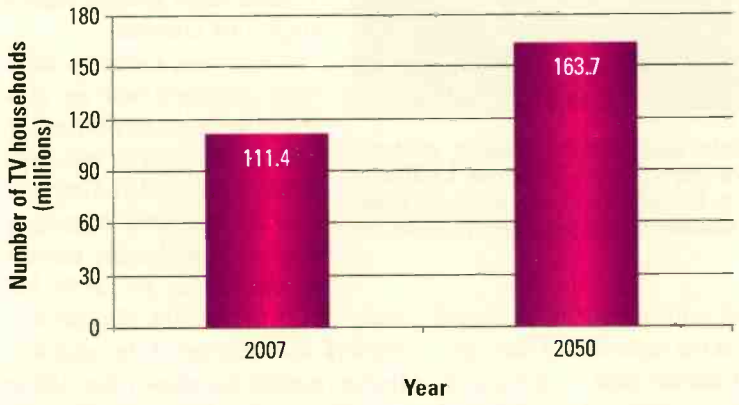
Increasingly, it is important that routers handle formats that carry emerging signal types. DVB-ASI — a 270Mb/s NRZ signal not to be confused with 270Mb/s SMPTE 259M serial digital video — carries compressed MPEG, with either single or multiple program transport streams. Fortunately, most modern routing systems can carry ASI in any level

FRAME GRAB

A look at the consumer side of DTV

Projected growth in number of households with TVs

By 2050, TV households will grow 47 percent to 163.7 million.



Source: Nielsen Media Research *www.nielsenmediaresearch.com*

intended for SMPTE 259M, despite the difference in coding.

With complex mixed signal types, the control system must understand the signals and only route connections that make logical sense. Connecting an HD output to an SD input or ASI to an encoder input is illogical. Moreover, crosspoint assignments that make such connections possible can waste available I/O ports.

Many facilities have segregated signals in routing blocks to make such choices efficient. A couple of decades ago, it was easy to do so because the smallest I/O block physically possible in a router was typically between 10 x 10 and 16 x 16. Today, however, the block sizes are often 32 x 32 or larger, making it harder to separate signals into logical blocks. Most routing is broken up today into logical or virtual blocks, with the control system understanding what signal types should be connected.

Control systems' increased role

Control systems have become more complex. They now support virtualization and allow complex pathfinding between matrix types. For example, if an SDI signal is routed to an NTSC port, the control system can be organized to recognize that a digital-to-analog conversion and encode are required to make the connection valid. The signal is routed through an appropriate interface and then back to an analog crosspoint before heading to the intended destination. This reduces the workload for operators and simplifies training, though at the expense of programming time to plan the control system properly.

For many years, control system designs were based on two basic models. In one, all control panels were linked on party line (coax or twisted pair) links, tying many control panels to the potential failure of a single piece of wire or connector. Although these busses were high in speed and deterministic, the architecture limited the number of control panels that could be online at the same time. Other systems used discrete lines to each panel, with even more limited extension of the total system size.

Control systems have become much more complex. They now support virtualization and allow complex pathfinding between matrix types.

Grass Valley's Trinix digital video routing switcher handles SD and HD signals from 3Mb/s to 1.5Gb/s in the same frame. It is available in three dense, fixed-frame sizes and features hot-swappable modules for easy servicing.

Today, control systems often work on TCP/IP networks, facilitating flexible cabling and even extension of the control system across a WAN connection. This is ideal for facilities in multiple locations or systems that must be distributed throughout a large building.

Many modern control systems permit status and monitoring using SNMP and Web services, moving control systems into the realm of common IT. It is, however, tricky to organize VLANs that will operate with deterministic control over a complex routing system.

Size matters

In the last five years, the size of routing systems has exploded, with several monolithic systems exceeding 1000 x 1000 and some with more than 2000 I/O ports. The market for such enormous systems is limited. But features essential to large, mission-critical routing systems have become prevalent. These features include redundant crosspoint cards and I/O modules, along with highly fault-tolerant control systems.

SMPTE recently completed work on the 3GHz SDI standard, named SMPTE 424M-2006, and is already shipping hardware. This new interface can carry 1080p30 HDTV, replacing the former dual 1.5GHz links needed with a single link interface.

Altera and Gennum have both developed and are now shipping chip sets supporting 424M. Although at one time 1080p was considered impractical for terrestrial broadcast, there is considerable interest developing in it partly because of the availability of consumer displays that support it. In addition, recent research has shown that 1080p may be practical in nearly the same compressed bit rate as 1080i.

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The effect on audio

Audio has benefited greatly from the development of advanced routing solutions. Several manufacturers now offer systems that handle both analog and digital audio, and even provide A/D and D/A conversion internal to the router. This permits the design of a facility that flexibly interfaces to legacy and new hardware without restrictions.

AES routing is sensitive to interruptions in the bit stream, however, and requires a synchronous router to avoid annoying disturbances in the audio. An AES synchronous router buffers all of the inputs so that all outputs are always framed the same, facilitating seamless cuts in the audio.

Another important part of routing AES is through clean switches, or soft switches, in which the two audio signals are blended at the point of transition to avoid a step function in the sound. An example of this is in a cut from high to low volume, which would produce out-of-band signals.

Other audio signal types that create challenges include compressed Dolby E and Dolby AC3. For all practical purposes, it is not possible to switch between two AC3 signals because the audio access unit is not constrained to fall on video frame boundaries. However, Dolby E was designed to be video-friendly and is constrained to video frames, facilitating cuts along with picture either as standalone or embedded audio.

Video hardware manufacturers will most likely design hybrid systems.

Multichannel audio can also be handled by putting three AES bit streams into three parallel paths through routing, carrying L, R, C, Ls, Rs and LFE. An additional AES pair can be added to carry Lt, Rt for some applications. Switching must be arranged to make simultaneous cuts on all channels of the 5.1 signal to ensure signal integrity.

Conclusion

Routing switchers may evolve over time to bridge the gap between conventional unidirectional video transport and common duplex IT networks. As traffic moves more as files and less as video signals, video hardware manufacturers will most likely design hybrid systems that facilitate interplay between existing IT and broadcast hardware. BE

John Luff is a broadcast technology consultant.

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06
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Managing DTV LOUDNESS with dialnorm

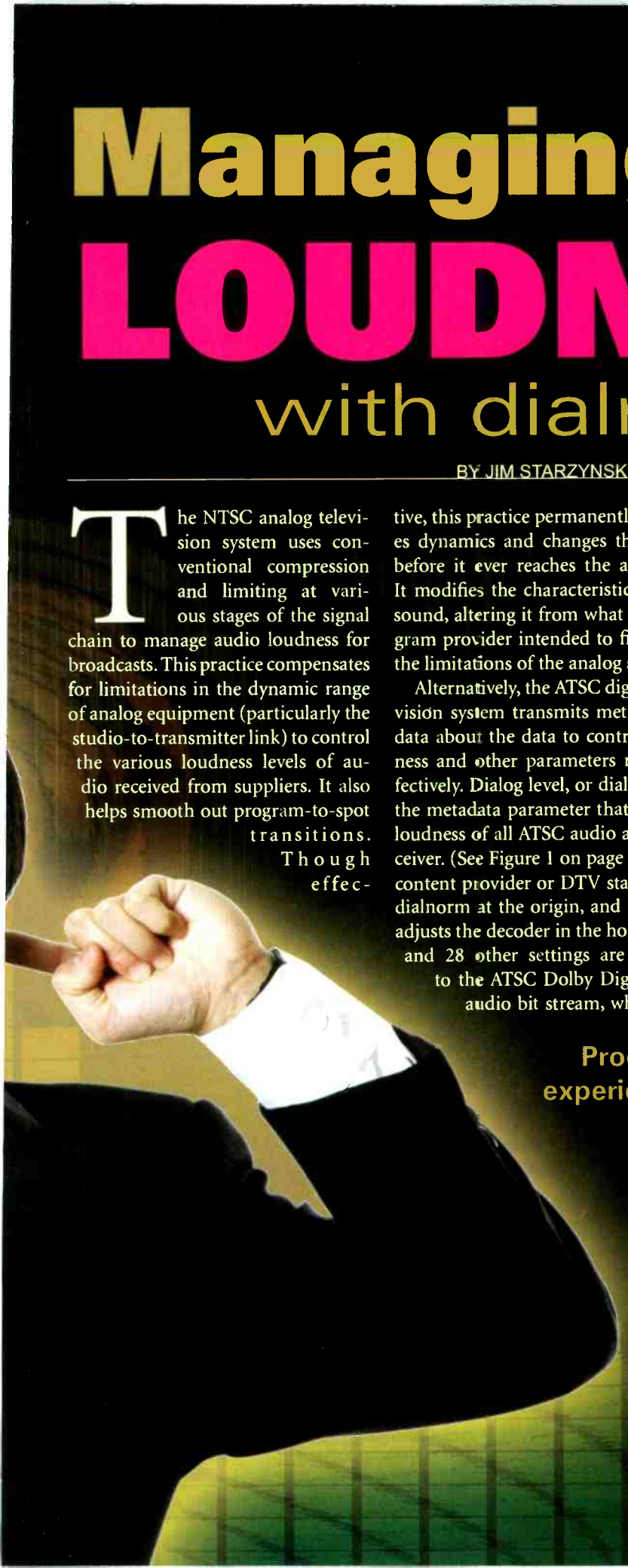
BY JIM STARZYNSKI

The NTSC analog television system uses conventional compression and limiting at various stages of the signal chain to manage audio loudness for broadcasts. This practice compensates for limitations in the dynamic range of analog equipment (particularly the studio-to-transmitter link) to control the various loudness levels of audio received from suppliers. It also helps smooth out program-to-spot transitions. Though effective, this practice permanently reduces dynamics and changes the audio before it ever reaches the audience. It modifies the characteristics of the sound, altering it from what the program provider intended to fit within the limitations of the analog system.

Alternatively, the ATSC digital television system transmits metadata or data about the data to control loudness and other parameters more effectively. Dialog level, or dialnorm, is the metadata parameter that sets the loudness of all ATSC audio at the receiver. (See Figure 1 on page 64.) The content provider or DTV station sets dialnorm at the origin, and it agilely adjusts the decoder in the home. This and 28 other settings are integral to the ATSC Dolby Digital AC3 audio bit stream, which also includes optional, user-selectable dynamic range control. The ATSC document A/53D refers to dialnorm as the practice that should be used by all broadcasters for managing loudness for DTV.

Program or commercial audio is best experienced when mixed at appropriate levels with varied dynamics. This mix is based on the choices made by the sound designer or the mixing engineer and predicated by the production. At home, without some type of processing, varying volume and dynamics can be uncomfortable to listen to as the sound jumps up and down when switching between programs, commercials and promos.

Ironically, a broadcaster's goal is to both accurately transmit material, maintaining the intended sonic characteristics of the production, and also to provide an enjoyable viewer experience. Not restricted by the analog system's limitations, dialnorm makes it possible to do just this by providing unaltered but normalized sound. Dialnorm sets the audio to a comfortable level, much like how a viewer uses a remote control to adjust the volume between TV show and commercial transitions. This is done automatically, without having to reach for the volume control, and it does not effect dynamics or compromise the soundtrack.



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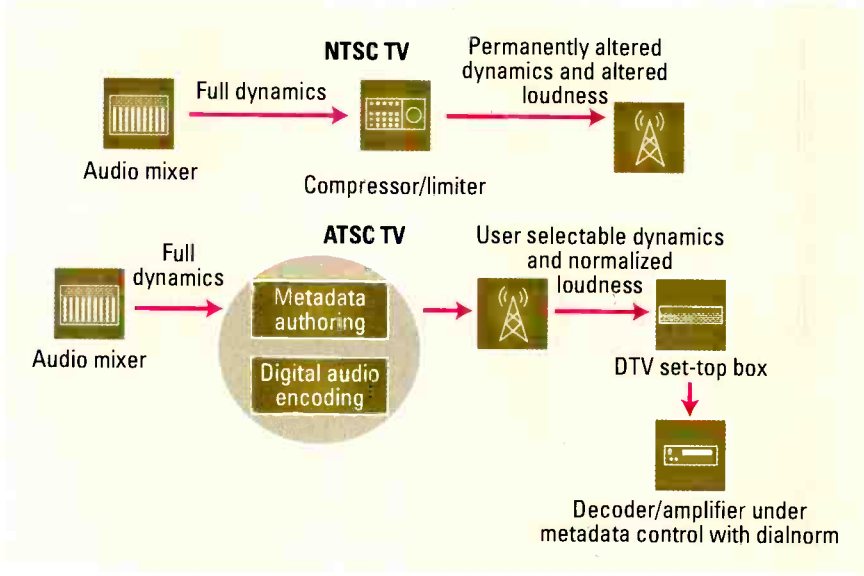

Figure 1. The proper use of dialnorm for DTV eliminates the need for destructive dynamic range processing and loudness compensation for broadcast.

How it works

Studies have shown that viewers adjust the volume of a television based on the level of the spoken word within a broadcast. A dialnorm setting is achieved by either measuring a program's dialog level or by mixing a program or spot's dialog amplitude to an already established dialnorm figure, which will be used by the DTV audio encoder.

With either method, the amplitude of the program dialog must match the dialnorm that's set in the audio encoder. This is required for loudness and for the optional dynamic range control to work properly. A Dolby LM100 broadcast loudness meter can take short- and long-term dialog measurements and display an easy-to-read, accurate number as the dialnorm figure. (See Figure 2.)

Audio and dialnorm are transmitted in the DTV bit stream simultaneously. The Dolby Digital system, which includes the decoder in the home, will level shift the volume by reducing the audio by the difference between the dialnorm figure and -31dBFS. (See Figure 3 on page 66.) So, if each program or spot is stamped with the proper dialnorm matching

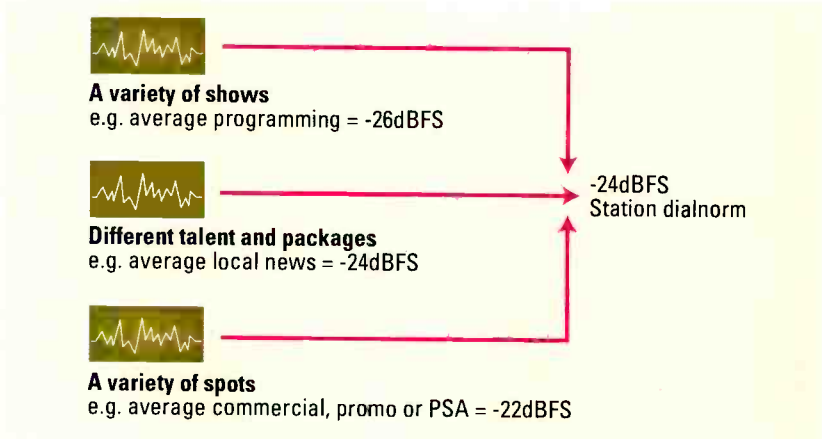

Figure 2. The Dolby LM100 is useful for measuring the loudness of program dialog. To acquire an acceptable dialnorm figure for station upconverts, an average of all content is determined, tested and implemented.

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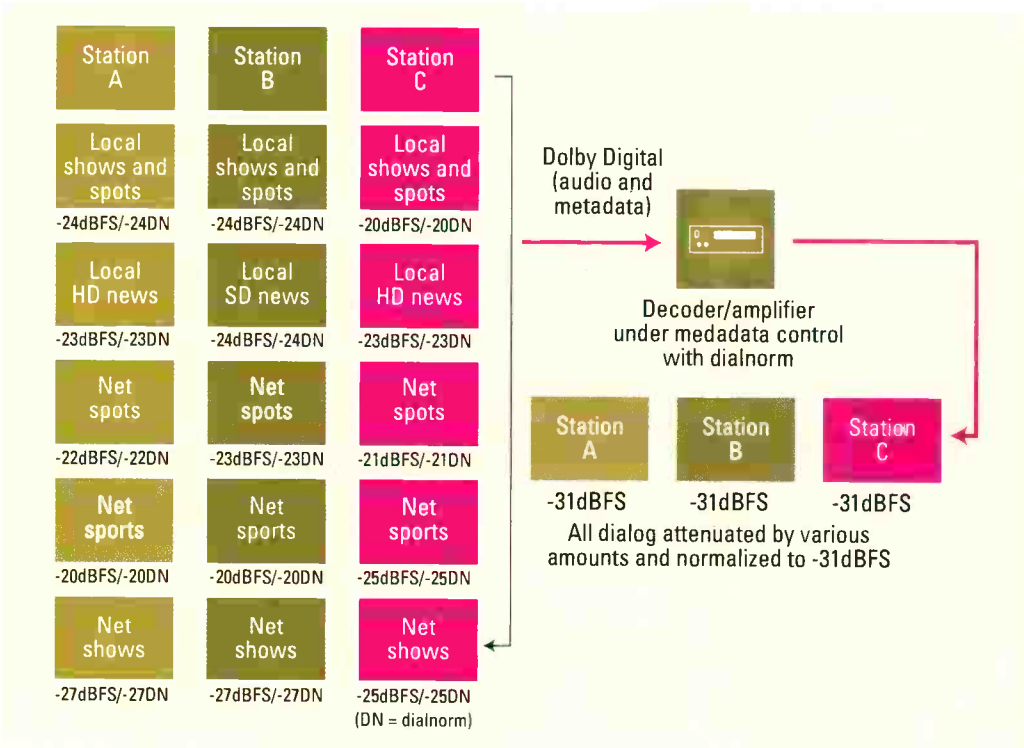

Figure 3. When all stations apply dialnorm universally, volume is normalized across the dial. As a result, viewers will not need to adjust the volume.

the level of the audio, dialog will automatically be level shifted to -31dBFS by the DTV system. Because this only engages once for each program or spot, and all audio accompanying the dialog is level shifted equally, dynamic range is not compromised. Transitions become smooth, no matter where in the -1dBFS to -31dBFS window the dialog was mixed. When all broadcasters do this properly, channel changing on the DTV dial is normalized.

A problem worth fixing

Unfortunately, due to a lack of awareness or understanding, not all DTV stations use dialnorm effectively. Many stations' dialnorm is frequently left at the encoder's -27dBFS default or is turned off, intentionally set to -31dBFS. Therefore, program audio recorded at a nominal -20dBFS stamped with -27dBFS dialnorm will be 7dB louder than a properly set ATSC bit stream. This same audio with dialnorm shut off (-31dBFS) will air 11dB louder!

Neglecting dialnorm is bothersome on a single channel and becomes a bigger nuisance for the audience when changing channels between properly set and incorrectly set stations in a market. Considering that the resulting level variance can easily exceed 10dB, it's easy to understand why properly adjusted dialnorm is critical for delivering the best listening experience for DTV viewers.

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Setting dialnorm properly is an easy, straightforward process for a DTV station engineer. It can be divided into two categories: network content or station content.

Setting up dialnorm for network content

Networks can distribute program and commercial metadata with their audio and video, either discretely or as part of a Dolby E bit stream. In most cases, this is used to directly drive the required Dolby 569 audio encoder's external metadata port. Master control at the station engages the switch to the network signal, and the dialnorm metadata follows. The local station airs the network's content, which includes the program-matched dialnorm.

In situations where networks distribute an ATSC bit stream for stations to transmit directly, the dialnorm is already contained in the network's Dolby Digital stream that gets passed directly to the audience.

Setting up dialnorm for station content

For upconverts at two-channel-only stations and local HD origination audio, a station engineer needs to acquire a dialnorm setting based on the average level of all programs, spots and local news. This process may be simplified by the existing, reduced dynamics used by programmers, by the news mixing engineer or perhaps by SD distribution that is already in place.

Once samples are evaluated, a number is determined and tested. Then the average figure can be entered as the station's unique dialnorm.

This process is a compromise that's necessary when SD programming is used and a metadata stream matched to the content isn't available to control the DTV audio encoder agilely. An acceptable comfort zone of -5.4dB to +2.4dB is the range that must be exceeded before it's likely a viewer will try to adjust the volume. This finding indicates that there is some dialnorm latitude.

Two-channel-only stations with audio encoders that do not support external metadata should include the network audio feed as part of the analysis to determine the station's average dialnorm setting. For audio accompanying HD local origination that's capable of distributing matched metadata, this signal should drive the audio encoder's metadata port directly. It's also acceptable for a mix to be set to a predetermined loudness that matches a preset dialnorm figure for that source.

In a new DTV world, putting in the time and effort to understand the process and to implement an effective dialnorm plan simply makes sense.

Conclusion

In a new DTV world, putting in the time and effort to understand the process and to implement an effective dialnorm plan simply makes sense. When done properly and universally, everyone benefits from the sonic experience this system is capable of providing. Supplying anything less is simply a disservice to a broadcaster's audience. BE

Jim Starzynski is principal engineer in advanced technology for NBC Universal.

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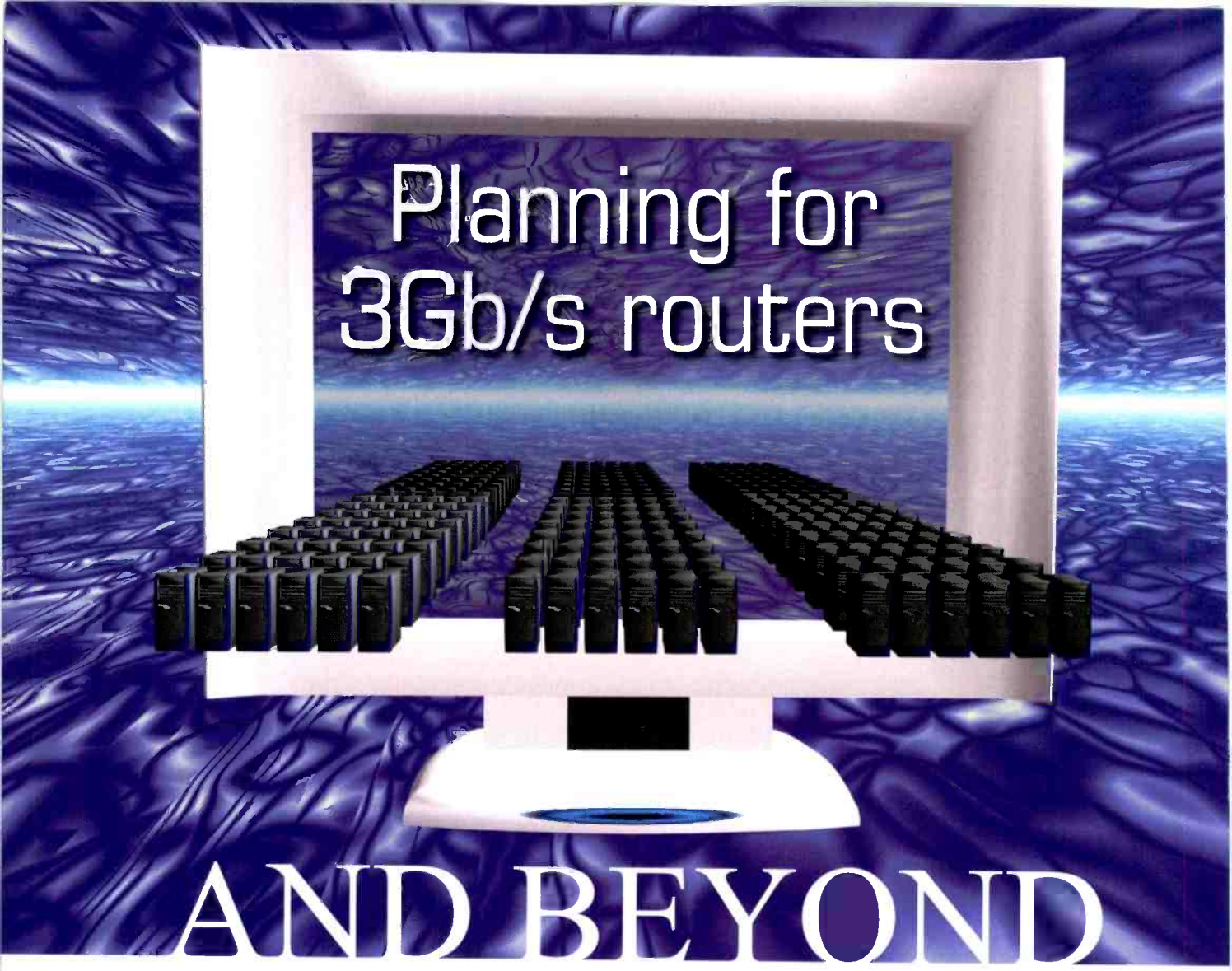


Planning for 3Gb/s routers AND BEYOND

BY TODD RIGGS

Next to the DTV transmitter, a central router is one of the biggest capital expenditures a broadcast station will make. Large routing systems with all of the associated control panels and wiring can carry seven-figure price tags, not including costs associated with the design and installation of the router.

Once installed, the router is expected to work reliably in a 24-hour-a-day operation, typically for 15 to 20 years. Routers installed 15 years ago have withstood a dramatic revolution from analog television with stereo audio to a world of multiple HDTV and SDTV standards, DTV multicasting, and 5.1 channels of Dolby surround sound.

Routers installed today must be prepared for the inevitable changes in signal formats, channel counts and interface connectivity that will occur in the future. For example, while no broadcaster is currently broadcasting in 1080/60p, at NAB2007, 3Gb/s-capable routers will be one of the hot new technologies to watch. Not only are they a natural progression from today's 1080/60i and 720/60p HD broadcasts, but also we are seeing evidence that motion picture production is moving in the direction of 1080/60p, and many display devices are already capable of supporting 1080p natively.

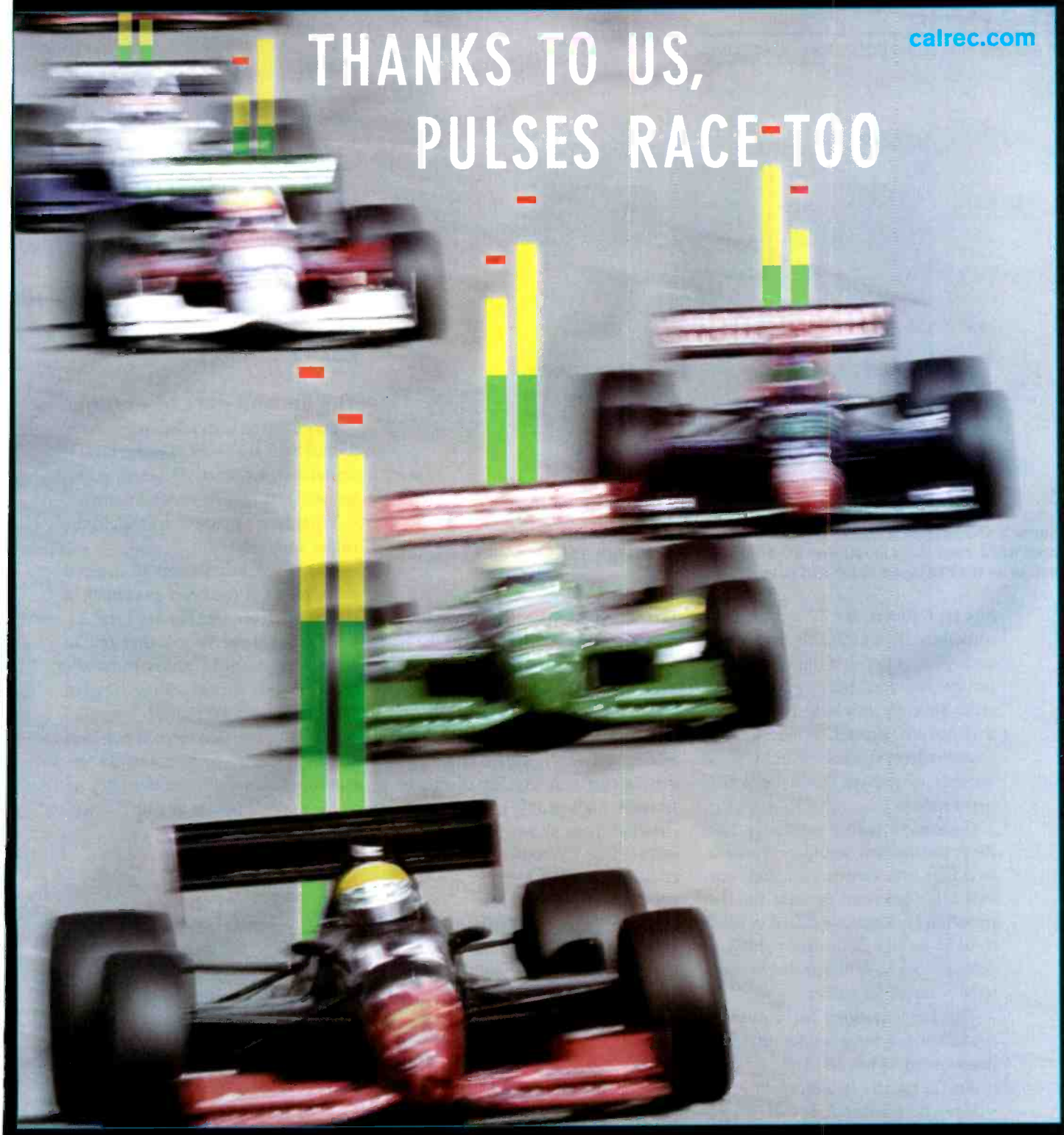
Planning for 3Gb/s routers

Transmission at 3Gb/s is nowhere on the horizon, and production equipment is limited in terms of 3Gb/s cameras, switchers and servers. But, the issue of 3Gb/s capability is something that is going to slowly integrate into broadcast facilities over the next five years. The key questions:

- Will the router you buy today be capable of withstanding and supporting the technology changes to come?
- If the purchase is for a big "house" router, how long do you expect it to be at the core of your facility?

If the answer is 10 to 15 years, which is common, you need to look at future technology trends. A facility may just be converting to 1.5Gb/s HD-SDI now and have absolutely no current plan for 3Gb/s. However, wouldn't it be nice to know that as the 3Gb/s standard becomes viable for content creation, distribution and transmission over the next five years, your house router will be able to handle it without the need to throw out the frame or undergo a major redesign?

If the purchase is for a small black



Sound gives pictures an emotional dimension that movement alone can't convey. The increasing use of surround sound adds even greater impact to the viewing experience. But it calls for much greater console capacity.

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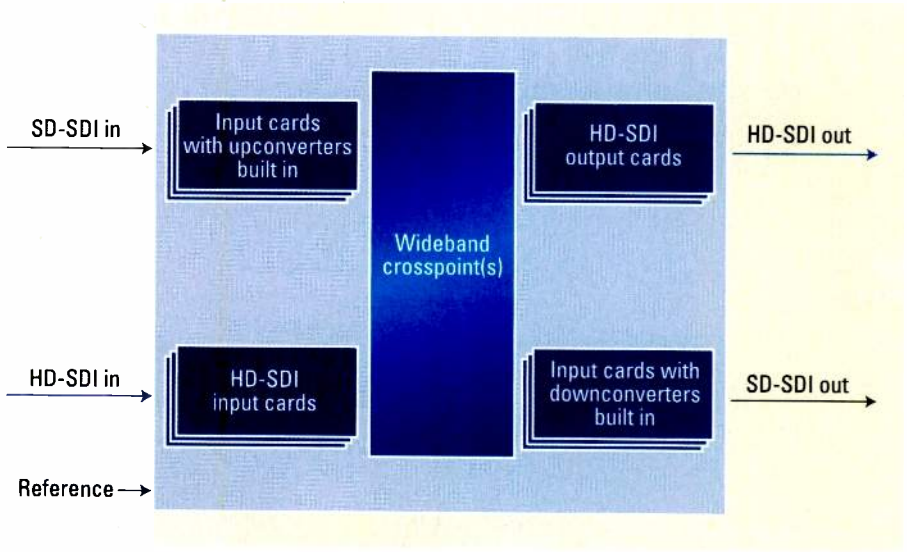

Figure 1. Example of a router using a bank of internal upconverters/downconverters on input and output cards to route an SD-SDI source to an HD-SDI, 1.5Gb/s or 3Gb/s output, as well as an HD-SDI signal to SD-SDI output

box-type router, say 32 x 32, buying something 3Gb/s-capable may not be as important because they are less expensive and don't necessarily have the same life cycle as a large router. Also, it is not uncommon to add a small router when dealing with a small number of sources/destinations in a new format.

Customers will most likely base their production equipment needs, switchers and cameras on their current infrastructure. Because the distribution backbone of a facility tends to be in service for longer periods of time, a move to 3Gb/s probably needs to be planned for earlier.

The key questions for customers considering a large router purchase that is going to last 10 years:

- Are the routers 3Gb/s-capable?
- If yes, how is that achieved?
- Do current modules have the ability, or is it going to be handled in their upgrade path?
- What does that upgrade path entail?
- If it does not support 3Gb/s, what are their plans?

Because many router vendors are already touting in their ads that they have 3Gb/s capability, this is something customers will increasingly be exposed to and need to start considering today.

Growing router demands

Another quantum leap on the horizon is the transport of multiple signals over IP or hybrid baseband/IP infrastructures. Audio demands also will be expanding dramatically. While analog and AES/EBU two-channel audio are currently the dominant audio formats, high-profile sporting events, entertainment shows and prime-time TV shows increasingly offer 5.1 channel surround sound. And many of today's digital audio consoles tout that they are already 7.1 and 10.1 Surround Sound-capable.

While all of the processing modules and other components in the broadcast infrastructure are not yet ready to support 3Gb/s, prospective buyers must ask vendors whether their product's architecture offers provisions for these technological advances on the horizon. It's highly likely that they will come to fruition in the router's lifetime.

With the advent of 3Gb/s routers and hybrid baseband/IP routers, we'll see more fiber-optic I/Os and cabling. The use of multiple transport streams over ASI via coax or fiber or IP via RJ-45 or fiber will also become more predominant. The need to save on wiring and connectivity costs will also lead to wider use of multiplexed signals between remote routers across a facility, city and country, as well as between mobile trucks.

The ins and outs of routing

Large central routers will be expected to deal with analog, SDTV and HDTV simultaneously, along with many popular new formats. The key questions:

- What type of converters should the router support?
- Should these converters be internal to the router or configured as a bank of external devices? (See Figures 1 and 2.)
- Or, should the broadcaster opt to add a level onto the router to handle new demands, such as adding a level of HD routing to a SD router?

While it's true that video servers and nonlinear editing systems can do format conversion, the router must step up to the plate to handle any up-, down-

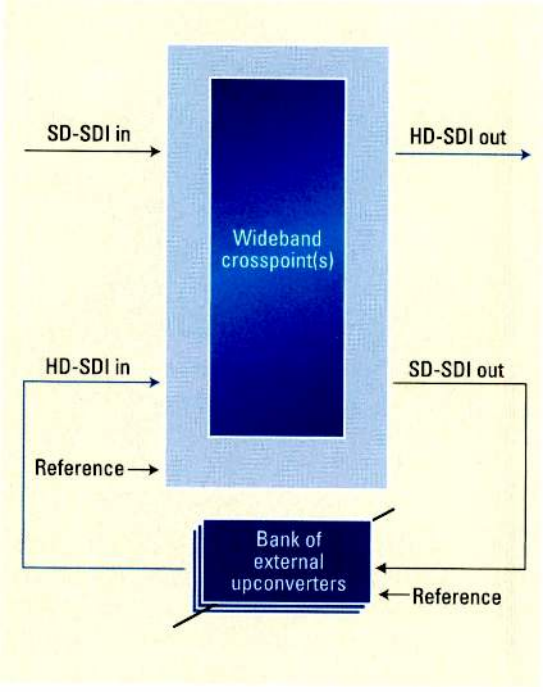

Figure 2. Example of a router using a bank of external upconverters to route an SD-SDI source to an HD-SDI, 1.5Gb/s or 3Gb/s output

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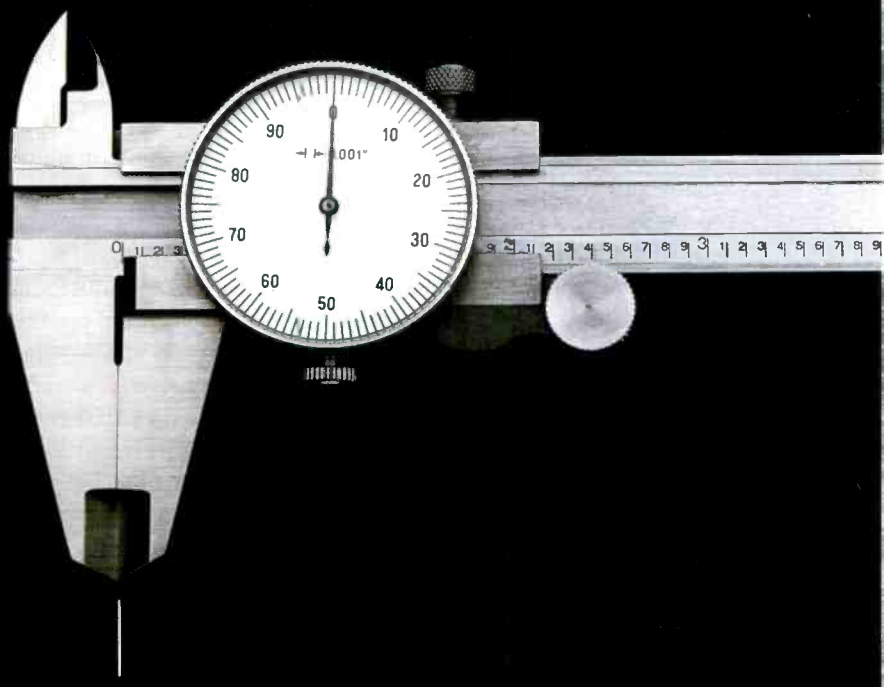

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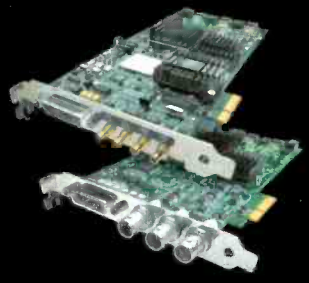

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and crossconversion requests intelligently and automatically. This signal processing and management must be done with minimal effort on the part of the user. And the router's internal signal processing has become more complex to support new formats.

Whether these digital signal processes are internal or external to the router, that additional signal processing will introduce a slight delay into the audio that causes it to go out of sync with the video. Frame synchronization should be considered for the overall system, either externally or on the router's inputs to correct for this timing delay.

Also, with centralcasting and remote station monitoring, we're seeing more signals transmitted via fiber-optic cable, where discreet signals are combined into a multiplex and demultiplexed back into discreet signals. This audio conversion and delay issue is becoming an increasingly common occurrence.

A bit about audio

In buying new routers, audio needs must be considered carefully. Some of the questions to ask when buying a new large router:

- What do my current and future audio requirements look like?
- Do I currently have discreet audio, and do I plan to keep all future audio additions discreet?
- How many channels of discreet audio will I need? (If it is a lot, you may want to buy a frame just for current audio needs that is big enough to add inputs/outputs, as well as add channel count.)
- If your desire is to have embedded audio, do you have need to process the audio?
- If so, is the router capable of processing audio (e.g., channel swapping, summing, muting, level adjustments) internally?
- If not, or if the customer prefers to keep that out of the router, they need to make a list of the external muxes and demuxes that will need to be on the router's inputs and outputs.

Framing the issues

Overall, prospective customers should fully evaluate their own needs and the architecture of the router to determine if the investment they make today will be flexible enough to meet their facilities' changing needs tomorrow. Among the questions that a prospective buyer should ask:

- What has the router's architecture been designed for?
- Have the modularity, frame layout, power and cooling systems been designed for what the future may or may not hold?
- Can it meet the facility's require-

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ments today, as well as adapt to what the future will be?

While baseband routing is the primary focus today, IP routing will likely become a reality in the future. So, we must ask:

- Has the router been designed in a way so that it will be able to route future signals, such as IP?
- If so, how will that be accomplished?
- Will it simply involve adding new I/O modules and updating a database?
- Or will it require a separate frame?

This is a bit of an unknown, but it is not unlike asking the old "is it future proofed?" question.

Getting in control

With large routers, there are many choices to make. Large routing systems often offer different types of control panels that can be located throughout the facility, depending upon the unique requirements of each work area. Router control panels can be X-Y, multi bus, single bus or button per source in function, and hardware, software or Web-based in type. Prices are going to vary depending upon size, type and quantity of the control panels that are chosen, and that's something the broadcaster and systems integrator will have to consider.

With a Web-based interface, control, configuration and diagnostics can be accessed from PCs that can log into a facility's LAN or WAN, thus making it easier to control routers that are on site locally as well as remotely.

Also, different areas of the facility have control requirements that call for different types of panels. They may also vary as to the accessibility of numbers of sources and destinations. Thought needs to be put in to analyze job function to determine the type of panel required, as well as user and group access rights and privileges.

Because control panels are not typically on a large router's frame itself, it must use a communications protocol to talk to the central router. Today, these connections can be made via serial port or coax, Ethernet and connection via the Web.

Control questions

The selection of control panels is an area that requires careful consideration. Among the issues that a prospective buyer must consider:

- How do different user groups need to view the sources and destinations on the router?
- How often do their particular list of sources and destinations change?
- What is their work location in relation to the frame's location?

There is a wide range of panels to choose from, and they vary by physical size, layout, menu structure,

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method of communications and price. There is no one-size-fits-all, and facilities will almost always have a combination of them. A designer needs to interview the various user groups to determine what their needs are so he or she can select the right panel for that job function. This is an important point. This is the user interface to the router. The system may run great, but a clunky interface will leave the engineering staff having to defend its decision.

Planning for growth

Planning for growth means anticipating changes and planning for how those changes will be handled. Questions to ask before buying:

- What are my control requirements?
- How is the router configured, and how easy is it to change?
- If you need to make changes, such as modify a database or add any I/Os, how does the system incorporate those changes?
- Can these modifications be done in the background, with little or no disruption, or do they require having the system to go down for a period of time?

The user needs to pick a frame size that will handle their current needs as well as future requirements. If a customer needs a 128 x 128 HD router with no expansion, that could most likely be put in a fairly small frame, say 10RU or smaller. If, however, the customer needs to expand, by how much does he or she need to expand? Is it just that particular format, or will the customer be adding additional formats over the life of the router?

Also, you don't have to buy a completely full frame right off the bat. Different manufacturers have different I/O granularity. Consider the cost to upgrade. A smaller I/O size potentially means it will be cheaper per board, which in today's world means adding a board or two for a few inputs doesn't have to go through the capital process.

The bottom line

Five years ago, many installations involved a separate video and audio router, but with advances in technology, it now makes sense to combine video and audio routing in the same system. For a television broadcast facility, a smaller router is beneficial because it leaves space for other things. But on today's space-challenged mobile production units used for HDTV telecasts of sports and entertainment, space is a critical concern.

A few years ago, many 256 x 256 SDI routers with AES audio would have required multiple frames for each format, all with their own power supplies, fans and controllers. Today, comparable functionality is available in a single frame that is 30RU or smaller.

This progress is owing to advances in the internal circuitry on the

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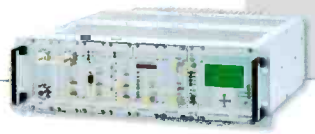

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components; improved I/O layouts; improvements in power consumption and cooling; and smaller, faster processing components. This drastically reduces the physical size of the cards.

This consolidation has, in turn, reduced the footprint of the router itself, as well as the number of power supplies that must be used. The drastically reduced power consumption and cooling requirements lower the cost of operation, as well as extend the life of the system components.

For owners of older routers, the savings on the electricity bill and the cost of replacing bad power supplies can be significant over many years of operation. And that is money that could be applied towards the purchase of a newer, more energy-efficient router.

A house router has to work. So we need to ask:

- How reliable is it?
- Are the critical parts hot swappable?
- How easy is it to get to those parts if there is a failure?
- What is the power draw of the frame, and how does it cool?

That may sound trivial, but electricity bills come every month. It's part of the cost of ownership. A router that draws less power will cost less over its lifetime, while one that cools well will not require as much air conditioning. And those factors, combined in an efficient system, will allow for a longer life span of the individual components in the frame.

Final key points

In a cost analysis of a major router purchase, consider that internal converters will piggy-back on the router's existing cable and power supplies, whereas external routers will require additional cabling and power. Because of the complexities involved with the purchase, design and installation of a large central router, as well as the relatively lean engineering staffs at most facilities, many broadcasters and mobile truck companies must enlist the help of systems integrators.

However, once the system has been installed, broadcasters must plan for repairs, configuration changes and upgrades because these will be inevitable. Therefore, choose a router that provides as much easy accessibility from the front of the router, so you don't have to move equipment or pull it forward to access it from a rear panel.

Fans, control panels, power supplies and other key components all need to be hot-swappable parts. And there should be back-up components ready to take over should the main units fail. After all, fail-safe operation is the broadcasters' primary goal. BE

Todd Riggs is product marketing manager for Harris Broadcast Communications, Router Systems Division.

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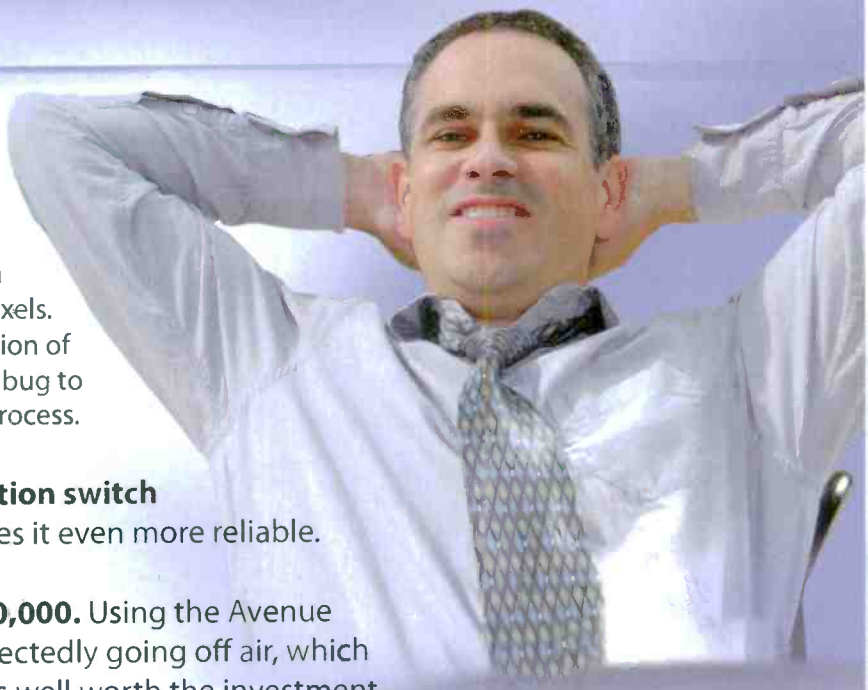

You can use the **sophisticated detection system** to your advantage by adjusting the switch's parameters for *your* facility's needs. For example, the black detection system allows you to set both the threshold and the percentage of non-black pixels. But that's not all, you can also determine the portion of the picture to be considered. This allows a corner bug to be either included or excluded in the detection process.

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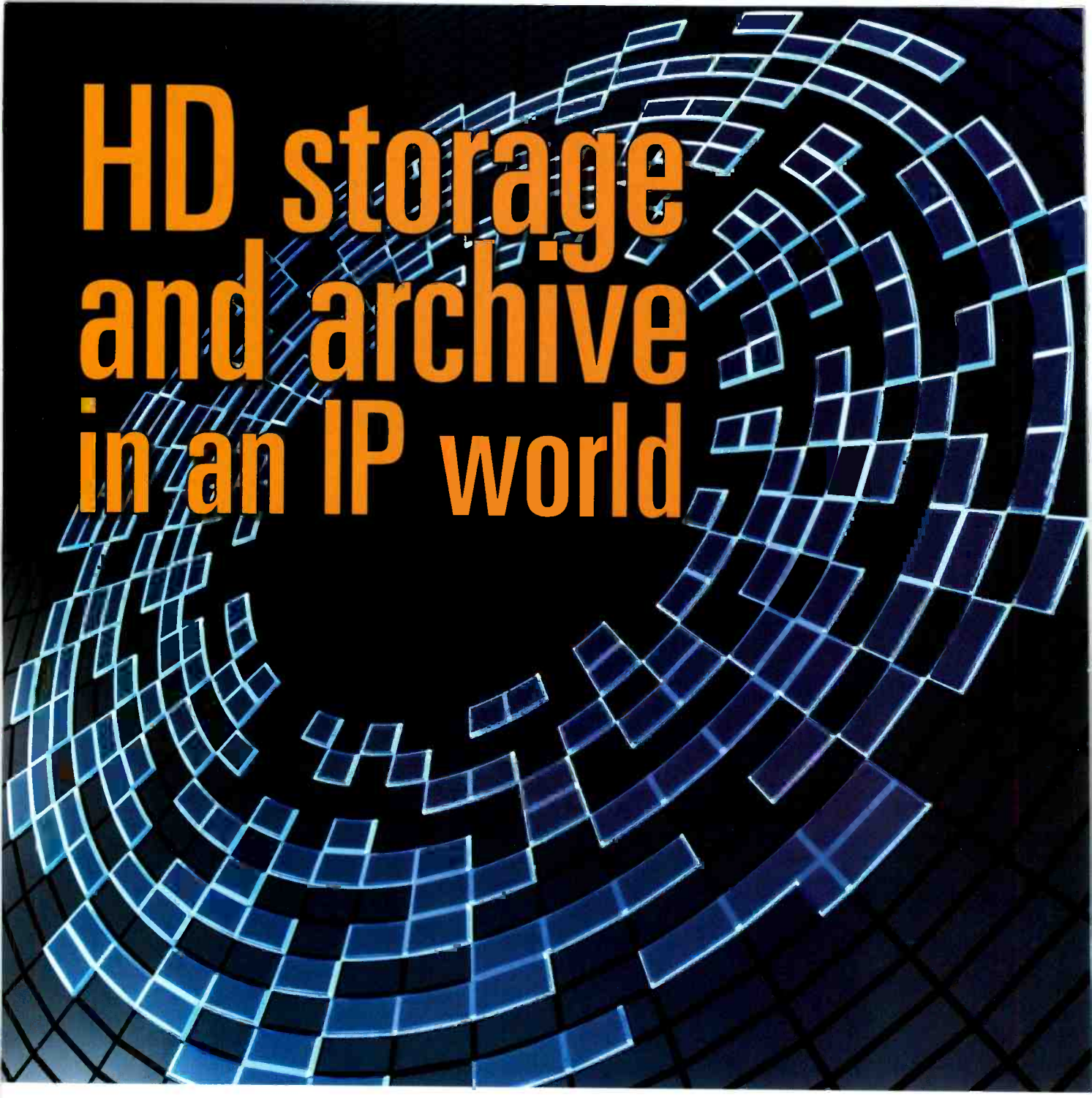
HD storage and archive in an IP world



Just 10 years ago, videotape was the only practical choice for archival storage. Now, it makes little sense to prolong the videotape life span.

BY TORE B. NORDAHL

Some of you who are more experienced remember the early Ampex robotics systems of the 1970s, retrieving 2in videotape cartridges for replay of TV commercials. This was not for archive, but for online use.

By the 1990s, Ampex was gone from the broadcast video scene, and StorageTek, Sony and others were pushing even larger robotics systems for archives of videotape cassettes and data tape cartridges. With the emergence of recordable optical discs (CD-DVD), several jukebox archive systems came to market. It is fair to say, however, that none of these robotics systems encountered great success in the broadcast business, largely because of the modern video server. The business of the compressed HD storage and

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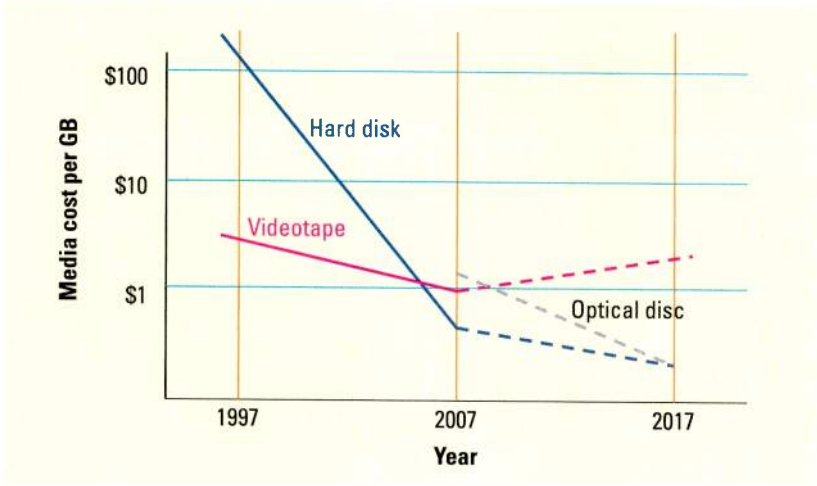

Figure 1. Over the past 10 years, there has been a steep decline in the cost of hard disk drive storage per gigabyte. While the cost of digital videotape storage has remained fairly constant, it is predicted to increase over the next decade as market demand declines. Suitable optical disc currently costs about $1.30 per gigabyte. That cost is expected to fall significantly as new technologies advance and mature.

archive requirements for broadcasting and teleproduction will be the focus of this article — not the high-end world of uncompressed HD for digital cinema and Hollywood post.

Storage costs

A few years ago, archive playout was generally real time as SDI and manual retrieval. This was primarily because the IP digital video infrastructure was not sufficiently developed or adopted by broadcasters, though video servers were everywhere. And hard disk storage was still significantly more expensive than videocassette storage.

That relationship has changed, particularly in the fully professional segments. Sony's HDCAM tapecassette for typical camcorder use holds 42GB at a cost of $40, or less than $1 per gigabyte. A small, $40 Panasonic DVCPRO-HD tapecassette holds 25GB, which is about $1.60 per gigabyte. The latest hard disk drive with a capacity of 500GB sells for about $250, or about $0.50 per gigabyte. (See Figure 1.)

Camera storage

All emerging HD camcorders seem to have one thing in common: They don't include videotape. The internal videotape cassette drive has been replaced with internal removable flash RAM, optical disc or hard disk. Videotape is no longer a consideration when designing a future-proof archive system, except for the preservation of any old on-the-shelf cassettes.

Ideal for short-term acquisition, flash memory cards, such as the Panasonic P2, offer high-speed recording in a small, lightweight form.

In the IP/IT world, all connections should be electronic or networked, because physically removing and replacing storage media from one subsystem to another disrupts the design purpose and efficiency goal of file-based workflow. The only exception should be in the first step of acquisition, when nonlinear media is removed from the HD camcorder and replaced in a networked device. In most HD camcorder applications, this is necessary, as, by definition, a camcorder is used on remote locations. Wireless solutions may exist or be developed to eliminate some remove-and-replace operations (i.e. ENG); however, it is not within the scope of this article to discuss wireless in any detail.

Flash RAM cards

Flash memory cards, such as the Grass Valley CF, Ikegami RAMPak and Panasonic P2 are primarily reserved for short-term acquisition storage because they cost $60 to $120 per gigabyte. Applications are therefore seemingly limited to the remove-and-replace devices needed in HD camcorders' first step in acquisition but not anywhere else in the workflow. The old videotape cassette in the camcorder often ended up as acquisition raw storage archive on the shelf, but flash RAM cards are too expensive for such use. Therefore, the disadvantage with flash RAM is that, to preserve acquisition raw footage, an additional step is required to archive raw footage.

Optical disc cartridges

The optical disc cartridges, such as the Sony PD and InPhase holographic storage, offer one obvious advantage over videotape: nonlinear random access. The advantage over flash memory is that the optical disc can be used as acquisition raw storage archive. As a matter of fact, it may be considered deep archive, if we agree

Although its primary use is acquisition remove-and-replace transition storage, Sony's PD 23GB optical disk cartridge is well suited for long-term on-the-shelf storage. Sony also offers PD robotic systems and has announced a 50GB PD.

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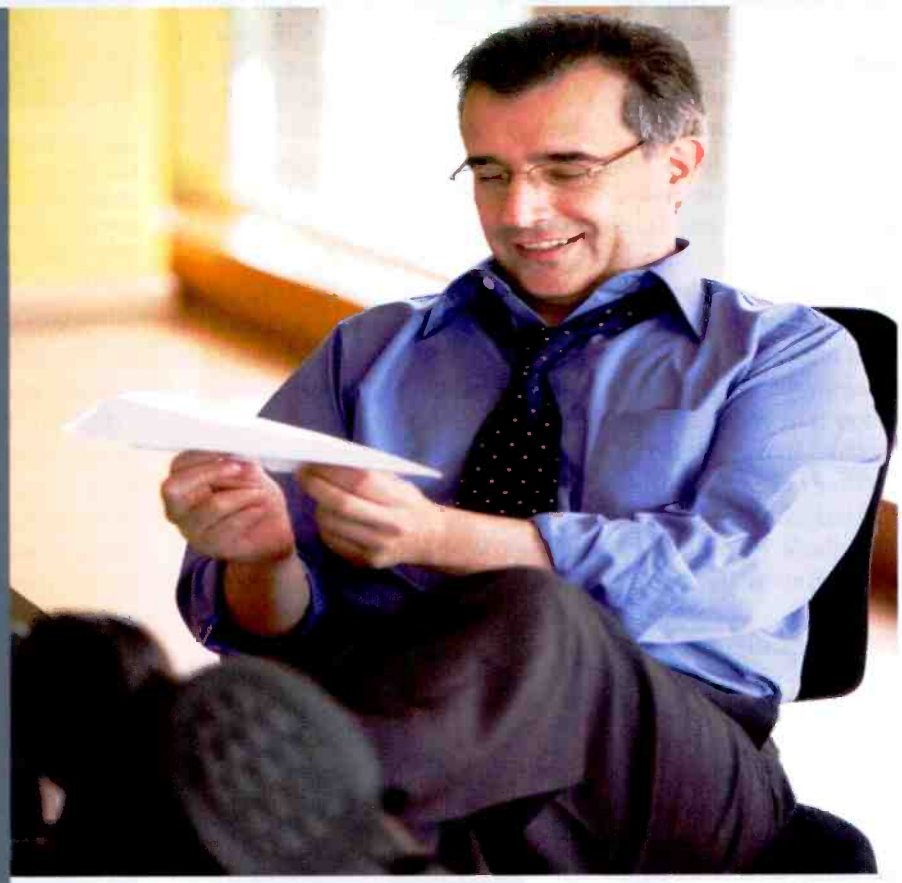

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Engineering The Broadcast Future

that the raw archive is likely to be accessed less in the future than the edited and formatted program derived from the raw. Sony's PD is now an established product in the company's XDCAM HD camcorders with current capacity of 23GB per cartridge, proven reliability and capacity, offering a sufficient one hour of high-quality compressed HD capacity. But what about the emerging technology of holographic optical disc recording? The InPhase Technologies Tapestry systems' optical disc cartridge are slightly larger in size than the PD, a compromise that offers the ability to hold 300GB in one cartridge.

Unfortunately, the Tapestry in its first-generation state requires a relatively large drive subsystem for the cartridge's write/read process, which adds to physical size, expense and weight and is likely to exclude HD camcorder integration for several years to come.

Sony's PD is well suited for both acquisition remove-and-replace and acquisition raw archive applications, while InPhase Tapestry may only be suitable for purpose-designed high-density deep archive applications because there is no natural process of recording (as in HD camcorder acquisition) ahead of the archive recording.

Hard disk drive

The hard disk drive arena looked pretty good five years ago. Today, at greatly elevated capacities with an economical cost of $0.50 per gigabyte, the hard disk drive is perfect for compressed HD storage at any level, including some archive applications.

The hard disk is even entering professional HD acquisition in the form of Iomega's removable REV PRO hard disk cartridge and drive. Grass Valley made it an integral part of its Infinity DMC camcorder, as did Ikegami in its HDN-X10 FieldPak. The major difference between the REV PRO and the FieldPak is that the REV PRO is a hard disk platter-only cartridge with an integral spin motor, and the FieldPak is a complete hard disk drive module.

Disc: Hard vs. optic

Both Grass Valley and Sony advocate IP and file-based workflow. And at 35GB original capacity, with Grass Valley's compressed HD bit rate somewhat higher than Sony's PD record bit rate on 23GB capacity, the REV PRO and PD are comparable. The difference is the price. Grass Valley offers an inexpensive external or internal REV PRO drive, enabling the user to ingest economically into a workstation, server or network. The PD cartridge is half the price of the REV PRO; however, Sony requires the use of a more expensive VTR-like PD cartridge player (or player/recorder) with optional GigE port providing IP connectivity to the network.

The REV PRO cartridge is certainly acquisition remove-and-replace friendly but less acquisition raw-archive friendly compared with the PD due to higher cost per hour of storage for similar quality compressed HD.

InPhase Technologies' Tapestry promises extremely high-density holographic optical disc storage. A Tapestry cartridge holds 300GB, making it ideal for high-capacity deep archive use.

Hard disk array

The hard disk array is the most universal professional media storage technology in daily use. It has experienced exceptional growth over the past 10 years in dedicated video

Hard disk storage offers a strong option for any level of storage, even on-the-shelf long-term archive. However, the primary use for the Grass Valley REV PRO (left) and the Ikegami FieldPak2 (right) is at the acquisition level.

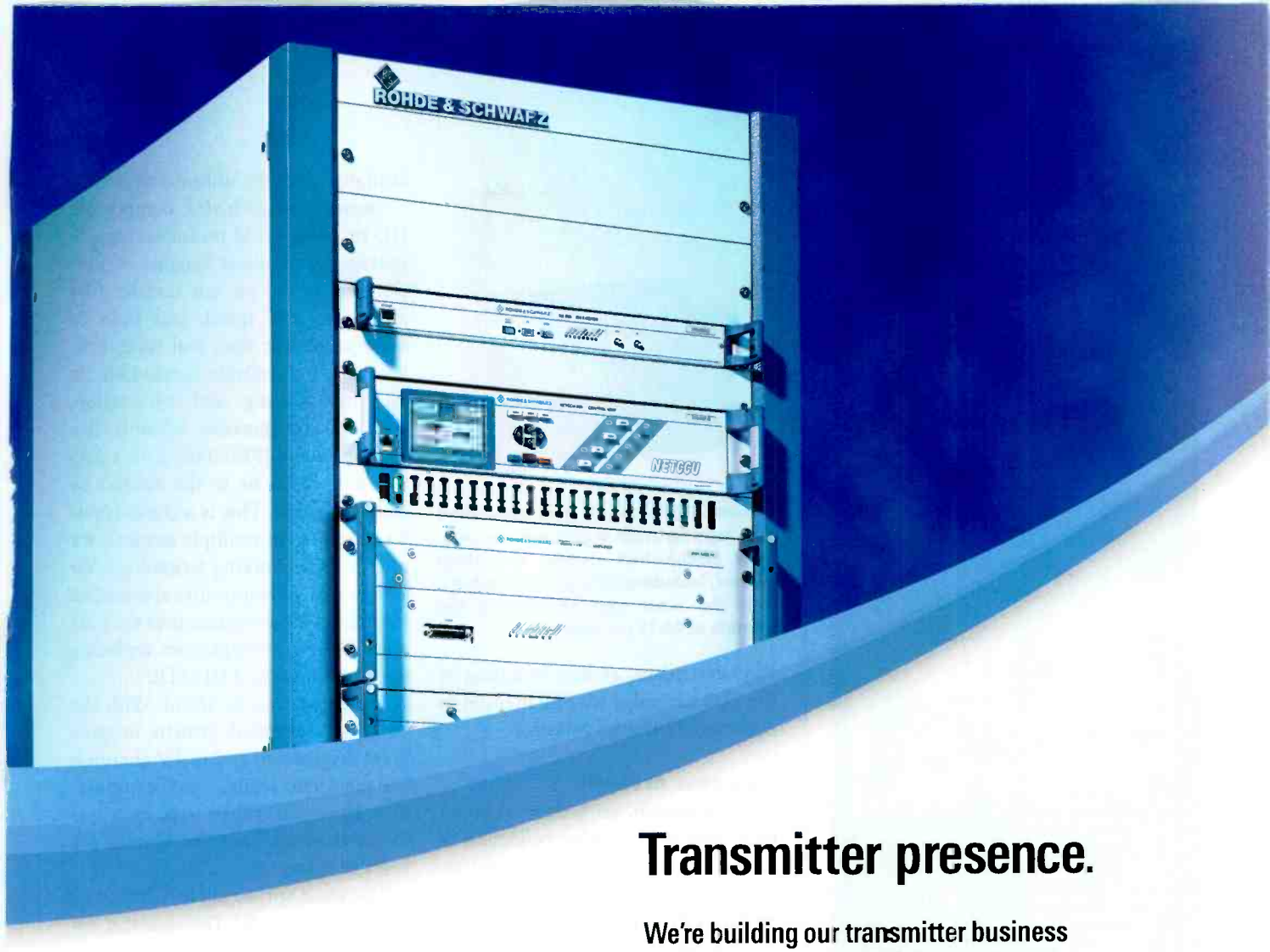
server systems, in SAN and NAS, and in standalone workstation add-on disk arrays.

Overall, the hard disk is difficult to beat. One inexpensive 500GB hard drive offers a sustained transfer speed of more than 50MB/s (400Mb/s) and stores more than 10 hours of high-quality compressed HD at a cost of $0.50 per gigabyte. That price, however, increases to $1 or more per gigabyte by adding array packaging, controllers and RAID.

Redundancy is something difficult, expensive or not available with cartridge storage. Think about it. A basic 10TB (10,000GB) NAS array for $10,000, with multiple GigE connections does not feature robotics, is always online, and has a true file-based workflow, with redundancy. That's the equivalent of about 300 optical or hard disk cartridges. A robotic system with a capacity of less than 100 cartridges may cost $50,000 or more.

The data tape

First as reels, then cassettes and now cartridges, data tape has been around since the early days of computers. Just like magnetic disks (hard disks), recording densities have skyrocketed, while prices have declined. One format today is LTO's third-generation Ultrium tape cartridge with 400GB of native capacity at a price of about $65 per cartridge, or $0.15 per gigabyte. Just like with Sony's PD and Grass Valley's REV



Transmitter presence.

We're building our transmitter business with performance, reliability, and service.

Our installed transmitter base is large and growing. There are many reasons:

- Both air-cooled and liquid-cooled, solid-state technology for exceptional reliability
- VHF and UHF, Analog and Digital
- Small footprint, low noise, high efficiency
- Responsive US-based service
- Unbeatable support

We've sold more digital television transmitters than anyone in the world. Like so many others, you stand to benefit from our technical excellence, comprehensive US service infrastructure and proactive support. Find out more at **test-rsa.com/TVTrans/BE3**, and while you're there, get your free 488-page Test & Measurement catalog.

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April 16-19, 2007, Booth #C2927

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The 400GB LTO Ultrium third-generation data tape cartridge works well for long-term on-the-shelf storage and deep archive, including robotics applications. It is the most cost effective of the formats at $0.15 per gigabyte.

PRO cartridges, archive handling of the LTO cartridge may be manual or automated through robotics.

The new archive

By definition, an archive is about long-term storage. It's a collection of records, documents or other materials of historical interest. The definition implies infrequent access.

We need to think in terms of perhaps 20 years or more. And a key factor is that the hard disk drive and the hard disk array is a completely self-contained player/recorder with permanent electronic connectivity to the network. All cartridges (and cassettes) require an external player/recorder and the mechanical process of inserting and removing the cartridge, and keeping track of the cartridge manually or by automation. It is extremely important for end users to select data industry widely adopted standards for any data tape format and to avoid proprietary formats and devices for long-term storage.

Where no access is needed for a long time, there is no need for hard disk array or robotics. Barcode and electronically inventory the data tape cartridge, place it in the vault, and (nearly) forget about it. If some access is needed in the medium term, leave the file on the nearline hard disk array. For as long as frequent access is required, the file is obviously available from the online disk array.

Storing and archiving compressed HD in an IP world means taking advantage of the great benefits of networking, where we can transfer files at any suitable speed, real time or faster or slower than real time, limited only by available bandwidth. In HD broadcasting and production, with new compression schemes like AVC-Intra and JPEG2000, a file's data rate is likely to be in the 50Mb/s to 150Mb/s range. This is a comfortable bit rate, even at multiple streams, for today's IP networking technology. We will see new and innovative approaches to facilities infrastructure over the next several years, perhaps even replacing the now entrenched HD-SDI.

Exciting times are ahead. With the current accelerated growth in program origination and in TV channels and platforms available to the population, there will still be large increases in the demand for video storage for years to come.

The most surprising conclusion of the above analysis? The demand for robotic archive systems in the future of professional HD television does not seem to be a major growth area. The primary reason? If you need a file every month or two, leave it in the nearline disk array; if you need a file every year or two (or if it's an archive master), put it manually on the archive shelf in a data tape cartridge. Because of continuing networking advances and declining costs per gigabyte, the hard disk array will continue to expand its applications and take market share away from tape-based long-term storage. BE

Tore B. Nordahl is principal of nordahl.tv LLC, a Los Angeles-based consulting firm delivering HDTV technology reporting, product strategy and market research services.

Tore B. Nordahl's latest publication is the HD ENG & EFP Camcorders Report. *Visit* www.nordahl.tv for more information.

Spring **2007**
PRODUCT GUIDE

Marshall Electronics
BROADCAST MULTIMEDIA DIVISION

NAB booth# SU1926

MegaPixel Resolution

V-R72P-2HDSDI
Price: $2999.00

Expanding Our New Line of
TFT-MegaPixel™
High Definition Monitors

see page 2

Marshall Electronics' new line of TFT-MegaPixel™ displays feature the highest pixel density available for 3.5" to 10.4" monitors, providing greatly improved images compared to similar LCD and CRT monitors. Unlike many other LCD monitor manufacturers who simply package OEM open-frame monitor sets, Marshall Electronics has developed a proprietary technology that incorporates end-to-end digital signal processing, resulting in superior image quality with more than twice the resolution of our competitors. Significant improvements have been achieved in brightness, contrast ratio, and viewing angle. All models feature displays calibrated to SMPTE-C/EBU standards for unsurpassed color gamut and color temperature accuracy. Configurations include combinations of SDI/HDSDI, Component SD/HD, DVI, VGA, S-Video, and Composite video inputs, and are available in one, two, three, and four-screen configurations.

NEW PRODUCTS

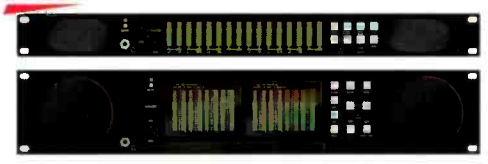
NEW

Truck Edition Monitors

The new TFT-MegaPixel™ Truck Edition Monitors are specially designed for broadcast trucks and video walls, with 20% more screen area than comparable racks of the same size.

see page 3

NEW



Audio Monitors

Marshall Electronics introduces the new AR-DM Series Rackmount Digital Audio Monitors - Ultra-nearfield monitoring systems with interchangeable input modules.

see page 4

NEW

SunBrite Monitors

Marshall Electronics introduces a new line of SunBright monitors, designed specifically to provide sharp images with vivid color in outdoor applications with high ambient light.

see page 6

TFT-MegaPixel™ Dual and Stand-Alone Monitors




Dual 7.0" | Stand-Alone 7.0" | Dual 9.0" | Stand-Alone 9.0"

wide 1.2 TFT-MegaPixel™

Inputs	7.0" 800 x RGB x 480		9.0" 800 x RGB x 480	
Composite 1, Composite 2	V-R72DP-2C $1999.00	V-R70DP $999.95	-	-
YPrPb, DVI, VGA, S-Video, Composite	V-R72P-2HDA $2899.00	V-R70P-HDA $1599.00	-	-
SDI	V-R72P-2SD $2899.00	V-R70P-SD $1499.00	-	-
HDSDI/SDI	V-R72P-2HDSDI $2999.00	V-R70P-HDSDI $1999.00	-	-
HDSDI/SDI, YPrPb, DVI, VGA, S-Video, Composite	V-R72P-2HD $3999.00	-	V-R902DP-AFHD $4699.00	V-R901DP-AFHD $2699.00




Dual 8.4" | Stand-Alone 8.4" | Dual 10.4" | Stand-Alone 10.4"

1.44 TFT-MegaPixel™

Inputs	8.4" 800 x RGB x 600		10.4" 800 x RGB x 600	
VGA, DVI	V-R82DP-VGA $1799.00	V-R84DP-VGA $999.00	V-R102DP-VGA $1999.00	V-R104DP-VGA $1199.00
Composite 1, Composite 2	V-R82DP-2C $1999.00	V-R84DP-2C $1399.00	V-R102DP-2C $2499.00	V-R104DP-2C $1599.00
SDI 1, SDI 2	V-R82DP-2SDI $2999.00	V-R84DP-2SDI $1799.00	V-R102DP-2SDI $3399.00	V-R104DP-2SDI $1999.00
HDSDI/SDI	V-R82DP-HDSDI $3399.00	V-R84DP-HDSDI $2099.00	V-R102DP-HDSDI $3699.00	V-R104DP-HDSDI $2299.00
YPrPb, DVI, VGA, S-Video, Composite	V-R82DP-HDA $3099.00	V-R84DP-HDA $1999.00	V-R102DP-HDA $3399.00	V-R104DP-HDA $2199.00
SDI, YPrPb, DVI, VGA, S-Video, Composite	V-R82DP-SD $3699.00	V-R84DP-SD $2199.00	V-R102DP-SD $3999.00	V-R104DP-SD $2399.00
HDSDI/SDI, YPrPb, DVI, VGA, S-Video, Composite	V-R82DP-HD $4299.00	V-R84DP-HD $2499.00	V-R102DP-HD $4599.00	V-R104DP-HD $2699.00

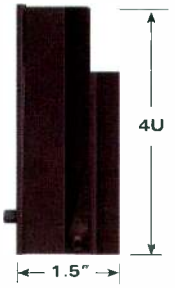
2.4 TFT-MegaPixel™

	8.4" 1024 x RGB x 768		10.4" 1024 x RGB x 768	
VGA, DVI	V-R842DP-XGA $2499.00	V-R841DP-XGA $1399.00	V-R1042DP-XGA $2799.00	V-R1041DP-XGA $1599.00
HDSDI/SDI, YPrPb, DVI, VGA, S-Video, Composite	V-R842P-AFHD $4999.00	V-R841P-AFHD $3899.00	V-R1042DP-AFHD $5299.00	V-R1041DP-AFHD $4499.00

TFT-MegaPixel™ High Definition Truck Edition Monitors

Perfect for broadcast trucks or video walls, Marshall Electronics' new Truck Edition monitors feature our award winning TFT-MegaPixel™ system and are a cost effective solution for numerous broadcast and professional video applications. Ready to rack mount in 4RU or 5RU, these monitors provide up to 20% more screen area than our competitors' LCD models that occupy the same rack space. This is in addition to the weight and power consumption benefits over similar CRT monitors. Each screen includes a single SDI/HDSDI input with loop-through output. Our HyperProcess™ de-interlacing algorithm employs motion compensation to display the smoothest moving images possible. All image formats are scaled to fit on screen in the highest possible resolution using our proprietary digital signal processing and state-of-the art LSI with ColorMatch™ conversion to emulate the SMPTE-C/EBU colorspace.

V-R902DP-TE | Dual 9" High Definition 800 x 480 Monitor Set with HDSDI Inputs



Display (Viewing Area)	9.0" Diagonal (7.75" H x 4.65" V) (196.8mm x 118.08mm)
Resolution (Pixels)	800 x RGB x 480
Pixel Pitch	0.246mm H x 0.246mm V
Brightness (in cd/m²)	400 cd/m²
Contrast Ratio	500:1
Inputs per panel	1 SDI/HDSDI (Multi-Rate Auto-Detect)
Dimensions	19.24" W x 7.0" H x 1.5" D (485.7mm x 177.8mm x 38.1mm)
Approx. Weight	6.2 lbs (2.80 kg)
Power Consumption	App. 50 Watt (5 Amp 12 VDC Class 2 Power Supply Included)

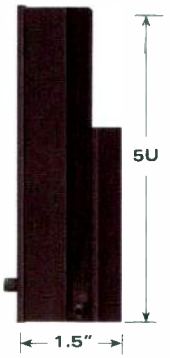
- 9.0" 1.2 TFT-MegaPixel™ High Definition Displays with 800 x RGB x 480 Resolution
- 100% Digital Processing (10-bit)
- 5 Year / 50,000 Hour Backlight
- High Resolution Scaling
- Wide Viewing Angle: 130° in all directions provides superior visibility
- 400 cd/m² Luminance produces enhanced image quality in a variety of lighting conditions
- 500:1 Black/White Contrast Ratio with response rates less than 25 ms resulting in the smoothest moving images
- Front panel controls for Brightness, Contrast and Color
- Two large color Tally Indicators

Price: $3899.00

1.2 TFT MEGAPIXEL

BACK LIGHT LIFE 50,000 HOURS

V-R1042DP-TE | Dual 10.4" High Definition 1024 x 768 Monitor Set with HDSDI Inputs



Display (Viewing Area)	10.4" Diagonal (8.3" H x 6.2" V) (211.2mm x 158.4mm)
Resolution (Pixels)	1024 x RGB x 768
Pixel Pitch	0.2055mm H x 0.2055mm V
Brightness (in cd/m²)	300 cd/m²
Contrast Ratio	700:1
Inputs per panel	1 SDI/HDSDI (Multi-Rate Auto-Detect)
Dimensions	19.24" W x 8.67" H x 1.5" D (485.7mm x 220.22mm x 38.1mm)
Approx. Weight	7.2 lbs (3.27 kg)
Power Consumption	50 Watt (5 Amp 12 VDC Class 2 Power Supply Included)

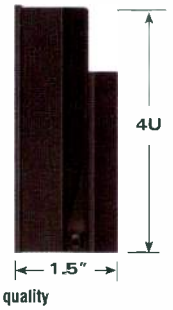
- 10.4" 2.4 TFT-MegaPixel™ High Definition Displays with 1024 x RGB x 768 Resolution
- 100% digital processing (10-bit)
- 5 Year / 50,000 Hour Backlight
- High Resolution Scaling
- Wide Viewing Angle: 170° in all directions provides unrivaled visibility
- 300 (cd/m²) Luminance produces enhanced image quality in a variety of lighting conditions
- 700:1 black/white Contrast Ratio with response rates less than 25 ms resulting in the smoothest moving images
- Front panel controls for Brightness, Contrast and Color
- Two large color Tally Indicators

Price: $4599.00

2.4 TFT MEGAPIXEL

BACK LIGHT LIFE 50,000 HOURS

V-R1042DP-TE4U | Dual 10.4" High Definition 1024 x 768 monitor set with HDSDI Inputs - 4RU Version



Display (Viewing Area)	10.4" Diagonal (8.3" H x 6.2" V) (211.2mm x 158.4mm)
Resolution (Pixels)	1024 x RGB x 768
Pixel Pitch	0.2055mm H x 0.2055mm V
Brightness (in cd/m²)	300 cd/m²
Contrast Ratio	700:1
Inputs per panel	1 SDI/HDSDI (Multi-Rate Auto-Detect)
Dimensions	19.24" W x 7.0" H x 1.5" D (485.7mm x 177.8mm x 38.1mm)
Approx. Weight	7.2 lbs (3.27 kg)
Power Consumption	App. 50 Watt (5 Amp 12 VDC Class 2 Power Supply Included)

- Thin Bezel - Fits in only 4RU
- 10.4" 2.4 TFT-MegaPixel™ High Definition Displays with 1024 x RGB x 768 resolution
- 100% Digital Processing (10-bit)
- 5 Year / 50,000 Hour Backlight
- High Resolution Scaling
- Wide Viewing Angle - 170° in any direction provides unrivalled visiblity
- 300 (cd/m²) Luminance produces enhanced image quality in a variety of lighting conditions
- 700:1 black/white Contrast Ratio with response rates less than 25 ms resulting in the smoothest moving images
- Brightness, Contrast and Color Controls on rear panel
- Two large color Tally Indicators

Price: $4799.00

2.4 TFT MEGAPIXEL

BACK LIGHT LIFE 50,000 HOURS

Marshall Electronics Rackmount Digital Audio Monitors with Dolby® Digital / Dolby-E® Capability

Marshall Electronics introduces the AR-DM Series Rackmount Digital Audio Monitors - high quality, ultra-nearfield audio monitoring systems for space critical environments with interchangeable input modules and field-upgradeable firmware capability.

Featuring five models - two 1RU and three 2RU units - the new AR-DM Series Digital Rackmount Audio Monitors are ideal for TV facilities, studios, post production, VTR bays, mobile production vehicles, satellite links, and wherever multichannel audio monitoring is required. All models support 16 audio channels with four slots for the available interchangeable input modules, including SDI/HDSDI with re-clocked loop through (8 stereo de-embedded channels), quad unbalanced BNC AES/EBU with loop through, and quad balanced AES/XLR to DB-25 with loop through. With 100% digital processing, Class D (digital) amplification, selectable stereo downmix modes, Dolby® Digital/Dolby-E® decoding capability (with optional Dolby-E module), a 1/4" headphone jack with Level control, and an RS-485 port for on-site firmware upgrades, the AR-DM Series provides pristine audio quality and unrivaled flexibility.

The AR-DM1 and AR-DM2 each provide tri-color LEDs for monitoring of signal presence and system status while the AR-DM1-B and AR-DM2-B provide 10 and 20-segment tri-color bargraphs respectively. Both VU and peak metering are supported. The flagship AR-DM2-L provides dual 4" high resolution 640xRGBx480 LCD monitors capable of displaying a wealth of information, including a high contrast, tri-color 16-bargraph display in one window while showing critical Metadata or Channel Status information in the other. Channel, Group, Mix, Dolby®, and Balance selection - along with saved configurations - are easily accessed via the system's large navigation buttons. For audio playback, 1RU units provide twin loudspeakers while 2RU models provide larger, high performance transducers plus a subwoofer.

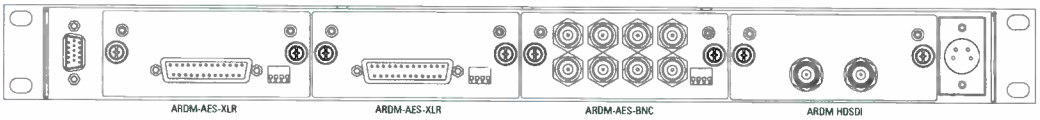
1RU

AR-DM1 - 16 Channel Digital Audio Monitor - 1RU Mainframe

AR-DM1-B - 16 Channel Digital Audio Monitor - 1RU Mainframe with Tri-Color LED Bar Graphs

- Only 1RU (1.75")
- User-Configurable with any 4 input modules plus Dolby® module
- 100% Digital Processing
- Class D Audio Amplification
- Dolby® Digital/Dolby-E® Decoding (with optional module)
- Selectable Stereo Down-Mix Modes
- 16 LED Indicators for channel presence (AR-DM1)
- 16 Tri-Color VU/PPM 10-Segment LED Bar Graphs (AR-DM1-B)
- RS-485 Port enables on-site firmware upgrades
- Balance and Volume Control
- 1/4" Headphone Jack

Rear View (Shown with Input Modules)



Available Input Modules:

- **ARDM-HDSDI** Single SD/HD-SDI (BNC)
- **ARDM-AES-BNC** Quad Unbalanced AES/EBU (BNC)
- **ARDM-AES-XLR** Quad Balanced AES/EBU (DB-25 to XLR)

Dolby® Digital / Dolby-E®

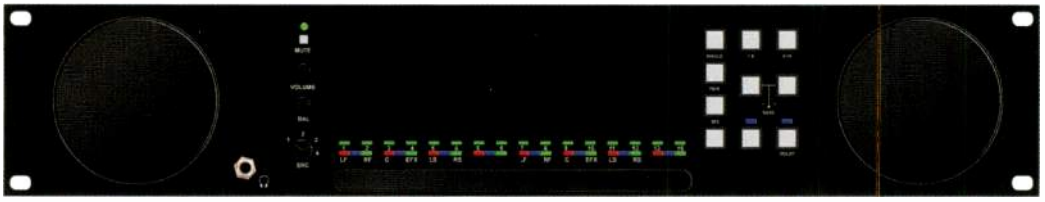
- **Optional Dolby Digital / Dolby-E Decoder Module** (Installed in mainframe)

MIX & MATCH Input Modules

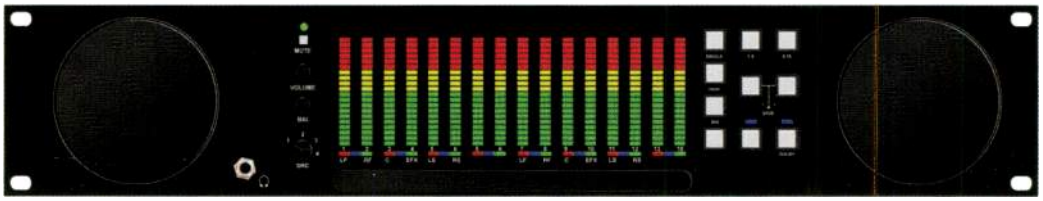
® Dolby is a registered trademark of Dolby Laboratories

2RU

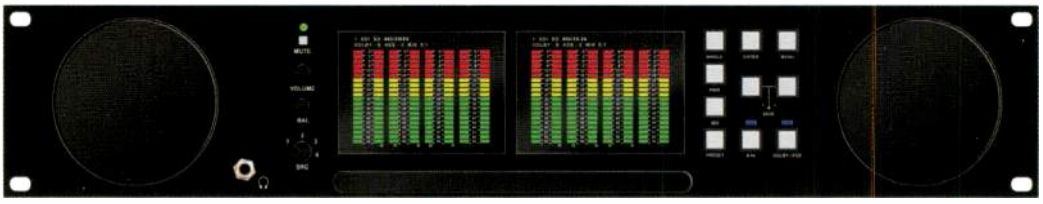
AR-DM2 - 16 Channel Digital Audio Monitor - 2RU Mainframe



AR-DM2-B - 16 Channel Digital Audio Monitor - 2RU Mainframe with Tri-Color LED Bar Graphs

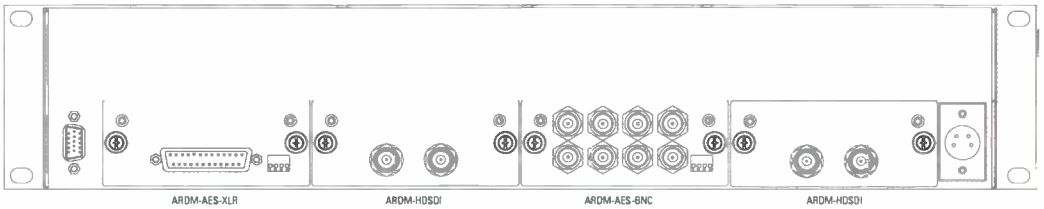


AR-DM2-L - 16 Channel Digital Audio Monitor - 2RU Mainframe with Dual High-Resolution LCD Displays



- User-Configurable with any 4 input modules plus Dolby® module
- 100% Digital Processing
- Class D Audio Amplification
- Powerful Stereo Speakers and Subwoofer
- Dolby® Digital/Dolby-E® Decoding (with optional module)
- Selectable Stereo Down-Mix Modes
- 16 LED Indicators for channel presence (AR-DM2)
- 16 Tri-Color VU/PPM 20-Segment LED Bar Graphs (AR-DM2-B)
- 2 High Resolution LCD Displays capable of displaying meters, metadata, channel status, and more (AR-DM2-L)
- RS-485 Port enables on-site firmware upgrades
- Balance and Volume Control
- 1/4" Headphone Jack

Rear View (Shown with Input Modules)



Available Input Modules:

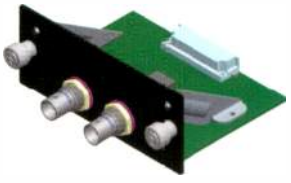
- **ARDM-HDSDI** Single SD/HD-SDI (BNC)
- **ARDM-AES-BNC** Quad Unbalanced AES/EBU (BNC)
- **ARDM-AES-XLR** Quad Balanced AES/EBU (DB-25 to XLR)

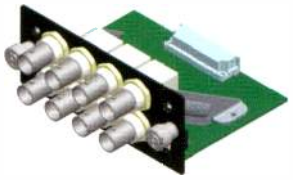
Dolby® Digital / Dolby-E®

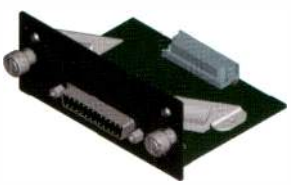
- Optional Dolby Digital / Dolby-E Decoder Module (Installed in mainframe)

MIX & MATCH Input Modules

Input Modules







ARDM-HDSDI

- Multi-Rate SDI/HDSDI Video Input (Auto-Detect)
- Re-Clocked SDI/HDSDI Loop-Through Output
- SDI: SMPTE 259M-C (270Mbps)
- HDSDI: SMPTE 292M (1.385, 1.485/1.001Gbps)
- Supports 8 Stereo Embedded Channels or Dolby® Multi-Channel Decoding with optional module

ARDM-AES-BNC

- 4 Unbalanced AES/EBU Inputs (BNC)
- 4 Passive Loop-Through Outputs (BNC)
- Supports 4 Stereo Channels or Dolby® Multi-Channel Decoding with optional module

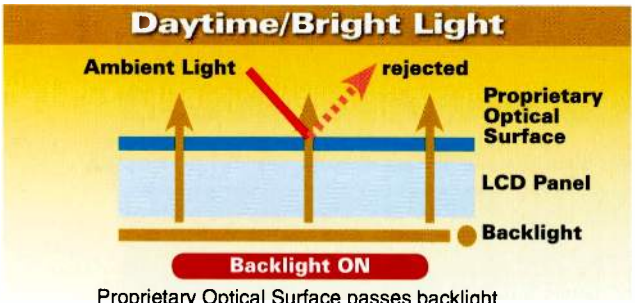
ARDM-AES-XLR

- 4 Balanced AES/EBU stereo inputs (DB-25)
- 4 Passive Loop-Through Outputs (DB-25)
- DB-25 to 8 XLR Break-Out Cable included
- Supports 4 Stereo Channels or Dolby® Multi-Channel Decoding with optional module

Included Break-Out Cable

SunBrite - Outdoor High Definition / Standard Definition Monitors

Marshall Electronics introduces a new line of SunBrite Monitors, designed specifically for outdoor applications with high ambient light. SunBrite monitors feature an innovative technology incorporating a proprietary optical design. It dramatically boosts the efficiency of the backlight's light utilization and minimizes the surface reflection of ambient light. The transmissive LCDs produce high-contrast images, even in challenging outdoor lighting conditions. This technology features a much wider color reproduction range than typical transflective/reflective LCDs or LCDs with increased backlight performance.



Proprietary Optical Surface passes backlight, but rejects ambient light.

Proprietary Optical Surface passes backlight.

V-LCD65SB-SDA

6.5" SunBrite Standard Definition LCD Monitor with SD Component and Composite Inputs. Ideal as a field monitor with direct access to advanced features such as Aspect Ratio, Screen Markers, Safe Area, Blue Only, Monochrome mode and more. Screen resolution is 640 x RGB x 480.

V-LCD84SB-AFHD

8.4" SunBrite High Definition LCD Monitor with Composite, S-Video, SD/HD Component, SDI/HDSDI, VGA, and DVI inputs. Advanced features include Aspect Ratio, Screen Markers, Safe Area, Blue Only, Monochrome mode, Color Temperature settings, User Presets and more. Screen resolution is 800 x RGB x 600.

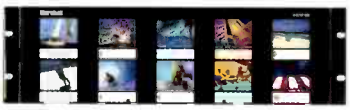
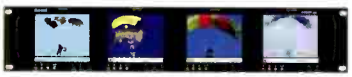
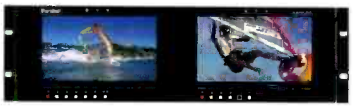
V-LCD15SB-AFHD-DT

15" SunBrite High Definition LCD Monitor with Composite, S-Video, SD/HD Component, SDI/HDSDI, VGA, and DVI inputs. Advanced features include Aspect Ratio, Screen Markers, Safe Area, Blue Only, Monochrome mode, Color Temperature settings, User Presets, and more. Includes desktop stand. Screen resolution is 1024 x RGB x 768.

Composite

	Display	# of Displays	Rack Spaces (Rack Depth)	Resolution (Backlight in cd/m² luminance)	Video Inputs per Display (Total)						Audio Inputs				Tally	Features	Price
					S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	SDI Embedded	AES/EBU	Balanced XLR	Unbalanced RCA			
V-R18P 	1.8"	8	1RU D(11")	480 x 234 (250)		1 (8)										N	• The ONLY tiltable rack on the market with 3 displays in 1RU! • High Resolution LCD Panels • Active Loop-Through Outputs • NTSC/PAL Auto-Recognition	$2299.00
V-R25P 	2.5"	10	3RU D(2.65")	480 x 234 (250)		1 (10)										N	• The ONLY rack on the market with 10 displays in 3RU! • High Resolution LCD Panels • Active Loop-Through Outputs • NTSC/PAL Auto-Recognition • Blue screen when signal not present	$3299.00
V-R43P 	4"	3	2RU D(1.9")	480 x 234 (300)		2 (6)										Y	• Ultra-Compact: Only 2RU • Active Loop-Through Outputs • NTSC/PAL Auto-Recognition • Low Cost	$1299.00
V-R44P 	4"	4	2RU D(1.9")	480 x 234 (300)		1 (4)										Y	• Ultra-Compact: Only 2RU • Active Loop-Through Outputs • NTSC/PAL Auto-Recognition • Low Cost	$1699.00
V-R53P 	5"	3	3RU D(2.5")	960 x 234 (350)		2 (6)				1 (3)						Y	• High Resolution LCD Panels • VGA Input on each display • Built-in Color Bar Generator • Active Loop-Through Outputs • NTSC/PAL Auto-Recognition	$2249.00
V-R563P 	5.6"	3	3RU D(2.5")	960 x 234 (350)		2 (6)										Y	• High Resolution LCD Panels • Built-in Color Bar Generator • Blue screen when signal not present	$1799.00
V-R63P 	5.8" wide	3	3RU D(2.5")	1200 x 234 (350)		2 (6)										Y	• Wide Screen High Resolution Panels • 16:9/4:3 Aspect Ratio Selectable • Blue screen when signal not present • Input settings stored in memory during power cycle • NTSC/PAL Selectable • Active Loop-Throughs / Bar Generator	$3099.00
V-R72DP-2C 	7" wide	2	3RU D(2.5")	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL		2 (4)										Y	• 1.2 TFT-MegaPixel™ 7" Wide Screen • 800 x RGB x 480 Dots with 1.2 million pixels • 100% Digital Processing • Bright 380 cd/m² luminance • 400:1 Contrast Ratio • 16:9/4:3 Selectable • Built-in Color Bar Generator	$1999.00
V-R72DP 	7" wide	2	3RU D(2.5")	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL		2 (6)										Y	• 1.2 TFT-MegaPixel™ 7" Wide Screen • 800 x 480 Dots with 1.2 Million Pixels • 100% Digital Processing • High Brightness: 380 cd/m² Luminance • 400:1 Contrast Ratio • Built-In Router: Any of 6 inputs on any display • Each display can sequence through all active inputs	$2995.00
V-R82DP-2C 	8.4"	2	4RU D(1.5")	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL		2 (4)										Y	• 1.44 TFT-MegaPixel™ 8" Screen • HyperProcess™ plus ColorMatch™ Conversion • 50 000 Hour Backlight • High Brightness: 500 (cd/m²) • Composite displayed as 10-bit digital • On-Screen Display (OSD) and "Blue Gun"	$1999.00
V-R1020P-2C 	10.4"	2	5RU D(1.5")	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL		2 (4)										Y	• Large 10.4" 1.44 TFT-MegaPixel™ • More screen area in less space than 9" CRT • Hyper Process plus Match Color Conversion • 50,000 Hour Backlight • Composite displayed 10-bit digital • On-Screen Display (OSD) and "Blue Gun"	$2499.00
V-R151P 	15.1"	1	6RU D(2.25")	1024 x 768 x RGB (250)	1	1				1					2	Y	• Compact: A 15" Display in Only 6RU • High Resolution LCD Panel • Built-In 125 Channel Cable-Ready TV Tuner (NTSC only) • Built-In Speakers • NTSC/PAL Auto-Recognition	$2199.00

LCD Racks
SDI

Display	# of Displays	Rack Spaces (Rack Depth)	Resolution (Backlight in cd/m² luminance)	Video Inputs per Display (Total)						Audio Inputs				Tally	Features	Price
				S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	SDI Embedded	AES/EBU	Balanced XLR	Unbalanced RCA			
V-R18P-SDI																	
	1.8"	8	1RU D(11")	480 x 234 (250)			1 (8)								N	• The ONLY tiltable rack on the market with 8 SDI displays in 1RU! • High Resolution LCD Panels • Active Re-Clocked Loop-Through Output • NTSC/PAL Auto-Recognition	$3599.00
V-R25P-SDI																	
	2.5"	10	3RU D(2.65")	480 x 234 (250)			1 (10)								N	• The ONLY rack on the market with 10 SDI displays in 3RU! • High Resolution LCD Panels • Active Re-Clocked Loop-Through Output • NTSC/PAL Auto-Recognition	$4599.00
V-R44DP-SDI																	
	3.5"	4	2RU D(1.9")	640 x 480 x RGB (250) 1 TFT MEGAPIXEL			1 (4)								Y	• Four 3.5" High Definition 4:3 Displays • 100% Digital Processing • Widest Quad-Screen Viewing Angle available: 130° • Brightest Quad-Screen available: 380(cd/m²) • 4:3/16:9/4:3-cropped DTV Aspect Ratios • On-Screen Display (OSD) and "Blue Gun"	$2999.00
V-R53P-SDI																	
	5"	3	3RU D(2.5")	960 x 234 (350)	1 (3)		1 (3)		1 (3)						Y	• High Resolution LCD Panels • Active Loop-Through for Composite and SDI • Built-in Color Bar Generator • Blue Screen when signal not present • Each channel has SDI to Composite D/A Converter • NTSC/PAL Auto-Recognition • Input configuration is stored in memory when unit is off	$3399.00
V-R563P-SDI																	
	5.6"	3	3RU D(2.5")	960 x 234 (350)	1 (3)		1 (3)								Y	• High Resolution LCD Panels • Built-In Color Bar Generator • Each channel has10-bit SDI to Composite D/A Converter	$2799.00
V-R63P-SDI																	
	5.8" wide	3	3RU D(2.5")	1200 x 234 (300)	1 (3)		1 (3)								Y	• Wide Screen High-Resolution Panels with 16:9/4:3 Selectable Aspect Ratio • Each channel has 10-bit D/A converter • Blue screen when signal not present • Input config. stored in memory, when unit is off • NTSC/PAL configuration switch • Active loop through; Bar Generator	$3699.00
V-R72P-2SD																	
	7" wide	2	3RU D(2.5")	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)	1 (2)							Y	•1.2 TFT-Megapixel 7-inch wide screen with 800 x 480 x RGB Dots • 100% digital processing • Bright 380 cd/m² luminance • 400:1 ratio of contrast between black and white • 4:3 and 16:9 screen aspect ratios • Standard multiformat inputs • Built-in Color Bars	$2899.00
V-R82DP-2SDI																	
	8.4"	2	4RU D(1.5")	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL			2 (4)								Y	• 1.44 million TFT-MegaPixel / 8.4 inch screens • 100% digital processing • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$2999.00
V-R82DP-SD																	
	8.4"	2	4RU D(1.5")	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)					Y	• 1.44 million TFT-MegaPixel / 8.4 inch screens • SDI plus all HD/SD analog signals • Hyper Process plus Match Color Conversion • 50,000 hour backlight life • 500 (cd/m²) brightness • On Screen Display (OSD) and "Blue Gun"	$3699.00
V-R102DP-2SDI																	
	10.4"	2	5RU D(1.5")	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL			2 (4)								Y	• Large 10.4- inch screens /1.44 TFT-MegaPixel • 100% digital processing • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness • On Screen Display (OSD) and "Blue Gun"	$3399.00
V-R102DP-SD																	
	10.4"	2	5RU D(1.5")	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)					Y	• Large 10.4- inch screens /1.44 TFT-MegaPixel • SDI plus all HD/SD analog formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$3999.00

LCD Racks
SDI

	Display	# of Displays	Rack Spaces (Rack Depth)	Resolution (Backlight in cd/m² luminance)	Video Inputs per Display (Total)						Audio Inputs				Tally	Features	Price
					S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	SDI Embedded	AES/EBU	Balanced XLR	Unbalanced RCA		
V-R151DP-AFSD NEW 	15"	1	6RU D(1.77")	1024 x 768 x RGB (500) 2.4 TFT MEGAPIXEL	1	1	1	1		1	1				Y	• High Resolution display - 1024 x RGB x 768 dots with 2.4 million pixels. • 16.7 million colors • Wide viewing angle - 150° in all directions provides excellent off-axis visibility. • 500 cd/m² luminance provides enhanced image quality in a variety of lighting conditions. • 450:1 contrast ratio with response rates less than 25 ms result in the smoothest motion.	$1799.00
V-R191P-SDI 	19"	1	8RU D(2.5")	1280 x 1024 x RGB (300)	1	1		1		1					Y	• High Resolution LCD panel,1280 x 1024 pixels. 1,310,720 total • CRT style viewing radius - 170° in any direction provides superior visibility • 500:1 contrast ratio, 4:3 and 16:9 screen aspect ratios for DTV operations • Standard multiformat inputs: composite, Y/C and SDI with active loop-through plus VGA/XGA input with automatic scaling • SDI input with standard 10-bit composite output is provided using 12-bit Digital to Analog processing • Three color tally indicators	$3995.00

LCD Racks
High Definition

V-R44P-HDSDI 	3.5"	4	2RU D(1.5")	640 x 480 x RGB (250) 1 TFT MEGAPIXEL					1 (4)						Y	• Four 3.5-inch Advanced Definition 4:3 screens • Bright 250 cd/m² luminance • 350:1 ratio of contrast between black and white • 4:3 and 16:9 screen aspect ratios for DTV applications • Works with all SMPTE/ITU SDI/HDSDI production formats and frame rates	$3999.00
V-R653P-HDSDI 	6.5" wide	3	3RU D(2.5")	800 x 480 x RGB (500) 1.2 TFT MEGAPIXEL					1 (3)						Y	• 3 High Resolution 6.5-inch 1.2 TFT-MegaPixel wide screens • 100% digital processing • Bright 500 cd/m² luminance • 500:1 ratio of contrast between black and white • 4:3 and 16:9 screen aspect ratios • Works with all SMPTE/ITU SDI/HDSDI production formats and frame rates	$3999.00
V-R72P-2HDA 	7" wide	2	3RU D(1.5")	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)				1 (2)				Y	• 2 High Resolution 7-inch 1.2 TFT-MegaPixel wide screens • Analog Signals converted to 10 bit digital • Bright 380 cd/m² luminance • 400:1 ratio of contrast between black and white • 4:3 and 16:9 screen aspect ratios • Works with all SMPTE/ITU SDI/HDSDI production formats and frame rates	$2899.00
V-R72P-2HDSDI 	7" wide	2	3RU D(1.5")	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL					1 (2)						Y	• 2 High Resolution 7-inch 1.2 TFT-MegaPixel wide screens • 100% digital processing • Bright 380 cd/m² luminance • 400:1 ratio of contrast between black and white • 4:3 and 16:9 screen aspect ratios • Works with all SMPTE/ITU SDI/HDSDI production formats and frame rates	$2999.00
V-R72P-2HD 	7" wide	2	3RU D(2.5")	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)		1 (2)						Y	• 2 High Resolution 7-inch 1.2 TFT-MegaPixel wide screens • 100% digital processing • Bright 380 cd/m² luminance • 400:1 ratio of contrast between black and white • 4:3 and 16:9 screen aspect ratios • Works with all production formats and frame rates	$3999.00
V-R82DP-HDA 	8.4"	2	4RU D(1.65")	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)			1 (2)	1 (2)				Y	• 1.44 million TFT-MegaPixel / 8.4 inch screens • Accepts all analog HD/SD formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$3099.00

LCD Racks

High Definition

	Display	# of Displays	Rack Spaces (Rack Depth)	Resolution (Backlight in cd/m² luminance)	Video Inputs per Display (Total) S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	Audio Inputs SDI Embedded	AES/EBU	Balanced XLR	Unbalanced RCA	Tally	Features	Price
V-R82DP-HDSDI	8.4"	2	4RU D(1.65")	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL					1 (2)							Y	• 1.44 million TFT-MegaPixel / 8.4 inch screens • 100% digital processing of HDSDI/SDI • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$3399.00
V-R82DP-HD	8.4"	2	4RU D(1.5")	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)		1 (2)	1 (2)	1 (2)					Y	• 1.44 million TFT-MegaPixel / 8.4 inch screens • Accepts all HD/SD formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$4299.00
V-R842P-AFHD	8.4"	2	4RU D(2.16")	1024 x 768 x RGB (400) 2.4 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)		1 (2)	1 (2)	1 (2)					Y	• High Definition Resolution 8.4-inch 2.4 TFT-MegaPixel screen • Analog Signals converted to 10 bit digital • Bright 400 cd/m² luminance • 400:1 ratio of contrast between black and white • Build-in Color Bar Generator • Standard Multiformat Inputs • Blue Gun for color adjustment • Zoom function • Build-in Color Bars • 6 Frame Marker Overlays with Center Mark	$4999.00
V-R902DP-AFHD NEW	9" wide	2	4RU D(1.5")	800 x 480 x RGB (400) 1.15 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)		1 (2)	1 (2)	1 (2)					Y	• High Resolution wide screen 800 x 480 RGB Dots with 1.15 million pixels • 16.7 million colors • Wide viewing angles - 160°-RL , 140° UD provides superior visibility when the viewer is not directly in front of the screen. • Bright 400 candelas per square meter (cd/m²) luminance produces enhanced image quality in varying light and viewing conditions. • 500:1 contrast ratio with response rates less than 23 ms	$4699.00
V-R102DP-HDA	10.4"	2	5RU D(1.5")	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)				1 (2)					Y	• Large 10.4- inch screens /1.44 TFT-MegaPixel • Accepts all analog HD/SD formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$3399.00
V-R102DP-HDSDI	10.4"	2	5RU D(1.5")	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL					1 (2)							Y	• Large 10.4- inch screens /1.44 TFT-MegaPixel • 100% digital processing of HDSDI/SDI • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$3699.00
V-R102DP-HD	10.4"	2	5RU D(1.5")	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)		1 (2)	1 (2)	1 (2)					Y	• Large 10.4- inch screens /1.44 TFT-MegaPixel • Accepts all HD/SD formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$4599.00
V-R1042DP-AFHD NEW	10.4"	2	5RU D(2.5")	1024 x 768 x RGB (300) 2.4 TFT MEGAPIXEL	1 (2)	1 (2)	1 (2)		1 (2)	1 (2)	1 (2)					Y	• High Resolution wide screen 1024 x 768 RGB Dots with 2.4 million pixels • 16.7 million colors • Wide viewing angles - 160°-RL , 140° UD provides superior visibility when the viewer is not directly in front of the screen • Bright 300 candelas per square meter (cd/m²) luminance produces enhanced image quality in varying light and viewing conditions • 700:1 contrast ratio with response rates less than 23 ms results in excellent quality for moving images	$5299.00
V-R151DP-AFHD NEW	15"	1	6RU D(1.77")	1024 x 768 x RGB (500) 2.4 TFT MEGAPIXEL	1	1	1		1	1	1					Y	• High Resolution display - 1024 x RGB x 768 dots with 2.4 million pixels • 16.7 million colors • Wide viewing angle - 150° in all directions provides excellent off-axis visibility • 500 cd/m² luminance provides enhanced image quality in a variety of lighting conditions. • 450:1 contrast ratio with response rates less than 25 ms result in the smoothest motion	$1999.00

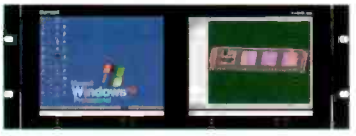
LCD Racks

High Definition

Display	# of Displays	Rack Spaces (Rack Depth)	Resolution (Backlight in cd/m² luminance)	Video Inputs per Display (Total) S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	Audio Inputs SDI Embedded	AES/EBU	Balanced XLR	Unbalanced RCA	Tally	Features	Price
V-R171P-HDA																	
																	
17"	1	7RU D(3")	1280 x 1024 x RGB (300)	1	1	1			1	1					Y	• SXGA 1280 x 1024 pixels, 16.7 million colors • Compact - fits in EIA standard rack 8U high • VESA 75 mount for wall, Ceiling or desk top • 170° CRT style viewing angles • V-Mount battery adapter • Composite/Component/DVI/VGA inputs	$2995.00
V-R171P-AFHD																	
																	
17" wide	1	6RU D(2.5")	1280 x 768 x RGB (450)	1	1	1		1	1						Y	• Rack mount and Desktop configurations • High Resolution wide screen 1280 x 768 Dots • Bright 450 cd/m² luminance • CRT style viewing radius - 170° in any direction • 500:1 contrast ratio • Pixel response less than 23 ms • 16:9 and 4:3 screen aspect ratios • Built-in Color Bar Generator • 6 Frame Marker Overlays with Center Mark	$2999.00
V-R231P-AFHD																	
																	
NATIVE RESOLUTION																	
23" wide	1	6RU D(2.5")	1920 x 1200 x RGB (250)	1	1	1		1	1	1					Y	• Totally Digital WUXGA 6.9 Megapixel 1920 x 1200 display • Native HD/SD screen formats (640 720, 1080 vertical lines) in TFT Pixel-to-Pixel™ mode • CRT style viewing radius - 176° in any direction • Bright 250 cd/m² luminance in any direction • 500:1 contrast ratio • 16:9 and 4:3 screen aspect ratios • All analog signals internally converted to 24 bit component digital with 5 line adaptive filter • 6 Frame Marker Overlays with Center Mark	$5999.00
NATIVE RESOLUTION 920 x 1080 DISPLAY										HDMI HIGH DEFINITION MULTIMEDIA INTERFACE				HDCP®			

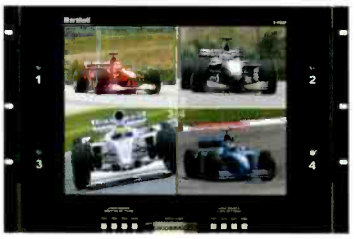
LCD Racks

DVI/VGA

V-R44P-DVI NEW																	
																	
4"	4	2RU D(1.9")	640 x 480 x RGB (250)							1 (4)					Y	• Four 3.5-inch High Definition 4:3 screens • 100% digital processing of DVI/VGA signals • Widest quad screen viewing radius available - 130° • Brightest quad screen available - 380(cd/m²) • 4:3, 16:9, and 4:3 of 16:9 DTV aspect ratios • On Screen Display (OSD) and "Blue Gun"	$3599.00
1 TFT MEGAPIXEL																	
V-R82DP-VGA																	
																	
8.4"	2	4RU D(1.5")	800 x 600 x RGB (500)						1 (2)	1 (2)					N	• For PC signals up to SXGA resolution (1280x1024) • 1.44 million TFT-MegaPixel / 8.4 inch screens • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$1799.00
1.44 TFT MEGAPIXEL																	
V-R842DP-XGA NEW																	
																	
8.4"	2	4RU D(1.5")	1024 x 768 x RGB (400)						1 (2)	1 (2)					N	• For PC signals up to SXGA resolution (1280x1024) • 1.44 million TFT-MegaPixel / 8.4 inch screens • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 400 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$2499.00
2.4 TFT MEGAPIXEL																	
V-R102DP-VGA																	
																	
10.4"	2	5RU D(1.5")	800 x 600 x RGB (600)						1 (2)	1 (2)					N	• For PC signals up to SXGA resolution (1280x1024) • Large 10.4 inch High Res screens • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$1999.00
1.44 TFT MEGAPIXEL																	
V-R1042DP-XGA NEW																	
																	
10.4"	2	5RU D(1.5")	1024 x 768 x RGB (300)						1 (2)	1 (2)					N	• For PC signals up to SXGA resolution (1280x1024) • Large 10.4 inch High Res screens • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 300 (cd/m²) brightness modification • On Screen Display (OSD) and "Blue Gun"	$2799.00
2.4 TFT MEGAPIXEL																	

LCD Racks

Quads

Display	# of Displays	Rack Spaces (Rack Depth)	Resolution (Backlight in cd/m² luminance)	Video Inputs per Display (Total)						Audio Inputs				Tally	Features	Price
				S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	SDI Embedded	AES/EBU	Balanced XLR	Unbalanced RCA			
V-R151P-4A																	
																	
15.1"	1	6RU D(2.25")	1024 x 768 (250)	1	4				1					N	• Compact - only 6U for 15" LCD • Hi Res LCD panel • Built-in Quad Splitter with on screen display • Freeze-zoom function and PIP capability • Available in NTSC or PAL config. (V-R151P-4A-PAL)	$2699.00
V-R154P																	
																	
15.1"	1	8RU D(3.33")	1024 x 768 x RGB (250)	1	4				1				8	Y	• Hi Resolution LCD panel • Built-in 125 channel cable ready TV tuner (NTSC only) • Built-in speakers • Built-in Quad Splitter with on screen display • Freeze-zoom function and PIP capability • Built-in audio bar graph display • Headphone output • Available in NTSC or PAL config. (V-R154P-PAL)	$4995.00
V-RD151-4																	
																	
15.1"	1	1RU D(22")	1024 x 768 x RGB (250)	1	4				1				2	N	• High Resolution 1024 x 768 pixels, 786,432 total • Bright 250 cd/m² luminance • 4 Video inputs with 75Ω termination and active loop through feature • Ultra-compact design fits in EIA standard rack 1U high • Built-in Quad Splitter/Sequential Switcher • Available in NTSC or PAL format • Key lock for secure transportation	$2699.00
V-R171P-4A																	
																	
17"	1	8RU D(3")	1024 x 768 x RGB (250)	1	4				1				2	N	• High Resolution 17" LCD monitor • Best viewing angle in the Industry - 170° in any direction • Menu driven 4:3 or 16:9 ratio switch • Built-in Quad Splitter with on-screen display • Freeze-zoom function and PIP capability • With optional HDSDI to VGA converter can accept 1080i or 720p • Only 2.5" deep • Available in NTSC or PAL config. (V-R171P-4A-PAL)	$2699.00

LCD Racks

Audio + Video

Display	# of Displays	Rack Spaces (Rack Depth)	Resolution (Backlight in cd/m² luminance)	Video Inputs per Display (Total)						Audio Inputs				Tally	Features	Price
				S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	SDI Embedded	AES/EBU	Balanced XLR	Unbalanced RCA			
V-R81PA																	
																	
7.9"	1	4RU D(2.65")	1400 x 234 (350)	1	2								4	Y	• Built-in speakers / Headphone output • Ability to choose any audio input to any speaker independently • NTSC/PAL auto recognition • 4 channel bar graph display • Low cost	$1999.00
V-R71PA-SDI																	
																	
7" wide	1	3RU D(2.65")	1440 x 234 (400)	1	1		1				4	2	4	N	• Wide Screen Hi Res panel with 16:9 to 4:3 ratio switch • Accepts all types of audio/video inputs • 4 channel high res bar graph display • NTSC/PAL auto detection • Active loop through; Bar Generator • Revolutionary Class D digital audio amplifier offers 5W per channel	$3299.00

LCD Racks

Pull-Out Drawers

V-RD151-4

V-RD151P

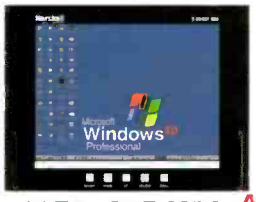
V-RD171P-HDA

Display	# of Displays	Rack Spaces (Rack Depth)	Resolution (Backlight in cd/m² luminance)	Video Inputs per Display (Total): S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	Audio Inputs: SDI Embedded	AES/EBU	Balanced XLR	Unbalanced RCA	Tally	Features	Price
15.1"	1	1RU D(22")	1024 x 768 x RGB (250)	1	4				1					2	N	• High Resolution 1024 x 768 pixels, 786,432 total • Bright 250 cd/m² luminance • 4 Video inputs with 75Ω termination and active loop through feature • Ultra-compact design fits in EIA standard rack 1U high • Built-in Quad Splitter/Sequential Switcher • Key lock for secure transportation • Available in NTSC or PAL config. (V-RD151-4-PAL)	$2699.00
15.1"	1	1RU D(22")	1024 x 768 x RGB (250)	1	1				1					2	N	• High Resolution 1024 x 768 pixels, 786,432 total • Bright 250 cd/m² luminance • Video and S-Video inputs with 75Ω termination and active loop through feature • Ultra-compact design fits in EIA standard rack 1U high • Built-in Speakers • NTSC/PAL recognition • Key lock for secure transportation	$2199.00
17"	1	1RU D(22")	1280 x 1024 x RGB (300)	1	1	1			1	1				2	N	• SXGA (1280 x 1024 pixels, 16.7 million colors • Compact - fits in EIA standard rack 8U high • VESA 75 mount for wall, Ceiling or desk top • 170° CRT style viewing angles • V-Mount battery adapter • Composite/Component/DVI/VGA inputs	$2995.00

Monitors

VGA

V-R84DP-VGA



V-R841DP-XGA NEW

V-R104DP-VGA

V-R1041DP-XGA NEW

Display	Resolution (Backlight in cd/m² luminance)	Inputs: S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI	Audio	Dimentions	Tally	Features	Price
8.4"	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL						1	1		9.1" x 6.875" x 2.5"	N	• Easy to View 8.4-inch screen • 100% digital processing • 5 Year /50,000 backlight life • 10 bit Analog to Digital conversion • Wide viewing angle - 130° • 500 (cd/m²) luminance • Response rates less than 25 ms • 4:3 and 16:9 screen aspect ratios • Direct access for all adjustments • Durable metal enclosure • Configurable ¼ 20 Mounting	$999.00
8.4"	1024 x 768 x RGB (400) 2.4 TFT MEGAPIXEL						1	1		9.0" x 6.875" x 2.5"	N	• Easy to View 8.4-inch screen • 100% digital processing • 5 Year /50,000 backlight life • 10 bit Analog to Digital conversion • Wide viewing angle - 130° • 400 (cd/m²) luminance • Response rates less than 25 ms • 4:3 and 16:9 screen aspect ratios • Direct access for all adjustments • Durable metal enclosure • Configurable ¼ 20 Mounting	$1399.00
10.4"	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL						1	1		10.25" x 8.5" x 2.5"	N	• Large 10.4-inch screen • 100% digital processing • 5 Year /50,000 backlight life • 10 bit Analog to Digital conversion • Wide viewing angle - 130° • 600 (cd/m²) luminance • 500:1 contrast ratio • Response rates less than 25 ms • Direct access for all adjustments • Durable metal enclosure • Configurable ¼ 20 Mounting • Operates on 12VDC	$1199.00
10.4"	1024 x 768 x RGB (300) 2.4 TFT MEGAPIXEL						1	1		10.25" x 8.5" x 2.5"	N	• Large 10.4-inch screen • 100% digital processing • 5 Year /50,000 backlight life • 10 bit Analog to Digital conversion • Wide viewing angle - 130° • 300 (cd/m²) luminance • 500:1 contrast ratio • Response rates less than 25 ms • Direct access for all adjustments • Durable metal enclosure • Configurable ¼ 20 Mounting • Operates on 12VDC	$1599.00

Composite

	Display	Resolution (Backlight in cd/m² luminance)	Inputs: S-Video	Inputs: Composite	Inputs: Component HD/SD	Inputs: SDI	Inputs: HDSDI/SDI	Inputs: VGA	Inputs: DVI (HDMI w/Adapter)	Inputs: Audio	Dimentions	Tally	Features	Price
V-LCD3.5-PRO 	3.5"	480 x 234 (250)		1							3.62" x 3.32" x 0.95"	N	• High resolution LCD Panel • Bright 250 cd/m² luminance • NTSC only • Miniature and lightweight package • Optional stand • Optional Power Supply (V-PS12-500) • Weighs only 0.32 lbs	$399.00
V-LCD4-PRO-L 	4"	480 x 234 (250)		2							5.51" x 3,62" x 1.81"	N	• Heavy Duty compact metal cabinet with brushed aluminum finish has 1/4" mount for ease of installation • Switchable dual video BNC inputs • Color, tint, contrast and brightness control • Wide viewing angle • Active loop through feature • Weighs only 0.92 lbs	$399.00
V-LCD4-PRO-L-KIT 	4"	480 x 234 (250)		2							5.51" x 3,62" x 1.81"	N	**Kit includes:** • V-LCD4-PRO-L • Weather Proof Caring Case • High Capacity Battery • Charger • Can run up to 1 hour and 20 min on the battery	$474.00
V-LCD5.6-PRO 	5.6"	960 x 234 (250)		1						1	6.4" x 5,3" x 2.0"	N	• Plastic cabinet with 1/4" mount • Side mounted volume, color, contrast and brightness controls • Mirror Mode • Power supply and adapter cables included • Built-in speaker • Measures 6.4"W x 5.3"H x 2.0"D • Weighs only 1.14 lbs	$399.00
V-LCD5.6-PRO-KIT 	5.6"	960 x 234 (250)		1						1	6.4" x 5,3" x 2.0"	N	**Kit includes:** • LCD5.6-PRO • Padded Caring Case • High Capacity Battery • Charger • Cables • Can run up to 1 hour and 45 min on the battery	$429.00
V-ASL7070 	7" wide	1440 x 234 (200)		1						2	7" x 4,75" x 1.0"	N	• Low Cost Wide Screen Field Monitor • NTSC/PAL System Selectable • Mirror Mode • Headphone Jack with volume control • IR Audio for wireless headphone • On Screen Display (OSD) for adjustment functions	$499.00

Composite

	Display	Resolution (Backlight in cd/m²) luminance)	Inputs: S-Video	Inputs: Composite	Inputs: Component HD/SD	Inputs: SDI	Inputs: HDSDI/SDI	Inputs: VGA	Inputs: DVI (HDMI w/Adapter)	Inputs: Audio	Dimentions	Tally	Features	Price
V-R70DP 	7" wide	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL	1	2							7.60" x 5.16" x 2.16"	Y	• High Resolution 7-inch wide screen 800xRGBx480 Dots with 1.2 million pixels • Optical grade polycarbonate screen cover • Analog signals converted to 10 bit digital • Bright 380 cd/m² luminance • 400:1 ratio of contrast between black and white luminance • 4:3 and 16:9 screen aspect ratios • "V" Mount battery adapter included • Built in Color Bars • Blue Screen for color adjustment	$999.95
V-ASL8080 	8"	640 x 480 x RGB (380)		2						2	7.8" x 5.8" x 1.3"	N	• Low Cost Screen Field Monitor • NTSC/PAL System Selectable • Mirror Mode • Headphone Jack with volume control • On Screen Display (OSD) for adjustment functions	$529.00
V-LCD8-PRO 	7.9"	1440 x 234 (350)	1	1							9.41" x 6.25" x 1.50"	N	• Plastic cabinet with 1/4" mount • Bright and vivid color picture • Slim, portable design • Low power consumption • Accepts composite and S-Video, each with active loop through • NTSC/PAL auto recognition • Power supply included • Weighs only 1.7 lbs	$949.00
V-R84DP-2C 	8.4"	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL		2							9" x 6.875" x 2.50"	Y	• 1.44 million TFT-MegaPixel / 8.4 inch screens • Hyper Process plus Match Color Conversion • Optical grade polycarbonate screen cover • Rugged Enclosure with AR/Scratch Resistant screen • 500 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and Blue "Gun"	$1399.00
V-R104DP-2C 	10.4"	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL		2							10.25" x 8.5" x 2.50"	Y	• 1.44 million TFT-MegaPixel / 10.4 inch screens • Large 10.4 Screen Field Monitor • Optical grade polycarbonate screen cover • Hyper Process plus Match Color Conversion • Rugged Enclosure w AR/Scratch Resistant screen • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$1599.00

Monitors

Composite + VGA

V-LCD12.1-SVGA

V-LCD15

V-LCD17

V-LCD20

Display	Resolution (Backlight in cd/m² luminance)	Inputs: S-Video	Inputs: Composite	Inputs: Component HD/3D	Inputs: SDI	Inputs: HDSDI/SDI	Inputs: VGA	Inputs: DVI (HDMI w/Adapter)	Inputs: Audio	Dimentions	Tally	Features	Price
12.1"	800 x 600 x RGB (210)	1	1				1		1	11.50" x 8.75" x 1.25"	N	• Lightweight and portable • Remote control included • Built-in speakers • Optional VESA adapter available (VESA 75mm Adapter V-LCD-VA) • NTSC/PAL switchable • Optional Ceiling Mount ($75.00) • Optional Wall Mount ($75.00) • Low cost • Weighs only 3.25 lbs	$899.00
15.1"	1024 x 768 x RGB (250)	1	1				1		1	15.37" x 12.19" x 2.10"	N	• High resolution LCD panel • Remote control included • Built-in speakers • Optional VESA adapter available (VESA 75mm Adapter V-LCD-VA) • NTSC/PAL switchable • Optional Celling Mount ($75.00) • Optional Wall Mount ($75.00) • Weighs only 9 lbs	$999.00
17.0"	1280 x 1024 x RGB (250)	1	1				1		1	16.96" x 14.29" x 2.16"	N	• Best viewing angle in the Industry - 170° in any direction • Software driven 16:9 to 4:3 switch • HD Ready: will accept 1080i or 720p with optional HD/SVGA converter • VESA 75mm mount compliant • NTSC/PAL switchable • Weighs only 12.95 lbs	$1999.00
20.1"	640 x 480 x RGB (450)	1	1				1		1	20.08" x 18.90" x 2.36"	N	• Ultra bright 450 cd/m² luminance • Highest contrast ratio 400:1 • Full function remote control • NTSC/PAL switchable • VESA 75mm mount compliant • Weighs only 17.95 lbs	$2799.00

Monitors

SDI

V-R70P-SD

V-R84DP-2SDI

V-R84DP-SD

Display	Resolution (Backlight in cd/m² luminance)	Inputs: S-Video	Inputs: Composite	Inputs: Component HD/3D	Inputs: SDI	Inputs: HDSDI/SDI	Inputs: VGA	Inputs: DVI (HDMI w/Adapter)	Inputs: Audio	Dimentions	Tally	Features	Price
7" wide	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL		1		2					7.60" x 5.16" x 2.16"	Y	• High Resolution 7-inch wide screen 800xRGBx480 Dots with 1.2 million pixels • Optical grade polycarbonate screen cover • 100% digital processing • Analog signals converted to 10 bit digital • Bright 380 cd/m² luminance • 400:1 ratio of contrast between black and white luminance • 4:3 and 16:9 screen aspect ratios • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • Built in Color Bars • Blue Screen for color adjustment	$1499.00
8.4"	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL				2					5" x 6.875" x 2.5"	Y	• 1.44 million TFT-MegaPixel / 8.4 inch screens • Optical grade polycarbonate screen cover • 100% digital processing • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$1799.00
8.4"	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL		1		1		1			9" x 6.875" x 2.5"	Y	• 1.44 million TFT-MegaPixel / 8.4 inch screens • Optical grade polycarbonate screen cover • SDI plus all HD/SD analog signals • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$2199.00

Monitors
SDI

	Display	Resolution (Backlight in cd/m² luminance)	Inputs: S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	Audio	Dimentions	Tally	Features	Price
V-R104DP-2SDI 	10.4"	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL				2					10.25" x 8.5" x 2.5"	Y	• Large 10.4- inch screens/1.44 TFT-MegaPixel • Optical grade polycarbonate screen cover • 100% digital processing • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$1999.00
V-R104DP-SD 	10.4"	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL	1	1	1	1		1		1	10.25" x 8.5" x 2.5"	Y	• Large 10.4- inch screens/1.44 TFT-MegaPixel • Optical grade polycarbonate screen cover • SDI plus all HD/SD analog formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$2399.00
V-R151DP-AFSD NEW 	15"	1024 x 768 x RGB (500) 2.4 TFT MEGAPIXEL	1	1	1	1		1		1	19.02" x 10.45" x 1.77"	Y	• High Resolution display - 1024 x RGB x 768 dots with 2.4 million pixels • 16.7 million colors • Wide viewing angle - 150° in all directions provides excellent off-axis visibility • 500 cd/m² luminance provides enhanced image quality in a variety of lighting conditions • 450:1 contrast ratio with response rates less than 25 ms result in the smoothest motion	$1799.00

Monitors
TV Tuner

	Display	Resolution (Backlight in cd/m² luminance)	Inputs: S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	Audio	Dimentions	Tally	Features	Price
V-ASL7000 	7" wide	1440 x 234 (200)		2						2	7.375" x 4.625" x 1.0"	N	• NTSC VHF/UHF/CATV (cable ready) 125 channel tuner built-in • 2 Composite NTSC plus 2 Mono Audio inputs • Composite NTSC output • Built-in FM Transmitter 87.5 to 89.5 MHz • Will work from 10V to 16V DC • Weight only 1.0 lb	$549.00
V-ASL8000 	8"	640 x 480 x RGB (380)		2						2	7.99" x 5.9" x 1.4"	N	• NTSC VHF/UHF/CATV (cable ready) 125 channel tuner built-in • 2 Composite NTSC plus 2 Mono Audio inputs • Composite NTSC output • Built-in FM Transmitter 87.5 to 89.5 MHz • Will work from 10V to 16V DC • Weight only 1.0 lb	$599.00
V-LCD-12-TV 	12.1"	800 x 600 x RGB (210)	1	1				1		1	11.50" x 8.75" x 1.25"	N	• Lightweight and portable • Remote control included • Built-in speakers • Optional VESA adapter available (VESA 75mm Adapter V-LCD-VA) • NTSC/PAL switchable • Optional Ceiling Mount ($75.00) • Optional Wall Mount ($75.00) • Low cost • Weighs only 3.25 lbs	$959.00

Monitors

TV Tuner

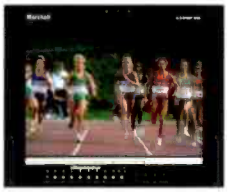
	Display	Resolution (Backlight in cd/m² luminance)	Inputs: S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	Audio	Dimentions	Tally	Features	Price
V-LCD15-TV 	15.1"	1024 x 768 x RGB (250)	1	1				1		1	15.37" x 12.19" x 2.10"	N	• High resolution LCD panel • Remote control included • Built-in speakers • Optional VESA adapter available (VESA 75mm Adapter V-LCD-VA) • NTSC/PAL switchable • Optional Ceiling Mount ($75.00) • Optional Wall Mount ($75.00) • Weighs only 9 lbs	$1059.00
V-LCD17-TV 	17.0"	1280 x 1024 x RGB (250)	1	1				1		1	16.96" x 14.29" x 2.16"	N	• Best viewing angle in the Industry - 170° in any direction • Software driven 16:9 to 4:3 switch • HD Ready: will accept 1080i or 720p with optional HD/SVGA converter • VESA 75mm mount compliant • NTSC/PAL switchable • Optional Ceiling Mount ($75.00) • Optional Wall Mount ($75.00) • Weighs only 12.95 lbs	$2059.00
V-LCD20 	20.1"	640 x 480 x RGB (450)	1	1				1		1	20.08" x 18.90" x 2.36"	N	• Ultra bright 450 cd/m² luminance • Highest contrast ratio 400:1 • Full function remote control • NTSC/PAL switchable • VESA 75mm mount compliant • Weighs only 17.95 lbs	$2799.00

Monitors

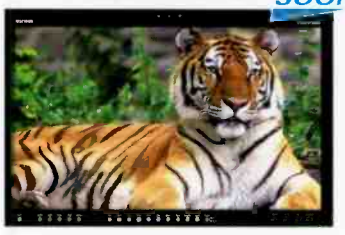
High Definition

V-R70P-HDA 	7" wide	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL		1	1						7.60" x 5.16" x 2.16"	Y	• High Resolution 7-inch wide screen 800xRGBx480 Dots with 1.2 million pixels • Optical grade polycarbonate screen cover • 100% digital processing • Analog signals converted to 10 bit digital • "V" Mount battery adapter included • Bright 380 cd/m² luminance • 4:3 and 16:9 screen aspect ratios	$1599.00
V-R70P-HDSDI 	7" wide	800 x 480 x RGB (380) 1.2 TFT MEGAPIXEL					1				7.60" x 5.16" x 2.16"	Y	• "V" Mount battery adapter included • High Resolution 7-inch wide screen 800xRGBx480 Dots with 1.2 million pixels • Optical grade polycarbonate screen cover • 100% digital processing • Analog signals converted to 10 bit digital • Bright 380 cd/m² luminance	$1999.00
V-R84DP-HDA 	8.4"	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL	1	1	1			1	1		9" x 6.875" x 2.5"	Y	• 1.44 million TFT-MegaPixel/8.4 inch screens • Optical grade polycarbonate screen cover • Accepts all analog HD/SD formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and Blue "Gun"	$1999.00
V-R84DP-HDSDI 	8.4"	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL					1				9" x 6.875" x 2.5"	Y	• 1.44 million TFT-MegaPixel/8.4 inch screens • Optical grade polycarbonate screen cover • 100% digital processing of HDSDI/SDI • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$2099.00

Monitors
High Definition

	Display	Resolution (Backlight in cd/m² luminance)	Inputs: S-Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	Audio	Dimentions	Tally	Features	Price
V-R84DP-HD 	8.4"	800 x 600 x RGB (500) 1.44 TFT MEGAPIXEL	1	1	1		1	1	1		9" x 6.875" x 2.5"	Y	• 1.44 million TFT-MegaPixel/8.4 inch screens • Optical grade polycarbonate screen cover • Accepts all HD/SD formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 500 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$2499.00
V-R841P-AFHD 	8.4"	1024 x 768 x RGB (400) 2.4 TFT MEGAPIXEL	1	1	1		1	1	1		9" x 6.9" x 2.8"	Y	• High Definition 8.4-inch 2.4 MegaPixel screen • "V" Mount battery adapter included • Optical grade polycarbonate screen cover • Bright 400 cd/m² luminance • 400:1 ratio of contrast between black and white luminance • Blue Gun for color adjustment • Zoom function • 4:3 and 16:9 screen aspect ratios	$3899.00
V-R901DP-AFHD NEW 	9" wide	800 x 480 x RGB (400) 1.15 TFT MEGAPIXEL	1	1	1		1	1	1		TBD	Y	• High Resolution wide screen 800 x 480 RGB Dots with 1.15 million pixels • 16.7 million colors • Wide viewing angles - 160°-RL , 140° UD provides superior visibility when the viewer is not directly in front of the screen • Bright 400 candelas per square meter (cd/m²) luminance produces enhanced image quality in varying light and viewing conditions • 500:1 contrast ratio with response rates less than 23 ms results in excellent quality for moving images • 16:9 and 4:3 screen aspect ratios for DTV applications in HD and SD formats	$2699.00
V-R104DP-HDA 	10.4"	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL	1	1	1			1	1		10.25" x 8.5" x 2.5"	Y	• 1.44 million TFT-MegaPixel/10.4 inch screens • Optical grade polycarbonate screen cover • Accepts all analog HD/SD formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$2199.00
V-R104DP-HDSDI 	10.4"	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL					1				10.25" x 8.5" x 2.5"	Y	• 1.44 million TFT-MegaPixel/10.4 inch screens • Optical grade polycarbonate screen cover • 100% digital processing of HDSDI/SDI • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$2299.00
V-R104DP-HD 	10.4"	800 x 600 x RGB (600) 1.44 TFT MEGAPIXEL	1	1	1		1	1	1		10.25" x 8.5" x 2.5"	Y	• 1.44 million TFT-MegaPixel/10.4 inch screens • Optical grade polycarbonate screen cover • Accepts all HD/SD formats/frame rates • Hyper Process plus Match Color Conversion • 50,000 hour backlight half life • 600 (cd/m²) brightness modification • Includes V-Mount Battery Adapter / 4 Pin XLR Pwr • On Screen Display (OSD) and "Blue Gun"	$2699.00
V-R1041DP-AFHD NEW 	10.4"	1024 x 768 x RGB (300) 2.4 TFT MEGAPIXEL	1	1	1		1	1	1		10.25" x 8.5" x 2.5"	Y	• High Resolution wide screen 1024 x 768 RGB Dots with 2.4 million pixels • 16.7 million colors • Wide viewing angles - 160°-RL , 140° UD provides superior visibility when the viewer is not directly in front of the screen. • Bright 300 candelas per square meter (cd/m²) luminance produces enhanced image quality in varying light and viewing conditions. • 700:1 contrast ratio with response rates less than 23 ms results in excellent quality for moving images • 4:3 and 16:9 screen aspect ratios for DTV applications in HD and SD formats	$4499.00
V-R151DP-AFHD NEW 	15"	1024 x 768 x RGB (500) 2.4 TFT MEGAPIXEL	1	1	1		1	1	1		19.02" x 10.45" x 1.77"	Y	• High Resolution display - 1024 x RGB x 768 dots with 2.4 million pixels • 16.7 million colors • Wide viewing angle - 150° in all directions provides excellent off-axis visibility • 500 cd/m² luminance provides enhanced image quality in a variety of lighting conditions • 450:1 contrast ratio with response rates less than 25 ms result in the smoothest motion	$1999.00

Monitors
High Definition

	Display	Resolution (Backlight in cd/m² luminance)	Inputs: S Video	Composite	Component HD/SD	SDI	HDSDI/SDI	VGA	DVI (HDMI w/Adapter)	Audio	Dimentions	Tally	Features	Price
 V-R201P-AFHD NEW	20" wide	1366 x 768 x RGB (430)	1	1	1		1	1	1		18.69" x 12.24" x 2.09"	Y	• Totally Digital WXGA 1366 x 768 display • Native HD/SD screen formats (640, 720 lines) in TFT Pixel-to-Pixel™ mode • CRT style viewing radius - 178° in any direction • Bright 430 cd/m² luminance • 500:1 contrast ratio • 16:9 and 4:3 screen aspect ratios • All analog signals internally converted to 24 bit component digital with 5 line adaptive filter • 6 Frame Marker Overlays with Center Mark	$2999.00
 V-R231P-AFHD	23" wide	NATIVE RESOLUTION 1920 x 1200 x RGB (250) NATIVE RESOLUTION 1920 x 1080 DISPLAY HDMI HIGH DEFINITION MULTIMEDIA INTERFACE HDCP®	1	1	1		1	1	1		20.88" x 15.03" x 2.77"	Y	• Totally Digital WUGA 6.9 Megapixel 1920 x 1200 display • Native HD/SD screen formats (640, 720, 1080 vertical lines) in TFT Pixel-to-Pixel™ mode • CRT style viewing radius - 176° in any direction • Bright 250 cd/m² luminance • 500:1 contrast ratio • 16:9 and 4:3 screen aspect ratios • All analog signals internally converted to 24 bit component digital with 5 line adaptive filter • 6 Frame Marker Overlays with Center Mark	$5999.00
 V-R261P-AFHD COMING SOON	26" wide	1366 x RGB x 768 (500)	1	1	1		1	1	1		TBD	Y	• High Resolution wide screen 1366 x 768 RGB Dots • 16.7 million colors • Wide viewing angles - 160° in any direction provides superior visibility when the viewer is not directly in front of the screen • Bright 500 candelas per square meter (cd/m²) luminance produces enhanced image quality in varying light and viewing conditions • 450:1 contrast ratio with response rates less than 18 ms results in excellent quality for moving images • 16:9 and 4:3:9 screen aspect ratios for DTV applications in HD and SD formats • 6 Frame Marker Overlays with Center Mark • Easy to see three color tally indicators • Adjustment Settings Memory	TBD
 V-R321P-AFHD COMING SOON	32" wide	1366 x RGB x 768 (500)	1	1	1		1	1	1		TBD	Y	• High Resolution wide screen 1366 x 768 RGB Dots • 16.7 million colors • Wide viewing angles - 160° in any direction provides superior visibility when the viewer is not directly in front of the screen • Bright 500 candelas per square meter (cd/m²) luminance produces enhanced image quality in varying light and viewing conditions • 450:1 contrast ratio with response rates less than 18 ms results in excellent quality for moving images • 16:9 and 4:3:9 screen aspect ratios for DTV applications in HD and SD formats • 6 Frame Marker Overlays with Center Mark • Easy to see three color tally indicators • Adjustment Settings Memory	TBD
 V-R371P-AFHD COMING SOON	37" wide	1366 x RGB x 768 (500)	1	1	1		1	1	1		TBD	Y	• High Resolution wide screen 1366 x 768 RGB Dots • 16.7 million colors • Wide viewing angles - 160° in any direction provides superior visibility when the viewer is not directly in front of the screen • Bright 500 candelas per square meter (cd/m²) luminance produces enhanced image quality in varying light and viewing conditions • 450:1 contrast ratio with response rates less than 18 ms results in excellent quality for moving images • 16:9 and 4:3:9 screen aspect ratios for DTV applications in HD and SD formats • 6 Frame Marker Overlays with Center Mark • Easy to see three color tally indicators • Adjustment Settings Memory	TBD

6.5" and 7" Stand Alone Monitor Kits

A range of pre-packaged kits for 6.5" and 7.0" stand-alone monitors are available. Each kit includes options that make these monitors even more portable. Every kit is provided at a discounted package price and no substitution of components is allowed. All of the kits include components required for portable operation and include a durable carry case, analog component breakout cable, A.C. stand alone power supply and cleaning wipes. A variety of kits are available with batteries, charger, sun hood, plus Anton Bauer Gold and four pin D.C. power adapter cables. Tough, rugged and lightweight, the carry case provides the safest transportable environment for your monitor. Each case is manufactured with a proprietary HPX™ high performance resin, and features secure Press & Pull latches, automatic pressure relief valve and a durable soft-grip handle. This is the most comfortable, toughest case available. Airtight, watertight, dent & shatter-resistant, our carry case is made to defy the elements.

Part Number	Including	Description	Qty	Price
V-R65P-HD-K1	V-R65P-HD RGB-5HD15-6 V-CC1 V-PS12-3.3 V-HWP-K	6.5" HD monitor Analog Video Break-Out Cable Carrying Case A.C. Power Supply Cleaning Wipe	1 1 1 1 10	3899.00
V-R65P-HD-K2	V-R65P-HD-K1 V-PAC-D V-PAC-XLR V-H700P	Anton Bauer Gold Power Adapter 4 pin XLR Power Adapter Viewing Hood	1 1 1 1	3999.00
V-R65P-HD-K3	V-R65P-HD-K2 V-R65-BA IDX-E50S	see above V Mount Battery Adapter Battery	1 1	4399.00
V-R65P-HD-K4	V-R65P-HD-K2 IDX-VL-2Plus	see above 2 Channel Sequential Charger	1 1	4999.00
V-R70-K1	V-CC7 V-PS12-3.3 V-HWP-K	Carrying Case A.C. Power Supply Cleaning Wipe	1 1 10	249.95*
V-R70-K2	V-R70-K1 V-PAC-D V-PAC-XLR V-H700P	see above Anton Bauer Gold Power Adapter 4 pin XLR Power Adapter Viewing Hood	1 1 1 1	449.95*
V-R70-K3	V-R70-K2 IDX-E50S	see above Battery	1 1	649.95*
V-R70-K4	V-R70-K3 IDX-VL-2Plus	see above 2 Channel Sequential Charger	1 1	1185.00*

** Only when purchase with 7" LCD monitor*

Accessories for Stand Alone / Video Assist Monitors

V-H7M Price: $99.95
V-H9OO Price: $129.00
V-H1OM Price: $129.00

Sun Hood for 7", 8.4", 10.4" monitors. Use for viewing in bright lighting or outdoors.

V-ABA-01

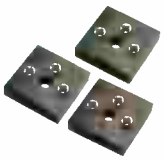
V-Mount to Anton Bauer Adapter. Use to power Marshall Electronics monitors that have V-Mount plate with Anton Bauer Gold Mount battery.
Price: $199.00

V-DV-PWR1

Use the DV-Power pack with Marshall Electronics line of Stand Alone monitors. This product is the perfect solution for users of DV and HDV Camcorders.
Price: $299.00

V-R65-BA

Mount for IDX Batteries
Attaches to V-R65P-HD monitor.
Price: $150.00



V-LCD70TMB-02

Set of 3 Tripod Mount Brackets with screws. Fits all single screen 7.0", 8.4", 10.4" and V-R65P-HD monitors. Mounting plate can be installed to any side of monitor enclosure. Compatible with most 1/4-20 threaded mounting devices.
Price: $29.95

V-HWP-K

Package of 10 non-toxic, anti-static, alcohol and ammonia free cleaning wipes for LCD displays.
Price: $9.95

V-CC1, V-CC7

Airtight, watertight, dent & shatter-resistant, carry case for V-R65P-HD.
Price: $199.00

V-LCD-MT-01

Camera Hot Shoe Mount.
Attaches monitor to camera.
Price: $24.95

V-NF110 Price: $122.00
V-DG110 Price: $132.00
V-MG1104 Price: $162.00

Articulating arms provide a flexible way to mount a monitor onto your camera. Supports monitors up to 10".

V-LCD4-ST

Plastic desktop stand.
Supports 4"-7" monitors.
Price: $39.95

VP-0149-SF-A
Price: $45.00
Fixed stand for V-R151DP-AFHD.

VP-171AFHD-SF-01
Price: $45.00
Fixed stand for V-R171P-AFHD.

VP-0172-SF-A
Price: $56.00
Fixed stand for V-R201P-AFHD.

VP-LCD171H-ST-01
Price: $229.00
VESA stand with pivot and tilt.

V-PAC-D-XLR

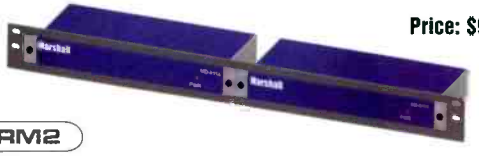
Power Adapter Cable.
4-pin XLR-F to Anton Bauer PowerTap
Price: $60.00

V-PAC-XLR

Power Adapter Cable.
2-pin twist-lock to 4-pin XLR-M
Price: $60.00

Distribution Amplifiers

	In	Out	Features	Price
MD-0114 	1 Composite	4 Composite	• Use in short cable run and desktop/ multimedia applications • Self terminating 75Ω BNC input • 75Ω BNC outputs (4) • Power indicator on front panel • All connections in rear of module • Install in rack or use on the desktop	$89.95
MD-0114-EQ 	1 Composite	4 Composite	• Convenient front panel adjustments of gain and high frequency equalization • Adjustments to compensate for cable runs up to 1000' • Self terminating 75Ω BNC input • 75Ω BNC outputs (4) • All connections in rear of module • Install in rack or use on the desktop	$159.95
BD-0114 	1 Composite	4 Composite	• Signal Bandwidth up to 300Mhz • Use 3 modules for Y-Pr-Pb applications • Self terminating 75Ω BNC input • 75Ω BNC outputs (4) • All connections in rear of module • Install in rack or use on the desktop	$179.95
MD-0512 	1 Component/ RGBHV	4 Component/ RGBHV	• Signal Bandwidth up to 350Mhz • Multiple applications • HD-15 Input Connection self terminating 75Ω • 2 HD-15 Output Connections • All connections in rear of module • Install in wall or use on the desktop	$159.95
MD-0514 	1 Component/ RGBHV	4 Component/ RGBHV	• Signal Bandwidth up to 350Mhz • Multiple applications • HD-15 Input Connection self terminating 75Ω • 4 HD-15 Output Connections • All connections in rear of module • Install in rack or use on the desktop	$179.95
BD-0314 	1 SDI	4 SDI	• Use for distribution of SDI signals 143Mbs to 540Mbs • Self terminating 75Ω BNC SDI input • 4 reclocked and equalized BNC SDI Outputs • Power indicator on front panel • All connections in rear of module • Install in rack or use on the desktop • Can also be used as a signal repeater • Includes power supply	$299.00
BD-0914-D 	1 HDSDI/SDI	4 HDSDI/SDI	• Use for distribution of HDSDI or SDI signals 143Mb/s to 1.5Gb/s • Self terminating 75Ω BNC SDI input with adaptive equalization • 4 buffered and reclocked BNC HDSDI or SDI Outputs • Power indicator on front panel • All connections in rear of module	$699.00



Price: $95.00

V-CRM2

Single RU Conversion and D/A Module Bracket

Single RU (1.75" tall) Conversion and Distribution 2 Module Bracket. Two Marshall Electronics 7.75" wide or one 7.75" plus one 4.75" wide conversion or distribution modules can be securely installed into a standard EIA 19" rack with the V-CRM2 mounting bracket. Every V-CRM2 includes one blank panel and one 4.75" adapter for a clean cosmetic appearance.

Price: $95.00

V-CRM3

Single RU Conversion and D/A Module Bracket

Single RU (1.75" tall) Conversion and Distribution 3 Module Bracket. Up to three Marshall Electronics 4.75" wide conversion or distribution modules can be securely installed into a standard EIA 19" rack with the V-CRM3 mounting bracket. Every V-CRM3 includes two blank panels for a clean cosmetic appearance.

Converters

	In	Out	Features	Price
MC-0201-4 	4 S-Video	4 Composite	• Compact design can be installed on the tabletop, wall mounted or placed into a standard 19" EIA rack using the optional V-CRM2 rack kit • Full bandwidth conversion of S-Video (Y/C) chrominance and luminance components to composite video • Four channels of conversion in each MC-0201-4. This is a perfect fit for use of S-Video signals with the Marshall Electronics 4 screen monitor set model V-R44P • Low Power consumption less than 10 watt • Operates from 6 Volt DC • S-Video signal loops out for use with downstream equipment like switcher, vision mixer, or VCR	**$189.95**
BC-0301-08 	1 SDI	1 SDI 1 S-Video 2 Composite	• Converts component serial digital signal to analog composite and Y/C • Active loop through for SDI signal with reclocking • Simultaneous outputs for 2 video and 1Y/C (S-video) • PAL/NTSC auto detection with led indicator • Pedestal on/off selection for NTSC signals • 10-bit processing with two-times over sampling • Supports closed captioning • Includes color bar generator	**$289.00**
BC-0301-10 	1 SDI	1 SDI 1 S-Video 2 Composite	• Converts component serial digital signal to analog composite and Y/C • Active loop through for SDI signal with re-clocking • Simultaneous outputs for 2 composite video and 1 Y/C (S-video) • PAL/NTSC auto detection with led indicator • Pedestal on/off selection for NTSC signals • 10-bit digital encoding with 4x over sampling • Supports closed captioning • Includes Color Bar Generator and Power Supply	**$379.00**
BC-0103-08 	1 Composite 1 S-Video	1 SDI	• Converts Composite Video or Y/C to Digital Component (SDI) • Illuminated power and input signal indicators • Adaptive filtering removes NTSC interlace artifacts • 2x over sampling for true color reproduction • 10 Bit analog to digital conversion • 8-bit qauntization of output signal • Supports closed captioning	**$495.00**
BC-0103-10 	1 Composite 1 S-Video 1 Component	1 SDI	• Converts Component, Composite Video or Y/C to Digital Component (SDI) • Illuminated power and input signal indicators • NTSC or PAL operation with automatic detection • Adaptive filtering removes NTSC interlace artifacts • 2 x over sampling for true color reproduction • 12 Bit analog to digital conversion • 10-bit qauntization of output signal • Supports closed captioning	**$575.00**
BC-0909-AD 	1 Component or 1 S-Video or 1 Composite	2 HDSDI/SDI	• Converts Analog High Definition (SMPTE-260/274/296M) to Digital (HDSDI) • Converts Analog Composite (PAL/NTSC) to Digital (SDI SMPTE-259M) • Converts Y/C (S-Video) to Digital (SDI) • End to end 10bit processing • 2x over sampling of Composite and Y/C signals • Adaptive comb filter for noise reduction on composite and Y/C signals	**$1995.00**
BC-0909-DA 	1 HDSDI or 1 SDI	1 HDSDI/SDI 1 Component	• Converts HDSDI to Analog High Definition YPrPb • Converts SDI to Analog Composite (PAL/NTSC) • Converts SDI to Y/C (S-Video) • Converts SDI to Analog Component RGB/Y, R-Y, B-Y/YUV • PAL/NTSC auto detection with led indicator • Active loop through for SDI signal with re-clocking • Automatic detection range of 142Mb/s to 1.485Gb/s • Automatic Compensation of SDI input for cable length up to 1000' • 10-bit processing with 4x over sampling	**$999.00**
MC-0105 	1 Composite 1 S-Video 1 VGA	1 VGA	• NTSC or PAL operation with automatic detection • Illuminated power and input signal indicators • Converts Composite Video or Y/C (Svideo) to VGA (RGBHV) for display on projectors or data screens • Transforms interlaced 525/625 images to Progressive Scan • Adaptive filtering removes NTSC interlace artifacts • 2x over sampling for true color reproduction. VGA output processed as 4:4:4/RGB • Automatically scales NTSC input to 640x480 RGB Pixel screen format • Automatically scales 525 input to 768x576 RGB Pixel screen format • Automatic Gamma correction. Automatic color space conversion • Seamless switching between VGA and composite or Y/C inputs	**$249.00**

Accessories

V-R70-1M **Price: $85.00**

Rack mount adapter kit for all V-R70DP models.
The V-R70-1M can be used to mount any of our 7-inch portables into a standard 19-inch EIA rack. Two monitors can be installed or a single monitor with a blank insert that is included.

V-R84DP-1M / V-R104-1M **Price: $99.00/$129.00**

Rack mount adapter kit for all V-R84DP/V-R104DP models.
A single V-R84DP/V-R104DP model with 8.4/10.4 Inch screen can be installed into a standard 19-inch EIA rack with this kit.

V-CB1

Price: $19.95

Converters and D/A Base Holder for desktop use
For desktop applications like editing and graphics, use the V-CB1 stand to reduce the footprint of the conversion or distribution module. The V-CB1 stand provides a sturdy base with a secure attachement to the module while reducing the desk space to under 4 square inches.

RGB-5HD15-X

RGB-5HD15-6	6ft	$34.95
RGB-5HD15-10	10ft	$39.95
RGB-5HD15-15	15ft	$59.95
RGB-5HD15-25	25ft	$68.50

BNC Breakout Cables
Our RGB-HD-15-X cables are available in 6, 10, 15 and 25 foot lengths and are used to transform individual signals, such as RGBHV from BNC connections to a Female DB/HD-15 connector.

V-BG-P-MS

Price: $249.00

V-BG-PCB-MS

Price: $199.00

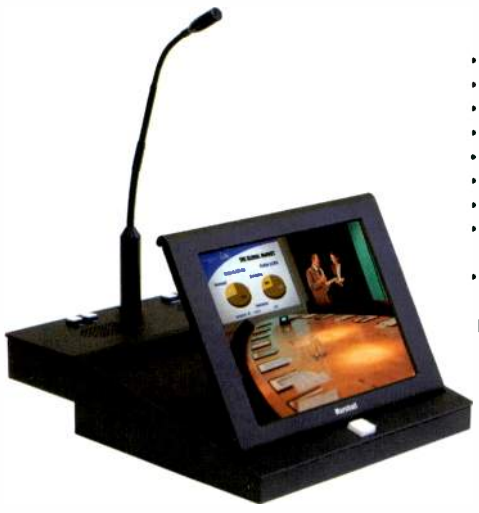
Color Bar Generator NTSC/PAL (Handheld and PCB)
Use the V-BG-P-MS portable color bar generator in the field or on the desctop. This dual model runs on a standard 9VDC battery or optional external power supply, and is used to generate a full field color bar test pattern as a composite video signal for PAL or NTSC Systems.

Power Supplies

V-PS12-5V-1 | V-PS12-500 / V-PS12-1000 | V-PS6-1.2A

Part No	Description	Price
V-PS6-1.2A	6VDC (3.3A) P/S w/ twist-lock connector	$39.95
V-PS9-3.3A	9VDC (3.3A) Power Supply w/ twist-lock connector	$79.95
V-PS9-3.3	9VDC (3.3A) Power Supply w/ coax plug	$79.95
V-PS12-500	12VDC (500mA) regulated Power Supply w/ coax plug	$16.00
V-PS12-1000	12VDC (1A) regulated Power Supply w/ coax plug	$24.95
V-PS12-5V-XLR	12VDC (5A) P/S w/ 4-pin XLR connector	$89.95
V-PS12-5V	12VDC (5A) w/ coax plug	$89.00
V-PS12-5V-1	12VDC (5A) P/S w/ twist-lock connector	$89.95
V-PS12-6.6A	12VDC (6.6A) P/S w/ twist-lock connector	$99.95

COMING SOON



AV-840 / AV-1040

Pedestal Microphone with 8.4"/10.4" TFT-MegaPixel Monitor

- **Desktop or recessed installation**
- **Precision gooseneck microphone**
- **High Resolution 8.4/10.4" screen**
- **Display tilts to store/view**
- **Internal Speaker plus Audio Jack**
- **100% Digital Processing**
- **5 Year/50,000 Hour Backlight**
- **Accepts VGA, SVGA, and XGA plus composite and S-Video**
- **Wide viewing radius - 130°**
- **Microphone PTT/PTM/On/Off**
- **Remote control RS-232, GPI**
- **GPI Input output**
- **500 (cd/m²) brightness**
- **500:1 contrast ratio**
- **Excellent quality moving images**
- **4:3 and 16:9 screen aspect ratios**
- **Security enclosure locks microphone and local adjustments**
- **Lighted Controls**

Use our TFT-MegaPixel™ AV-840/AV-1040 as a direct replacement for podium microphones and benefit from the extra versatility of the integrated computer and Audio/Video monitor. The goose-neck microphone is manufactured by our renowned MXL division and delivers maximum clarity while the video/computer display expands the applications where a podium microphone is required. The system can be operated locally or via remote control RS-232 and GPI, plus there are General Purpose Outputs to provide interface to projectors, screens, lights, etc. A Universal voltage DC Power supply is also included for the system with phantom power.

Price: TBD

Marshall Electronics

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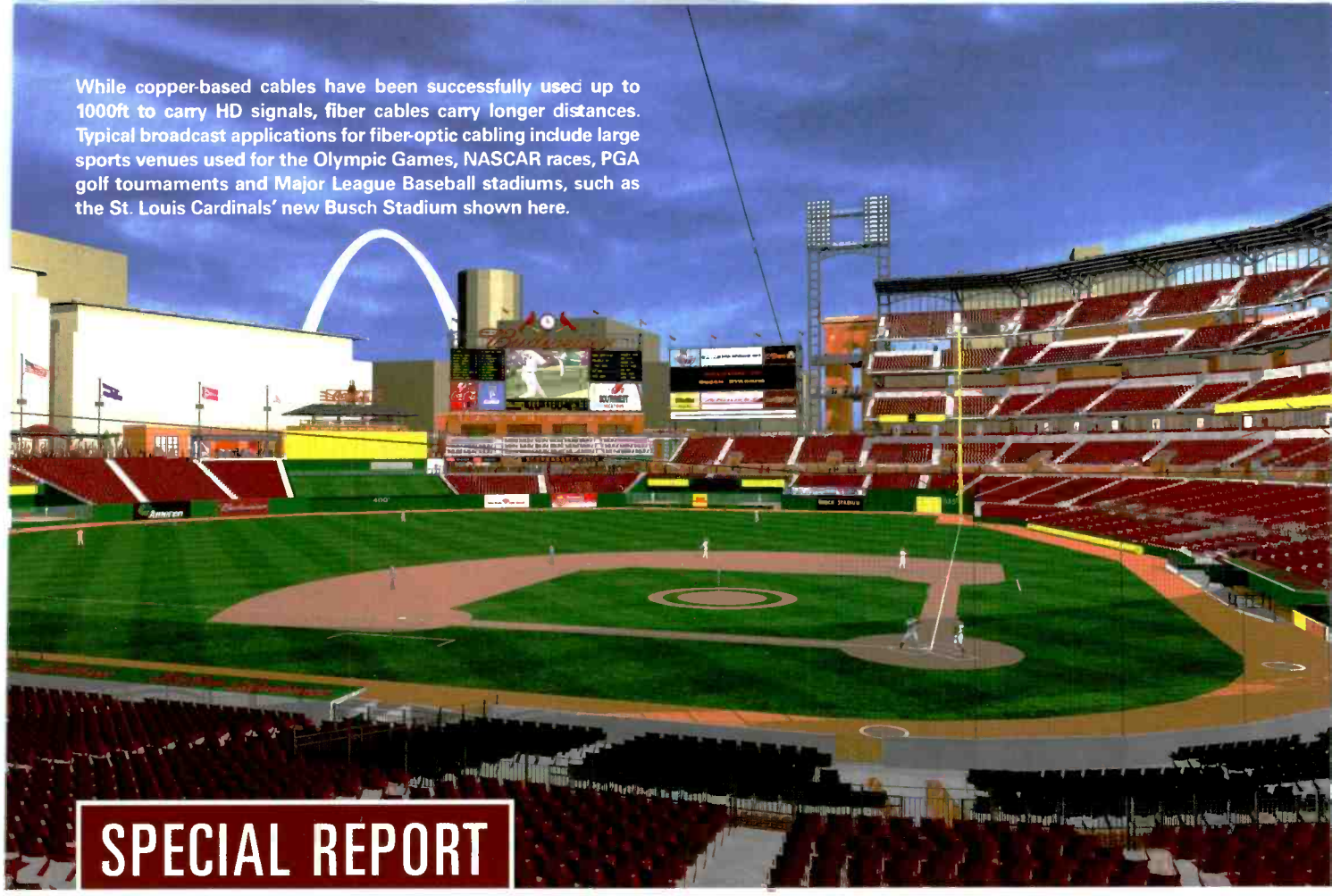


While copper-based cables have been successfully used up to 1000ft to carry HD signals, fiber cables carry longer distances. Typical broadcast applications for fiber-optic cabling include large sports venues used for the Olympic Games, NASCAR races, PGA golf tournaments and Major League Baseball stadiums, such as the St. Louis Cardinals' new Busch Stadium shown here.

SPECIAL REPORT

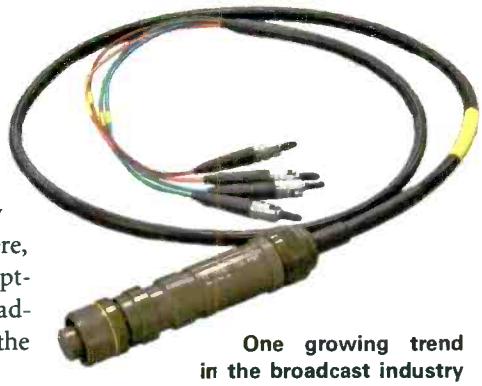
Fiberize your broadcast facility

BY STEVE LAMPEN, BOB SEBESTO AND KIP COATES

In reality, there is no such word as fiberize. But since the introduction of fiber-optic cables in the 1970s, every year has been proclaimed the year that broadcasters would go fiber. When the move to HD started in the 1990s, the industry once again heard the fiber's siren song. But few went that route. Virtually all signal-carrying media in the broadcast arena is still copper-based cables. So what happened?

Broadcast engineers are a savvy lot. They do not jump on a new technology simply because it's there, as consumers often do. Before adopting a new way of doing things, broadcast engineers want to know that the change will:

- simplify their broadcast lives;
- reduce the cost of what they are doing;
- allow them to do something they could not do otherwise; and



One growing trend in the broadcast industry is the use of tactical fiber-optic cables to replace standard SMPTE or triax cables for remote field applications. These cables are not only lighter in weight than traditional cabling, but also smaller in size.

• improve the performance of their systems.

When HD appeared on the scene, manufacturers developed copper cables that offered improved designs, improved materials and, most important, performance far beyond what was possible with existing classic copper cables. Today, there are copper digital video cables tested to 4.5GHz bandwidth, with guaranteed return loss numbers, designed specifically for use in SuperHD and other high-bandwidth applications. Some cables, such as RG-11, have been successfully used up to 1000ft carrying HD signals — even though their recommended distance is 550ft.

A thousand feet covers a lot of ground. This leaves a few long-run applications as fiber territory. Some examples include voice, data and video for new stadiums and large sports venues for the Olympic Games, golf events and NASCAR, as well as building-to-building tie lines, building and studio backbones, and the ability to interface with the phone company or other carriers.

Fiber also has the lock on bandwidth. Although 4.5GHz might be cutting edge for coax, it's child's play for single-mode fiber. In fact, the only limitation on single-mode cabling is how much you are willing to spend on the boxes. (There are even commercial drivers up to 100GHz.) For those wanting to stay with lower-cost components, high-bandwidth (2GHz to 4GHz) 50µm multimode fiber is also an option for links up to 550m (1804ft).

Meanwhile, we have the advent of 10GigE networking on copper cables, specifically 10GBASE-T using Cat 6a. But, like all category cables, this is limited to 100m (328ft), and many proposed cables cannot even go that far. With 10GB, you could run six HD bit streams — if you could get them into an Ethernet format. We might be approaching or even equaling the bandwidth of many fiber systems with these kinds of copper cables, but fiber still cannot be beat on distance.

Fiber also has the lock on bandwidth. Although 4.5GHz might be cutting edge for coax, it's child's play for single-mode fiber.

Many studios have added fiber to their backbones, while still relying on category cables for horizontal cabling. While multimode fiber is still the norm for traditional networking applications, single-mode fiber is the choice for the majority of broadcast applications.

An advantage of tactical fiber cabling for field applications is that it can be rolled off the reel and deployed effectively on-site over extended distances from 1km (0.6mi) to 2km (1.2mi). And because the cables are built to military standards, they can stand up to repeated redeployment and outdoor environments.

Price point

The cost of fiber can't be beat. Fiber is inexpensive. The cost of the fiber has never been the stumbling block. It is the cost of conversion that has been the problem.

Copper cables can simply attach from output to input, with no conversion or other boxes required. This makes copper cheaper, easier to install, and arguably, more reliable (at least with fewer points of failure).

Sound choice

One of fiber's benefits is noise immunity. Because fiber cables run optical signals, they are completely immune from RFI, EMI or any other electromagnetic source of interference. This means you could install fiber-optic cable on your broadcast antenna, and it would work fine. I'm not sure why anyone would want to do that, but if you had an application for it, you could.

The only problem is that the source and destination boxes do not use optical signals inside and lack any immunity to electromagnetic interference. So, until we have devices that manipulate (i.e. amplify) the signal optically, we will be stuck with electronic boxes and optical conversion in and out. Where's my optical transistor? Along the same lines, a fiber cable, if it is fiber only (i.e. does not contain any metal), can be lightning-proof as well.

Fiber moves in

Broadcast antennas aside, there are some places and reasons for fiber's use, and it is slowly and inexorably moving into the broadcast realm. Perhaps one reason is because all these signals are now digital video and audio. In other words, they are data.

Imagination to Creation

FOR-A®
INNOVATIONS IN VIDEO and AUDIO TECHNOLOGY

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Many HD mobile production studios, such as the Dome Productions truck shown here, carry reels of tactical fiber to roll out to remote sites, whether across a golf course, on a professional football field or through the streets of Times Square for a special event in New York City.

Fiber and data have had a long and fruitful marriage, so there is a lot of engineering expertise — and fiber products — to play with your data (video or otherwise).

Digital signals are different from traditional analog signals. They can be shipped, manipulated, stored, transmitted, reassembled and used as a data bit stream — and then turned back into video whenever convenient. And that convenient point might just be the consumer plasma screen on the living room wall.

The SMPTE 311M standard

SMPTE has a standard for fiber-optic camera cable called SMPTE 311M. This cable contains both fiber and copper elements and is the standard for HD cameras. These cables, however, can be problematic, especially when used in a remote truck or van.

Here's why: When a single-mode fiber breaks, you can't simply get out a razor blade and a couple of tools and fix it the way you could repair triax in the analog world. Therefore, you will have to carry extra fiber-optic camera cables in your truck in case one of them fails. And any truck weight savings you may have realized because of these low-weight cables is now gone.

When a single-mode fiber breaks, you can't simply get out a razor blade and a couple of tools and fix it the way you could repair triax in the analog world.

The trouble with triax

When broadcasters looked at triax to carry digital signals, they found that it works fine for SDI (270Mb/s at 135MHz) but was difficult for HD (1.485Gb/s at 750MHz). And when some users said they wanted to go a minimum of 1000m (3280ft), there was no way any triax could do that with HD. So that was the end of triax.

You might disagree, saying there are many cameras running HD down triax. However, if you read the fine print,

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you will learn that it is not true digital HD down triax. It is converted to wideband analog video and is then converted back to digital HD at the receiving end. Because the transmission over the triax is analog, it is more susceptible to EMI (noise), which, when converted back to digital, can potentially produce artifacts in the video image.

and can be used for extended distances, such as 1km (0.6mi) to 2km (1.2mi).

Because tactical fiber-optic cables are based on military standards, they can easily withstand constant redeployments, as well as the abuse often associated with cables strung out over a golf course for a week or in the streets of New York City. Additionally,

Based on military standards, tactical fiber-optic cables can easily withstand ... the abuse often associated with cables strung out over a golf course for a week.

The tactical response

One increasingly popular option is the use of tactical fiber-optic cables, which replace standard SMPTE or triax cables for remote applications. These cables are not only lighter than traditional cabling but are also smaller with some of the new field installable connectors, such as Optimax, broadcasters can repair broken fibers in minutes rather than hours.

At the beginning of this article, we discussed how we could take HD signals up to 1000ft of RG-11. If we ran HD signals down fancy new RG-11 triax of the same construction, 1000ft would cover a lot of ground. It would certainly cover all the studio installs and might even cover many small and midsized sports venues. And, if this cable broke, you could repair it on the spot. All we have to do then is convince the camera manufacturers that HD on triax would work for a multitude of installations and ask them to offer that as an option on their HD cameras. BE

Steve Lampen is multimedia technology manager, Bob Sebesto is fiber optics business development manager, and Kip Coates is entertainment products marketing manager for Belden.

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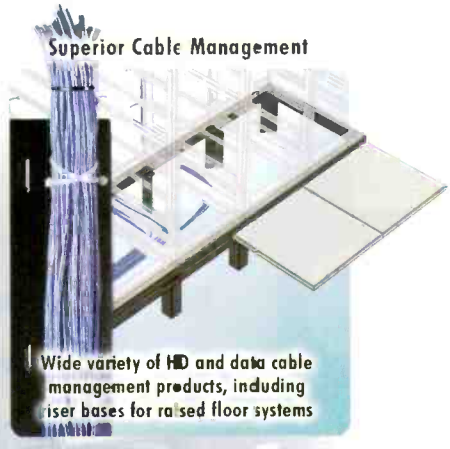

Wide variety of HD and data cable management products, including riser bases for raised floor systems

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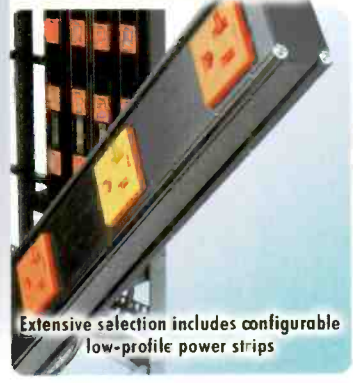

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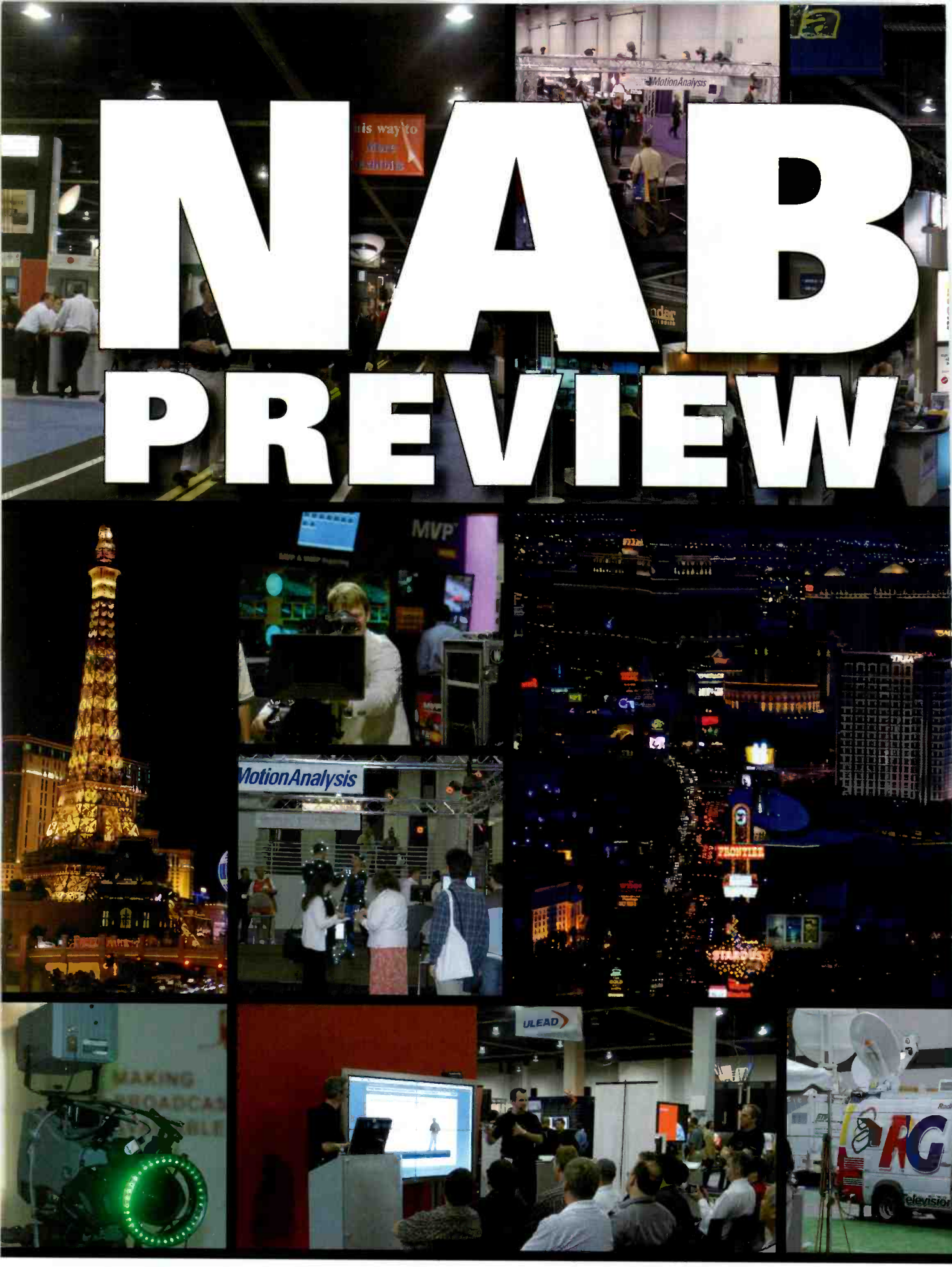
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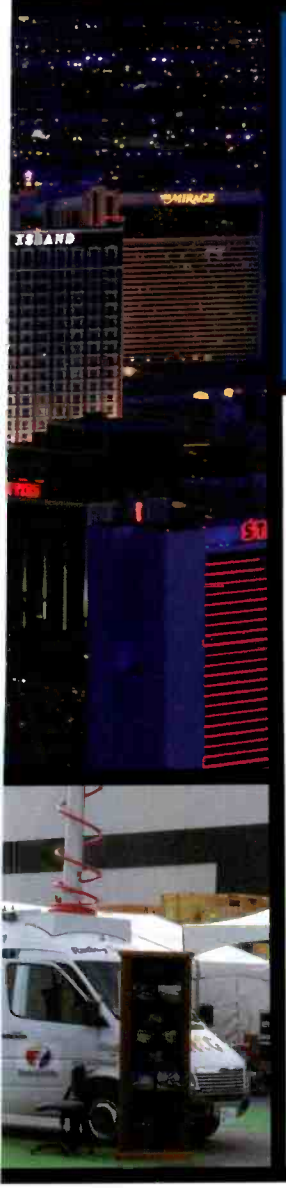

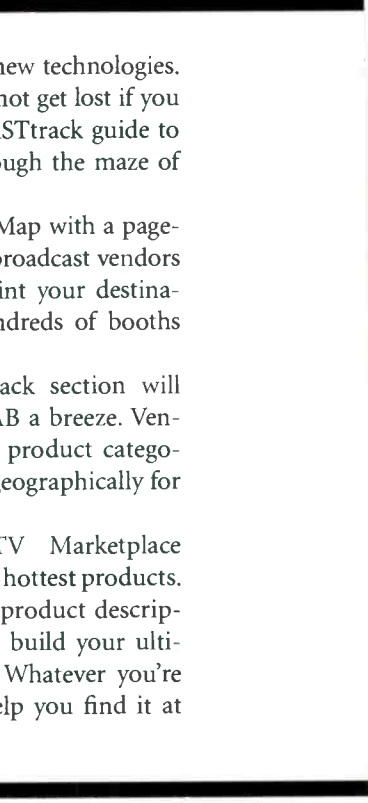

The NAB show always serves as a place for broadcasters worldwide to gather and learn more about their industry. Not only does it provide the opportunity to see tomorrow's technology today, but also it offers attendees the chance to have questions answered on the technology and policy.

Every year, the *Broadcast Engineering* staff provides a guide full of comprehensive coverage to help you make the most of this chaotic event. First, we announce the winners of our sixth annual Engineering Excellence Awards competition. We'll recognize these facilities at NAB for their achievement in each of nine categories.

Next, at NAB2007, vendors from around the world will be displaying new solutions and updated favorites, giving broadcasters the chance to shop for a wide range of new technologies. You'll save time and not get lost if you use our map and FASTtrack guide to plan your route through the maze of booths.

Our Exhibit Hall Map with a page-referenced index of broadcast vendors will help you pinpoint your destination among the hundreds of booths and new products.

And our FASTtrack section will make navigating NAB a breeze. Vendors are divided by product categories and then listed geographically for easy reference.

Finally, our DTV Marketplace showcases this year's hottest products. Browse 28 pages of product descriptions and photos to build your ultimate shopping list. Whatever you're looking for, we'll help you find it at NAB. ■

The BroadcastEngineering sixth annual ExcellenceAwards

Note from the editor

This year's *Broadcast Engineering* Excellence awards totaled 50 entries, which exceeded last year's total of 42. In addition, the contest pages posted on our Web site generated more than 23,000 page views!

The winning entries were selected based on the votes received from our readers on the Web site. Twenty lucky voters were selected at random to receive a *Broadcast Engineering* T-shirt. T-shirts will be mailed by April 1.

Congratulations to all of the entrants in this year's contest. You represent the highest quality in television, production and network technology. To see firsthand the equipment and solutions used by these leading facilities, visit the NAB booths of the vendors described in the stories. For directions to each vendor's booth, see our map, which begins on page 145.

Brad Dick

Brad Dick
Editorial Director

Chosen from 50 cutting-edge facilities by our readers, the winners and runners-up are:

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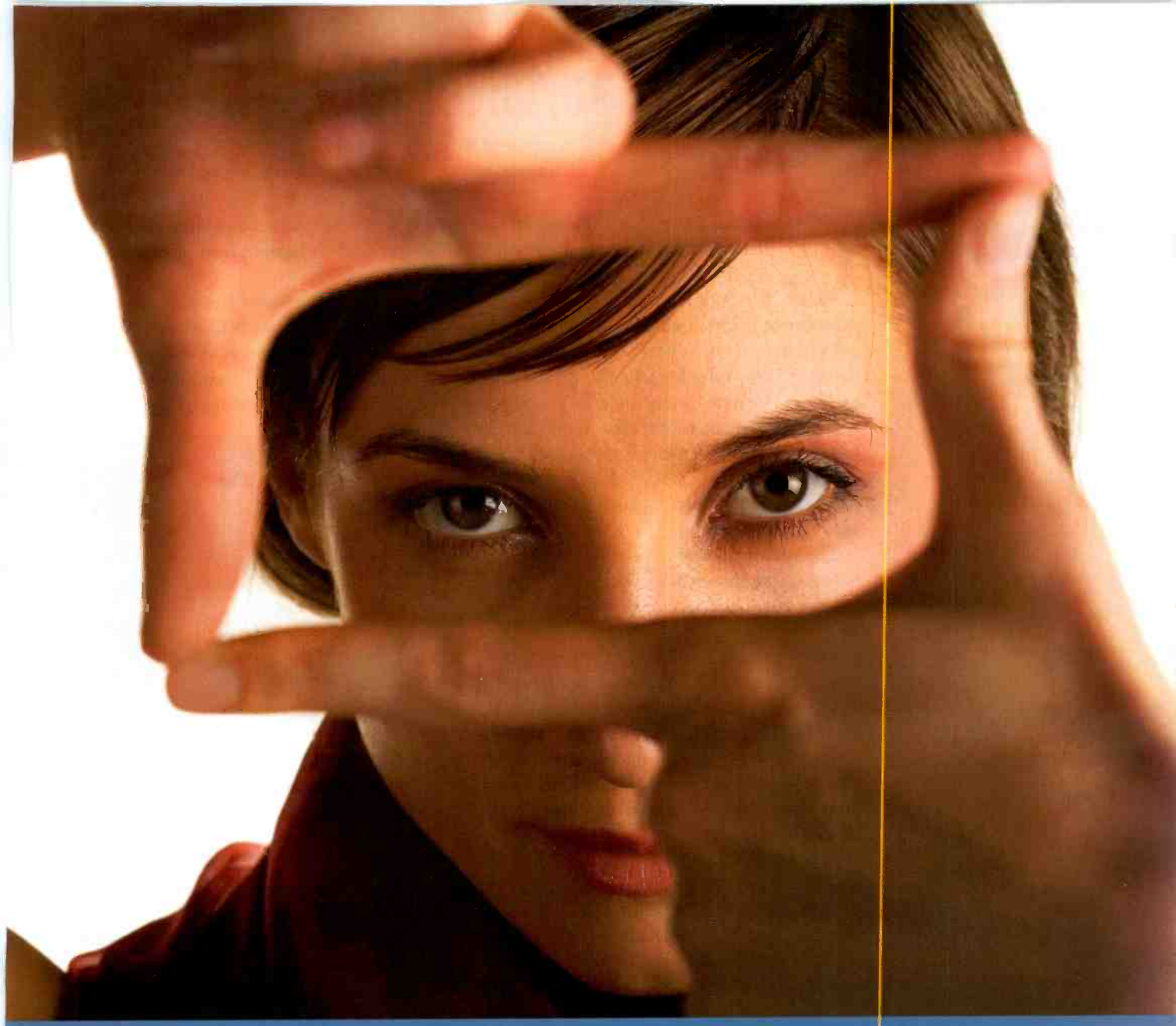

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FLORICAL SYSTEMS

WINNER:

Comcast SportsNet Mid-Atlantic

Category

New studio technology — station

Submitted by

Harris

Comcast SportsNet Mid-Atlantic

Winner of new studio technology — station

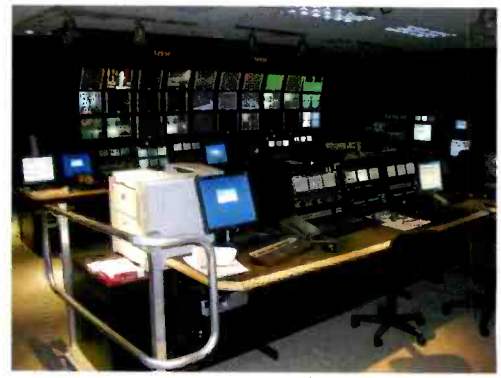
Comcast SportsNet Mid-Atlantic in Bethesda, MD, is a 24-hour cable sports network. Systems integrator Beck Associates helped design, integrate and install all equipment and consoles in the network's new origination facility, which is almost double the size of the previous one. The new facility includes a studio, a central equipment room with more than 50 racks, five master control rooms, a production control room, three post-production editing rooms, a news content playback room and nine editing suites.

The facility needed to provide greater flexibility in program distribution, while improving the quality of service to viewers; expand live production capability and allow for a seamless transition to HD in the near future; and help Comcast SportsNet go tapeless.

The new system is wideband digital at its core. Harris' NEXIO server system provides storage, editing and playout of news content. The server offers extensive third-party integration and open standards for a high degree of interoperability.

Servers play out program material in SD and HD. Program content is brought in via fiber or satellite and played directly to air or recorded on SD or HD NEXIO servers for later playback. News content is also acquired via satellite or fiber. Material is ingested into the server in SD, edited on Harris NewsFlash high-res craft and news editors and stored on NEXIO.

NewsFlash eliminates the wait for transfers, dubs or field tapes. NEXIO can play out NewsFlash clips as soon as they begin copying to disk. Working in conjunction with Avid iNEWS, content is played back to air



using Harris' MOS Playlist Manager. NEXIO Pilot controls and monitors. HD master control helps produce HD programming.

Networking is key in the new facility. Most devices can communicate with one another over Ethernet. More than 90 percent of the communications between devices in the facility is over a TCP/IP network. This eliminated a great deal of serial cabling, the space required to support it and the associated hardware. ■

RUNNER-UP:

Category

New studio technology — station

Submitted by

TSL

BOOM

Romanian DTH broadcaster Boom contracted UK-based systems integrator TSL to design and build a new digital satellite facility. The facility now plays host to 10 originated channels with commercials and 31 pass-through channels, and has the capability to expand channel capacity. A new infrastructure provides a package of 24/7 channels with pay-per-view and interactive services. It reaches 7.1 million households and is broadcast in Romanian.

With a budget of less than $2.5 million, TSL devised a turnkey solution based on Pebble Beach System's Neptune automation. The Neptune controls the entire facility and is integrated with a SeaChange Broadcast

Media Library (BML). For other parts of the workflow, Neptune also acts a mini media asset management system and data mover, allowing simple direct media transfers between the server and a Sony PetaSite S-series data archive library.

The Neptune enables operators to ingest media to the server from videotape frame accurately. ■

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tvone

WINNER:

Lifetime

Category

New studio technology — network

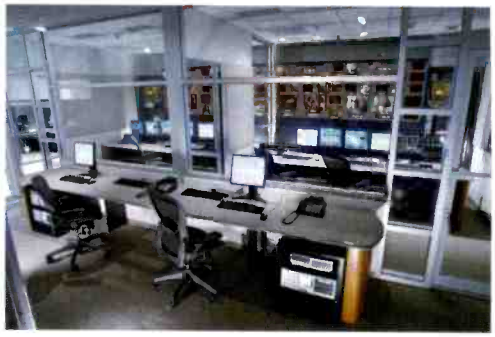
Submitted by

Ascent Media Systems & Technology Services

Lifetime

Winner of new studio technology — network

Lifetime's 50,000sq-ft Technical Operations Center at 111 8th Avenue in New York City is the culmination of many years of intensive planning, driven by the vision of an HD-ready facility using complex digital media systems and applications. The end result: a virtually tapeless delivery to air workflow for Lifetime's women's networks on ad-supported basic cable in the United States, as well as new broadband programming in development for Lifetimetv.com.



Ascent Media Systems & Technology Services headed a design team that included Lifetime's engineering department as well as the network's newly formed Digital Media Task Force, a team comprised of broadcast and IT engineering experts.

From the outset, plans were in place for a centralized digital asset management system and a data center relocation, naturally blending the previously diverse cultures of broadcast and IT. The biggest design challenges involved the digital media applications and infrastructure supporting the production systems, vendor development partnerships and interoperability, and change management surrounding entirely new workflows. Equally critical was the selection of a media asset management partner. Following a comprehensive review process, Venaca's S3 production system was selected to serve as the core digital media application. ■

RUNNERS-UP:

Category

New studio technology — network

Submitted by

NEP Studios/SSL

The Daily Show

In just two weeks, the entire cast and crew of "The Daily Show" moved from NEP Studio 54 into a new space across town in New York City from the smaller digs it had occupied since 1998. New construction to prepare the facility and make room for expanded offices and production space began in January 2005 and spanned six months.

A new Solid State Logic C100 digital audio console serves as the centerpiece of a retrofitted audio production room. The new version 2 software includes expanded I/O capacity and TouchPan. ■

Submitted by

CEI

Rainbow Network Communications

Rainbow Network Communications is a supplier of SD and HD program origination and distribution services to the multimedia industry. With a complex array of live and prerecorded programming to handle, Rainbow recognized the need for a new generation of live video multichannel master control rooms. It entrusted this challenge to system engineering firm Communications Engineering Inc. (CEI) and the Rainbow engineering team. ■

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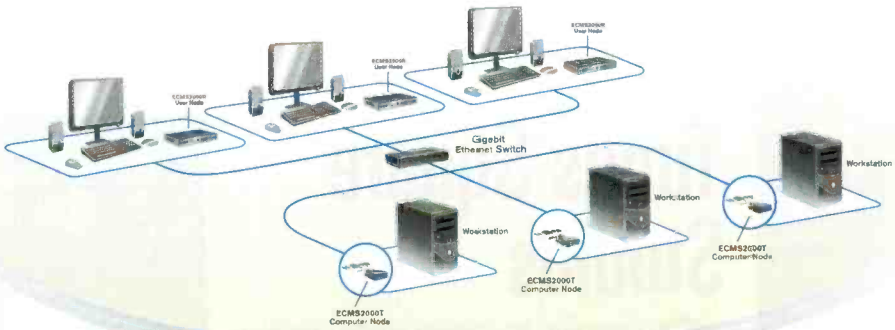

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WINNER:

Rainbow Media

Category

New studio technology — HD

Submitted by

Front Porch Digital

Rainbow Media

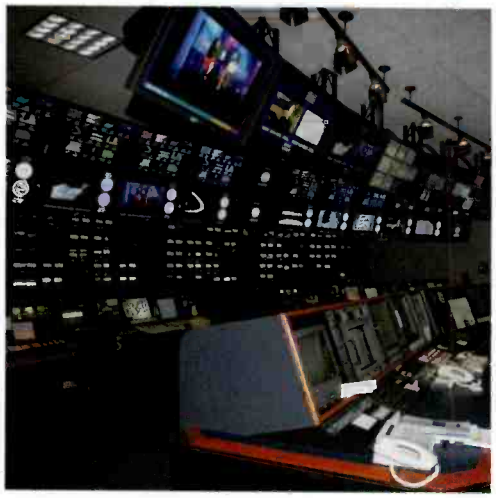
Winner of new studio technology — HD

VOOM HD Networks, a subsidiary of Rainbow Media, provides movies on five of its 15 channels throughout the day, which led to the network finding itself overwhelmed by the task of managing the HD content storage playing out nearly 150 HD movies.

VOOM HD's channels include movies, sports, music, travel, fashion, the arts, cartoons and news. Each of these HD video files is about three times the size of equivalent SD programs. Rainbow Media had established a data tape-based playout model for SD assets used by its national networks, but the faster operation of the data tape drives compared to the network's server systems resulted in bottlenecks at the server. The network wanted to approach HD content management from a new angle.

To manage efficient storage of the network's significant library of large HD files, the network turned to Front Porch Digital's DIVArchive. The storage system enables interoperability between large digital media storage devices, video servers, editing systems and digital media workflow applications, simplifying the process of preserving, managing and accessing content.

The network had two main objectives: to ensure that all the VOOM content could easily be transferred in and out of nearline storage faster than real time, and, in the process, to maximize efficient use of the data tape technology being used.



In order to achieve these objectives, a two-tier storage layer was incorporated into the design under the management and control of DIVArchive. The first tier uses 20TB of Nexsan ATABeast FC disk storage, and the second tier uses an ADIC Scalar 10K library with seven IBM LTO tape drives. The DIVArchive Storage Plan Manager policy engine controls all of the network's content throughout its lifecycle and stores it on the appropriate devices based on performance and cost. ■

RUNNER-UP:

Category

New studio technology — HD

Submitted by

National TeleConsultants

Times Square Studios

Converting an existing studio complex to HD is no small task, especially when the revision can't interfere with live daily two-hour network broadcasts originating from the same facility. Such was the challenge for National TeleConsultants' project team during its significant design upgrade of core engineering facilities at Times Square Studios in New York City, where "Good Morning America" (GMA) and other network programming is produced. In order to accommodate daily production of these shows, SDTV program video was switched live in a temporary mobile production trailer parked outside.

The project also included a coordinated HD/SD redesign of ABC's 66th Street master control facility, where GMA's production, news ingest, editing, playout and release control room are located. New equipment included up- and downconversion, frame syncs and HD terminal fiber gear. ■

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WINNER: Tribune

Category
New studio technology — nonbroadcast

Submitted by
The Systems Group

Tribune

Winner of new studio technology — nonbroadcast

In fall of 2005, Tribune consolidated its Washington, D.C., publishing and broadcast bureaus into a single facility on the seventh floor of the historic Woodward & Lothrop Building. The Tribune media center houses bureaus for Tribune Broadcasting and Tribune newspapers such as the "Los Angeles Times," the "Chicago Tribune" and "Newsday." The Systems Group (TSG) designed and integrated Tribune Broadcasting's TV news bureau into the media center.

TSG was charged with updating the bureau to a digital infrastructure, integrating key pieces of legacy analog equipment, providing extensive satellite downlink and uplink capabilities and improving workflow through server-based nonlinear editing and playback. A key consideration in equipment selection and system design was operational simplicity for the staff.

The Grass Valley DNP platform was chosen for its integration of desktop editing, ENPS interface, and server-based recording and playout with M-Series servers. An SD-SDI facility router using embedded audio ties the new digital systems to islands of analog equipment converted with Evertz modular cards.

Two operationally identical control rooms include Sony DFS-700 switchers and Mackie 24-8 bus mixers to allow the bureau to provide two simultaneous feeds to its more than two dozen sister stations across the country.

An Evertz MVP system provides control room operators with flexible video monitoring of feeds with 40 video inputs driving three large DLP screens. A Raritan Paragon KVM matrix (for 16 users and 64 computers) connects operators in control rooms, at the news desk and to resources in the equipment room.

Vincor installed four steerable satellite dishes ranging in size from 3.6m to 4.9m on the rooftop. The 4.9m dish is used daily for uplinks to Tribune stations, including from Boston, New Orleans and Sacramento, CA. ■

RUNNER-UP:

Category
New studio technology — nonbroadcast

Submitted by
AZCAR

Modeo Mobile TV Network

Crown Castle International lauched a mobile TV network, Modeo, using 5MHz nationwide spectrum acquired from the FCC.

AZCAR provided systems design and technology integration services. The goal of the project was to develop a DVB-H-based broadcast center that met the challenge of delivering high-quality content to mobile devices.

The greatest design challenge was to bring together the latest in traditional broadcast and next-generation mobile TV technology into a cohesive, efficient broadcast center supporting dozens of mobile content channels and file services.

The facility supports the ingest of many different content types and sources to include both linear and nonlinear content sources delivered by satellite and IP-based transport services. ■

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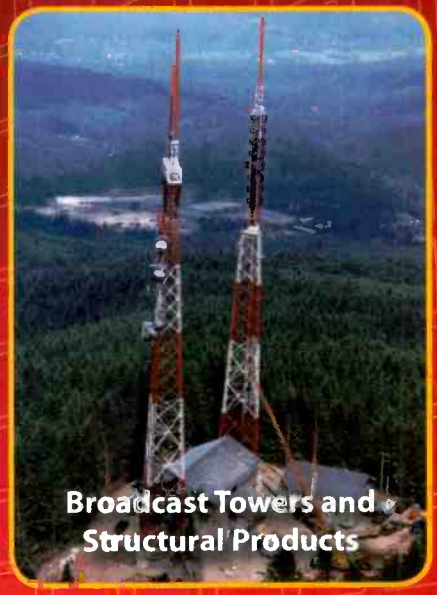

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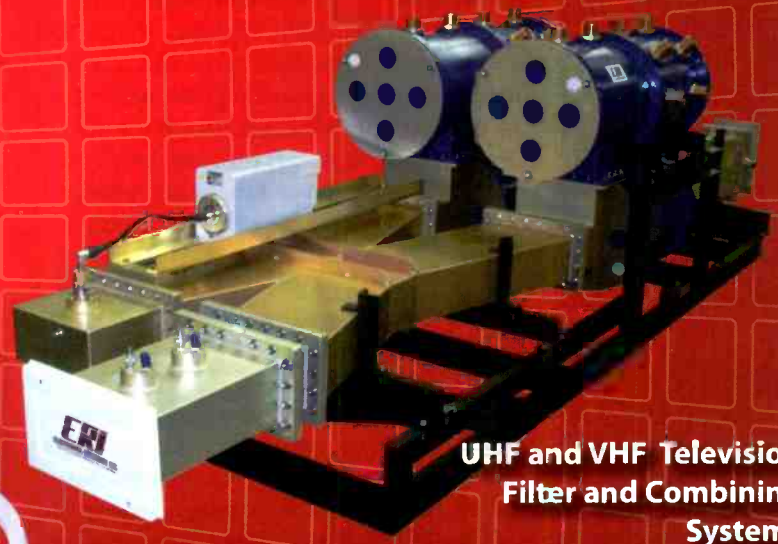

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WINNER:

Trinity Broadcast Network

Category
Station automation

Submitted by
TV Magic

Trinity Broadcast Network

Winner of station automation

Two years ago Trinity Broadcast Network (TBN) needed to find a way to comply with new FCC regulations for digital television. TBN also wanted to use this upgrade to enable affiliate stations to receive network feeds and insert local programming and interstitials.

The exceptional size and scale of the project led the network to seek out help from systems integrator TV Magic. TV Magic designed an inexpensive but flexible automated master control system that supports five DTV channels and allows for unattended operation. TV Magic also installed that system across all 32 of the network's affiliate stations throughout the United States. The time frame from design to installation for the project was 18 months.

For each unique TBN affiliate, a separate full-power master control system was designed, built, tested and configured. TV Magic coordinated its field crews with stations to ensure timely receipt of gear, installation, cutover and training. TV Magic crews traveled from site to site to install the new systems into each station, often working around obstacles including limited space and ongoing operations. The systems integrator performed on-site operator training as part of the install, and TV Magic engineers provided telephone-based technical support for any operations or engineering issues at the affiliate stations.

Each system includes a multichannel server with ingest and playout, branding with squeezeback, a character generator and logo insertion, plus EAS and other FCC compliance — controlled through a flexible automation system. A customized Sundance Digital Titan automation system enables the unattended operation capability desired by TBN. The integrated broadcast system also incorporates Miranda terminal gear and Imagestore channel branding processor, Masstech loggers, 360 Systems or Omneon media servers, and Keywest Technology secondary logo insertion and EAS systems. The system is housed in two full-sized APW racks.

TBN stations will continue to do some local ingest and production, as well as develop remote monitoring capabilities. ■

RUNNER-UP:

Category
Station automation

Submitted by
Sundance Digital

KGW-TV

When the automation and servers are eight years old, no longer supported by the manufacturer, and the servers lack the storage capacity for a growing facility, it's time to explore new options. This was the case for KGW-TV, a Belo station in Portland, OR.

The station determined that Sundance Digital Titan automation offered the best technology and operational flexibility, along with solid support and a favorable pricing structure. The decision on a replacement video server, however, was up-in-the-air until Grass Valley approached KGW with the opportunity to be the first facility to install its new K2 series — an advanced IT-based media server and client system designed specifically to share and reuse digital media assets.

The new Titan and K2s went on-air smoothly in January 2006, with only the typical speed bumps associated with training everyone on new gear and user interfaces. Since then, the system has been extremely reliable. ■

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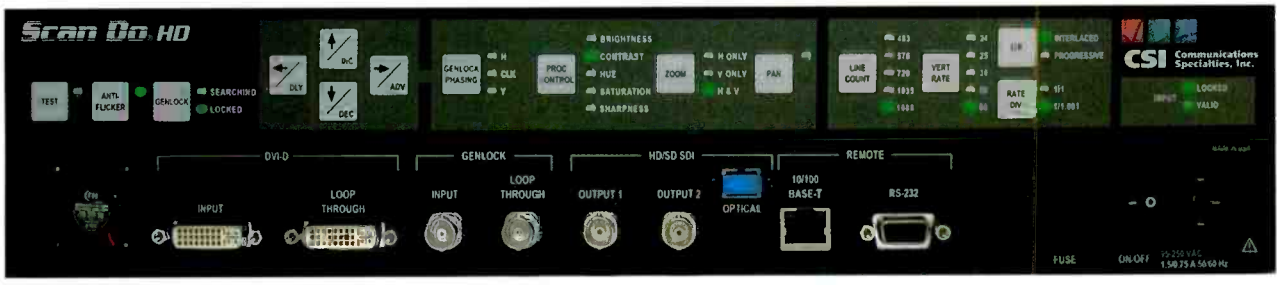

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WINNER:

Scripps Networks

Category

Network automation

Submitted by

Omneon

Scripps Networks

Winner of network automation

Scripps Networks worked with systems integrator Ascent Media to transform its broadcast operations department into a new media logistics division. The company's new IT-based infrastructure serves as a platform for leveraging its growing asset library across traditional broadcast channels and emerging platforms and channels, while also enabling the sharing of content internally.

The new infrastructure provides a stable on-air platform for SD channels that were migrated onto the new playout system throughout 2006. It also allowed the network to launch Food Network HD and HGTV HD. The Food Network HD and HGTV HD programs are shot at a 16:9 aspect ratio and then ingested to an Omneon Spectrum media server via Snell & Wilcox MEMPHIS HD encoders. The encoders ingest the HDTV content, integrating two of the systems with the servers to encode all HGTV program material acquired, as well as HD commercials and promos.

The network uses one 24TB Spectrum media server to support HD ingest and two 12TB Spectrum systems for redundant playout operations. Under the control of an OmniBus Colossus automation package, the servers provide a scalable server platform that will facilitate the network's future growth and integration with systems, including the facility's Avid editing systems. Colossus manages archiving of content from the servers via a Masstech Hierarchical Storage Management system, to a StorageTek nearline archive. OmniBus OPUS interchange software will enable data exchanges between automation and a DAM system yet to be installed.

The MXF-compliant servers allow operators to intermix SD and HD content while handling audio tracks independently. As HD material is ingested, Dolby E 5.1 audio is decoded and re-embedded as discrete tracks, which can be moved throughout the facility, without introducing delay, and then converted to 5.1 immediately prior to transmission. ■

RUNNER-UP:

Category

Network automation

Submitted by

The Systems Group

Viacom Networks

Viacom Networks has maintained its Network Operations Center (NOC) in Hauppauge, NY, for more than 20 years.

In the summer of 2005, to accommodate a number of expected network launches, Viacom engineering conceived the Supersuite concept. The idea was to provide a common user-friendly design to accommodate all network requirements, allowing for the rapid launch of a new network within six to eight weeks of the request from operations. The new design would support a flexible, standardized and interchangeable operating paradigm so that any operator could command any channel from any workstation under a highly automated control system.

Having worked together on other critical projects, Viacom turned to The Systems Group to detail the concepts and bring the plan to life in a short four-month project cycle timed to launch the first four networks. ■

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WINNER:
Globo News

Category
Newsroom technology

Submitted by
TV Globo

Globo News

Winner of newsroom technology

Globo TV in Brazil faced the challenge of deciding the best way to migrate from its tape-based workflow to a file-based one. The network chose its 24-hour news channel, Globo News, to be the host of an experimental and innovative tapeless implementation.

The main priority for the network was reliability and redundancy to provide uninterrupted programming and to establish ingest servers with local storage for backups, and standalone playout servers that could operate independently of the system. The same playout servers also had to receive multiple simultaneous streams faster than real time.

The system had to use a high-quality, low-res file format with jog/shuttle operation, frame accuracy and allow access to these files while recording. It had to be flexible to support multiple file formats and all AV effects. It needed an integrated logging system for news and sports programs to allow collaborative work between the archive and news production teams. It also needed to be able to keep the original bit stream of the video from ingest to playout, except on the segments where effects were applied, to avoid cascading compression and decompression processes. Finally, the system needed to completely integrate with Sony XDCAM.

Based on these concepts, two independent, yet integrated, systems were implemented. One was designed for the daily operation of Globo News, and the other system was implemented to be used during the 2006 FIFA World Cup. The two systems consisted of 14 ingest machines; five low-res editing suites; one high-res editing suite; 20 desktops for

browsing low-res materials, with the capacity to export them directly to the playouts without rendering; two desktops for real-time logging; and storage with 900 hours (at 40Mb I-frame) in a fully mirrored configuration.

The system operates transparently with MPEG-2 AVI/MXF and Windows Media/MPEG-4. The renders are MPEG-2 bit stream aware, so the original bit stream remains unchanged on the final files without recompression. ■

RUNNER-UP:

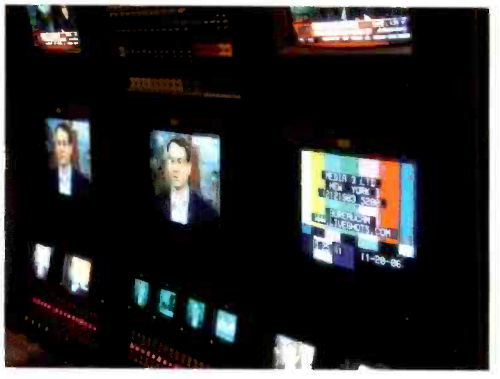
Category
Newsroom technology

Submitted by
Media 3

Live Shots NY

Media 3 just completed a live broadcast facility elegantly disguised as a luxurious Midtown executive club. Working with TPG Planning and Design, Media 3 designed the facility with maximum flexibility and sophistication in mind to accommodate a clientele that regularly includes heads of state, CEOs and celebrities.

The new 16,000sq-ft facility supports two control rooms, five studios, broadcast service panels and 24 fiber tie lines to Ascent Media's Fifth Avenue hub. Every source and destination throughout the facility is on a Miranda router, eliminating the need for any hard patching. From anywhere in the facility, guests



can monitor up to four signals simultaneously to keep current on world events that could affect their impending appearance.

The facility's four live-shot studios are prelit and always ready to go at a moment's notice. The facility is designed around Media 3's BureauCam live-shot system. ■

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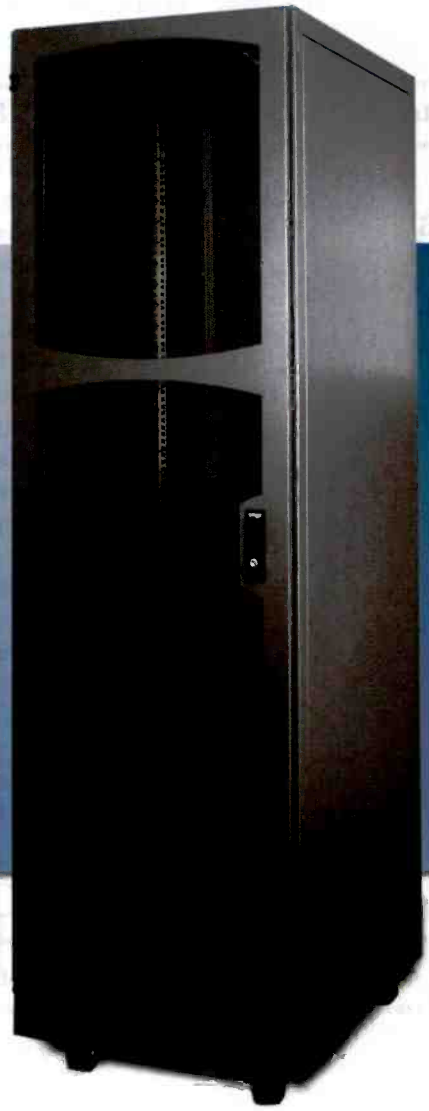

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WINNER:
Discovery

Category
Post & network production facilities

Submitted by
National TeleConsultants

Discovery
Winner of post & network production facilities

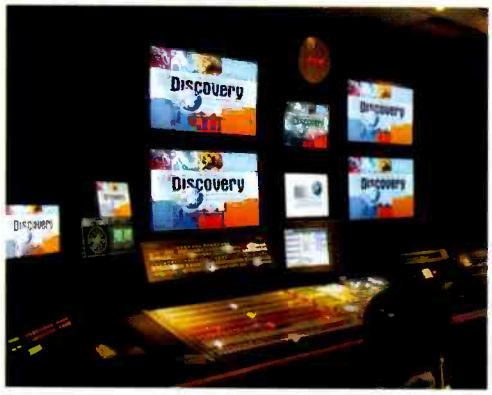
This year, Discovery Communications added an HD control room to its production center in Silver Spring, MD, to serve the expanding HD and SD production needs. The new room needed to be easily configurable between HD and SD and serve triple duty as a control room for live events, a post-production editing suite and a program-reformatting room. National TeleConsultants designed and created this multipurpose HD/SD room.

To serve these varied tasks, equipment choices included a Grass Valley Kalypso Duo HD/SD production switcher, an Avid Deko 3000 Hybrid HD/SD character generator and EVS XT2 HD/SD production servers with Grass Valley LVS Live Event Management System controllers to record and play audio and video on short turnaround, as needed.

In order to provide complex communications often required for live events, a sophisticated, easily programmable intercom system was needed. For this, a Telex/RTS Adam-CS 64 x 64 Matrix Intercom was chosen to support live-event production.

In addition to the technical and operational requirements, the control room had to physically fit within an existing space not originally intended for this purpose. The space did have several crucial features already in place, including sound-isolated walls and close proximity to the in-house production studio.

Flat-panel, large-screen HD LCD monitors from Clarity and Sony helped make efficient use of space; they take up far less space than



traditional CRT monitors. The addition of an Evertz 3000 MVP multi-image display processor enables control room users to quickly reconfigure the room's monitors for live HD/SD production or post-production work. This programmable system allows directors to resize and reassign video fed to the displays in any desired format at a moment's notice.

To put a premium on space, the HD control room needed to include an audio control room. In order to accomplish the sound isolation needed, a room within a room was constructed for audio control. The room included a compact Calrec Zeta 100 audio console. ■

RUNNER-UP:

Category
Post & network production facilities

Submitted by
SGI

Ascent Media Group

To address the problems of faster turnaround in a 4K data-centric media environment, Ascent Media Group (AMG) gutted its 100,000sq ft building in Burbank, CA, and rebuilt it from the ground up. The company chose SGI as prime contractor, and SGI Professional Services worked hand-in-hand with the group to design and integrate AMG's data-centric production network, ProdNet, which is dedicated to manufacturing, repurposing and distributing large media assets in huge volumes. It also offers studio clients secure methods for accommodating a large variety of deliverables.

The SGI InfiniteStorage CXFS shared file system was a major product component for AMG, particularly in the telecine department, where each frame must be handled as an individual file. The frames add up to 24 files for each second of film. In addition, file sizes range from moderate to large, depending on whether they are HD, 2K or 4K resolution. ■

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WINNER:
KWHY-TV

Category
RF systems

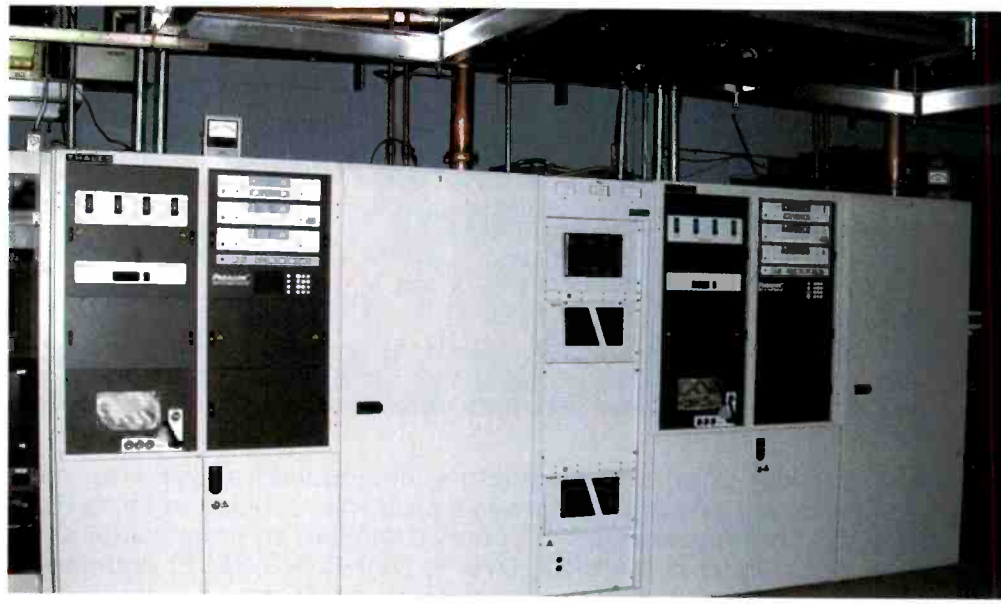
Submitted by
Grass Valley

KWHY-TV

Winner of RF systems

KWHY-TV is an NBC owned-and-operated Spanish-language station serving the Los Angeles Hispanic market. The station's analog channel 22 and digital channel 42 have been co-located since 1999 at the Mt. Wilson RF complex.

The present transmitter building will be vacated at the end of analog television. The KWHY-DT facility has been operating at 86kW ERP. However, RF studies determined that the ERP could be increased to 486kW. The studies also showed that coverage of the Hispanic community could be enhanced for the digital age by relocating to neighboring Mt. Harvard and sharing a transmitter room with sister station KVEA-TV Telemundo on analog channel 52.



Mt. Harvard is accessible only by four-wheel drive vehicle. Electricity rates in Southern California are among the highest in the nation. For these reasons, KWHY determined that reliability and efficiency were prime design factors for the replacement transmitter. Having evaluated the options, the design team selected the Grass Valley DCX Paragon digital transmitter, using up-to-date MSDC IOT technology.

KWHY already used a Grass Valley DCX transmitter for its digital service from Mt. Wilson, and the team considered moving it to the new location. However, it came up with a more imaginative solution. The existing DCX transmitter at Mt. Wilson was converted to an IOX analog transmitter by swapping out the exciter and modifying the RF system. This gave the station a newer, more reliable analog transmitter, retaining the existing one as a full-power backup. New DCX Paragons were installed at Mt. Harvard for the digital channel.

A single DCX Paragon amplifier cabinet is capable of providing the required KWHY TPO of 19.5kW. A second DCX Paragon cabinet was installed as a standby. This particular configuration, using MSDC IOT technology, maximized electrical savings and allowed KWHY to qualify for a substantial business incentive rebate from Southern California Edison, which helped offset the capital expenditures of the equipment.

A Dielectric TFU-26GTH slotted-coaxial antenna with 1.6° of electrical beam tilt and 0.6° of mechanical beam tilt was selected to optimize coverage of the Los Angeles metropolitan area, mounted on an existing 100ft tower. Tower work was performed by Stainless and Sunray Services. KWHY-DT went on the air from Mt. Harvard on June 28, 2006. ■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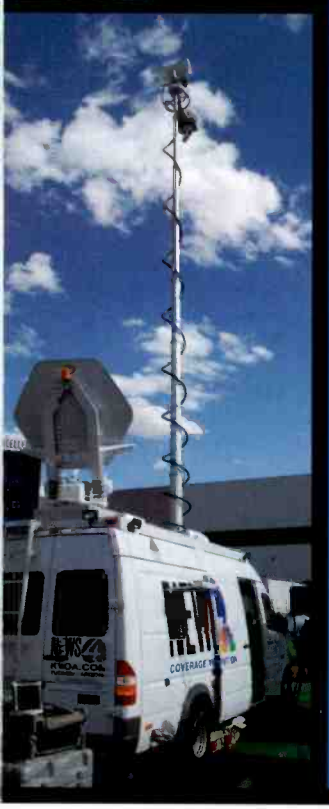

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Winding your way through the halls trying to find your way from point A to B? Getting all you want out of your NAB2007 experience will be easier with this guide at your side.

The *Broadcast Engineering* exhibitor map on page 145 gives you an overview of what is where and how far you'll have to trek to get there. Taking your planning a step further, the FASTtrack section on the following pages catagorizes the booths by interest. Looking for graphic and animation products? Flip to page 170 for a list of companies featuring graphics and animation products.

Listings are based on information provided to us by manufacturers. Booth numbers are provided by NAB and are current as of our press deadline. ■

AUDIO ACCESSORIES

ESE C1839
Wireworks C7617
Riedel Communications C9428
Linear Acoustic C1048
Aviom C11902
Hamlet N419
DK Technologies N1835
DPA Microphones N2227
Production Intercom N2235
Dolby Laboratories N2513
Wohler Technologies N3426
Audio-Technica U.S. N4526
Sonifex N4928
RCS N6511
Logitek Electronic Systems N6521
Wheatstone N7111
Sennheiser Electronic N7117
Studer Soundcraft/JBL N7715
Lectrosonics N8116
Broadcasters General Store/
Towerswitch N8322
Beyerdynamic N9014
Zaxcom N9017
Gefen SL2305
Comprehensive Video Group SL2520
Fairlight SL4010
TASCAM SL4016
Kramer Electronics SL6105A
MSoft SL8724
Chief Manufacturing SL9211
Adrienne Electronics SL9817
Genelec SL11215
Band Pro Film & Digital SU1320
Zandar Technologies SU2729
ISIS Group SU3313
Doremi Labs SU3608
Ward-Beck Systems SU9211
Claratech SU9307
TSL (Television Systems) SU14615
Sigma Electronics SU15512

AUDIO MIXERS, ON-AIR, PORTABLE, STUDIO, PLAYBACK

Burst Electronics C6726
Aviom C11902
Dolby Laboratories N2513
Prism Media Products N3116
STAGETEC (Salzbrenner Stagetec
Mediagroup) N4018
Euphonix N4021
Azden N4826
Sonifex N4928
Klotz Digital Audio Systems N5728
Logitek Electronic Systems N6521
Wheatstone N7111
Sennheiser Electronic N7117
Studer Soundcraft N7715
Telos Systems N7726
Calrec Audio N8529
JK Audio N9426
TASCAM SL4016
Abaltat SL7424
Mackie SL9208
Sony Electronics SU906
Pixel Instruments SU3111
ISIS Group SU3313
Doremi Labs SU3608
Ward-Beck Systems SU9211

AUDIO RECORDING, STORAGE, PLAYBACK

DNF CONTROLS N1526
Dolby Laboratories N2513
Euphonix N4021
Audio-Technica U.S. N4526
Sonifex N4928
RCS N6511
Zaxcom N9017
Gefen SL2305
Digital Vision SL3205
Fairlight SL4010
TASCAM SL4016
MSoft SL8724
Mackie SL9208
Sony Electronics SU906
Omneon Video Networks SU1326
Pixel Instruments SU3111
ISIS Group SU3313
Doremi Labs SU3608
NAGRAVISION SU7515
Pharos Communications SU8905
NVISION SU9605

AUDIO ROUTING, DISTRIBUTION

ESE C1839
Burst Electronics C6726
Switchcraft C7507
Riedel Communications C9428
Linear Acoustic C1048
Aviom C11902
Grass Valley N902
Patchamp N1226
DNF CONTROLS N1526
Evertz N1713
DK Technologies N1835
Dolby Laboratories N2513
Opticomm N2931
Crystal Vision N2935
Multidyne Video & Fiber
Optic Systems N3119
Wohler Technologies N3426
STAGETEC (Salzbrenner Stagetec
Mediagroup N4018
Utah Scientific N4321
Sierra Automated Sys. & Eng. N4413
Sonifex N4928
Klotz Digital Audio Systems N5728
Logitek Electronic Systems N6521
Lawo N7030
Wheatstone N7111
Grass Valley SL202
Gefen SL2305
Comprehensive Video Group SL2520
Keywest Technology SL2620
Communications Specialties SL2826
TASCAM SL4016
Sierra Video Systems SL6105
Kramer Electronics SL6105A
MSoft SL8724
Ensemble Designs SU2326
eyeheight SU2823
Image Video SU3305
Doremi Labs SU3608
Ross Video SU6010
Wegener Communications SU7915
Pharos Communications SU8905
Ward-Beck Systems SU9211
Telecast Fiber Systems SU10213
Network Electronics SU10605
Sigma Electronics SU15512

AUTOMATION, INCLUDING NEWS AND MASTER CONTROL

EVS C3607
Fujinon C4208
Octopus Newsroom Trading N413
Hi Tech Systems N710
vsn/JustEdit N717
DNF CONTROLS N1526
Masterclock N3213
Sierra Automated Sys. & Eng. N4413
Klotz Digital Audio Systems N5728
RCS N6511
Obor Digital N6730
Lawo N7030
Avid Technology SL106
Quantel SL720
Avid Technology SL1410
Dalet Digital Media Sys. SL4305
Barco SL4320
Adtec Digital SL6410
Telestream SL9214
Sundance Digital SL1410A
Florical Systems SU720
MicroFirst SU727
Irdeto Access SU2726
eyeheight SU2823
Leightronix SU3811
NVerzion SU4228
Miranda Technologies SU5220
OmniBus Systems SU5413

Continued on page 169

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The NAB2007 Exhibit Hall Map

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Thursday, April 19
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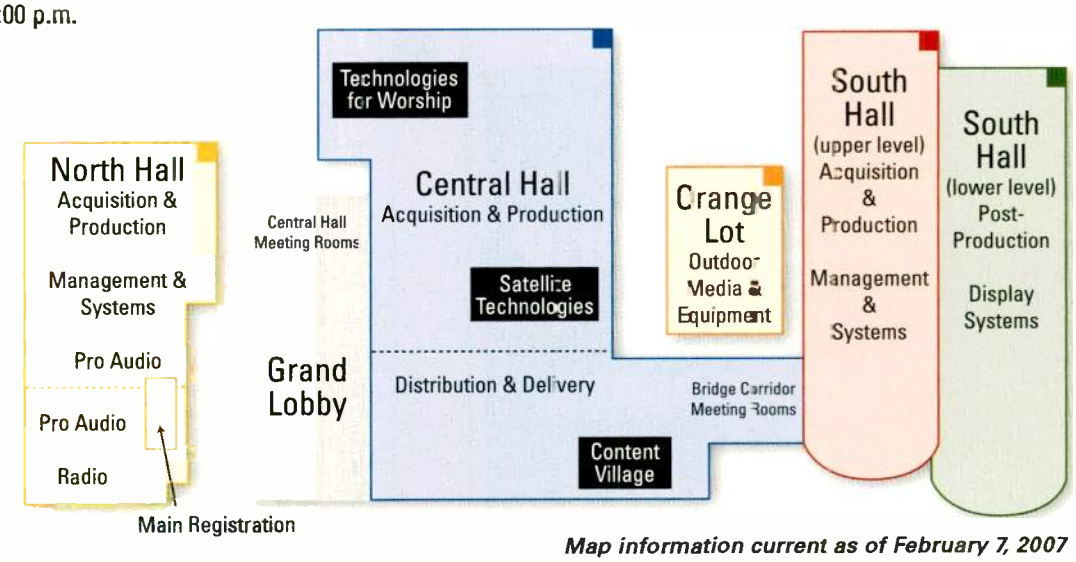

Map information current as of February 7, 2007

MAP INFORMATION

The following is a brief description of what you will find in this year's NAB map from *Broadcast Engineering*.

NAB has divided the convention halls into different product categories this year. To the right, you will see a listing of the categories and what products can be found in each. Next to each listing you will find a color square that indicates the convention hall each category is located in. On the overview map (above) you will see each hall with its product categories.

Our table of contents lists each hall and the pages they are found on. On each of these pages you will notice some booths are highlighted with different colors. The ▪ highlighted booths are our magazine advertisers, while the ▪ highlighted booths are our map advertisers.

We thank all of our advertisers for their support of our NAB coverage and exhibit hall map.

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PRODUCT CATEGORIES

▪▪▪ **Acquisition & Production** — Cameras, lenses, lighting and grip, and ingest technologies.

▪ **Post-Production** — Video editing, graphics, animation, special effects software and hardware, audio editing, music/sound libraries.

▪▪ **Management & Systems** — Video servers, systems integration, database technologies, digital asset management.

▪ **Distribution & Delivery** — Transmitters and towers for television, radio broadcasting, satellite technologies, cable, fiber, IPTV, mobile video and streaming products.

▪ **Display Systems** — Projection equipment, LCD and plasma displays, digital signage.

▪ **Pro Audio** — Audio recording and mixing equipment, encoding and compression technologies.

▪ **Radio** — The entire spectrum of products and services for analog, digital and streaming radio.

▪ **Outdoor Media & Equipment** — ENG vehicles, outdoor signage, satellite services, power generage and production equipment.

▪ **Content Village** — Owners, aggregators and producers showcase their digital content to align with broadcasters, distributors and delivery technologies.

▪ **Technologies for Worship** — Video and audio capture, mixing and presentation technologies and services geared toward the exploding religious marketplace.

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NORTH HALL

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4	Fischer Connectors	N409

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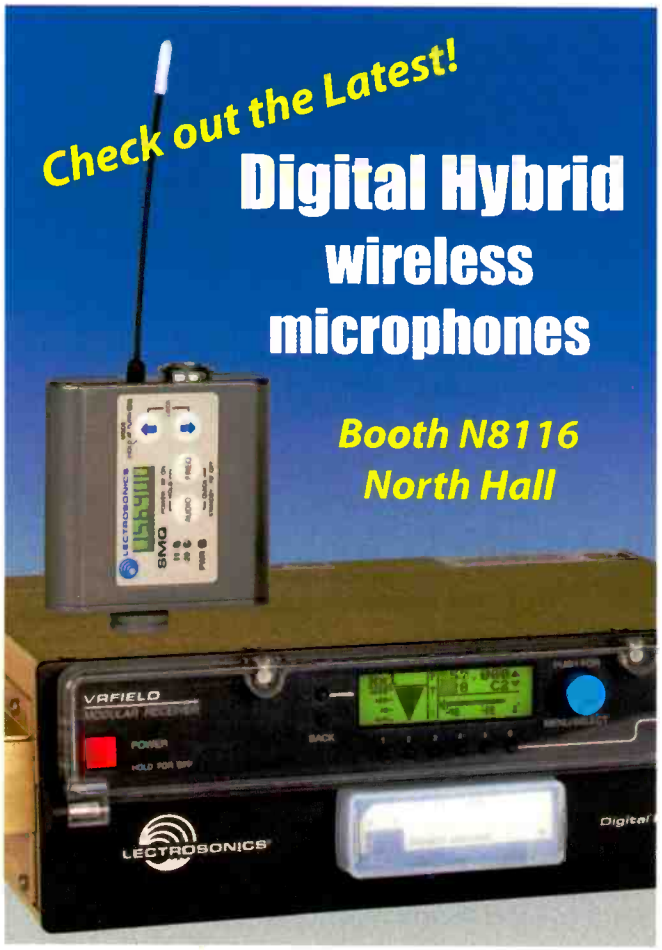

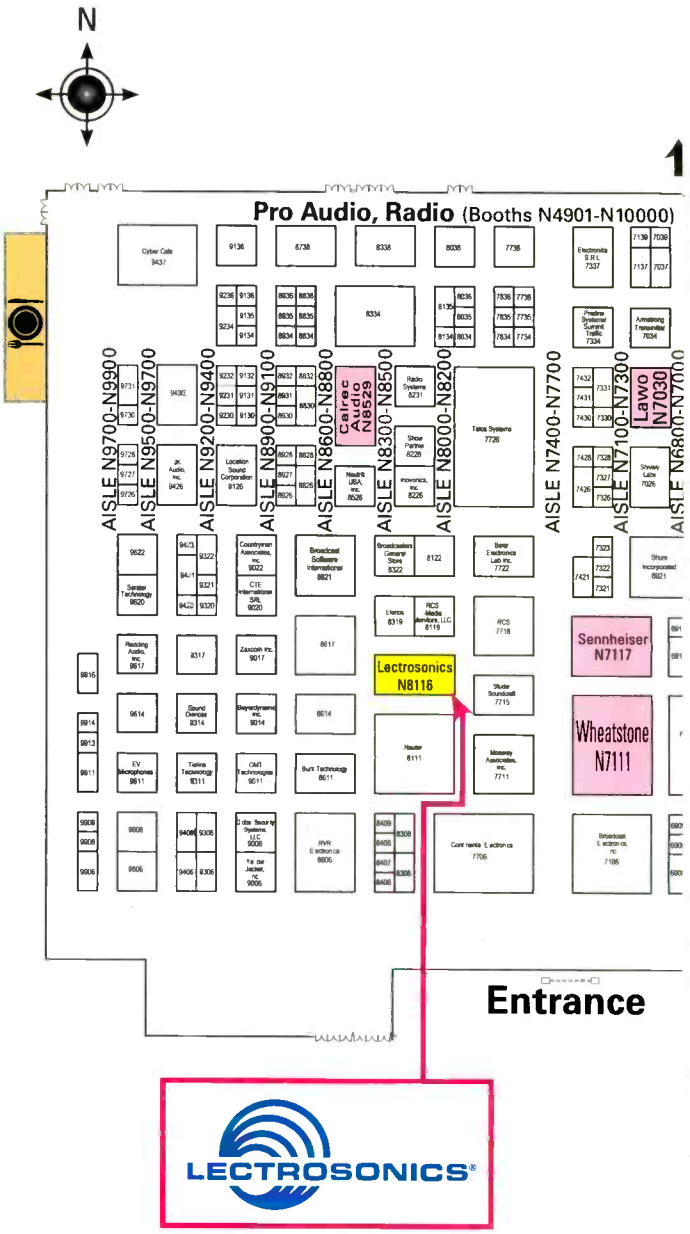

See Harris at booth #N2502 on page 5

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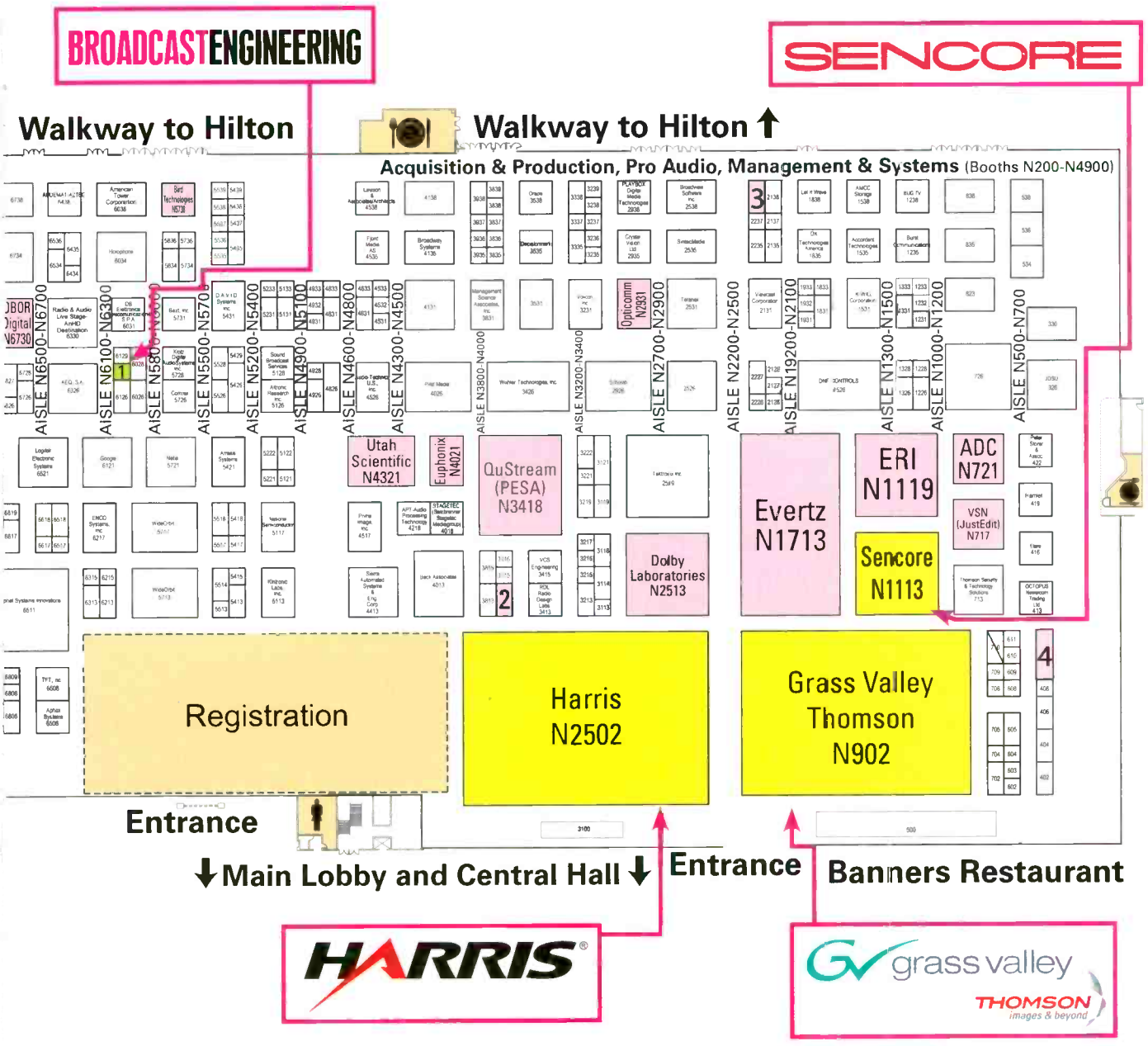

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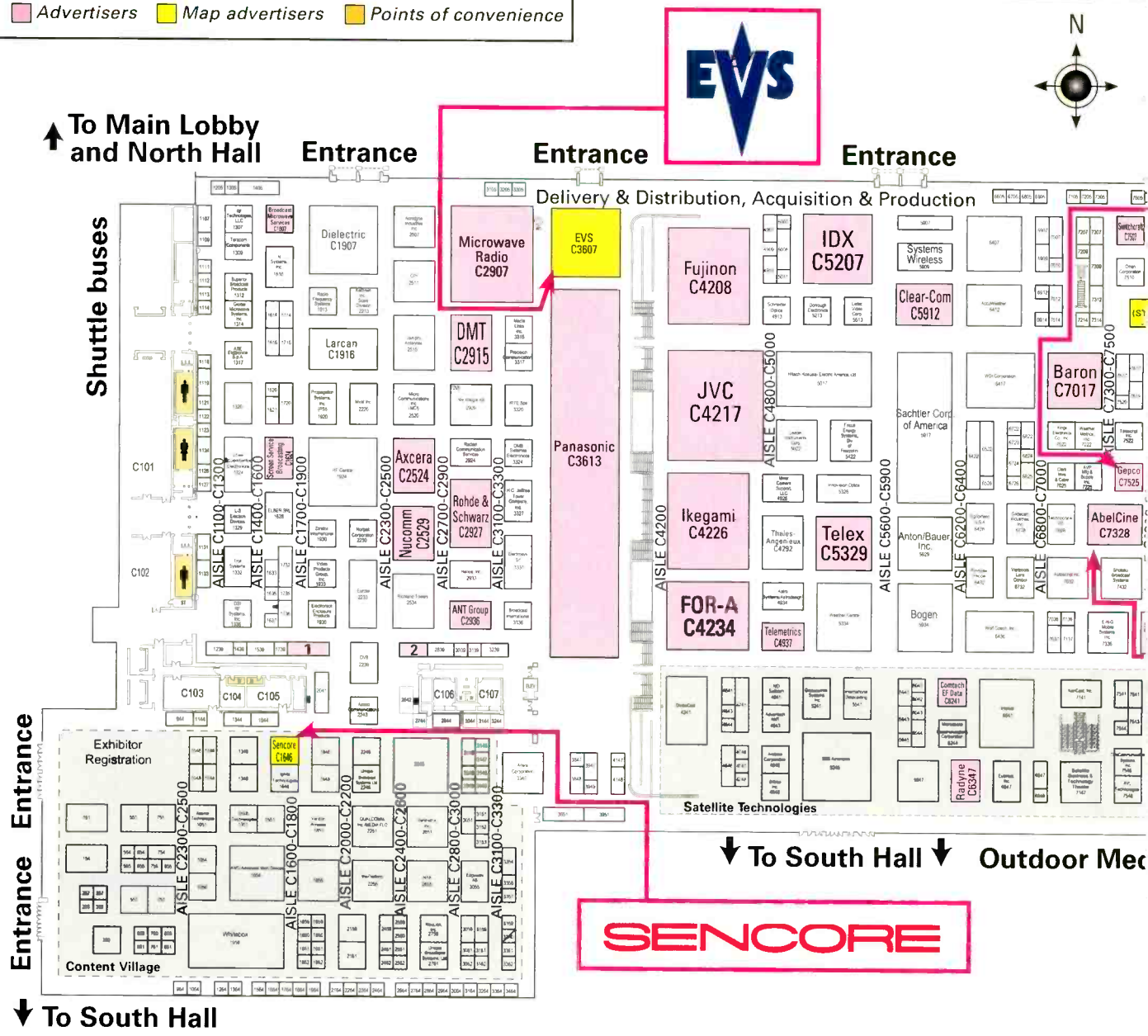

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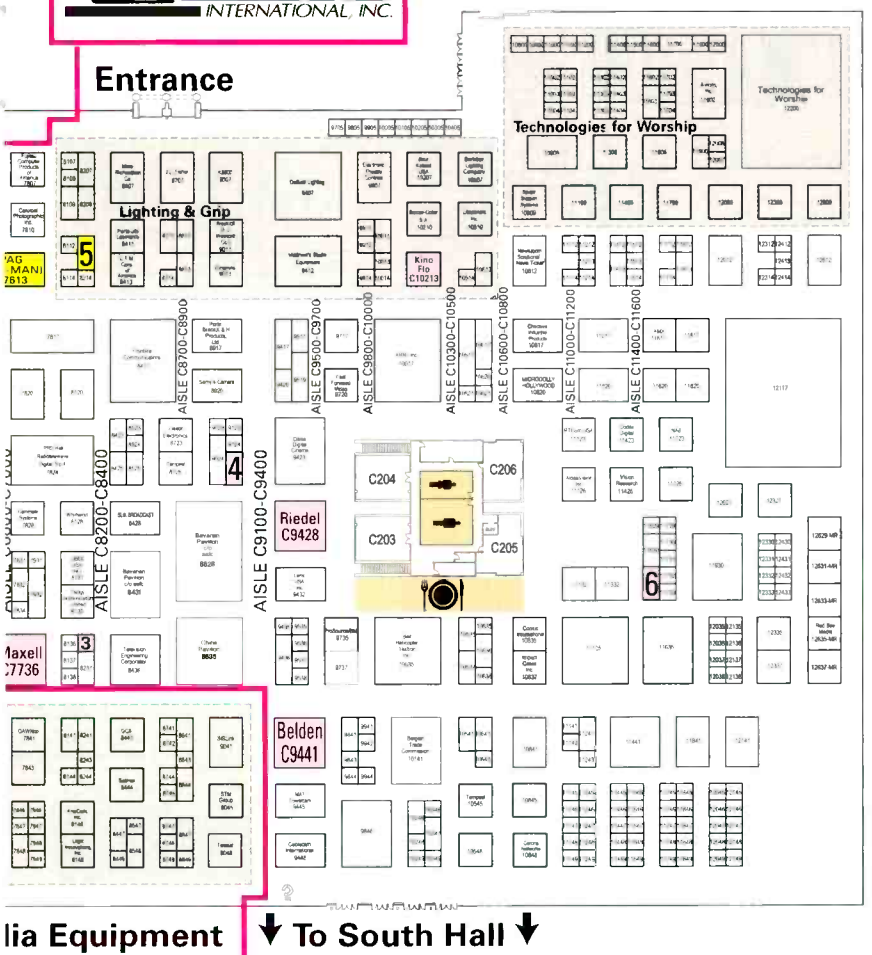

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See Xytech at booth #SU7526 on page 9

See Sencore at booths #C1646 on page 6 & N1113 on page 5

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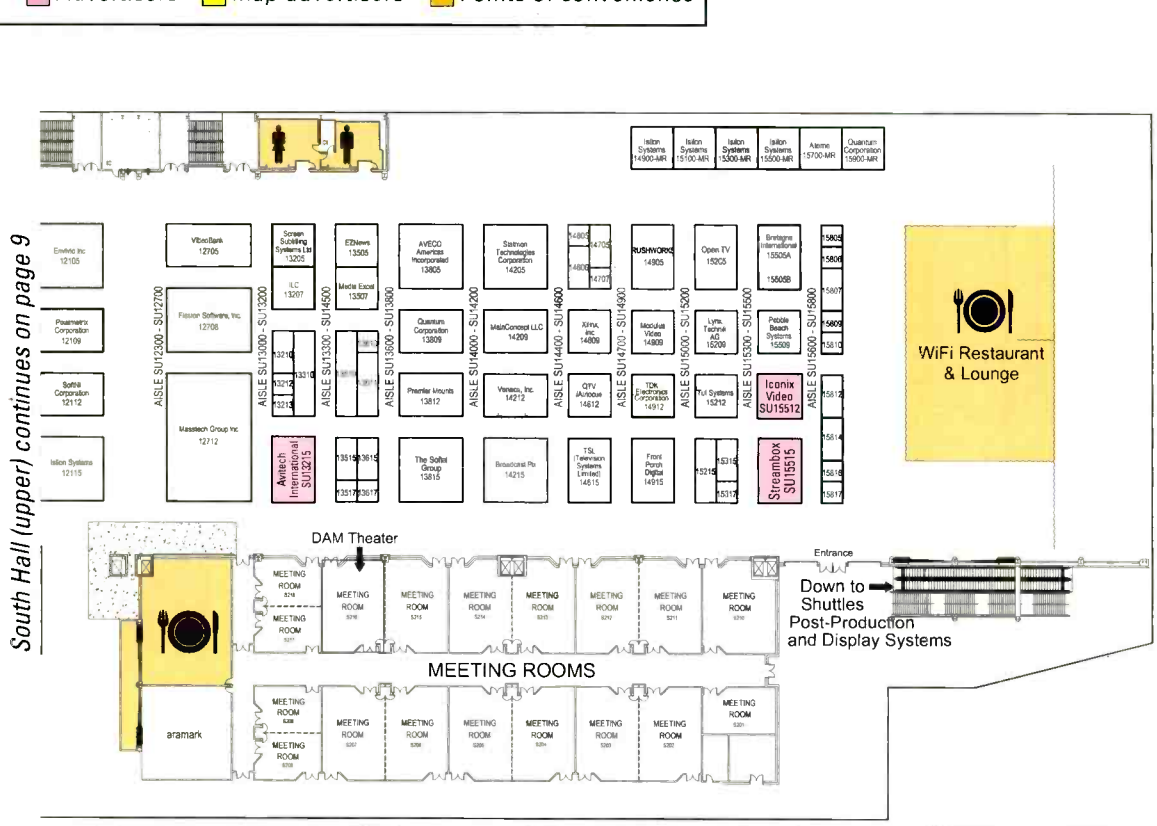

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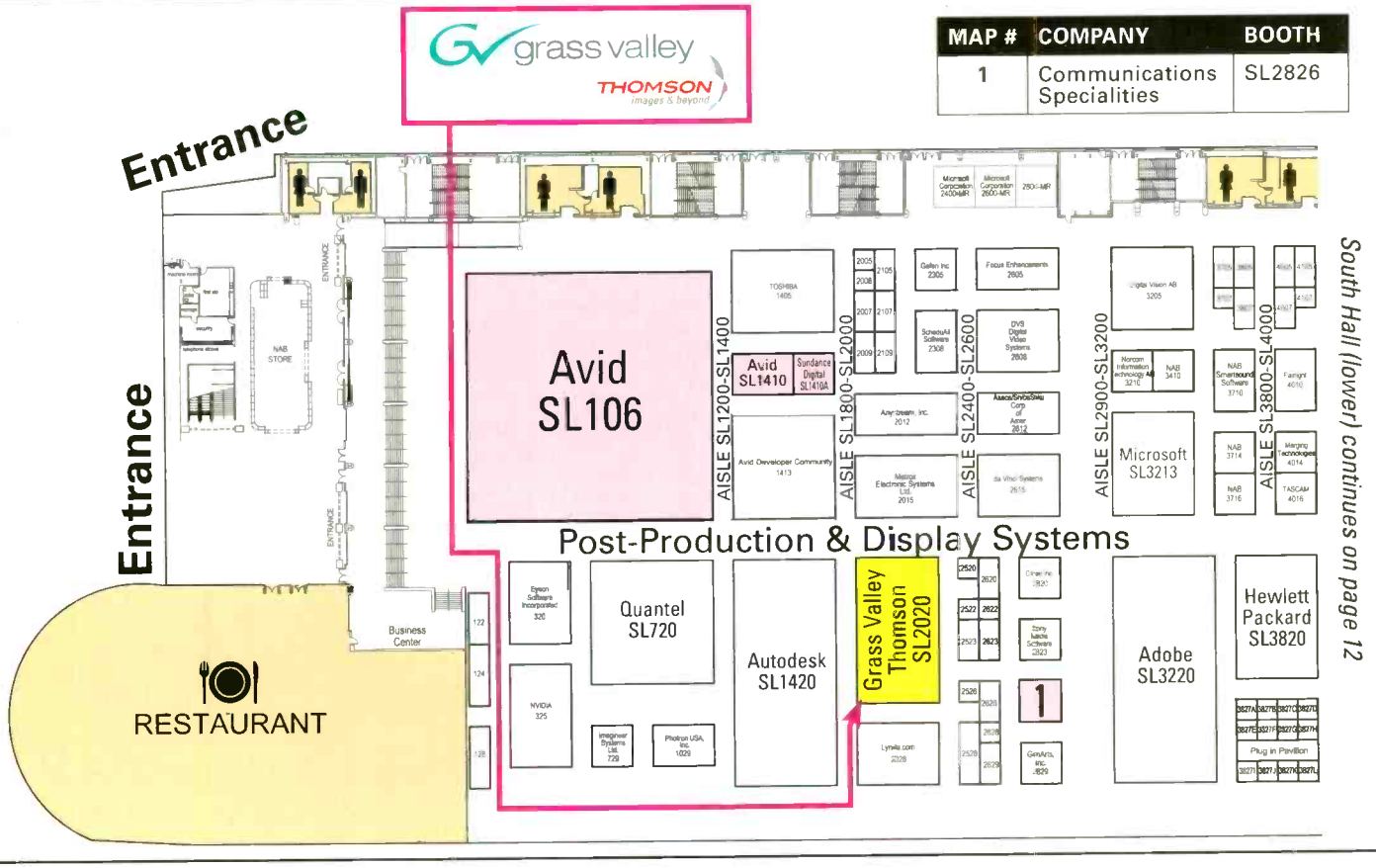

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OUTDOOR MEDIA & EQUIPMENT

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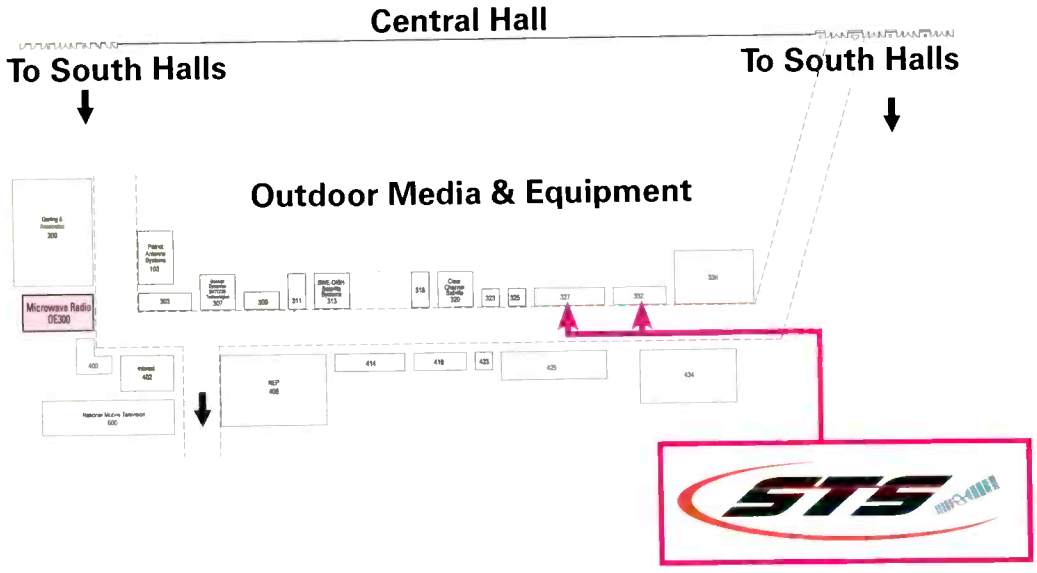

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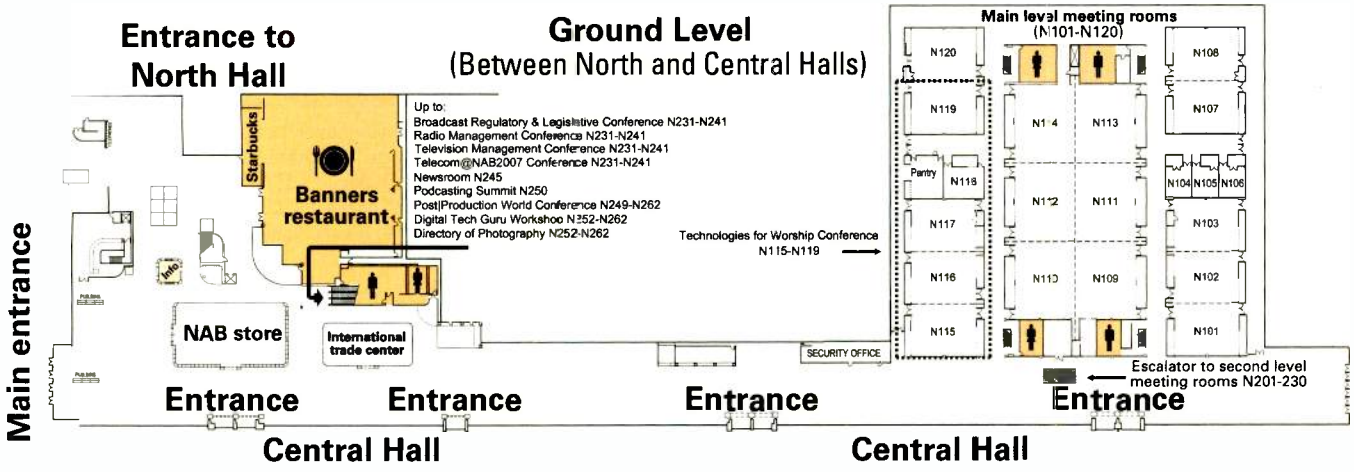

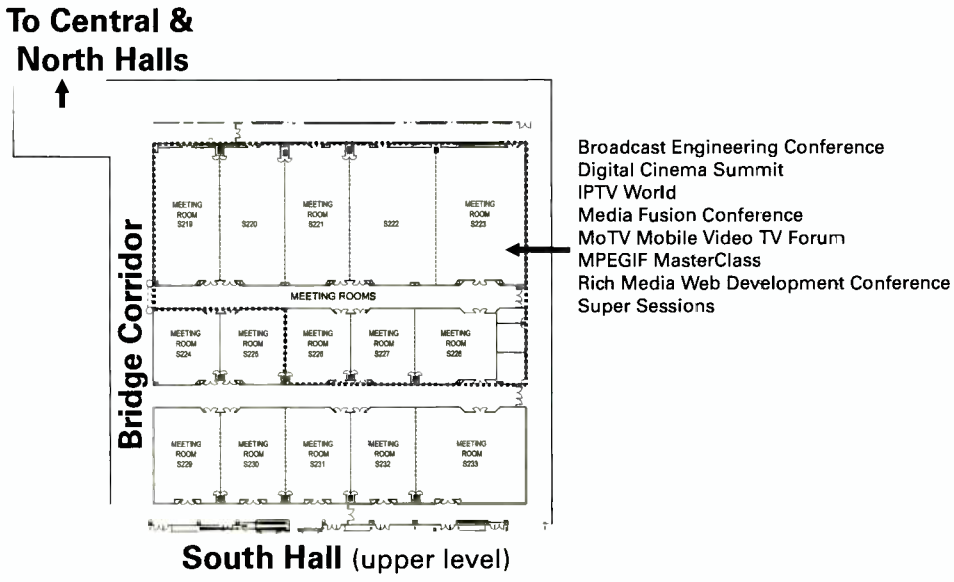

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TV Broadcast and Satellite

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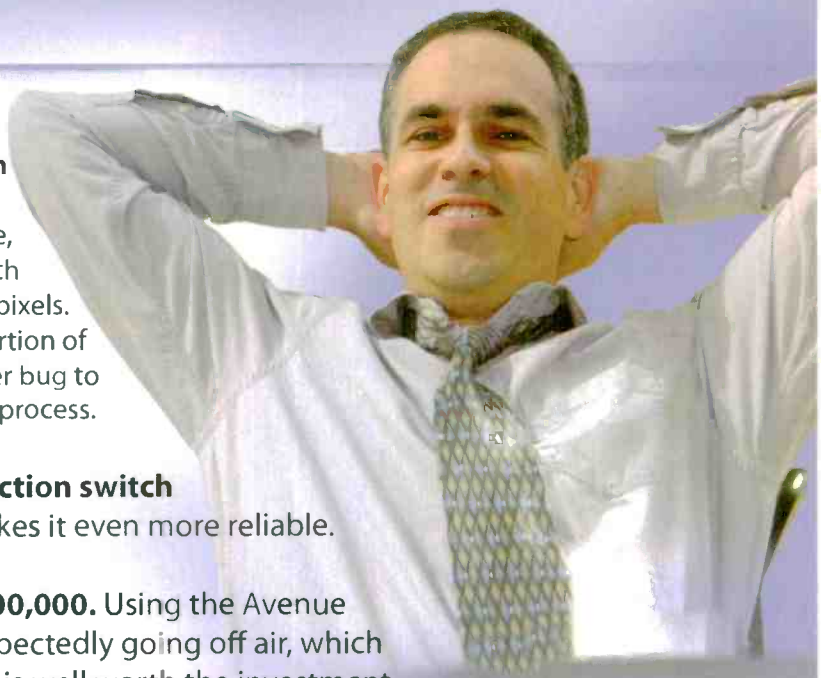

You can use the **sophisticated detection system** to your advantage by adjusting the switch's parameters for *your* facility's needs. For example, the black detection system allows you to set both the threshold and the percentage of non-black pixels. But that's not all, you can also determine the portion of the picture to be considered. This allows a corner bug to be either included or excluded in the detection process.

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NAB SU 2326

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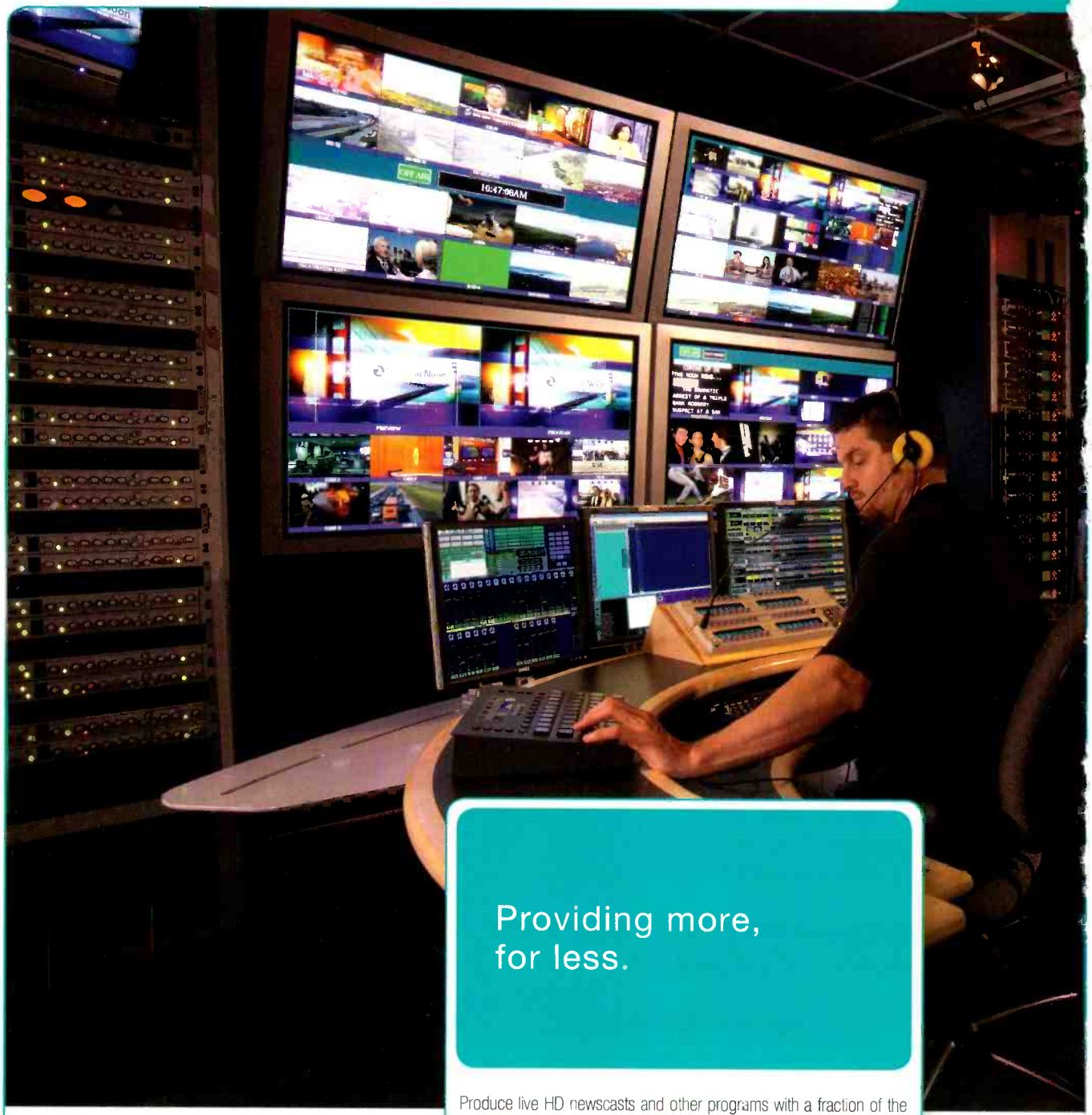

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See the Ignite HD at NAB North Hall, Booth N-902

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CAMERA SUPPORT, ROBOTICS, VIRTUAL SETS

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Color indicates advertisers

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ND Satcom C4941
SES Americom C5245
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Microwave Radio Comm. C2907
Harris N3100
Patriot Antenna Systems OE103
Microwave Radio Comm. OE300
ScheduAll Software SL2308
Motorola SU1920
Irdeto Access SU2726
TANDBERG Television SU4211
Scopus Network Tech. SU5408
Crispin SU6205
AZCAR SU7105
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Scientific-Atlanta SU9613
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VIDEO EDITING SYSTEMS

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Omneon Video Networks	SU1326
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Keywest Technology	SL2620
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> The new moves in the telecom and IPTV industry are significant of the mutation of our sector. NAB will be a major step to assess the readiness of the market to use the opportunities offered by IPTV technology and new communication medias.
>
> — *François Laborie, vice president product marketing, Vizrt*

DTV MARKETPLACE

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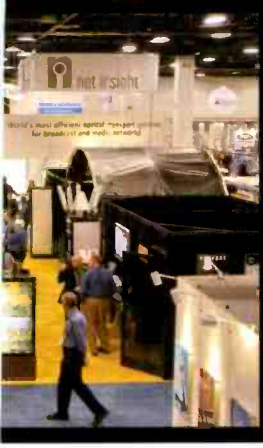


When attending the world's largest electronics media event, you'll face a wide variety of technologies, companies and products. How do you find that one, best-fit graphics platform or transmitter? Who offers the best weather radar or NLE? Finding the answers to these and other product-specific questions is sometimes difficult.

Fortunately, the editors at *Broadcast Engineering* are here to help. More than 250 new products are highlighted on the next 28 pages — more than you'll find anywhere else. To help your search be efficient, we've broken down the hundreds of products into 29 equipment categories. Along with complete descriptions, many listings include a photo so you'll know more about the solutions offered.

So, read on. The answers to tomorrow's technology challenges lie just ahead. ■

AUDIO ACCESSORIES

AUDIO ACCESSORIES
Aviom Pro64 series

Audio-networking products based on A-Net audio transport protocol; can distribute audio without being restricted by the physical locations of inputs and outputs or the direction of the signal flow; in auto mode, up to 64 channels (24b, 48kHz) are distributed throughout the entire network.

610-738-9005; www.aviom.com
BOOTH: C11902

WIRELESS AUDIO SYSTEM
Beyerdynamic Opus 900

Offers a wide variety of transmitters, including the DM 960 S, DM 960 B and the DM 969 S dynamic transmitters, the EM 981 S and the CM 930 B condenser transmitters, and the TS 900 M and TS 900 C pocket transmitters with rechargeable contacts — which are also outfitted with an ACT infrared interface for frequency setting; offers three receivers with 99 preprogrammed frequencies.

239-283-7880; www.beyerdynamic.com
BOOTH: N9014

PROGRAM OPTIMIZER
Dolby DP600

Allows cable, satellite, IPTV and terrestrial broadcasters to automatically analyze and correct program loudness; the codec options provide faster than real-time encoding, decoding and transcoding of the most common broadcast media files and audio formats; normalizes the loudness of audio programs with no impact on their original dynamic range.

415-645-5000; www.dolby.com
BOOTH: N2513

BIAMPLIFIED ACTIVE MONITORS, SUBWOOFERS
Genelec 8200/7200 DSP series

8200 series of biamplified active monitors and 7200 series of active subwoofers allow for all standard AES/EBU formats of digital audio; accept sampling rates ranging from 32kHz to 192kHz and traditional analog signals; integrated software allows 25 of the 8200 loudspeakers and five of the 7200 subwoofers to be denied and controlled via standard Cat 5 cabling.

508-652-0900; www.genelecusa.com
BOOTH: SL11215

STUDIO MONITORS
JBL Professional LSR4300 series

Measures and automatically compensates for low-frequency problems with built-in analyzers; includes high-resolution 24b, 96kHz AES/EBU and S/PDIF digital inputs to interface with digital broadcast consoles, computer audio I/O, playback sources and processors.

818-894-8850; www.jblpro.com
BOOTH: N7715

METADATA FRAME SYNCHRONIZER, GENERATOR
Linear Acoustic LA-5180 MetaMAX

Accepts external metadata via industry-standard RS-485 input or from the VANC space of an applied HD-SDI signal; analyzes and regenerates this metadata to keep it consistent and error-free.

717-735-3611; www.linearacoustic.com
BOOTH: C1048

NEARFIELD REFERENCE MONITOR
Klein + Hummel O 300

Features a system with three magnetically shielded drivers, low-distortion reproduction and neutral sound stage from 40Hz to 20kHz; includes a monitor designed to allow impulse peaks through and to respond with limiting only when a voice coil is in danger of thermal overload or a power amp risks overheating.

860-434-9190; www.klein-hummel.com
BOOTH: N7117

AUDIO EMBEDDER/DE-EMBEDDER
Network Electronics AV-SD-XMUX

Can embed/de-embed four AES signals simultaneously; features a built-in 18 x 16 AES router with four individual audio delay lines, AES inputs with sample rate conversion from 30kHz to 200kHz and audio processing within each AES group.

800-420-5909
www.network-electronics.com
BOOTH: SU10605

AUDIO MONITORING SOLUTION
TSL AMU2 8HD Dolby

Is HD- and fully Dolby E- and D-compatible; enables the audio channels from Dolby E and Dolby Digital signal streams to be decoded and accurately monitored for level and phase; up to eight individual audio signals are displayed on eight 53-segment tricolor bar graphs, with both PPM and VU scales.

+44 1628 676 200; www.tsl.co.uk
BOOTH: SU14615

AUDIO MIXERS, ON-AIR, PORTABLE, STUDIO, PLAYBACK

REMOTE ANALOG I/O BOX
Calrec AD5603

A 2RU analog I/O unit with 24 mic/line inputs and eight line outputs; has built-in PSU redundancy with single or optional dual IEC power connections; features phantom power indication on mic inputs and a tri-color signal LED indicating whether audio is present, normal or at clip for each input.

+44 142 284 2159; www.calrec.com
BOOTH: N8529

COMPACT DIGITAL CONSOLE
Calrec Audio Omega with Bluefin

Small digital console with high-density signal processing and 160 mono DSP paths; features 8 x 5.1 surround, stereo or audio groups, and 20 auxiliary outputs (20 mono or 10 stereo) and 48 outputs for multitrack or general-purpose feeds.

+44 142 284 2159; www.calrec.com
BOOTH: N8529

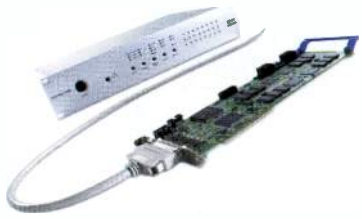
DSP PLATFORM
Studer SCore Live

For use with the Vista range of consoles; provides for up to 10 DSP card slots; can hold up to 12 I/O cards of various formats and additional GPIO; occupies 6RU; is user-configurable to maximize the use of the DSP in different applications; maintains full redundancy.

818-920-3212; www.studer.ch
BOOTH: N7715

> NAB has always been the most important trade show and conference in the industry.
>
> *— Carl J. Dempsey, chief executive officer, Wohler Technologies*

PCI AUDIO INTERFACE
Solid State Logic Mixpander



64-channel PCI audio interface for PCs is designed to be used with the Xlogic Alpha-Link audio converter range; when combined with the Alpha-Link converter range, Mixpander offers ultra-low latency audio monitoring with plug-in processing in place; up to four cards can be used in a single PC.

212-315-111
www.solid-state-logic.com
BOOTH: N2526

DIGITAL AUDIO MIXER
Euphonix System 5-B

Comprises a control surface, digital processing core, digital and analog interfaces, and a system management software application called eMix; is designed for high-quality sound, with full support for 24-bit I/O and internal processing at 40-bit floating point.

650-855-0400; www.euphonix.com
BOOTH: N4021

AUDIO PATCHBAY
Switchcraft StudioPatch 6425

Connects to I/O interfaces with common DB25 cables; includes phantom power and changeable normaling positions that can be set at full normal, half normal or non-normal modes.

773-792-2700; www.switchcraft.com
BOOTH: C7507

AUDIO CONSOLE
Wheatstone D-10

Features 12 programmable switches, redundant failsafe DSP/CPU card options, motorized faders, redundant power supply option, switched meters with system-wide access, a dedicated master, and group and DCM faders; includes 5.1 surround sound plus three stereo masters, eight stereo subgroup mixes and eight mix-minus outputs.

252-638-7000; www.wheatstone.com
BOOTH: N7111

AUDIO ROUTING, DISTRIBUTION

AUDIO ROUTER
Lawo Nova73 HD

Is scalable up to 8192 mono channels; synchronous system has defined latency of few samples; features a variety of interfaces and direct ATM link; is 96kHz and Dolby E compatible with integrated signal processing.

+49 7222 10020; www.lawo.de
BOOTH: N7030

DISTRIBUTED ROUTING SWITCHER
QuStream PESA Cheetah DRS 64x64

Offers all AES/analog/time code or mix with 64 AES or analog inputs by 64 analog or AES outputs; features include Dolby E routing, soft switching and delay functionality in the input and output frames.

631-912-1301; www.qustream.com
BOOTH: N3418

WIRELESS MATRIX KEYPANELS
Telex/RTS KP-612E and KP-412E

Twelve-position key panels available with push-button or lever key fit in a standard 19RU; feature two encoders: one for headset, microphone, auxiliary input and matrix in volume adjustment, and the other a knob for menu selection.

800-323-0498; www.telexintercoms.com
BOOTH: C5329

FIBER-OPTIC TRANSMISSION SYSTEM
Communications Specialties Pure Digital Fiberlink 7500 Series

Transmits all single-link DVI resolutions up to 1920 x 1200 and stereo audio over one single-mode, non-proprietary fiber; supports distances up to 15km; features a DVI loop-thru for monitor and EDID; provides two DVI outputs.

631-273-0404; www.commspecial.com
BOOTH: SL2826

> NAB represents a great forum for us to meet with and get feedback from a significant representation of our customers and prospects. Understanding what is on their minds, getting their reactions to new trends or market offerings, and sharing what we have going on is what we are looking forward to.
>
> *— John Sorensen, president, Broadway Systems*

Color indicates advertisers

AUTOMATION, INCLUDING NEWS AND MASTER CONTROL

MULTIPURPOSE COMPUTER
MicroFirst Engineering MPC-3200

Is housed in a 1RU box, powered by a Motorola PowerPC processor; provides frame-accurate serial machine control for up to 32 serially controlled devices, which are software-configurable to RS-232 or RS-422/485.

201-651-9300; www.microfirst.com
BOOTH: SU727

AUTOMATION AND ASSET MANAGEMENT
Florical Systems Acuitas

Is based on non-proprietary computer hardware; users can ingest, tag, play and archive digital content; supports single multistation and multichannel environments; auto-reconciles traffic; offers drag-and-drop operation.

352-372-8326; www.acutiastv.com
BOOTH: SU720

LOGGING SYSTEM
OmniBus Systems OPUS News & Sports Logging

Features fast one-button-press news logging using configurable events buttons, as well as intuitive on-screen control of live and prerecorded fees; includes capabilities for recalling, sorting and accessing content across multiple systems.

+44 8705 004339; www.omnibus.tv
BOOTH: SU5413

ASSET AND WORKFLOW MANAGEMENT
OBOR Digital Zeus

For physical asset management, tracks equipment using identifiers such as name, description and location; for technical workflow management, provides ticket generation and management, automatic routine ticket generation, interdepartmental communications, shift notes and service scheduling; for workforce management, offers personnel scheduling, assignment of duties, time card management and safety integration; for overall management, offers budgeting tools, key performance indicators, safety reports and training overviews.

407-352-6501; www.obordigital.com
BOOTH: N6730

GRAPHICS AUTOMATION
Miranda Xmedia Suite

Streamlines both live production and channel branding graphics workflows; is ideal for all types of news programs, including special events such as elections, as well as for branding and promotional graphics in master control; an open and modular architecture allows scaling from a single user up to hundreds of users across multiple locations.

514-333-1772; www.miranda.com
BOOTH: SU5220

MASTER CONTROL
NVISION NV5128-MC

Combines digital master control and multiformat routing in the same frame; is only 8RU, allowing facilities to save on valuable rack space; features optional built-in Dolby E decoding and a host of standard features that include A/B mixing with full auto transition control, multilevel video keying, logo store, two-picture squeezeback and audio over mixer.

530-265-1119; www.nvision.tv
BOOTH: SU9605

NEWS SYSTEM
Quantel Newsbox HD

The self-contained news system arrives ready to go on-air straight out of the box; is available in both HD now and HD-upgradable configurations, allowing broadcasters to manage their HD investments; comes with all that is needed to ingest material, view rushes, choose shots, edit stories, review finished pieces and play them out to air.

+44 1635 48 222; www.quantel.com
BOOTH: SL720

NEWSROOM SYSTEM
Harris NewsForce

Is built upon the NEXIO XS shared storage server architecture; includes a new generation of Harris editors, optimized for fast cutting and airing of news; with servers, editors and graphics systems working directly on the NEXIO storage area network, NewsForce provides newscasters with a streamlined, MOS-enabled infrastructure for producing, processing, distributing and managing SD and HD content.

513-459-3400
www.broadcast.harris.com
BOOTH: N3100, N2502

MASTER CONTROL AND PLAYOUT
OmniBus Systems iTX 1.2

Is designed to replace all of the functions of a broadcast master control and playout chain in a single software application; is fully featured for both SD and HD environments; new features include multiple audio tracks for multilanguage applications, open and closed captions, HD ingest, MXF and GXF support, and live instant playback for news, sports and entertainment programs.

+44 8705 004339; www.omnibus.tv
BOOTH: SU5413

AUTOMATION SYSTEM
Sundance Digital FastBreak NXT v3.0

Runs four active playlists simultaneously on a single Air Control Station; features greater visibility, an enhanced manual, automated join-in-progress functionality, streamlined GUI, and operator interfaces in French, German, Italian and Spanish; database standardization uses the Microsoft SQL platform.

972-444-8442; www.sundancedigital.com
BOOTH: SL1410A

PLAYLIST DELIVERY
NVerzion NControl

Playlist software directs digital feeds by serving them to air in a controlled sequential order of events; automatically rolls through video server or VTR content and produces a continuous stream of aired video; allows users to control audio playback devices for voice-overs, downstream keyers, logo inserters and more from within the playlist.

801-293-8420; www.nverzion.com
BOOTH: SU4228

ENTRY-LEVEL AUTOMATION
Pro-Bel Morpheus Foundation

Automation system suitable for one to six channels; offers many of the advance features of the Morpheous system in a compact, low-cost package; addresses key content management and delivery areas, including ingest, storage management, playout, master control and router automation, real-time manual intervention and feedback, and graphics/logo insertion.

631-549-5159; www.pro-bel.com
BOOTH: SU8511

OPEN STANDARDS AUTOMATION
VCI autoXe

Suite of tools and applications built on a service-oriented architecture; enables scheduling, monitoring, managing and playback of multiple channel streams; is based on the open standards-based XE Platform; allows transparent integration and interoperability with other broadcast systems, such as traffic, Pathfire and Omneon.

413-272-7200; www.vcisolutions.com
BOOTH: SU11620

> Even though a reliable communications system is critical to any successful broadcast or event, it is seldom on top of the shopping list when planning a project. NAB is a great venue to educate attendees about the expanded options available via new and innovative solutions.
>
> *— Thomas Riedel, managing director, Riedel Communications*

Color indicates advertisers

NEWS WORKFLOW ENVIRONMENT

Dalet Digital Media Systems Dalet News for Omneon

Is designed for small- to mid-sized newsroom facilities transitioning to file-based workflows; offers Dalet ingest, desktop editing, asset management, on-air playout and archiving capabilities integrated with Omneon Media Spectrum video server.

212-825-3322; www.dalet.com
BOOTH: SL4305

CAMERA SUPPORT, ROBOTICS, VIRTUAL SETS

CAMERA TROLLEY SYSTEM

Telemetrics TeleGlide

Is designed primarily for use in studio or sports applications; consists of a single or dual trolley for optimal load stabilization; the track is a dual rail system with connecting brackets; is fully servo controlled for smooth operation.

201-848-9818; www.telemetricsinc.com
BOOTH: C4937

FLUID HEAD

Sachtler Cine 30 HD

Comes with a side-load clamping mechanism for the camera plate, which increases the camera plate's sliding range and enables easy side loading of the fluid head with its premounted camera setup; the clamping mechanism is compatible with camera plates from a majority of popular manufacturers, including those from Oconnor and the ARRI Bridgeplate.

845-268-0100; www.sachtler.com
BOOTH: C5923

> NAB gives us the opportunity to address both world markets and the U.S. domestic market simultaneously. Trade shows these days are all about creating and nurturing relationships, and there is no better place to do that on a global scale than NAB.
>
> *— Adrian Scott, chief marketing officer, Pro-Bel*

PAN AND TILT HEAD
Shotoku S-DASH

Is designed for shooting high-speed movement, such as sports, motor racing and horse races; its pan-bar controller takes the form of a small pan and tilt head that can carry a viewfinder monitor TV and standard lens hand controls; the other control option, the joystick, is a desktop unit for use in production areas, OB trucks and other confined areas.

310-782-8491; www.shotoku.tv
BOOTH: C7432

METAL SPREADER
Panther Broadcast SD 100/150

Stable metal spreader for Panther's 100/150mm tripods; can be transformed into a dolly in seconds when used with the 100/150mm tripod; can be equipped with either studio wheels with brakes and cable guards or track wheels.

+49 89 613 900 33; www.panther.tv
BOOTH: C7328

CAMERAS, LENSES, ACCESSORIES

HD STUDIO LENS
Canon DIGISUPER 22xs

Maintains size and weight commensurate to that of other portable production cameras, weighing one-third a typical HD box lens; features 105mm input optical port that produces a high sensitivity, high contrast, optimized uniformity of brightness across the image plane.

800-321-4388; www.usa.canon.com
BOOTH: SU3020

HD CAMERA
Ikegami HDN-X10 Editcam HD

Includes a tapeless recording system and 2/3in 2.1 megapixel CMOS sensors for superior picture quality and wide dynamic range; uses the Avid DNxHD mastering codec to deliver HD-resolution full-raster (1920 x 1080) images that can be edited in real time.

201-368-9171; www.ikegami.com
BOOTH: C4226

CAMERA GRIP
Anton/Bauer EgripZ

Offers limitless operating positions; stabilizes the camera without adding unnecessary weight or constraint; attaches easily to any camera; weighs only 12oz.

800-422-3473; www.antonbauer.com
BOOTH: C5929

HDTV CAMERAS
Hitachi DK series

Employ 2/3in CCD imagers with full raster HDTV resolutions of 1920 x 1080 or 1280 x 720; feature 24, 25 and 30 progressive frame capture modes and improvements in sensitivity (F11 at 2000lx), signal-to-noise (>56dB HDTV) and resolution (>1000TVL in 1080i, >700TVL in 720p).

516-921-7200; www.hitachikokusai.us
BOOTH: C5017

> "There are other industry trade shows, conferences and events around the world that provide an opportunity for strong local presence, but NAB is the largest and has the broadest international mix"
>
> *— Jon P. Hammarstrom, senior manager worldwide video marketing, Tektronix*

POV HD CAMERA
Iconix Video HD-RH1

High-definition POV 3-CCD remote camera system features a 1/3in progressive 16:9 image sensor, backed by a 1/3in 3-CCD prism system for optics, using 14-bit quantization at the A/D conversion and processing steps; captures and outputs video in NTSC and PAL formats in all HD resolutions, while supporting frame rates of 24fps, 25fps, 30fps, 50fps and 60fps.

800-783-1080; www.iconixvideo.com
BOOTH: SU15512

HD CAMCORDER
Panasonic AG-HPX500

Combines the full production quality of 2/3in 3-CCDs, DVCPRO HD, 4:2:2 sampling and independent frame encoding with the versatility of interchangeable lenses and the creativity of variable frame rates; features progressive 2/3in 3-CCDs; records in 32 HD and SD formats, including 1080i and 720p in 100Mb/s DVCPRO HD; records on removable P2 solid-state memory cards in 1080/60i, 50i, 30p, 25p and 24p, in 720/60p, 50p, 30p, 25p, and 24p, and in DVCPRO50, DVCPRO and DV.

201-392-4127
www.panasonic.com/broadcast
BOOTH: C3613

Color indicates advertisers

HD STUDIO LENS
Fujinon XA22x7BES

Is designed for stations using ENG-type cameras for studio applications as well as those employing smaller field production units; features a focal length starting at 7mm and ranging up to 154mm; is well-suited for shooting in tight locations and smaller studios.

973-633-5600
www.fujinonbroadcast.com
BOOTH: C4208

CAMCORDER
JVC GY-HD251E

Offers live, uncompressed 1080i/60 and 720p/60 via HD-SDI with embedded audio; operates at 12V DC via either the built-in battery V-plate or the four-pin XLR input; features include BNCs for genlock, time code in/out, SDI and HD-SDI out, and a six-pin connector for remote control.

800-526-5308; www.jvc.com/pro
BOOTH: C4217

3-CCD HD CAMCORDER
Panasonic AG-HSC1U

Weighs 1.1lbs; delivers 1080i recordings with the accuracy and natural 3-CCD color reproduction for HD; is ideal for widescreen, high-resolution applications; records up to 88 minutes (41 minutes in the highest quality mode) of video on a high-speed 4GB SDHC memory card.

201-392-4127
www.panasonic.com/broadcast
BOOTH: C3613

"NAB enables us to identify trends in the industry so we can better accommodate the changing needs of our customers."

— Gerald Krulewicz, president, Wireworks

SINGLE-FORMAT HD CAMERA
Thomson Grass Valley LDK 4000 Mark II

Features 14-bit analog-to-digital conversion and other signal processing improvements derived from the LDK 8000 multiformat camera; is available either as a 1080i camera or as a 720p camera; is switchable between 50Hz and 50.94Hz.

503-526-8150
www.thomsongrassvalley.com
BOOTH: SL2020

P2 RECORDING CARD
Panasonic 16GB P2 card

Is designed for the company's line of solid-state camcorders and decks; connects instantly with laptops and major nonlinear editing systems to eliminate the task of digitizing; is reusable; allows a P2 HD camcorder such as the AJ-HPX2000 with five P2 slots to record up to 80 minutes of full frame rate, HD content.

201-392-4127
www.panasonic.com/broadcast
BOOTH: C3613

3-CCD HD CAMERA
Panasonic AK-HC3500

A 2/3in 2.2-megapixel 3-CCD camera designed for studio and electronic field production usage; the 9.9lb camera features an advanced single-channel transfer system and spatial offset processing for reduced aliasing and higher HD resolution (1100 horizontal lines); offers pristine HD images in 1080/59.94i and 1080/50i signals.

201-392-4127
www.panasonic.com/broadcast
BOOTH: C3613

CAMERA
Sony HDC-1400

Operates in either 1080/59.94i or 720/59.94P mode; includes three-skin detail control, multimatrix color control and high-quality SD downconversion capability; features compatibility with the HDVF-C35W color viewfinder; applications include HD studio broadcasts and live events.

1-800-686-7669
www.sony.com/professional
BOOTH: SU906

ENG/EFP LENS
Thales Angenieux 19 x 7.3 AIF

Provides improved focal range to help better capture action in the field; is available in the HD and SD series, as well as the new economically priced HD-E series; offers a focal range of 7.3mm to 139mm; weighs 4lbs, with 2X extender and 3.7lbs in the HD-E version.

973-812-3858; www.angenieux.com
BOOTH: C4929

> "This year, tighter integration between business and broadcast systems is more than a trend; it's permanent, and there are real solutions to be found at the show."
>
> *— Steve Krant, vice president sales & marketing, Sundance Digital*

CMOS SENSOR
Thomson Grass Valley Xensium

Has an array of 2.4 million pixels; is designed to offer a wider dynamic range, lower power consumption and improved signal-to-noise performance when compared with current CCD and CMOS imagers; incorporates on-board analog-to-digital conversion, further reducing noise and improving performance by eliminating a separate processing stage.

503-526-8150
www.thomsongrassvalley.com
BOOTH: SL2020

35MM FILM LENS
Thales Angenieux OPTIMO 28-76

Weighs less than 4.5lbs, perfect for handheld or steadicam operation; has an extremely fast aperture speed of T/2.6, with excellent contrast and color reproduction; has a 320-degree focus rotation with more than 25 witness marks for maximum accuracy; is available in PL and Panavision mount.

973-812-3858; www.angenieux.com
BOOTH: C4929

CGS, PROMPTERS, CAPTIONING

VIDEO TIME AND DATE GENERATOR
ESE ES-206U

References an internal standalone clock; the clock is line-frequency referenced; an internal DIP switch allows selection of a crystal time base reference; six digits of time and six digits of date are superimposed onto a video signal looped through the unit.

310-322-2136; www.ese-web.com
BOOTH: C1839

LIGHTWEIGHT PROMPTER
QTV/Autocue MSP08

Is an addition to the Master Series; is designed to meet the real-time requirements of top-end broadcast studios; when used with QNxt, it untethers the prompter from the control PC and the camera, enabling the operator flexibility.

203-406-1400; www.qtv.com
BOOTH: SU14612

PHD/SD CHARACTER GENERATOR
Dayang D³-CG 3-D

Features fast text search, editing and forwarding, real-time content update from a rolling data source, editing during playout, and on-the-fly control of roll crawl position and speed; generates up to nine animated logos simultaneously or independently.

+852 2730 2117; www.dayang.com
BOOTH: SU10205

GRAPHICS AND ANIMATION PRODUCTS

WORKFLOW AUTOMATION
Telestream GraphicsFactory V2.0

Automates file-based graphics assembly, providing a faster, more efficient means to repurpose, rebrand and replace ads for a variety of high-volume distribution needs; new features in version 2.0 include audio overlays and the addition of black-into-source clips to allow bumpers, trailers and interstitial overlays in the graphic layers.

877-257-6245; www.telestream.net
BOOTH: SL9214

IMAGE PROCESSING
Boris FX Red 4.1

Update includes new treatment tools and a redesigned user interface optimized for effects creation workflows; features a Universal Binary plug-in for Apple Final Cut Pro, as well as a Universal Binary standalone Render Engine.

888-772-6747; www.borisfx.com
BOOTH: SL10520

IMAGE PROCESSING WORKSTATION
Digital Vision DVNR

Available in SD and HD formats; supports the highest standards in image processing, color correction, compression preprocessing and format conversion in real time; supports Digital Cinema Initiatives specifications, including 2048 x 1080 at 23.98Hz, 24Hz and 25Hz.

818-769-8111; www.digitalvision.se
BOOTH: SL3205

GRAPHICS ENGINE
Vizrt Viz|Multi-Platform Suite (MPS)

While most solutions embed graphics within the video stream, resulting in lower resolution and nonpersonalized content, Viz|MPS keeps the graphic and video content disassociated until the last minute; compositing of video and graphics happens directly on the viewer's display, with real-time, 3-D graphics rendered locally by each platform (phone or PC).

212-560-0708; www.vizrt.com
BOOTH: SL4810

INTERCOM, IFB PRODUCTS

INTERCOM CONTROL PANELS
Riedel 2100 series

Intercom control panels for Artist; feature 8-digit, high-contrast, full graphic LCD displays, showing label and cross-point level for each talk key; the talk buttons are illuminated with definable marker colors to allow instant function identification.

818-563-4100; www.riedel.net
BOOTH: C9428

CLIENT CARD
Riedel MADI Client Card

Integrates the Artist intercom platform and audio router systems; because all Artist intercom control panels are connected to the matrix via standard AES3 signals, it is now also possible to connect intercom panels to the audio router using the audio routers' infrastructure for panel distribution instead of laying additional cables.

818-563-4100; www.riedel.net
BOOTH: C9428

WIRELESS HEADSET INTERFACE
HME HSI6000

Is designed for use with the DX series wireless intercom systems; allows users to connect a standard 2.5mm cordless or cell phone headset to an HME BP200 beltpac; this adapter makes it more cost-effective for users of the HME DX series systems to replace headsets or add new users.

858-535-6060
www.hme.com/proaudio.cfm
BOOTH: C11632

BELTPACKS
Telex/RTS BP-319, BP 325 and BP-351

Portable user stations for use with RTS Two-Wire intercom systems; BP-319 is a microprocessor-controlled one-channel intercom beltpack; BP-351 is a microprocessor-controlled two-channel select intercom beltpack; BP-325 is a two-channel fully selectable intercom beltpack.

800-323-0498; www.telexintercoms.com
BOOTH: C5329

WIRELESS INTERCOM SYSTEM
HME Pro850 UHF

Version 3.10 now features an AC850 battery charger that charges up to four BAT850 NiMH rechargeable battery packs simultaneously in three hours; features frequency agility, a PC and PDA interface, simultaneous dual-channel interface, individual belt-pack volume control, and belt-pack channel lockout.

858-535-6060
www.hme.com/proaudio.cfm
BOOTH: C11632

IPTV

TRANSPORT STREAM MULTICASTER
Wegener DTV 720

Accepts inputs from satellite receivers and local off-air antenna, as well as up to four ASI inputs and up to two internal 8-VSB and QAM tuners; features an integrated Web browser and 10/100/1000BASE-T (GigE) output; builds up to 16 IP multicast transport streams from ASI and 8-VSB inputs, with each stream containing one program.

770-814-4000; www.wegener.com
BOOTH: SU7915

CONTENT PRODUCTION SYSTEM
SysMedia Plasma Gold

Handles interactive content, service design and data feeds; enables automatic synchronization between text and audio; features compatibility with ETV-BIF, ACAP, OCAP, IPTV, OpenTV, MediaHighway, MHEG and MHP.

+44 1293 814 200; www.sysmedia.com
BOOTH: SU11308

> NAB gives us the opportunity to meet the widest cross-section of our clients, from digital cinema theater owners, to TV broadcasters and ProAV integrators and more.
>
> *— Ramzi Shakra, marketing director, Doremi Labs*

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CONTENT DISTRIBUTION SYSTEM
Triveni Digital SkyScraper

Non real-time content delivery; enables the point-to-multipoint delivery of any digital content over cable, satellite, terrestrial and IP networks; supports digital files, media streams, IP traffic, software downloads and iTV programming.

609-716-3500; www.trivenidigital.com
BOOTH: SU8525

STORE AND FORWARD OPTION
Streambox Store and Forward

Extends the capabilities of all Streambox systems to better support storage, management and transmission of HD and SD video streams over IP-based networks; the optional feature enables field journalists to simultaneously transfer files and begin playout, thus making the story available to the news anchor before the file recording is complete.

206-956-0544; www.streambox.com
BOOTH: SU15515

LIGHTING EQUIPMENT

FLUORESCENT LIGHTING UNIT
Videssence V168-442TT V-Beam

Provides powerful, even 168W lighting for studio applications via a high purity aluminum reflector with 95 percent reflectance, four 42W triple tube lamps and an adjustable rotating mounting yoke.

626-579-0943; www.videssence.tv
BOOTH: C8212

SOFTLIGHTS
Kino Flo BarFly 100 and BarFly 200

High-output soft lights with one tube (BarFly 100) or two tubes (BarFly 200); include remote high-output, flicker-free select ballasts, sturdy alloyed fixtures, gel frames, focusing louvers and removable mounting plates.

818-767-6528; www.kinoflo.com
BOOTH: C10213

MICROPHONES, ACCESSORIES

PORTABLE WIRELESS RECIEVER
Lectrosonics UCR401

Has a digital hybrid wireless design that overcomes channel noise by combining digital audio with an analog FM wireless link; features SmartSquelch technology that adjusts squelching behavior; a DSP-generated ultrasonic pilot tone from the transmitter controls the receiver audio muting and eliminates thumps, pops and other transients.

800-821-1121; www.lectrosonics.com
BOOTH: N8116

PORTABLE RECEIVER
Sennheiser EK 3241

Is designed for location sound recording; uses a 36MHz switching bandwidth that is tunable in 5kHz increments to generate 7200 frequency options; can be powered from a camcorder or via a rechargeable battery that delivers between nine hours and 18 hours of continuous operation.

860-434-9190; www.sennheiserusa.com
BOOTH: N7117

MINIATURE DIGITAL MICROPHONE
Neumann KM D

Permits the output stage to be combined with various passive microphone capsules — onmidirectional, cardioid or hypercardioid; receives the output signal directly from the microphone capsule and digitally performs level matching; supports standard sampling frequencies from 44.1kHz to 192kHz.

860-434-5220; www.neumannusa.com
BOOTH: N7117

WIRELESS MIC SYSTEMS
Audio-Technica 1800 series

Dual-channel camera-mount UHF wireless systems; designed for simultaneous operation of two microphones; include the ATW-R1820 dual receiver featuring two independent receiver channels in a single unit.

330-686-2600; www.audio-technica.com
BOOTH: N4526

SURROUND MICROPHONE
Holophone H3-D

Is designed to automatically deliver 5.1 channels with no external mixing or signal manipulation required; has a multidirectional pickup pattern with 20Hz to 20KHz frequency response on five perimeter channels and a discrete LFE microphone located inside.

416-362-7790; www.holophone.com
BOOTH: N6034

MIC/LINE SOURCE SELECTOR
Sonifex RB-SSML1

The 1RU rack-mount contribution unit comprises a source selector for compressing or limiting an incoming microphone or line signal, along with selectable level metering and headphone monitor outputs.

+44 1933 650700; www.sonifex.co.uk
BOOTH: N4928

PORTABLE MICROPHONE SYSTEM
Soundfield ST350

Consists of a lightweight, multicapsule microphone and fully featured compact mic-pre/control unit that generates surround and stereo simultaneously at balanced line levels; can be powered by either mains or battery.

+44 1924 201089; www.soundfield.com
BOOTH: N9421

ON-CAMERA UHF WIRELESS SYSTEM
Azden 300LT

Consists of the 300UPR receiver and 30BT bodypack transmitter; is designed for small DV cameras; provides a choice of 240 UHF frequencies in the 794MHz to 806MHz band for interference-free performance.

516-328-7500; www.azdencorp.com
BOOTH: N4826

MOBILE VIDEO

TELEPRODUCTION SERVICES
NEP Broadcasting

Provides outsourced teleproduction services vital to the delivery of live sports and entertainment events worldwide; offers state-of-the-art facilities, engineering expertise and customer service; events covered include the Pan American Games, Goodwill Games and FIFA World Cup.

800-444-0054; www.nepinc.com
BOOTH: OE408

MOBILE AUTOMATED CONTENT REPURPOSING SYSTEM
Snell & Wilcox Helios Mobile

Repurposes TV content for small screens of portable handset displays; separates the image's foreground and background; concentrates the energy of the compression encoder on foreground elements while lessening the detail and prominence of background elements.

212-481-2416; www.snellwilcox.com
BOOTH: SU4220

MULTI-IMAGE DISPLAYS

MULTIVIEWERS
Avitech VCC-8000 series

Allow broadcasters to visually monitor video as well as DVI/VGA (computer) inputs on the same display; the distributed intelligent architecture enables an unlimited expansion for inputs; a single module provides up to eight inputs.

877-284-8324; www.avitechvideo.com
BOOTH: SU13215

HIGH-RES DISPLAYS
Zandar Technologies Predator HD MultiViewers

HD4, HD8, HD12 and HD16 offer HD images, driving high-resolution displays up to 1080p with auto-detect of SDI and HD-SDI signals; include audio and video monitoring, UMD and tallies, clock display, and LAN control; offer control options such as the Z-Configurator layout editing software, on-screen display, GPI and ZRP remote pane.

+353 1 450 0901; www.zandar.com
BOOTH: SU2729

> Workflow tools are of particular interest to systems integrators. My group places a very high priority in performing workflow analysis as a first step. NAB is a unique opportunity to view and evaluate the full range of available hardware and software solutions, to ensure our customers' objectives are met and the subsequent implementation goes smoothly.
>
> *— Stavros Hilaris, senior vice president technology, Ascent Media Systems & Technology Services*

LCD MONITOR
Panasonic BT-LH80W

A 7.9in HD/SD production LCD monitor; produces exceptional color reproduction and gradation; features a built-in waveform monitor that graphically displays luminance levels from -5 to 108 IRE; diagonal line compensation reduces the occurrence of jagged noise in the diagonal direction for improved response.

201-392-4127
www.panasonic.com/broadcast
BOOTH: C3613

DUAL HD MONITOR SET
Marshall Electronics V-R72P-2HDA

Features high-resolution, 1.2 million pixel screens with digital signal processing; is designed specifically for analog applications; accepts DVI and HDMI computer or video signals, and all SD and HD analog video standards and signal types.

800-800-6608; www.lcdracks.com
BOOTH: SU1926

BROADCAST MONITORING SYSTEM
Barco Networked Broadcast Monitoring System

Allows high-quality, low-latency distribution of video sources and metadata over an IP network towards multiple screens, even in different control rooms; consists of rear-screen projection modules or LCD panels, the NG System hardware and the Networked Broadcast Monitoring Suite software package.

678-475-8000; www.barco.com
BOOTH: SL4320

HD MONITOR
Marshall Electronics TFT-MegaPixel

Provides high-pixel density for 10.4in to 3.5in displays in one-, two-, three- and four-screen configurations; newly developed proprietary technology delivers a completely digital image process onto each screen; features improvements in brightness, contrast ratio and viewing angles.

800-800-6608; www.lcdracks.com
BOOTH: SU1926

TELESTRATOR
FingerWorks Telestrators Studio Version

Is designed for studio use or permanent installation in a TV mobile; consists of a rack-mount PC and an outboard 15in LCD touchscreen; the LCD is a rack-mount unit that can be built into a desk or a wedge-type enclosure; is also available with a heavy-duty stand.

604-862-4134; www.telestrator.com
BOOTH: SU11409

REAR-PROJECTION TVS
JVC HD-P61R2U and HD-P70R2U

Additions to HD-ILA rear-projection television lineup; HD-P61R2U screen measures 61in diagonal; HD-P70R2U screen measures 70in diagonal; use three-chip D-ILA technology to produce high brightness, contrast and resolution; feature 1920 x 1080 native resolution and HDMI inputs to connect an HDMI-compatible device for HD viewing.

800-526-5308; www.jvc.com/pro
BOOTH: C4217

MULTI-IMAGE PROCESSOR
Miranda Kaleido-X

Allows unlimited signal repetition over eight monitors; all the multi-image outputs can be grouped to create large, highly integrated monitoring systems; alternatively, the displays can be controlled independently for multi-room environments, using one or more remote control panels;can monitor up to 2304 channels of audio, including embedded, discrete AES or discrete analog.

514-333-1772; www.miranda.com
BOOTH: SU5220

NEW MEDIA, STREAMING PRODUCTS

COMPRESSION PRODUCTS
Harris

The suite of high-definition television MPEG-4 part 10 compression products address the contribution, distribution and transmission needs of the television industry; leverage the latest advances in compression algorithm technology; enable new applications and services by allowing lower-bandwidth operation of HD services over satellite, terrestrial and Internet Protocol Television delivery platforms.

513-459-3400
www.broadcast.harris.com
BOOTH: N3100, N2502

MPEG-2 HDTV ENCODER/DECODER
NTT Electronics H5100 series

An MPEG-2 HDTV encoder/decoder with enhanced audio capability; for use in contribution and content distribution; comes with maximum 16PCM channels of audio input; offers optional built-in Dolby E and Dolby Digital encoder; can transmit a maximum of 16 channels of audio alongside video..

+81 42 796 2496; www.nel-world.com
BOOTH: SU10220

HD H.264 ENCODER
NVISION NV2020

Uses video processing technology based on the H.264 compression standard to deliver low-latency, high-quality, artifact-free HD video at bit rates of 6Mb/s to 12Mb/s for building cost-effective HDTV services; these low bit rates enable more HD channels to be squeezed within the defined bandwidth.

530-265-1119; www.nvision.tv
BOOTH: SU9605

AVC HD ENCODER
Scientific Atlanta D9054

MPEG-4/H.264 toolset delivers high-quality HD and SD video at bandwidth-saving bit rates; features a flexible stat mux architecture to enable content distributors the ability to mix SD and HD content in MPEG-2 and MPEG-4 formats.

800-433-6222
www.scientificatlanta.com
BOOTH: SU9613

> We participate in over 50 industry events worldwide, and NAB affords us one of the very best opportunities to launch products, showcase new technologies and communicate with our clients.
>
> *— Cameron Francis, CEO, Network Electronics US*

ENCODER
ViewCast Niagara 7224

This eight-channel analog system was designed specifically to enable organizations to deliver live traffic video to public service agencies and local residents over the Internet in Windows Media and Real Video formats using industry-standard IP technology.

972-488-7200; www.viewcast.com
BOOTH: N2131

VIDEO STREAM PROCESSOR
Scientific Atlanta Digital Content Manager

Allows users to simultaneously process 2000 video streams in one device; delivers needed video processing horsepower for multiple channels of SD and HD programming, ad and local program insertion, and switched digital video service.

800-433-6222
www.scientificatlanta.com
BOOTH: SU9613

MPEG-2 ENCODER
Vela Argus HD

Delivers MPEG-2 transport stream output that is simultaneously distributed to a DVB/ASI port and to local storage, making it ideal for live distribution as well as for video archiving and other storage applications; supports HD/DSI, DVB-ASI output, VITC, LTC and SONY 9-pin control of VTRs; comes with the Media Advantage software application to control batch encoding.

727-507-5344; www.vela.com
BOOTH: SU5111

IP NETWORK PLATFORM
Scientific Atlanta Prisma II HD-RXR

High-density dual reverse receiver optics platform delivers 52 RXR in a 6RU chassis; delivers network via 5MHz to 9MHz bandpass; provides network design flexibility in a single configurable chassis.

800-433-6222
www.scientificatlanta.com
BOOTH: SU9613

ENCODING PLATFORM
Scopus UE-9410

Is a second-generation H.264 encoding platform; features improved compression capabilities, enhanced picture quality, and DVB-S/S2 and IP transmission schemes.

609-987-8090; www.scopus.net
BOOTH: SU5408

STREAMING VIDEO CARD
Barco

Supports multivendor and multicompression standards; allows digital streaming video simultaneously within the controller; nonstandard compression techniques and other stream transport can be ported to the platform; may be used alongside Barco's other interface cards, allowing for simultaneous deployment of multiple video technologies.

678-475-8000; www.barco.com
BOOTH: SL4320

POWER PRODUCTS, BATTERIES, GENERATORS

FAST-CHARGER
PAG v4-iPC

Is designed for PAG and Sony V-Mount Li-Ion batteries; features PAG's Intelligent Parallel Charging (iPC), which is capable of supplying 6A at 16.8V; is ideal for location use.

818-760-8285; www.pagusa.com
BOOTH: C7613

LI-ION V-MOUNT BATTERY
IDX System Technology ENDURA ELITE

Is designed for mobile, high-def ENG/EFP broadcast, production and professional applications with 142WH capacity; features a replaceable twin power cartridge design that extends continuous operation time to 3.5 hours.

310-891-2800; www.idx.tv
BOOTH: C5207

DUAL BATTERY MOUNT
PAG V-Mount Power Plate

Enables two L95 batteries to be used in parallel, providing a higher current-draw capability and a combined capacity of 190 watt-hours.

818-760-8285; www.pagusa.com
BOOTH: C7613

PRODUCTION SWITCHERS, VIDEO EFFECTS, KEYERS

MULTIFORMAT SD/HD PRODUCTION SWITCHER
Snell & Wilcox Kahuna

Provides small and medium-sized applications that require a 1-M/E or 2-M/E production switcher with a compact mainframe and control panels; features ability to intermix SD/HD sources seamlessly within the same production.

212-481-2416; www.snellwilcox.com
BOOTH: SU4220

SWITCHER
Broadcast Pix Slate AutoAspect

Includes aspect ratio management with new AutoAspect feature that allows 16:9 and 4:3 inputs, clips and graphics to be used interchangeably and mixed together in the same production, while maintaining the aspect ratio of each.

781-221-2144; www.broadcastpix.com
BOOTH: SU14215

BROADCAST DIGITAL KEYER
SAV HD HD-DSK

Provides fill, key, background and preview inputs with two programs and one preview output; operates with all current HD and SD standards; one keyboard can control up to 18 boards at the same time; up to four keyers fit in a 19in 1RU.

+33 1 53 38 22 00; www.sav.tv
BOOTH: N3713

SWITCHERS
FOR-A HVS-38SSAM and HVS-600HS

The HVS-38SSAM adds video playback and expanded still store functionality to FOR-A's SD/HD switchable, multiple bit rate HANABI HVS-3800HS; the HVS-38SSAM will be available as an option for the HVS-3800 2M/E HANABI model switcher.

714-894-3311; www.for-a.com
BOOTH: C4234

SWITCHERS
Brick House Video Callisto

Updated range of switchers includes chroma keyer and hot-cut, which enables the user to switch asynchronous signals directly on the program bus with no freeze frame on the output.

+44 1962 777733
www.brickhousevideo.com
BOOTH: SU6806

HIGH-RESOLUTION VIDEO SCALERS/AV SWITCHERS
Analog Way Easy Fade/Easy Cut

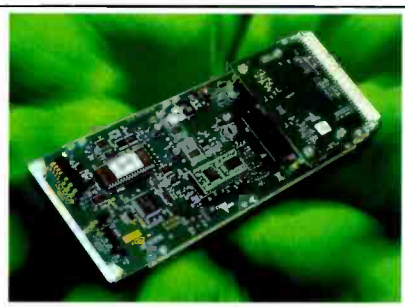
Feature computer output format up to 1600 x 1200, four video inputs including one RGB or YUV component on BNC, analog output on an HD15 connector, RGB output up to UXGA, seamless or smooth switching modes and non-volatile frame memory.

212-269-1902; www.analogway.com
BOOTH: SL2107

> We always look forward to this opportunity to meet face-to-face with current and prospective clients, which is vitally important to our continued development of products that best address their needs.
>
> *— Dan Duffell, marketing manager, Solid State Logic*

Color indicates advertisers

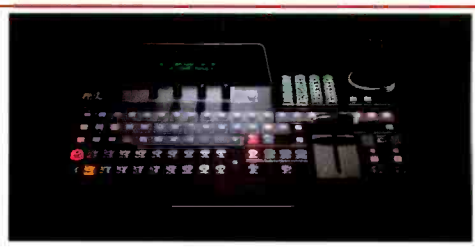
HD CHROMA KEYER
Crystal Vision Safire HD 2



Features processing that allows more tolerance to difficult colors in the foreground and enhanced shadow processing for more natural-looking shadows; can restrict chroma keying to an area that contains the sports graphics by forcing foreground everywhere else in the picture.

+44 1223 497049; www.crystalvision.tv
BOOTH: N2935

SWITCHER
FOR-A HVS-600HS



The latest HANABI series 1 M/E switcher; expands the features included in the HVS-500HS, a compact switcher introduced last year; accepts HD, SD, HDV and DV formats; offers four HD/SD-SDI inputs and five HD/SD-SDI outputs in the base configuration.

714-894-3311; www.for-a.com
BOOTH: C4234

MULTIFORMAT, DUAL-CHANNEL HD VIDEO PROCESSOR
TV One C2-7300

Features the ability to de-embed and process the full eight channels of digital stereo audio of any frequency embedded within each of the two SDI and HD-SDI inputs; outputs up to 16 AES stereo audio channels at a frequency of 24kHz, 32kHz, 48kHz, 96kHz or DARS synchronized using the two HD-44 connectors on the back of the unit.

859-282-7303; www.tvone.com
BOOTH: SU7226

OPTICAL SWITCHING PLATFORM
Opticomm Optilinx OLX-3000

Switches digital signals up to 4.25Gb/s with any of its 144 ports, all housed in a compact 4RU chassis; also available in a 288-port version in an 8RU chassis; provides high-speed switching between ports with minimal effect on overall network latency.

858-450-0143 ext. 242; www opticomm.com
BOOTH: N2931

> A hot topic at NAB this year will be how a broadcaster (or publisher of content as they have now become) can protect and track rights, and maximize the return on investment from their content in this new digital age.
>
> *— Graham Sharp, vice president and general manager, Avid Video*

RECORDING MEDIA

HD VIDEO DISK RECORDER
Doremi Labs V1-HD/LE

Can record up to 80 minutes of HD-SDI video on its two internal removable SCSI drives; works well in broadcast applications where it can function as a drop-in replacement for professional HD videotape recorders.

818-562-1101; www.doremilabs.com
BOOTH: SU3608

SATELLITE EQUIPMENT, SERVICES

DIGITAL COFDM HD/SD RECEIVER
Nucomm Newscaster DR

Offers DVB-T compliance at 6MHz, 7MHz and 8MHz channels; provides variable IF bandwidth from 4MHz to 16MHz in the 1.99GHz to 2.7GHz bands and from 4MHz to 24MHz in the 6.4GHz to 7.1GHz bands.

908-852-3700; www.nucomm.com
BOOTH: C2529

PORTABLE SATCOM TERMINAL
ND SatCom MPT1000

Supports transmission of voice, data and video; allows for fully meshed, single-hop network transmission; is ideally suited for out-of-area missions, in remote or rough terrain where low weight and rapid terminal deployment is key.

214-231-3400; www.ndsatcom.com
BOOTH: C4941

SATELLITE TRUCKS AND SERVICES
Satellite Tech. C/Ku-band truck

Features split power systems and simultaneous C-Band/Ku-Band transmission capability; STS operates two dual-path KU satellite uplink/production trucks and one C/KU hybrid truck, serving the midwestern United States.

800-838-1472; stslivetv.com
BOOTH: OE327, OE332

FIBER NETWORK
GlobeCast RIBU 2G

Connect points-of-presence in Asia, America and Europe through a common platform; is built for broadcast traffic, both permanent and ad hoc; is completely HD-ready.

212-373-5140; www.globecast.com
BOOTH: C4241

SATELLITE-TO-TERRESTRIAL TRANSCODER
DMT NABLA

Is capable of delivering up to 100W Rms with a modular and versatile structure, featuring a built-in satellite receiver and advanced control systems; interface connections, power supply and cooling air circulation have been designed to comply with the operational requirements and constraints typical of telecom stations.

856-423-0010; www.dmtonline.com
BOOTH: C2915

BANDWIDTH OPTIMIZATION TOOL
Comtech EF Data

Allows users to instantly estimate potential operating expense savings; validates the possibilities for optimizing satellite bandwidth use and throughput using realistic satellite link and earth-station configurations.

480-333-2200; www.comtechefdata.com
BOOTH: C6241

OPEN STANDARD MODULATOR
Radyne DM240XR

Includes DVB-S2 CM, VCM and ACM mode support, and DVB-S and DVB-S2 compliancy; enables data rates up to 250Mb/s; features a Pro-MPEG GigE interface; supports ASI, DVB Parallel, HSSI and G.703.

602-437-9620; www.radyne.net
BOOTH: SU5529

STUDIO, FACILITY SUPPORT PRODUCTS

CONSOLE FURNITURE
TBC Consoles IntelliTrac

Allows unlimited lateral positioning of critical monitors via front and rear device tracks; includes a full range of articulating arms for distance, height and tilt control for mounting flat-panel monitors, speakers, phones and task lighting.

631-293-4068; www.tbcconsoles.com
BOOTH: SU5405

RACK-MOUNT TEMPERATURE DISPLAY
Middle Atlantic TEMP-DEC Decora

Monitors internal enclosure temperature and provides an LED readout; fits into any Decora-style opening; features adjustable over temperature setting, and local and remote over-temp notification.

973-839-1011 x1272; www.middleatlantic.com
BOOTH: SU7826

> "NAB2007 is our best opportunity to visit with customers and talk about business and opportunities in an exciting, positive environment."
>
> *— Rich Runnels, director of sales, APWMayville*

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HD VIDEO PATCHBAY
Switchcraft MVP series

Features two rows of 34 jacks (rated to 3GHz and for 30,000 mate/unmate cycles) in a 1RU patch panel; options include normalled or non-normalled with 75Ω termination or non-termination.

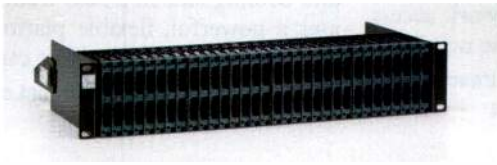
773-792-2700; www.switchcraft.com
BOOTH: C7507

REMOTE CONTROL SYSTEM
ANT Group Garda System

Allows broadcasters to completely monitor and control site equipment, independently from who produced it; connects any product, vintage or new, inside a side and presents the collected data, alarms and events in a standard, comprehensive interface.

+39 0365 34558; www.antgroup.it
BOOTH: C2936

GIGE PATCH PANEL
ADC Unipatch



Features a high-density, 32-port normalled through card frame system to patented ADC-Krone Direct-Edge LSA plus termination system; is rated for 30,000 insertions/withdrawals; is cable-agnostic; Cat 6-rated patch cords are keyed to ensure proper patching.

952-917-0279; www.adc.com
BOOTH: N721

HIGH-DENSITY PATCHING SYSTEM
ADC Super High-Density Coax (SHDC)

Is designed for AES audio, 5.1 and 7.1 audio applications where coax medium is preferred but space is critical; is available in 1RU and 1.5RU; the jack features a patent-pending switchable termination feature that allows users to select or de-select a 75Ω termination function on each circuit pair.

952-917-0279; www.adc.com
BOOTH: N721

DIGITAL WORKSTATION EXTENDER
Avocent ECM2000U

Provides hardware-based digital extension of video, keyboard, mouse, USB media and audio signals over UTP cabling.

800-275-3500; www.avocent.com
BOOTH: SL13016

BRIGHT SINGLE-CHIP DLP PROJECTOR
Christie DS+650

High-resolution with BrilliantColor multi-primary image processing; delivers 6500 ANSI lumens with variable contrast ratio up to 7500:1 and SXGA+ resolution with scaling to UXGA; includes a range of standard inputs for installation location and source connection flexibility.

800-407-7727; www.christiedigital.com
BOOTH: SL5413

PRINTERS
Dymo RhinoPRO series

Ideal for labeling wires and cables, panels, consoles, and other electronic equipment; hot keys let users instantly print wire wraps, flags, patch panel, fixed length and serialized labels.

203-355-9000; www.rhinolabeling.com
BOOTH: C8236

TRANSPORT CASE
Pelican Products 1780

Features nearly 14,000 cubic inches of storage space with two double-wide handles and dual sets of rugged polyurethane wheels; includes a lid equipped with a polymer O ring for dust/waterproof seal.

1-800-473-5422; www.pelican.com
BOOTH: C9125

TBCS, FRAME SYNCS, CONVERSION EQUIPMENT

HD UP/CROSSCOVERTER
Brick House Video Syntax

Uses a super-resolution bandlet algorithm to bring the advantages of motion-compensated processing without associated high costs or artifacts; offers up-/crossconversion with SDI I/O in a 1RU package.

+44 1962 777733
www.brickhousevideo.com
BOOTH: SU6806

MULTIFORMAT CONVERTERS
Edirol VC series

Consists of the VC-300HD and VC-200HD; offers flexible format conversion of digital/analog, HD/SD or compressed/uncompressed signals; accepts signals and direct connections from computer RGB sources; a wide variety of output devices — record decks, data projectors or plasma/LCD displays — can be directly connected.

360-594 4282
www.edirol.com
BOOTH: SL8208

NETWORK ENCODER
Telestream Pipeline

Provides serial digital video and audio ingest into Telestream's FlipFactory and Episode series transcoding applications; offers shared network access by anyone connected to the network.

877-257-6245; www.telestream.net
BOOTH: SL9214

UPCONVERTER
Evertz 7711UC-HD

Features auto-sensing HD/SD inputs, a built-in frame sync, noise reduction, aspect ratio conversion, metadata extracting, and re-embedding and color correction; this two-slot module is also offered with a discrete AES option.

905-335-3700; www.evertz.com
BOOTH: N1713

FORMAT CONVERTER
Thomson Grass Valley ProCoder 3.0

Is a software package running on a standard PC that provides file format conversion, either as a standalone application or as a plug-in to a desktop editor such as EDIUS; upgrade adds the latest acquisition formats, outputs for mobile video and MP3 players, and support for multi-CPU and multi-core PCs.

503-526-8150
www.thomsongrassvalley.com
BOOTH: SL2020

VIDEO CARD
AJA XENA 2K

A video card for Windows XP; delivers uncompressed SD, HD and dual link HD; enables customers to work with 2K frames in a flexible and future-safe architecture.

530-274-2048; www.aja.com
BOOTH: SL6113, SU7511

DISTRIBUTION/SIGNAL PROCESSING FRAME
QuStream Fortel 603

Features 20 slots, redundant internal power supplies, frame controller cards and cooling fans in a 3RU frame; creates a powerful, flexible platform to house distribution amplifier cards.

631-912-1301; www.qustream.com
BOOTH: N3418

VIDEO CONVERTERS
Ensemble Designs BrightEye

Pocket-sized video converters, audio embedders and HD processing; ideal for mobile, desktop, broadcast and post; interface to the full range of SD video formats; include analog audio and AES digital audio converters and embedders.

530-478-1830
www.ensembledesigns.com
BOOTH: SU2326

> NAB is an ideal forum to cultivate the growing awareness of DVB-T and DMB systems and convert that interest into purchases.
>
> *— Alex M. Perchevitch, president, Jampro Antennas*

SDI SYNCHRONIZER
Crystal Vision SYNNER-E

Combines a synchronizer, audio tracking delay and an embedder; is designed for surround sound and multiple-language applications; allows Dolby E and standard AES within a single audio group and embeds AES or analog audio into the SDI.

+44 1223 497049; www.crystalvision.tv
BOOTH: N2935

TELCO EQUIPMENT

MULTIPLEXER AND DE-MULTIPLEXER
Network Electronics FR-2RU-DWDM-MUX40-C

40-channel DWDM multiplexer and de-multiplexer features C-band 100GHz channel spacing according to ITU-T G.694.1, as well as 0.5dB channel uniformity; signals can be uni- or bidirectional; is signal- and bit rate-transparent.

800-420-5909
www.network-electronics.com
BOOTH: SU10605

MICROWAVE RECEIVER
MRC MDR-2

A portable, dual-diversity digital microwave receiver that may be rapidly deployed to cover sports, news and outside broadcasts from ground locations, from the air, or from a moving vehicle; uses the latest maximal ratio combining technology to optimize the quality and usable range of the transmitted signal.

978-671-5700; www.mrcbroadcast.com
BOOTH: OE300, C2907

> NAB is a great place to reach those more difficult markets. With technical products, it is so much easier to demonstrate the capabilities in person where people can learn and watch.
>
> — *Amy Fraley, marketing manager, TV One*

DTV REPEATER MODULE
TeamCast GFX-3000

Allows users to build gap fillers, transposers or regenerative retransmitters for DTV, meeting the DVB-T/DVB-H standards; acts as a gap filler in a single-frequency network, offering powerful digital processing for maximizing repeated signal power and quality.

312-263-0033; www.teamcast.com
BOOTH: C2639

MPEG OVER IP CROSSLAYER ANALYZER
Sencore MIP 1860

Provides real-time monitoring of hundreds of MPEG/IP streams to ensure QoS; features embedded TAP for monitoring without disrupting service, combined IP/MPEG-2 transport stream measurements and live video decoding of any transport stream locally or remotely.

1-800-736-2673; www.sencore.com
BOOTH: C1646, N1113

HD RASTERIZER
Tektronix WVR7000

Is designed for simple video and audio monitoring; includes options for SD video, composite video, AES-EBU and analog audio; is ideal for camera color calibration and setup in production, and for color correction and verification of non-compressed audio in editing suites.

800-833-9200; www.tektronix.com
BOOTH: N2519

TEST & MEASUREMENT EQUIPMENT

COLOR ANALYZER SET
DK-Technologies PM5639

Measures both CRT and LCD monitors; includes an LCD probe, a CRT probe and a display unit; the LCD probe has a stand to hold it steady in front of the monitor screen, while the CRT probe comes with a suction cup to secure it to the screen.

800-421-0888
www.dk-technologies.com
BOOTH: N1835

MEDIA ANALYSIS SERVER
Harris Videotek QuiC

Now features data-analysis parameters and file-correction tools; enables customers to analyze files during ingest, correct certain file problems on-the-fly with no operator intervention; is designed to improve workflow efficiency.

513-459-3400
www.broadcast.harris.com
BOOTH: N3100, N2502

MPEG-2 TEST AND MONITORING PLATFORM
Pixelmetrix DVStation-IP

Provides MPEG-2 transport stream analysis and monitoring over an IP connection via a 10/100/1000Mb/s Ethernet port; configurable to sense video traffic on any set of IP address pairs, extract the MPEG-2 TS and perform extensive verification.

954-472-5445; www.pixelmetrix.com
BOOTH: SU12109

TV ANALYZER
Rohde & Schwarz ETL

Performs in real time; features high-quality baseband outputs; also features a wide range of TV signal analysis function and integrated spectrum analyzer functions; offers an open platform for future hardware or software updates.

888-837-8772
www.rohde-schwarz.com/USA
BOOTH: C2927

REMOTE STATION MONITORING
Miranda iControl Remote Station Monitoring (RSM)

Enables a network operations center to monitor multiple regional stations using visual and acoustic monitoring; uses Kaleido-Alto-HD multi-image processors at each remote station for signal monitoring and probing, with the signals streamed back using Allegro encoders as full-motion video and audible audio to the iControl RSM desktop monitoring station.

514-333-1772; www.miranda.com
BOOTH: SU5220

VIDEO MONITORING SYSTEM
Wohler Technologies Touch-It/SDI

Features a 16-channel SD-SDI touchscreen monitor and 16 x 1 switcher, on-screen individual channel ID, GPIO, tally and individual channel controls for color, tint/hue, brightness, contrast and aspect ratio; outputs multichannel screen and target screen as VGA.

510-870-0810; www.wohler.com
BOOTH: N3426

Continued on page 205

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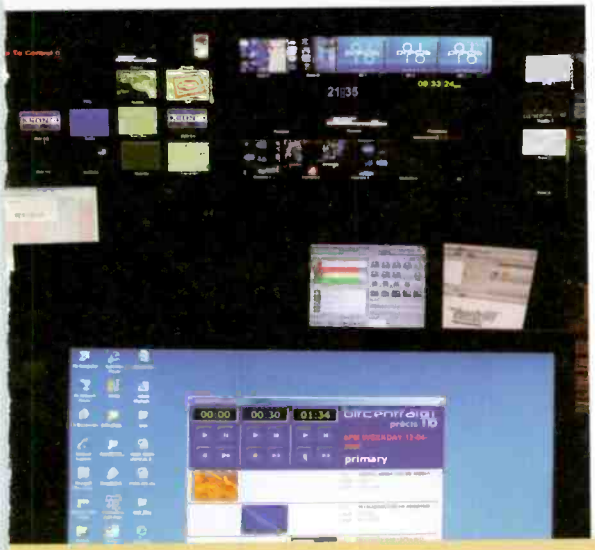
news. anytime. anywhere.

bitcentral

5 Great Reasons Your Station Needs Bitcentral NOW!

1. Upgrade to a complete, nonproprietary digital solution – ingesting, editing, newsroom integration, play-out and archiving
2. File stories faster – Edit on notebooks, submit stories anytime, anywhere, over broadband or microwave
3. Produce for multiple platforms – TV, mobile phones, websites, video on demand, 24-hour dedicated news channels, etc.
4. Distribute and share HD/SD content with anyone, anywhere – quickly and easily
5. Archive using inexpensive commodity storage devices



Go Digital with us and see what your newsroom's been missing.

In a sudden turn of events, newsrooms across America are discovering the incredible new opportunities created by Bitcentral's exciting nonproprietary, digital news production system. From ingest and edit to newsroom integration and archiving, Bitcentral gets stories on-air faster and manages the news easier than ever before.

Precis – Bitcentral's fully integrated, end-to-end, open architecture solution – eliminates videotape and dozens of expensive, time-consuming steps. With Precis, field contributors are able to edit stories on laptops then submit them, ready to air anywhere, via broadband.

Precis lets stations distribute and manage the news across multiple platforms and formats. So now it's possible to simultaneously deliver stories to anyone and everyone, anytime and anywhere – all with just a click of a mouse.

Oasis – Bitcentral's digital archiving and distribution system – makes it easy for newsrooms to archive their stories on digital storage devices and then instantly and automatically share them across groups or across the country via broadband.

It's simple to schedule an onsite or online presentation plus receive a FREE GIFT* – a $170 value, just call 800–214-2828 and speak with a representative, or visit us at NAB BOOTH # SL 7715

news. anytime. anywhere.

bitcentral

Precis transforms digital news production – makes remote contribution simpler and faster

In a move that's revolutionizing the news industry, Precis from Bitcentral is taking stations out of the videotape age and into the digital millennia.

Suddenly, news managers are able to get their stories on air faster, easier and from more places than ever before.

Precis' fully integrated, end-to-end, non-proprietary digital system will provide newsrooms with a totally complete solution – one that includes ingesting, editing, newsroom integration and cost effective archiving.

"We thoroughly surveyed the market and found no other competing product to be as comprehensive, easy to install or attractively priced as Precis."

Dan Billings, Director of Engineering & Technology, Waterman Broadcasting

With Precis, field contributors can edit stories on location using notebooks, then submit those stories immediately over broadband or microwave – ready to air from anywhere.

Precis also allows broadcasters to produce for multiple platforms, including TV, mobile phones, websites, video on demand, and 24-hour dedicated news channels. Stories can be distributed simultaneously to anyone, anywhere, all at just the click of a mouse.

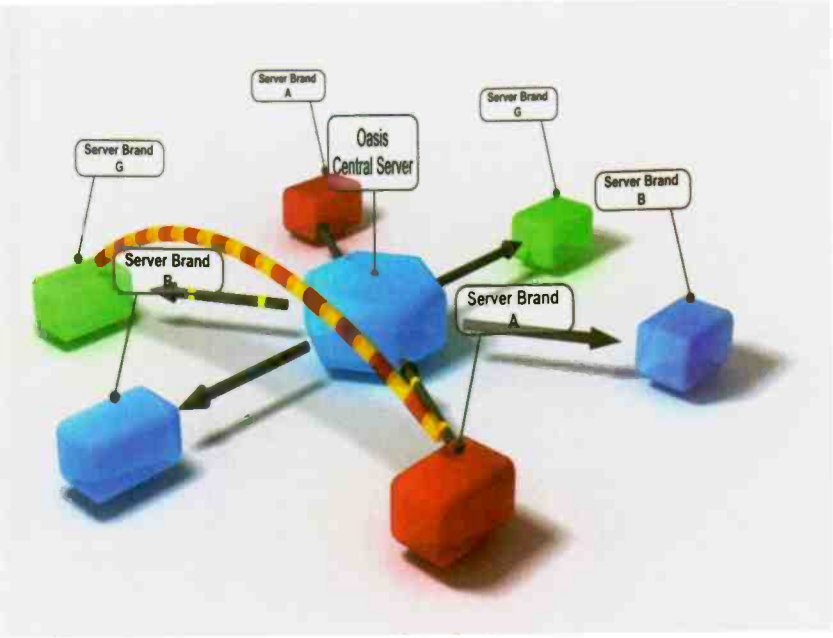
Precis also simplifies story management by using a single interface for national and local stories. Plus it integrates with the most popular newsrooms systems, including iNews, ENPS, and all editing software.

Additionally, the system offers the first true end-to-end HD news production system.

Get an Onsite or Online demo by calling 800-214-2828 – or visit us at NAB Booth # SL 7715

bitcentral news. anytime. anywhere.

Oasis stuns newsrooms – dramatically improves distribution and archiving [Simplifies Sharing, Slashes Costs]



Oasis, Bitcentral's digital sharing and archiving solution has burst on the scene, and news managers everywhere are being wowed by its ability to leverage their news assets.

With Oasis, newsrooms are able to quickly, easily and cost-effectively share stories across groups and across the nation – all at the click of a mouse.

Oasis connects with existing news production systems (whether they are proprietary or tape-based) and saves stories as digital files on commodity storage devices, allowing journalists to instantly and automatically share stories over their existing bandwidth without the traditional dub and feed process.

"For the first time – Oasis makes it practical to share video content across a region and the nation"

David Folsom, Vice President, Technology, Raycom Media

Advanced search features automatically tie scripts and slugs to the video. And there's a visual directory of all available news assets, making it easier than ever to locate and share stories with participating stations.

Oasis also allows newsroom groups to share content between HD and SD stations.

Because Oasis archives stories digitally on commodity storage devices – instead of videotape and restrictive, proprietary equipment – stations are reaping incredible savings in time, money and physical storage space.

And since Oasis' stories can be transmitted using a station's existing bandwidth, there are even greater savings. As a result, newsrooms are seeing a return on their investments in just a few short months.

Bitcentral's onsite & online demonstrations are available immediately by visiting us at NAB Booth # SL 7715

"Precis doesn't just digitize the workflow – it redefines th workflow."

Craig Porter, Director of Engineering, Broadcast Systems KRON4/Young Broadcasting

WRAL in Raleigh NC, the nation's leader in HD news, uses Precis to simultaneous produce for multiple platforms. This includes their 24 hour a day cable News Chann pictured above.

Let Bitcentral introduce you to the innovative world of DIGITA NEWS PRODUCTION! [NAB BOOTH # SL 7715]

Continued from page 200

TV TRANSMITTERS, FEEDLINE, ANTENNAS, TOWERS, SERVICES

6GHZ ATTENUATORS
Bird Technologies Group

Available in 2W, 5W and 10W; are built with precision stainless steel connectors and bodies designed to offer durability, lower VSWR and better accuracies at all frequencies up to 6GHz; standard dB values available are 3dB, 6dB, 10dB, 20dB and 30dB.

440-248-1200
www.bird-technologies.com
BOOTH: N5738

UHF ANTENNA
ERI TRASAR UHF

Dual-channel transmitting antenna; allows stations with N+1/N-1 or adjacent DTV assignments to share one antenna; can be top- or side-mounted, or used as a structural member in the company's STACKER optimized antenna structure solution.

812-925-6000; wwww.eriinc.com
BOOTH: N1119

DIGITAL TV EXCITER
Axcera Axciter

Is reprogrammable and field upgradable with new software versions; system includes AXACT dynamic digital pre-correction and DT-Vision digital signal analysis; features a VGA front-panel display; supports slave-mode and SFN operation.

800-215-2614; www.axcera.com
BOOTH: C2524

UHF STEREO TRANSMITTER
Screen Service SCT 100U/S 10W

Has a modular construction, conventional cooling, and AGC and ALC controls; features three-slope linearity pre-correction; can program the local oscillator from the front panel; has a preset for precision OFFSET..

+39 030 3582225; www.screen.it
BOOTH: C1624

COFDM DIGITAL TRANSMITTER
Broadcast Microwave Services Truck-Coder II

Meets rugged environmental needs of ENG/OB operations; provides 100 presets that can be entered through front-panel controls or downloaded through a front-panel Ethernet port; includes a 2RU controller and antenna-mounted RF unit configured to operate in the 2GHz frequency band.

858-391-3050; www.bms-inc.com
BOOTH: C1607

TRANSMITTERS
Acrodyne (Ai) Quantum Depressed Collector IOT

Linux-based transmitters can be installed in both analog and digital service applications; use the e2v ES-CIOT; operate efficiently in either digital or analog service; equivalent energy savings are available in either mode of operation.

610-917-1182; www.acrodyne.com
BOOTH: C2507

VHF ANTENNA
Electronics Research (ERI) XWING

A side-mounted VHF TV antenna featuring ERI's new SLIMWing design; uses stainless steel construction for the radiating elements, feed and grounding components; its two-bay modular design allows for ease of installation.

877-ERI-LINE; www.eriinc.com
BOOTH: N1119

BROADBAND RF TRANSPORT
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Provide broadband RF transport for CATV, FTTx video overlay and private network applications; 1310nm transmitters are available with a wide range of optical output powers up to 15dBm, in either standalone modules or rack-mount configurations with SNMP management; 1550nm transmitters are offered in short-, medium- and long-haul rack-mount configurations and provide SBS suppression of up to 23dBm with SNMP management.

626-293-3428; www.emcore.com
BOOTH: N2238

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Telecast Fiber Systems Telethon

Accepts both optical and electrical digital signals, ranging from 19.4Mb/s up to 1.5Gb/s uncompressed HD/SDI; multiplexes the signals for transmission in either or both directions, with up to 16 optical signals on one fiber.

508-754-4858; www.telecast-fiber.com
BOOTH: SU10213

VIDEO EDITING SYSTEMS

DIGITAL NEWSROOM SYSTEM
JustEdit vsnnews

Allows text and video to be edited in the same application; integrates the rundown planning and assigning of resources, text eciting, material ingest, storage and cataloging, archive integration, and shared editing of video and audio with voice-over from journalist workstations, graphics in real time and the automatic publication of news on the Web.

+34 93 734 99 70; www.vsn-tv.com
BOOTH: N717

EDITING SYSTEM
Thomson Grass Valley EDIUS SP SDI

Is combined with a PCI Express card that provides hardware-based acceleration, and broadcast-quality input and output interfaces using SDI interconnection for both SD-SDI and HD-SDI; supports embedded audio; a breakout box is available for analog audio IO, component video I/O and frame-accurate RS-422 VTR control.

503-526-8150
www.thomsongrassvalley.com
BOOTH: SL2020

MODULAR ROUTER
NVISION Synapse

Comprises more than 100 modules for HD/SD signal processing and transmission; can be cost-effectively integrated into one powerful media system over time; users can also integrate Synapse modules with any other NVISION router, router control and master control products in order to add specific features, increase system functionality and lower overall costs.

530-265-1119; www.nvision.tv
BOOTH: SU9605

FIBER-OPTIC ROUTER
Opticomm Optiva

The digital, daisy-chained fiber-optic communication platform features customizable, multi-oriented video, audio and data input configurations; supports most signals deriving from commercially available video, audio and/or data equipment in any configuration.

858-450-0143
ww.opticomm.com
BOOTH: N2931

256 X 256 VIDEO ROUTERS
Network Electronics VD256256L, HD256256L

Provide fully hot-swappable module cards, built-in dual-redundant power supply, and fully redundant control architecture and controller functions; features include TCP/IP control interface and TCP/IP interconnectivity with VikinX Modular control panels, as well as a comprehensive surveillance of the routers' vital parameters.

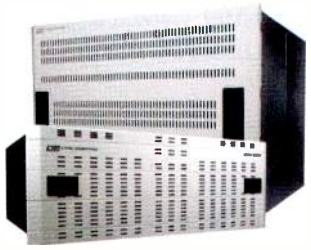
800-420-5909
www.network-electronics.com
BOOTH: SU10605

MASTER CONTROL SWITCHER
Pro-Bel Masterpiece

Offers HD and SD switching, advanced audio processing, and flexible keying and DVE options; upgrades include the addition of an HD DVE, as well as the option to install Dolby E decoders and logo storage.

631-549-5159; www.pro-bel.com
BOOTH: SU8511

DIGITAL ROUTING SWITCHERS
Utah Scientific UTAH-400 series



New features include a new frame for large routers up to 288 x 288 with fully automatic internal crosspoint redundancy, a new frame for small routers up to 32 x 32, and a new set of multirate input/output modules that are capable of handling all data rates from 1Mb/s up to 3Gb/s.

801-575-8801; www.utahscientific.com
BOOTH: N4321

VIDEO ROUTING SWITCHER
Sierra Video Systems Viper

Ultra-wideband video routing switcher features 500MHz bandwidth and hot-swappable video boards, control processors and power supply; offers configurations up to 64 x 64 in eight input and/or output increments.

530-478-1000; www.sierravideo.com
BOOTH: SL6105

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MEDIA STORAGE NETWORK
Avid Unity ISIS

Features four-way scalability, from 8TB to 192TB of storage and redundant, hot-swappable system components; supports up to 150 dual-stream 50Mb/s clients and up to 1000 user accounts; delivers real-time SD and mastering-quality DNxHD media in formats up to 145Mb/s.

800-949-2843; www.avid.com
BOOTH: SL106, SL1410

CAPTURE AND PLAYBACK CARD
Blackmagic Design DeckLink HD Studio

Allows capture from HDMI cameras or decks, as well as analog decks and set-top boxes; HDMI playback and analog playback allows connection to a wide range of video monitors, big screen TVs and video projectors.

408-954-0500
www.blackmagic-design.com
BOOTH: SL11020

> We expect well-integrated and master control and channel release solutions to be among the hot technology trends this year. Mobile TV in every form will also be a major hot spot, particularly via broadcasters' ATSC transmitters.
>
> *— Brian Cabeceiras, vice president, strategic marketing and technology, Harris Broadcast Communications Division*

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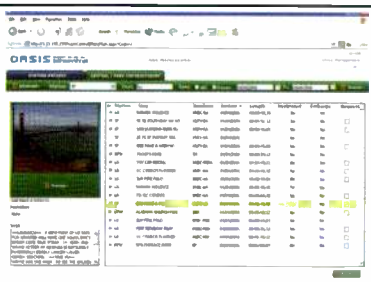
BitCentral OASIS



Is designed for broadcast news production; facilitates user collaboration and media sharing; blends client/server distribution with peer-to-peer distribution; enables streamlined file sharing between HD and SD stations within a group.

800-214-2828; www.bitcentral.com
BOOTH: SL7715

TAPELESS RECORDING MEDIA
Maxell Professional Disc for XDCAM

Optical media for XDCAM HD video systems; is designed for professional video and broadcast direct-to-disc tapeless recording; provides 23.3GB of high-capacity storage, fast transfer rates and a high-precision polycarbonate plastic cartridge to protect against dust and scratches.

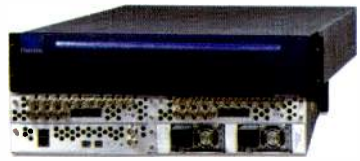
800-533-2836; www.maxell.com
BOOTH: C7736

MEDIA SERVER
Omneon Spectrum HD

Combines high-quality HD playout capability with flexible features to allow facilities to efficiently migrate to HD broadcasting; MediaPort playout modules can support one or two channels of HD MPEG playout of 4:2:0 and 4:2:2 material at bit rates up to 78Mb/s; handles DVB/ASI streams.

408-585-5000; www.omneon.com
BOOTH: SU1326

MEDIA SERVER
Omneon MediaDeck



Integrates media storage, system management, GigE connectivity, and SD or HD video I/O modules in one 2RU package; consists of eight 500GB SATA disk drives with dual-parity RAID, providing 3TB of usable storage with protection even in the event of two drive failures.

408-585-5000; www.omneon.com
BOOTH: SU1326

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OmniBus Systems OPUS 2

Is designed to move the content process from specialized hardware to a standard IT platform; features soft-XML support for customized logging and annotation, frame-accurate proxy generation and viewing, full-text indexing and searching, seamless integration with production editing systems such as Avid and Final Cut Pro, and standardized Web services data exchange with adjacent systems.

+44 8705 004339; www.omnibus.tv
BOOTH: SU5413

DATA MANGEMENT SOFTWARE
Quantum StorNet

Creates multi-tier storage archives, automatically moving data between different disk and tape resources to allow users to build highly scalable storage systems and reduce costs; is designed to be platform-independent.

719-536-5263; www.quantum.com
BOOTH: SU13809

NEARLINE STORAGE SERVER
SeaChange Broadcast MediaLibrary ML1G

Is based on Intel's new Dual-Core Xeon 5100 series processors; the system's patented, clustered network attached storage technology provides up to 500TB of open, shared file storage and backup broadcast-quality streaming from a single platform.

978-897-0100; www.schange.com
BOOTH: SU10812

VIDEO SERVER
360 Systems Image Server MAXX

The high-performance, three-channel broadcast video server with graphic store and key and fill supports MPEG-2 video up to 50Mb; inputs MPEG-2 and DV over GigE from Apple FCP and Avid, as well as TARGA files from graphics programs.

818-991-0360; www.360systems.com
BOOTH: SU9120

ARCHIVAL AND STORAGE SYSTEMS INTEGRATION
Crispin ArchiveManager

The archival and clip retrieval tool now integrates with the Omneon MediaGrid active storage system; provides a view of video server and archive content through an integrated database; allows for quick drag-and-drop asset transfers.

919-845-7744; www.crispincorp.com
BOOTH: SU6205

HD VIDEO SERVER
Doremi Labs MCS-HD

Features up to four independent HD video channels; can be used as a drop-in replacement for HD VTRs, for sports slow-mo and for the broadcast delay of up to two HD video channels; features HD-SDI and SDI in/out.

818-562-1101; www.doremilabs.com
BOOTH: SU3608

ASSET MANAGEMENT
Xytech Systems Enterprise Version 10

Provides a workflow solution for the creation, management, scheduling, tracking and delivery of physical and digital media assets; new capabilities enable the software to maintain metadata on both physical and digital media assets.

818-303-7800; www.xytechsystems.com
BOOTH: SU7526

PRODUCTION SYSTEM
EVS CleanEdit Suite

Is designed for sports and news; allows multiple users to take advantage of a common pool of media via a reliable system; offers ingest applications with ingest scheduler and VTR control, browsing, clipping and media management, editing in proxy or high resolution in native HD and SD formats, and immediate playout.

+32 4 361 70 00; www.evs.tv
BOOTH: C3607

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STORM TRACKER
Baron Services FasTrac

Is a Windows-based storm tracker; to create a manual storm track, users click and drag the mouse in the direction they want; a storm track instantly pops up, with a list of communities that lie in harm's way, as well as the time the storm should arrive.

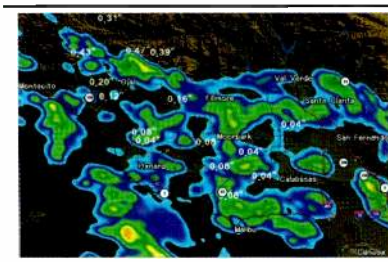
256-881-8811; www.baronservices.com
BOOTH: C7017

LIVE WEATHER DATA
Weather Metrics WxVision.Net

Combines live weather information with live streaming video, via the all-digital WxVision camera; users can view live weather conditions from remote locations; all video is sent over a standard DSL Internet connection.

800-393-6629; www.weathermetrics.com
BOOTH: C7222

ON-AIR RADAR SYSTEM
AccuWeather SelectWarn v2.0



Delivers on-screen weather graphics and video; uses the National Weather Service's official storm-based warnings; features an enhanced graphics toolkit, extensions of StormVision to track storm movement, and precise lightning forecasts and AccuRain to deliver neighborhood-specific rainfall amounts.

814-235-8600; www.accuweather.com
BOOTH: C6412

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CAMERA CABLE
Belden Brilliance Composite Camera Cable

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765-983-5815; www.belden.com
BOOTH: C9441

TRIAX CONNECTOR
Fischer Connectors 1053

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800-551-0121
www.fischerconnectors.com
BOOTH: N409

HYBRID FIBER BREAKOUT BOX
Gepco

Is a portable, SMPTE 304M hybrid fiber-to-ST breakout box with a reduced footprint; the breakout of the hybrid connector to discrete, industry-standard optical and electrical components allows for an HD camera-to-CCU interconnection over existing fiber tie lines in facilities where hybrid fiber interconnects may not be present.

847-795-9555; www.gepco.com
BOOTH: C7525

BNC CONNECTORS
Canare BCP-PC

The 75Ω connectors are designed for SD-SDI applications; include a longer body, making them easier to grip; feature a unique 3-piece crimp design, making assembly and field-replacement a snap; models are available for several industry-wide popular cables, with 26dB or less return loss at 1GHz and 20dB or less at 1.5GHz.

818-365-2446; www.canare.com
BOOTH: SU4805

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> — *Wayne Alonso, Azden*

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Snell & Wilcox's iCR

Automated content repurposing creates revenue-generating content for multiple distribution platforms.

BY JOE ZALLER

Consumers are rapidly embracing the personalized and often portable media experience, and this trend gives content owners, distributors and service providers the opportunity to monetize their media assets across multiple distribution platforms and target devices. For companies in these categories, the challenge is to enable the creation of high-quality masters that can be repurposed for various platforms, such as VOD, mobile phones, portable media viewers and Web publishing, in an automated, scalable, efficient and cost-effective way.

Traditional repurposing has relied on separate encoding and transcoding processing steps. But this slow and operator-intensive approach limits the amount of media that can be repurposed because of the cost involved and the time required.

Integrated repurposing

To address this challenge, Snell & Wilcox has developed iCR, an automated content mastering and repurposing workstation that integrates a unique mix of image conditioning, content mastering, quality control and content repurposing functionalities into one workflow. (See Figure 1.)

The system performs all encoding and transcoding processing steps concurrently. And once the master-encode process is under way, it allows you to complete mastering and repurposing tasks in about the same time it would take to perform a single encode/transcode operation using a conventional system. The system also provides tools that dramatically reduce the costs associated with manual QC processes.

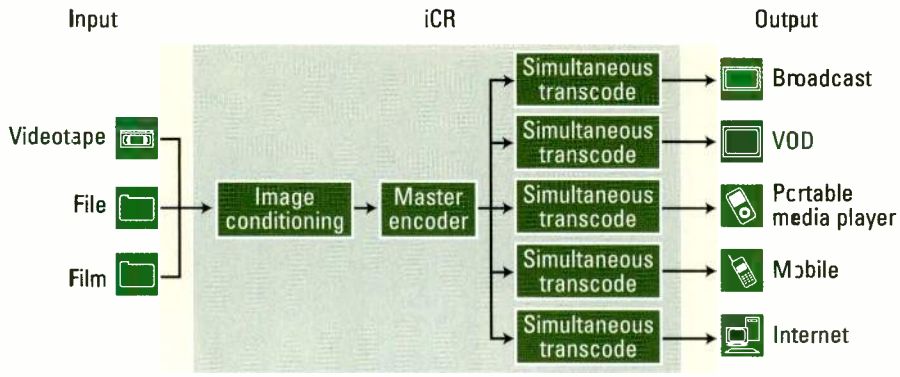

Figure 1. The iCR simultaneously repurposes content for multiple distribution platforms.

iCR features a complete range of SD and HD preprocessing and signal conditioning capabilities, including de-interlacing, frame-rate standards conversion, image resizing, aspect ratio conversion, multichannel audio handling and MXF metadata wrapping on the fly. Because noise, grain and other signal artifacts can cause visible blockiness and mosquito noise when pictures are compressed, the system uses sophisticated image preprocessing. Scene-change detection and 3-D wavelet-based noise reduction produce clean, artifact-free images for all distribution platforms.

Intuitive encoding

Because mobile phones, portable media players and computer screens feature progressive displays instead of the interlaced scanning used for TV broadcast, content delivered to these devices must have the interlace structure removed during the encoding and repurposing process. The system addresses this task with 3:2 cadence handling and de-interlacing capabilities to create various frame-rate SD and HD progressive masters and deliverables. It also automatically distinguishes between film and video-originated material and handles each in the most appropriate manner, allowing the user to create masters and deliverables from programs that feature mixed film and video content.

Quality control

Because the encode process is performed only once, and unlimited transcode processes can be achieved in parallel, it becomes much easier to repurpose content for multiple output formats. Automated QC monitoring is integrated at each step of the mastering and repurposing process to help streamline manual QC and allow you to focus on problematic areas rapidly.

Beyond just monitoring the technical characteristics of the video, the QC functionality also evaluates the quality and makeup of the video, audio and metadata content within the signal, both in the baseband and file

domains. This allows the system to automatically provide an analyzed response as to whether each element of the program meets satisfactory viewing quality standards, as well as the legal and contractual requirements necessary to generate revenue.

Scalability

iCR's open, scalable architecture can be configured to meet specific needs, from simple encoding to the full functionality of the entire system. Over time, it is possible to add support for new consumer devices and distribution platforms.

Likewise, system throughput can be easily increased by adding extra workstations or by upgrading systems to the latest processor technology. The system supports many standard interface types, including SNMP, VDCP and XML, and can integrate seamlessly with existing asset management or control and monitoring systems.

Instead of performing all these processes manually and individually, it is now possible to integrate them into a single-pass, automated process that a single operator can control.

Instead of performing all these processes manually and individually, it is now possible to integrate them into a single-pass, automated process that a single operator can control. Fast throughput allows the user to continue working and move from task to task without delay, instead of waiting for system processing functions to complete. In the course of the working day, this can add up to significant time savings. And by combining this concurrent processing with automated QC, iCR provides a low cost per deliverable while ensuring high-quality results, whatever the target platform. BE

Joe Zaller is vice president of marketing for Snell & Wilcox.

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Beyond intuition

New technology provides understanding for format and scan conversion fundamentals.

BY JOHN LUFF

As I write this article, I'm 33,000ft over Kansas en route home from the Hollywood Post Alliance Technical Retreat — the second technical conference I've attended in two weeks. Writing for a magazine like *Broadcast Engineering* requires a conscientious effort to see the forest for the trees. After two weeks of immersion in digital intermediate, IPTV, advanced compression and TCP/IP theory, I find it difficult to relate the future of our industry to a single-minded topic. So the task of writing about format scan and conversion looked daunting. Luckily, a company that participated in the conference offered a fresh view of fundamentals of format and scan conversion.

Seeing frames anew

FrameFree is a new technology company to most of us, but its image research roots go 17 years deep in Japan. The company sees video as the movement of content across the image plane rather than as frames. In much the same conceptual view that motion compensation seeks to find matches frame to frame, FrameFree ties critical points in an image to corresponding points in the succeeding frames.

The simplest analogy you may be familiar with is morphing, where a face is slowly converted to another by a gradual process of change. This leaves the similar points, for example, the eyes, in the same position, but gradually changes them to those of the second face. Over the space of many frames, the image slowly becomes the new face, and all similar features (mouth, hairline, etc.) convert to those from the target image.

But if you cease to view a TV signal as a series of pictures and instead view it as samples in time, it is natural to look at changes in the scene as a morphing of reality.

Interpolated reconstruction

Consider what would happen if you took some of the time samples — the frames — away. By relating the remaining samples to each other through finding critical points and figuring out where they have moved to, you might be able to replace the missing frames with an interpolation of the two end point pictures. This is similar to motion-compensated standards conversion, but it is subtly and fundamentally different. But how is frame interpolation related to scan and format conversion?

Format morphing

Think about converting a 525/30 signal to a 625/25 signal. Create mental pictures of the two sequences. They both have the same nature as samples in time of the real scene. But if you could sample the real scene with all 55 samples, you would find that they are all intimately related but simply slightly shifted in time, with an irregular cadence.

For example, look at the sample times in Figure 1, and consider how converting from one to the other can be viewed as an interpolation of the closest two frames from the source samples. Then create the missing time samples for the output format.

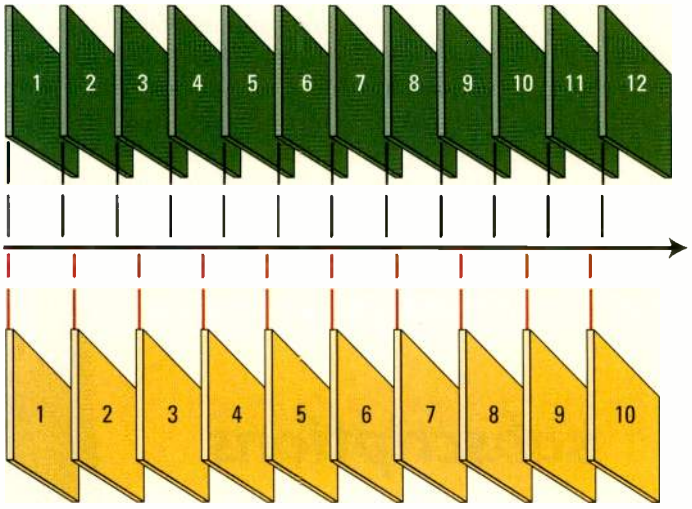

Figure 1. Frame alignment when converting between 525 and 625 frames

By looking at the problem this way, its mathematical nature is clear. If you can manufacture a frame where one does not exist in the source, you have the ability to convert any frame rate to any output frame rate. Now take the same analogy and think about the spatial samples. Then you will realize that the same thing can be done spatially at the pixel level.

Imagine 525- and 625-frame images scaled and overlaid in the real world. Their samples clearly would not lay on top of each other, but converting from one to the other

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would require to morph, or interpolate, between data points that exist in the source image. Then you can find any intermediate point corresponding to the output image. (See Figure 2.)

Applying the technology

Intuitively, I have understood this process for a long time, but watching FrameFree's technology demonstration made the intuitive much easier to describe. Of course, there is much more to the process. The company decomposes the image into a mathematical mesh using an existing technique called Critical Point Filters.

Applying this technology to modern motion imaging is powerful. FrameFree's only product to date is intended for the graphics and image processing industries, but I think the company is really on to something. The technology could be successful in many other applications.

For example, using this approach in cartoon animation could make much smoother animations for 30-frame television delivery without creating any additional animation cells. Simply interpolating between cells could save the artist time and improve the product.

This process could also be used to smooth out sports replays. By creating many more in-between frames, replays could appear stunningly fluid.

Real-time compression

What if this technique could be used to compress TV images for transmission? If the technology could transmit fewer frames, it would greatly reduce the amount of data. This is essentially what compression systems, such as MPEG, do when they create the much smaller B- and P-frames.

Converting high-resolution computer images to television output and vice versa would be no problem with this process. The same goes for converting 72-frame computer simulation to 25-frame film. Exactly the same processes happen, whether done using Critical Point Filters or any other approach. Interpolating in time and space is the general case problem. And after only 41 years in the business, I am beginning to understand it!

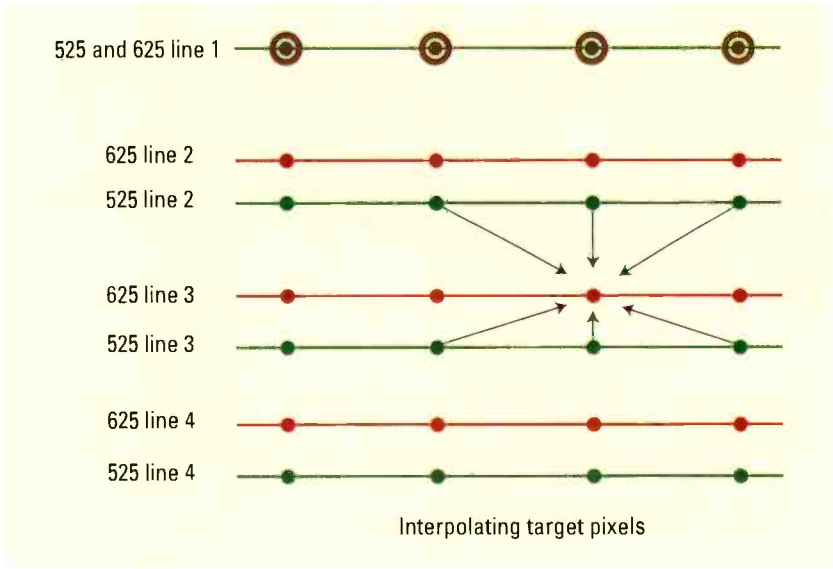

Figure 2. Interpolating target image pixels

Meeting of the minds

FrameFree is likely a long way from creating a real-time compression engine, or any of the other products, but I hope this helps you to see scan and format conversion in a new way. BE

John Luff is a broadcast technology consultant.

Send questions and comments to: john.luff@penton.com

Help Wanted

CHIEF ENGINEER
VIDEO PRODUCTION STUDIO

A Hollywood-based video production studio with THREE fully equipped stages, control rooms and support facilities seeks a production-experienced Engineer to manage and direct all aspects of our engineering department. Qualified candidates should have 5 years minimum strong practical experience in set-up of multi-camera, live, taped, HD & SD video production activities, as well as solid knowledge of video systems and experience in system integration and installation. Knowledge of the latest audio/video production equipment and technologies is important. Experience in HD production is very beneficial. Knowledge of real-time compositing or computer network management is a plus. The ability to prioritize and to calmly interface well with non-technical coworkers and clients is critical. Additional responsibilities, based on experience, include technical facilities design and planning, equipment maint-enance, and shared daily operational responsibilities with a small engineering staff. Salary commensurate with exp-erience. Please respond by emailing your cover letter and resume to **ahoogeveen@productiongroup.tv** or by faxing it to (323) 962-2182.

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Weigel Broadcasting Co. in Chicago has an immediate opening for a Systems Engineer. Exp. in the workflow and operations of broadcast on-air delivery systems and work with the Dir. of Engineering to manage and create efficient workflows. Extensive knowledge of the workflow and IT aspects of broadcast automation systems, video servers, traffic systems, Telestream Flip Factory, Avid Unity, Media Composers, Newscutter XP, & related broadcast equipment required. Willing to work and take calls 24/7. We recently completed a new, state of the art transmission facility. Resumes: HR, 26 N. Halsted, Chicago, IL 60661, Fax: (312) 705-2656. Email: humanresources@wciu.com. No calls. EOE.

Help Wanted

NEP Broadcasting is seeking Mobile Unit Engineers of all experience levels to manage and monitor mobile unit broadcast operations at remote sites, perform preventative maintenance, trouble-shoot, execute changes and engineering updates on the mobile unit. Degree, training, 3+ years experience in broadcast technology, equipment, facilities, and production or any combination considered. Maintenance engineering background a plus. Please send resume and salary history to NEP Broadcasting LLC, hr@nepinc.com, Fax: 412-820-6045, 2 Beta Drive, Pittsburgh, PA 15238.

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KOAT-TV is looking for a Maintenance Engineer. The successful candidate will have a clear understanding of News Technical Operations and must possess the knowledge base to maintain the hardware and systems that support a successful News product. This position requires a thorough knowledge of ENG camera systems, editing equipment, live trucks and SNG vehicles. Component-level troubleshooting is required and digital systems knowledge is necessary. Please send resume along with a cover letter stating where you found out about this job to: Daniel Brown, Director of Engineering, KOAT-TV, 3801 Carlisle Blvd. NE, Albuquerque, NM 87107. ~KOAT-TV, A Division of Hearst-Argyle Television, is an Equal Opportunity Employer~

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An awakening

In the broadcast industry, ultraconservative companies are a dying breed.

BY ANTHONY R. GARGANO

Radio Corporation of America, known more familiarly as simply RCA, has its roots in the Victor Talking Machine Company, which was headquartered in Camden, NJ. Most of the craftsmen at the Victor Talking Machine Company were skilled in carpentry and wood refinishing, and they produced an acoustic phonograph called the Victrola — the entertainment centerpiece of many early last century family parlors. As a result, the family parlor became the living room, and the entertainment centerpiece evolved into radio and eventually television. And, oh yes, the dominant skill sets of the company were transformed from carpentry and woodcraft to electrical engineering and electronic technicians.

RCA bites the dust

In its prime, RCA was a pacesetter in both the engineering development and the manufacturing of consumer televisions. It was also a leading developer of advanced video, audio, and RF technology and products for everything from the broadcast studio and transmitter site to the top of the transmission tower.

Joining RCA in the mid-70s, I missed that heyday period. Unfortunately, I arrived on the scene just in time to ride down a long, slippery slope that took the company from market dominance and ultimately out of the professional broadcast scene.

Just three months before RCA announced that it was shutting down its professional division, the company chose me to attend the Tuck Executive Program at Dartmouth College. The program was euphemistically referred to as "charm school" within the company.

Returning to New Jersey from "charm school," I looked forward to applying my newly honed skills to growing a business. Instead, I was put to work shutting one down! Ultimately, it would be three years before the light switches were thrown for the last time and the doors locked.

Taking care of business

RCA had spent more than 60 years supplying professional studio and RF equipment to major broadcasters and production facilities around the world. An orderly shutdown of the business meant closing down engineering, phasing out manufacturing, laying off sales and support staff, and eventually selling the remaining physical assets. Most importantly though, it required RCA to provide customer support, which meant replacing parts and providing service for a minimum of 10 years.

Joining the RCA mafia

RCA spent a year fending off lawsuits, terminating its workforce and trying to assure disappointed customers that they would continue to receive support. This year was more time than anyone should have to spend in such a gloomy, negative environment.

At the end of that year, I received two offers. One option was to sign on for another year in the phaseout activity at RCA. The other was to join Sony. At the time, there were so many ex-employees of RCA working for Sony that, internally, they were affectionately referred to as Sony's "RCA mafia." It was an easy decision to join the mafia.

Different strategies

Moving to Sony was quite a change and an eye-opener. Within a few weeks, I was on a plane to Tokyo for my Sony indoctrination. It didn't take long to understand why RCA was dethroned from its broadcast market leadership position. Where RCA had fewer than 20 VTR engineers, Sony had more than 200. RCA had perhaps 10 camera engineers; Sony had more than 100.

Even in its heyday, RCA used an ultraconservative shop order-based manufacturing process. If, for example, RCA needed to build studio cameras, a shop order was issued for a specific quantity, usually not more than 50. That meant 50 sets of parts were ordered, and a production line was reconfigured to handle the build. Sony, on the other hand, with virtually continuous production, had none of the cost inefficiencies associated with stop-start production and received significant quantity discount opportunities on large parts buys.

This contrast between ultraconservative and super-aggressive business practices can be seen in all industries. Naturally, Sony has become a dominant force in the broadcast, production and post industries. But cycles are inevitable. When the keys to market success transitioned to digital- and computer-based technology, new market leaders came to the fore, and so the cycle continues. But that's a story for another day. BE

Anthony R. Gargano is a consultant and former industry senior executive.

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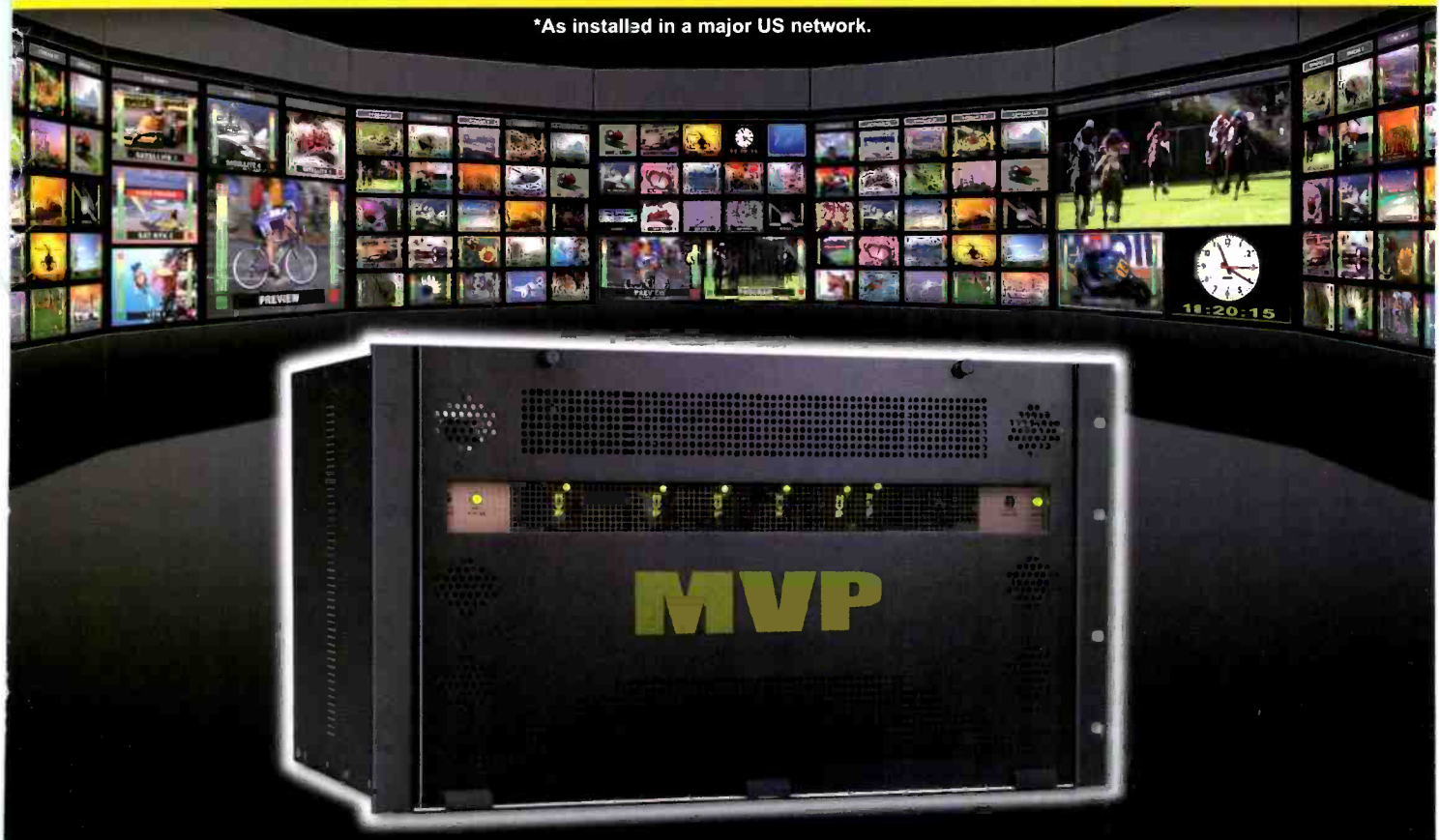

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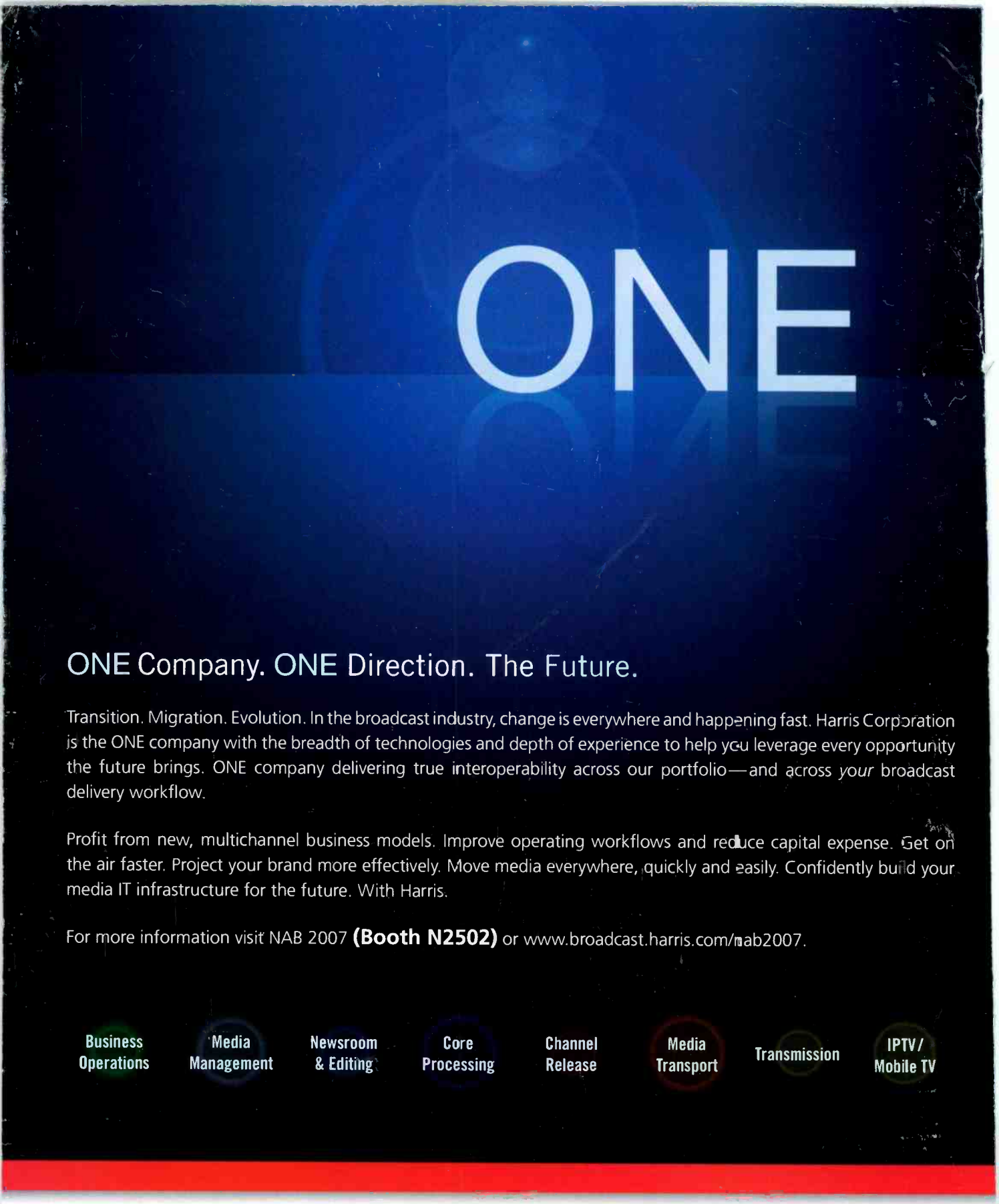

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