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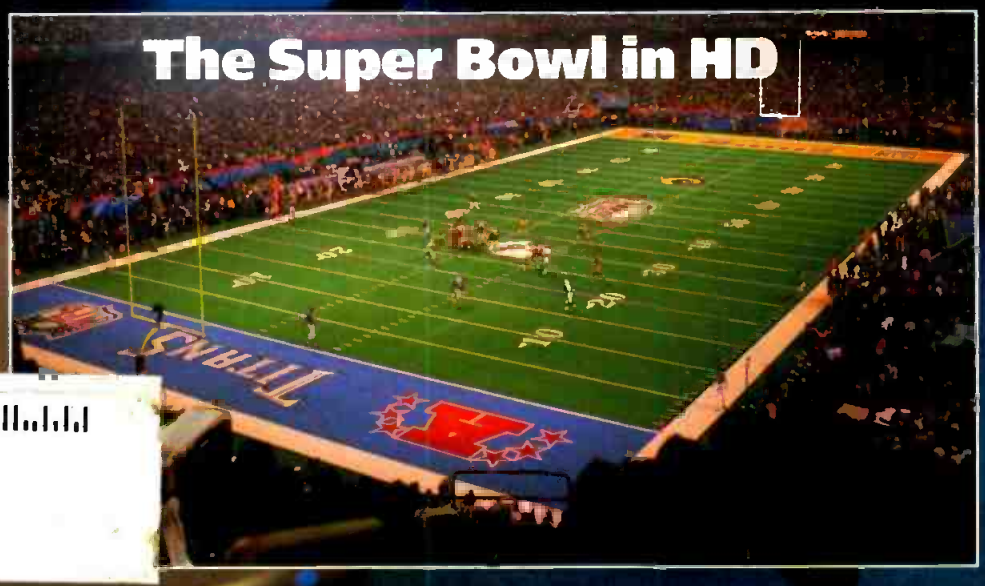

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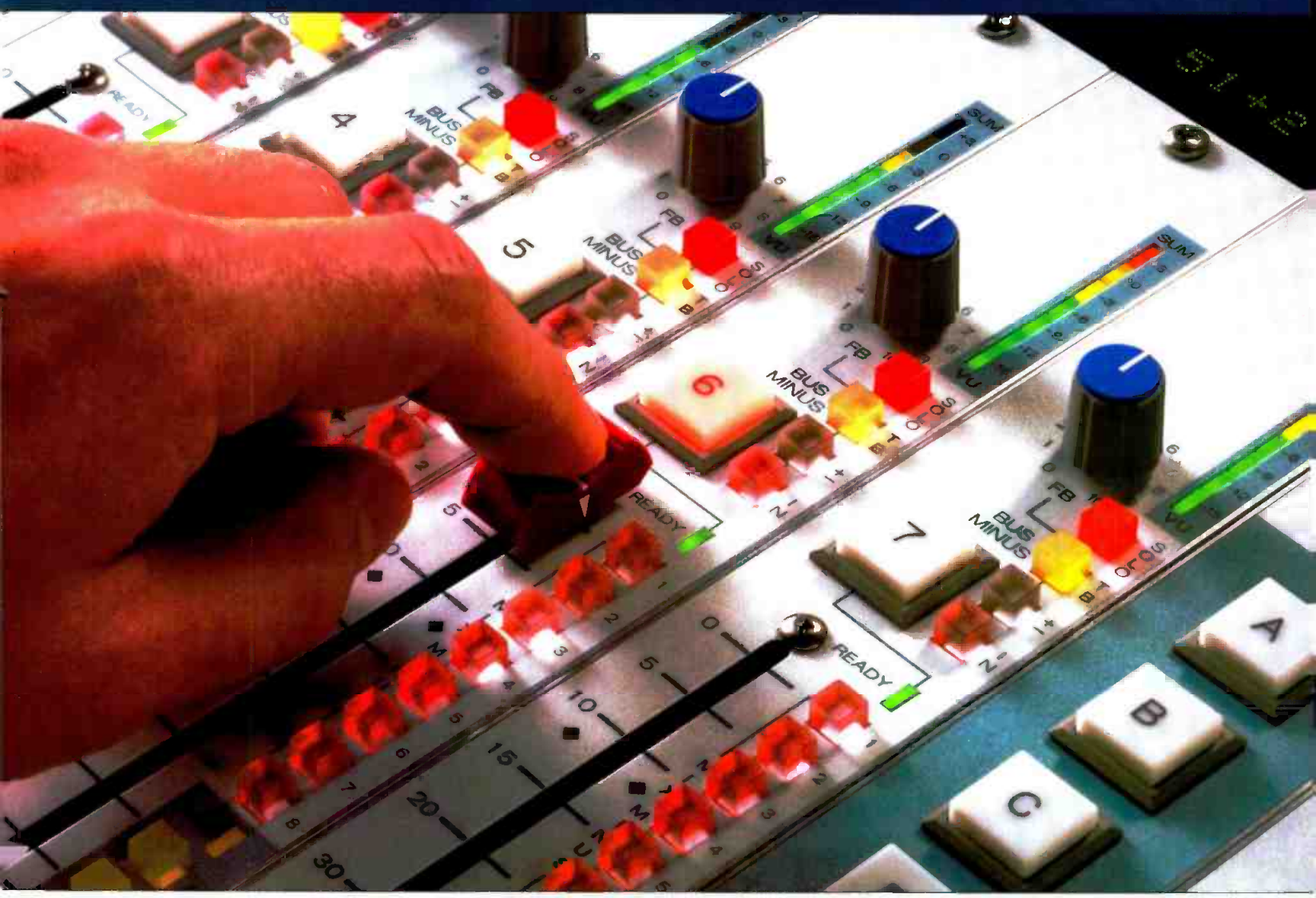

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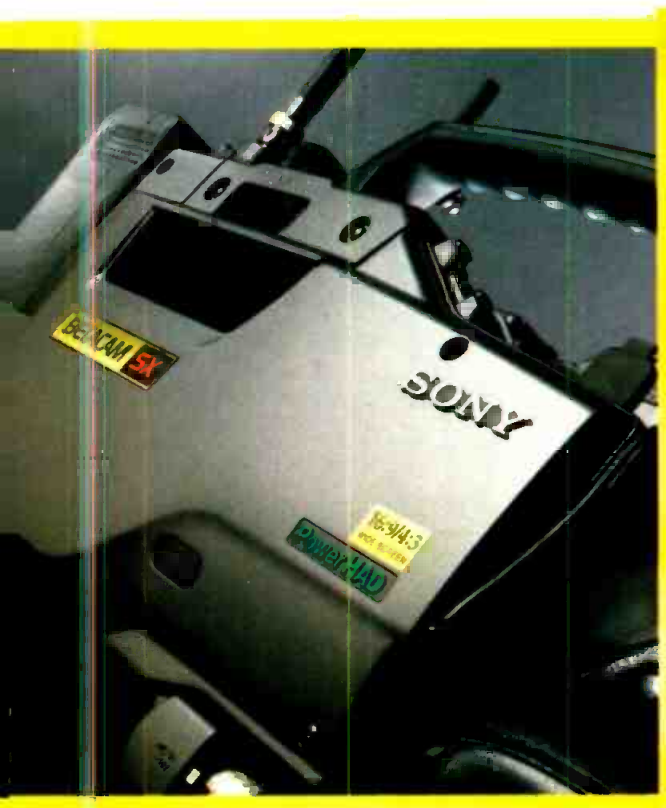

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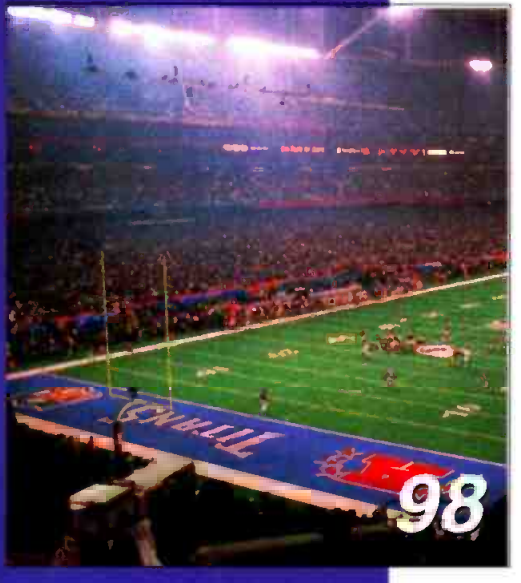

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ON THE COVER: *The Fire HD editing suite at Riot, Santa Monica includes the new Sony HD 24 Frame progressive equipment, Sony HDCAM equipment, Sony HD monitors, Panasonic HD5 and a G4 Macintosh computer. Photo by Anthony Nelson of Anthony Nelson Photography.*

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Questions? Contact:
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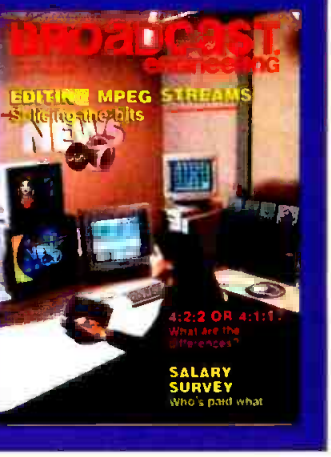
FREEZE FRAME

A look at the technology that shaped this industry.

Today's digital world requires sampling (A/D conversion) of studio video for both processing and transmission. In order to select the minimum Nyquest sampling frequency, you'd have to know the uppermost frequency in the analog source. What is the upper limit specified in the SMPTE 170M studio video standard.



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Editorial

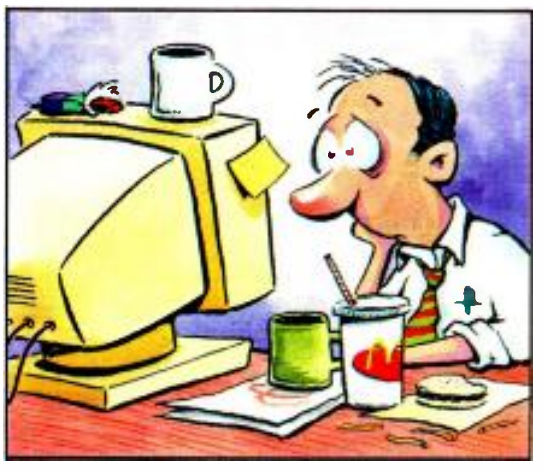
Mouse potatoes

Based on a recently released study, it appears that we're doomed to live most of our lives in front of our computers. If you think Tom Hanks and Meg Ryan were "connected," just wait.

In a recently released study, the Fortino Group claims that, thanks to the PC and the Internet, our lives will soon devolve to the point where we live our lives through a 15-inch screen. No longer will our focus be on *personal interactions* with humans, but rather on *computer interfacing* with the rest of the world. The study lays claim to some data that's frankly shocking.

Baby boomers, those having just crossed 50, will spend five and one-half years of their lives on the Internet. The only reason the baby boomers won't spend more time logged-on is that we just won't live long enough to push up those numbers. We'll be dead before we can waste (my term) more of our lives staring at that 15-inch screen. If you think five years staring at the computer is a long time, just wait. It gets worse.

The Fortino study claims that Generation Y, my son's age group, will spend more than 23 years online – *23 years*! That represents nearly one-third of his life. He could take a job and retire in less time. It's frightening to think of spending so much of one's life "pointing and clicking." In reading this, the first thing I thought of was all the fun he'll miss out on by not interacting in the real world: water skiing, skateboarding, fishing, meeting girls — having some fun!



The study claims our kids' lives will be cyberspace focused. Two-thirds of all Generation Y marriages will originate from contacts first made in cyberspace. I can see it now. "You've got mail" and "Sleepless in Seattle" rolled into one. It sure doesn't sound like much fun to me.

The report also claims the average AOL user will hear "You've got mail" more than 400,000 times. Where's my hammer? I don't like machines talking to me. It's bad enough that they don't listen.

And talk about wasted time; Fortino's report claims that the average Internet user will spend almost three years "lost" somewhere in cyberspace. Three years! My company monitors how much time I spend surfing the Net. If they think I'm wasting three years of my work life, they may add an extra three years before I can retire.

The study also claims the average worker is wasting more than 400 hours a year cybersoaring with "no apparent direction or constructive reason." That's two and a half months of no productivity from every Internet worker. If that word gets out, you'll be able to hear the "sucking" sound of Internet Explorer being yanked from office desktops all across the country.

The most disgusting claim from the study was that the average Internet user would click the mouse more than 42 *million* times. If you've read my editorials for any time at all, you know I hate the mouse. To think I'll be caressing that dumb thing's butt 42 million times ... I'm going to be sick.

Fortunately, the study did have some good news, at least for me: It says that I'm above average. The study claims that the typical Internet user will misfile 120 pages of information and mislog 33 folders every month. The way I figure it, I've got those figures beat already and it's only the 10th of January.

Brad Dick

Brad Dick, editor

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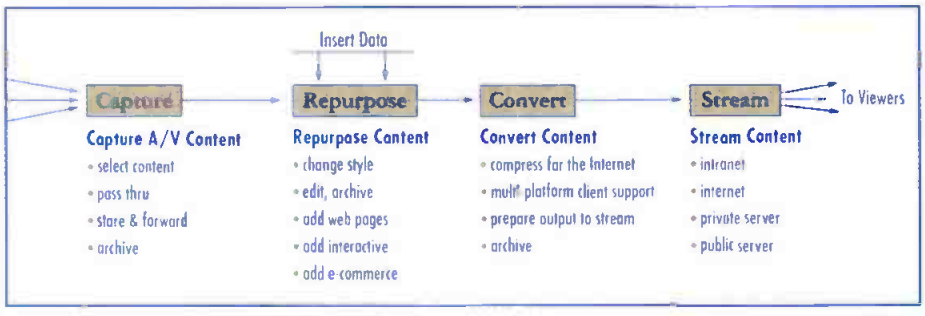
The New Antenna– Are You Ready To Use It?

It's all about distribution. Oh sure, content is king but without distribution, the content sits on the shelf. How do broadcasters distribute today? Let me count the ways; traditional terrestrial emission, digital terrestrial emission, cable, satellite, MMDS, other wireless methods and of course the Internet.

We are aware that Internet broadcast is fraught with problems; or should I say opportunities. After all, in every problem there is an opportunity screaming to get out. From the perspective of a broadcaster, the Internet may be viewed as an antenna of a different breed. However, many broadcasters are paralyzed with indecision as to whether to broadcast using the new antenna. It's a natural reaction to new technology. Rather than wait for the skies to clear, shake off the indecision, start small and learn the new rules of the road.

Accepting the premise that the new antenna will be good for business someday, what steps are required to put it on air today? Figure 1 shows a simple model that may be used as a guide. Four steps are needed to implement an Internet broadcast. Let's call this the CRCS ("circus") model for Capture, Repurpose, Convert and Stream.

The CRCS Model for Internet Broadcast



Capture

This is the portal to the Internet feed process. All of its components are familiar and readily available to the broadcaster. This stage functions to capture or produce selected A/V content and archive if needed. This function may be as simple as a video feed passthru switch or as complex as a live production studio. Really, this block depends to a large extent on the nature of the video source that needs to be streamed to the web. At this point, the A/V material may still need further modifications however.

Repurpose

This stage involves metamorphosing the captured or produced content in someway so that it you, the broadcaster, provide all the functionality of an A/V web server plus a high bandwidth connection to the Internet. Depending on viewership, the internet connection may require SONET/SDH rates (155Mb/s typically) or higher. This fact is enough to unnerve most broadcasters.

The public server approach moves most of the streaming burden to a 3rd party service provider. Broadcast.com, Real Networks and others operate such streaming services. There are tradeoffs using any public streaming service, but at least the millsrone of internet high bandwidth connectivity is removed. Expect 10's or even 100's of thousands of streams from these providers.

Conclusion

The CRCS model should help you to identify and categorize the design variables that need attention for Internet broadcasting. Pinnacle Systems is creating products in all four spaces of the model. We offer products to capture, repurpose, convert and stream A/V content to the web. Our Thunder line of servers and iThunder products make streaming to the web a simpler process. We are committed to providing solutions to broadcasters so that they can effectively use the "new antenna".

Al Kovalick
Chief Technical Officer, Broadcast Group
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Reader Feedback

The end is near

I rarely write responses to editorials, but I just happen to be on a flight to Las Vegas for CES 2000 and found some time to read the December issue of BE. As a veteran of over 36 years in the broadcast industry, I would like to applaud your position on DTV and your comments to station owners and operators regarding the need to invest now in the future.

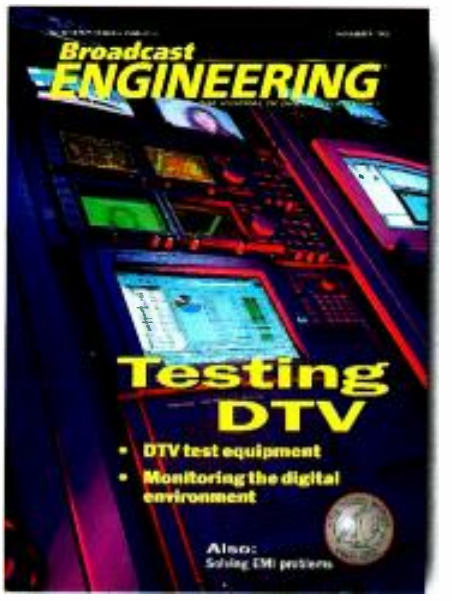
Every time a new media delivery system has come along in the past 50 years there have been those who have predicted doom and gloom for the existing media.

As we look back over the history of our industry, we see that the media

delivery systems of the past are still in place and most are doing quite well. In fact, those that have invested in the future, adapted to change, embraced the new technologies and blended them with their traditional businesses are the ones that became the leaders of today's industry. It is nothing more than the age-old axiom of "adapt or die."

My hope for the next decade is that more broadcasters will decide that it's time to adapt rather than sit around waiting to die.

Jay C. Adrick
Vice President, Broadcast Systems Integration
Harris Broadcast Communications Division
Mason, OH



Loved the November issue

Thank you for the November article on lightning protection (Don Markley's Transmission & Distribution column). I've always wondered whether those "lightning elimination" schemes were actually useful devices or just pseudo-science. It's good to know that there's at least some unbiased anecdotal information attesting to their effectiveness.

I also found the "Monitoring in the Digital Environment" article very interesting. It's nice to have all of the vitals laid out in one handy little chart.

And I got a chuckle out of the editorial, "Everyone's an Expert." But I'm a little mystified as to why no one has announced their BLT or WLT technology yet!

Keep up the great work. Your magazine is such a pleasure to read.

Regards,

Joanne Bandlow
Cablevision Systems

Remember Quad?

It was great to see how many readers were still up-to-speed on what's considered antiquated technology. December's Freezeframe question focused on two-inch quad tape machines: *What was the equivalent linear writing speed of the two-inch quad deck?* While most entries were correct, answers included numbers from 91.24ips to 1200ips, the correct answer is, of course, approximately 1500ips. The exact speed depends upon the condition (wear) of mechanical parts.

The following readers provided correct answers and will receive a *Broadcast Engineering* T-shirt.

Srini Murthy, Larcan. (Srini says a Kellogg's spot was the first commercial sourced on a quad? Anyone dispute that?)

Marlin Jackson, KLEW-TV, Lewiston, ID. (This guy is still using one!)

Mike Plott, Oakland, CA

John Harris, Georgia State University

Howard Chasteen, Colorado Springs, CO

Phil Titus, KUED, Salt Lake City

Louis Johnson, WGNX, Atlanta

Tim Stoffel, WXXI, Rochester, NY

Don Norwood, Digitrack, Hickory, NC

Dennis Boswell, WLTZ-TV, Columbus, GA

It was interesting that half the entries provided the math to prove their calculations—even if they were wrong. Thanks to all who entered. See page 8 for this month's question. ■

Send your thoughts and questions to us at:
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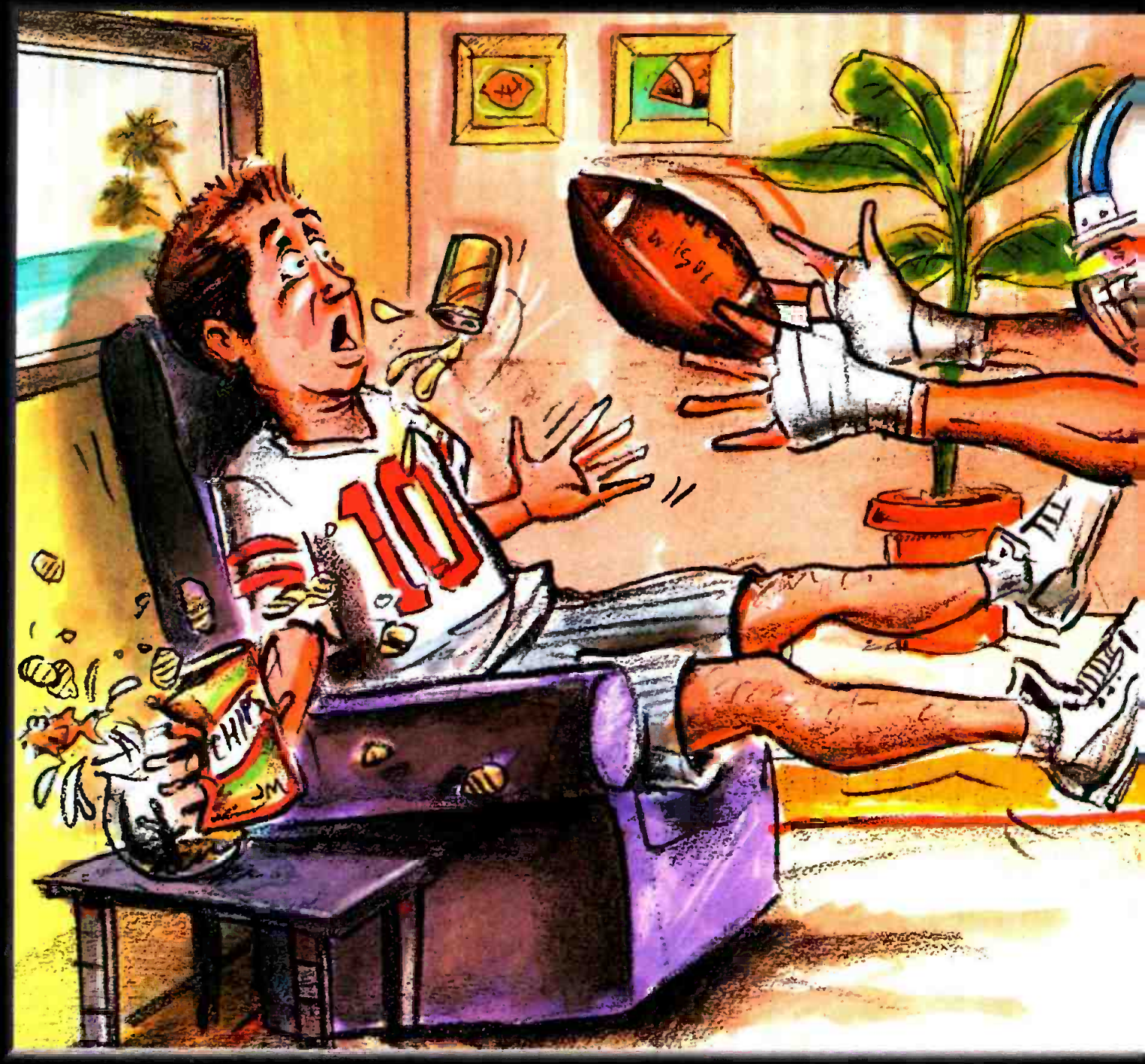

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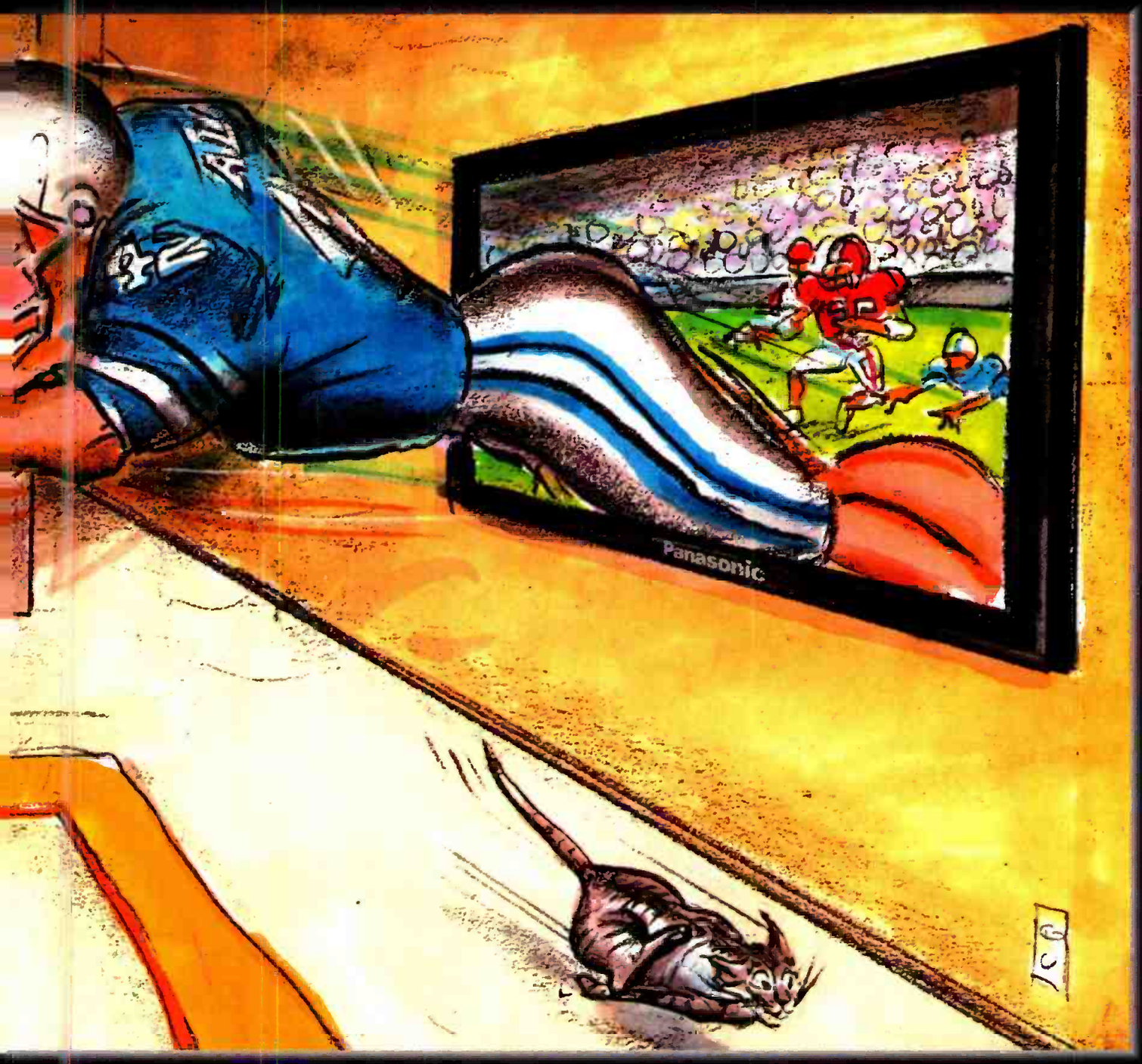

this season

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Paris and Berlin at exactly midnight as they were all in the same time zone; thus the 43 VTRs were put to good use.

"This show was so complicated and complex," said Patterson, "that it stands on it's own. After 30 years in the business, 23 as of February at ABC, I have never worked on a broadcast that came together technically and editorially as well as this one did."

Ann Moss, director of PBS's Technical Operations Center in Alexandria, VA, said, "This was a once-in-a-lifetime broadcast. It was an amazing coproduction that has never been attempted before on such a grand scale. The on-air look was very smooth and it proved the work of the behind scenes people."

The on-air product was not the only thing that concerned Moss, "Not only did we have to worry about the worldwide program, but we also had Y2K concerns, which could have hit us in any of the countries as we were doing the broadcast." A veteran broadcaster, but new in her post at PBS, Moss marveled at the "ability of many countries to prepare and deliver a broadcast of this scope while dealing with potential Y2K issues. It was truly admirable, in itself."

Key to the PBS operation were WNET, New York, and WGBH, which coproduced the program with the BBC and the PBS operations center in Alexandria, VA. Since PBS only has distribution capabilities in Alexandria, Atlantic Video was used for the live segments of its network programming.

"PBS received a semi-clean feed from the BBC," Moss reported, "which allowed us and our member stations to a add inserts of our own, as needed." Moss said, "If you could have listened in on the intercom, you would have been amazed about the behind the scenes effort that went into getting this broadcast on the air." Moss noted the biggest feat was the ongoing live closed captioning done by the Caption Center staff at WGBH for the entire 26-hour broadcast.

Adding local flavor to the network production were "Millennium Postcards" produced by some 52 of the PBS member stations and aired during the New Year's event.

The ABC 2000 control room oversaw satellite feeds from 63 remote locations during the network's 24-hour broadcast of New Year's festivities. Photo courtesy of Ida Mae Astute/ABC.

According to the BBC, "12.8 million people around the U.K. stayed indoors to greet the new millennium in front of their television sets. The showpiece program, which cost $19.4 million, captured the dawn of the new year across the world — this year they stayed and watched longer." Early viewing figures indicated that rival ITV had attracted about 4.1 million viewers. No figures have been offered for here in the U.S. or worldwide.

When it was all over, the comments and accolades weren't. Long-time Los Angeles television engineer Don Sears said, "The New Year's coverage by ABC and PBS was some of the most remarkable television I have ever seen."

The sheer number of fiber, satellite, coax and operational centers that went into this project, not to mention the hundreds of local television stations and master controls with their local spins on the New Year's festivities gave the American viewing audience something they will long remember. ■

Hollywood cheats movie goers

Movies and feature films have always been a mainstay in television's repertoire of program material. For nearly all of the first 35 years of television's 50-year history, the telecine was the most important part of the TV station besides the transmission system, but many newcomers to the industry haven't even seen a film chain, except as a museum piece.

Nonetheless, there is still a requirement to transfer film to whatever media your station wants or needs. The task of making these transfers has fallen to a select few organizations scattered around the country and to a group of operators who formerly were known as video operators and now choose to call themselves "colorists."

Despite the demise of the local telecine, the machines that the colorists operate are still a big business and they command some of the highest pay in the industry for their talents.

Colorists are called upon to not only transfer film for later viewing on television stations and networks, but they also are the crafts persons who do the very specialized effects work that make today's movies believable. With good old chroma key and the skill of a colorist, almost any effect is possible.

There are many players in the telecine machine business, but there are three major companies that have the lion's share of the business: Cintel, Philips and Sony. The differences come from how each of these three companies approaches the process; how the film is scanned and transferred. All three companies, through a transfer house with one of their machines, can and will deliver to you a film, on tape, in nearly any video format you choose:

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NTSC or ATSC. With the multiplicity of ATSC "flavors" available, this becomes more important to the local engineering staff.

The key to a good film-to-tape transfer is to get the most you can from the typically 35mm print onto the tape. With any of the current television broadcast systems, we will never get the maximum resolution from a piece of 35mm film over the air and here's why. According to Kodak, film has 4096 pixels x 3112 lines of resolution per 35mm frame. That's over 12 megapixels. When you consider the movie is in a 1.85:1 aspect ratio, that works out to 4096x2214 or more than nine megapixels. Here in the U.S., the best we can ever hope to transmit in ATSC is 2,073,600 pixels (1080x1920).

But why should broadcasters balk? Today's broadcaster can equal anything the film folks are projecting in the theaters across the country.

At ShoWest in Las Vegas this past year, George Lucas announced, that his movie "Star Wars: Episode 1 - The Phantom Menace" would be released "digitally" and shown at four theaters: two on the East Coast and two on the West Coast. Since then Hollywood has been gearing up to bring you more movies in HDTV, but onto the big screen. On the coattails of "Star Wars," Miramax released "An Ideal Husband" and "Shakespeare In Love." Disney Studios also released "Tarzan" in digital cinema, just a few months ago.

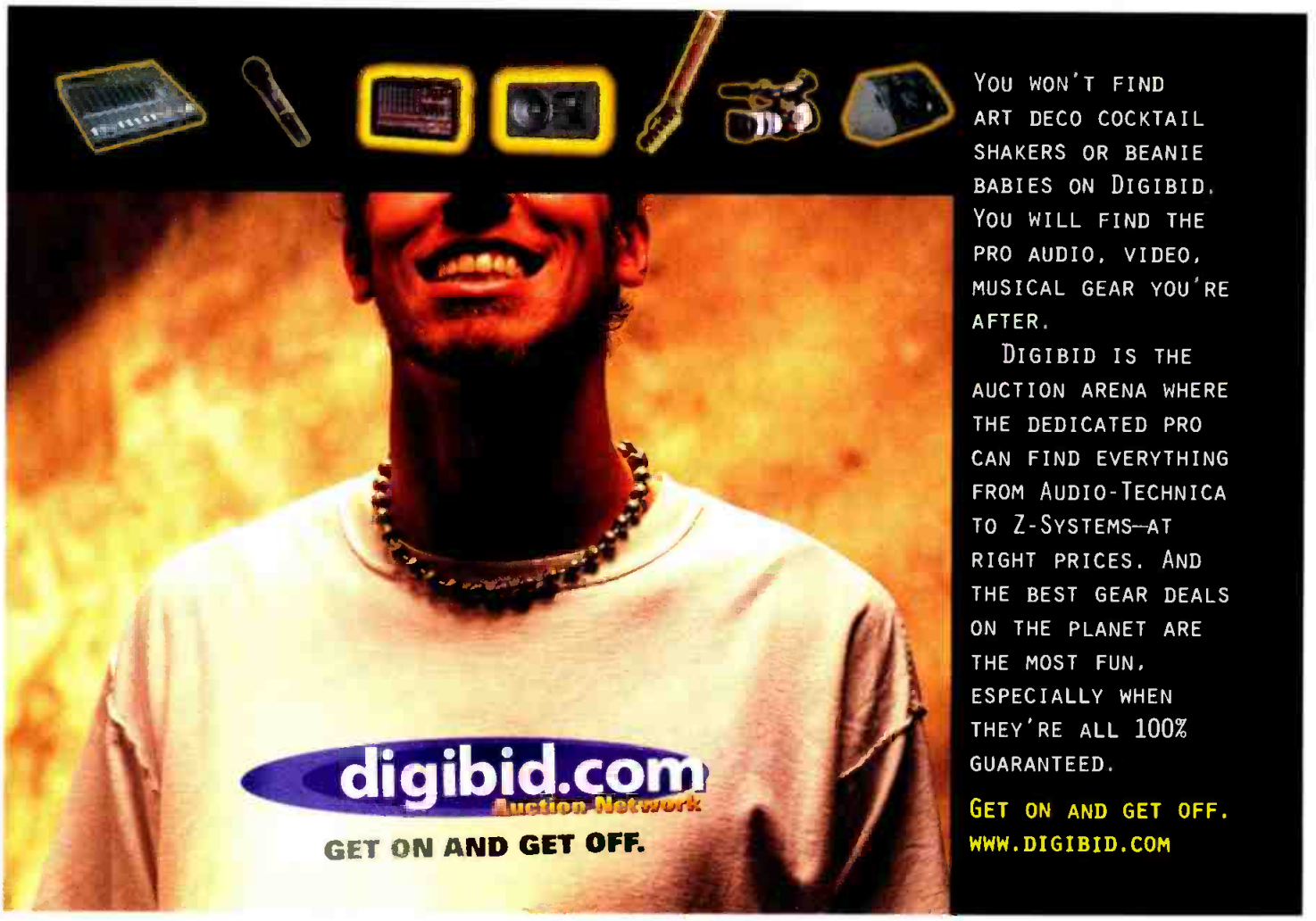
Star Wars was transferred from its Inter Positive (IP) on a Spirit telecine machine to a Panasonic HD D-5 videotape machine. Industrial Light and Magic then transferred those images to a Pluto array for playback in the theater. The arrays used 20 18GB drives. Compression was a 5:1, using the Panasonic HD D-5 format.

Display technology

Theaters have been projecting the images with a well-touted Texas Instruments Cinema projector that "squeezes" the 1920x1080 raster images to fit the DMDs. DLP Cinema projector, with its 1280x1024 DMD arrays, projected those images onto the big screen with the use of an anamorphic lens to regain the 2.4:1 image. 1280x1024 only computes out to slightly more than 1.3 megapixels. Broadcast stations transmit HDTV at 1920x1080, which equals about two megapixels. Both are a far cry from the 12 megapixels Kodak claims for its film product and the nine megapixels for a theatrical release on the big screen.

In all fairness though, the images for the Hughes/JVC projector were recorded to fill the 1920x1080 raster. The images were played back from the Pluto array and scanned onto the infrared CRT's that illuminate the Image Light Amplifiers (ILA). These images were then collapsed so that the image had the correct aspect ratio of 2.4:1.

What's wrong with all this is? Hollywood doesn't seem to realize that today's DTV broadcasters are already transmitting HDTV to the home. What's being shown at a digital cinema theater near you is less than full HDTV quality. The only differences are that at the theater it's on a big screen and you have to put up with the



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other members of the audience. The resolution of theatrical presentations does not equal the full capability of either HDTV or 35mm quality.

If a station or network has one of these movies on D-5 tape and has the equipment to play it back on, it could be one of the first in its market to show a product that is as good or better than what is being shown digitally in the theaters.

Jim Mendrala, vice president of technology at Real Image Technology Inc., said that in "Tarzan," RGB files are converted to HDTV by using a software program that rendered each frame out in a HDTV format. For "Toy Story 2" the images were then color corrected for the Texas Instruments DLP Cinema projector and recorded in HDTV with the QuVis box.

"Compression of these images," Mendrala continued, "is said to be around 20:1 using a proprietary wavelet compression technology. These HDTV 1920x1080 images are then uncompressed and played back from the QuVis box to the TI DLP Cinema projector in the theaters using a SMPTE 292M protocol."

Some in the film industry claim that a 35mm release print film does not have more than 2K resolution and that projector weave further reduces the resolution even further. In his "Star Wars" presentation, Lucas ran everything through the computer at 2000 pixel resolution so everything would be consistent. Even the movie "Pleasantville" was done at 2000 pixel resolution.

Mendrala noted, "Two other productions come to mind. The first one is 'The Last Broadcast' that was shown in 1999 by Digital Projection in a few theaters, on large screens. It was a film produced using home and industrial quality camcorders. The second was the record setting 'The Blair Witch Project,' also shot with standard home video equipment then transferred to 35mm film for theatrical release. In this case, the original material was only 640x480, or just over 307,200 pixels."

With the success of these two motion pictures, does this mean that films should be presented with less resolution than what has been traditionally the norm? Films such as "Laurence of Arabia" and "The Sound of Music," both of which are on 70mm film, will likely look poor when played back in digital cinema on a screen with only 1.3 megapixel resolution. It 's likely that films like these will need at least 12 megapixels to do them justice.

If a station or network has one of these movies on D-5 tape and has the equipment to play it back on, it could be one of the first in its market to show a product that is as good or better than what is being shown digitally in the theaters.

The future

What do we have to look forward to? "Bicentennial Man," which opened mid-December, has been showing in HD at theaters across the U.S. and in Canada. You can expect to see "Mission to Mars" released in HD (or, at least, in higher-definition than is transmitted every day to your viewers) next month, followed in May by "Dinosaur."

One of the fallacies of theatrical HDTV color is that it is undersampled. The argument is that the eye cannot see fine details in color. While this is true, it depends on how far the viewer is from the image. The eye can resolve about one minute of arc of resolution. This means that if you view an image at the correct distance, (for HDTV that's about three screen heights) then the eye cannot see any finer color resolution in the image. This is fine in the home where most people sit at least 10 to 12 feet from their screens. In many theaters, this means you would have to be sitting in the back row of the auditorium. Most people when they come into a theater tend to sit about half way to two thirds back from the screen. Therefore, the images must have better color resolution than HDTV's 4:2:2 or 4:2:0. That just won't cut it for the big screen; equal resolution of RGB or 4:4:4 is necessary.

"If you want to see the potential image capability of HDTV, go to one of the new films projected in digital cinema," Mendrala says. "Sit about three screen heights from the screen, keeping in mind that the resolution you'll see is slightly less than what DTV stations are transmitting when airing an HDTV show. HDTV for the home is not only widescreen TV but also big screen TV."

Doug Darrow, business manager for DLP Cinema at Texas Instruments says, "This is not the finished solution. We are taking the technology out of the lab and putting it in a real-world environment. We expect to see improvements as we go along. We want the improvement we develop to be derived from the movie industry and the patrons; the people who pay the money to see the movies."

All the networks and DirecTV are transmitting HDTV programs daily. If Hollywood continues to reduce image quality in theater releases, viewers may choose to stay home and watch pay-per-view, rent or buy HDTV recordings. Mendrala said, "If that's the case, the movie theater industry will be, like the passenger railroad industry, a thing of the past. The movie studios however will still make movies and market the products that movies promote." ■

CEA offers antenna selection on the Web

The Consumer Electronics Association unveiled a new website designed to help both retailers and consumers determine the type of antenna they will need to receive DTV signals.

The website, which is can be found at www.antennaweb.org, is a fast and effective tool that will help the TV

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station engineer, retailer or viewer choose the proper antenna to receive off-air local television signals.

The site is designed to be fast and user friendly. Users are asked to enter the address and zip code where the antenna is to be installed. A street map showing the house location will appear in the center of the screen. The display will also show a color code indicating which kind of antenna will do the job. The site reflects the same color-coding scheme developed by the CEA in the very early days of DTV for its color-coded maps. The color-coded area corresponds to a legend, which spells out the appropriate type outdoor antenna that is needed to receive local television signals.

CEA holds very tight standards when it comes to antennas. Criteria for an outdoor antenna can be found in the Association's Engineering Bulletin EIA/CEB-6-C. Outdoor antennas that meet or exceed these criteria are allowed to carry the outdoor antenna mark, which corresponds to the color-coded maps.

CEA's "AntennaWeb" also provides the additional capability for calculating information about "distant signal reception." For example, a Washington, D.C. resident who wants to receive a Baltimore signal can make use of this "distant signal reception" feature. The user clicks on the station they want to receive. A point-to-point algorithm calculates and factors in the more distant, outlying station, in addition to the local ones. The same map then indicates what type of antenna is needed to bring in the distant signal, and also will show the direction of the TV tower transmit signal, giving additional information for installing the antenna.

The CEA does certify indoor antennas providing they meet or exceed minimum industry-wide performance requirements as related to indoors antenna exigencies. The CEA plans to begin displaying an "indoor mark" at the retail level starting May 1.

CEA first demonstrated this website during the 2000 International Consumer Electronics Show in Las Vegas last month.

"AntennaWeb.org is the next logical stage in our Antenna Selector Mapping Program," explained Gary Shapiro, president of CEA. "The paper maps being introduced at the retail level that show consumers what type of outdoor antenna will work in their geographic areas have been extremely well-received, but now we are tak-

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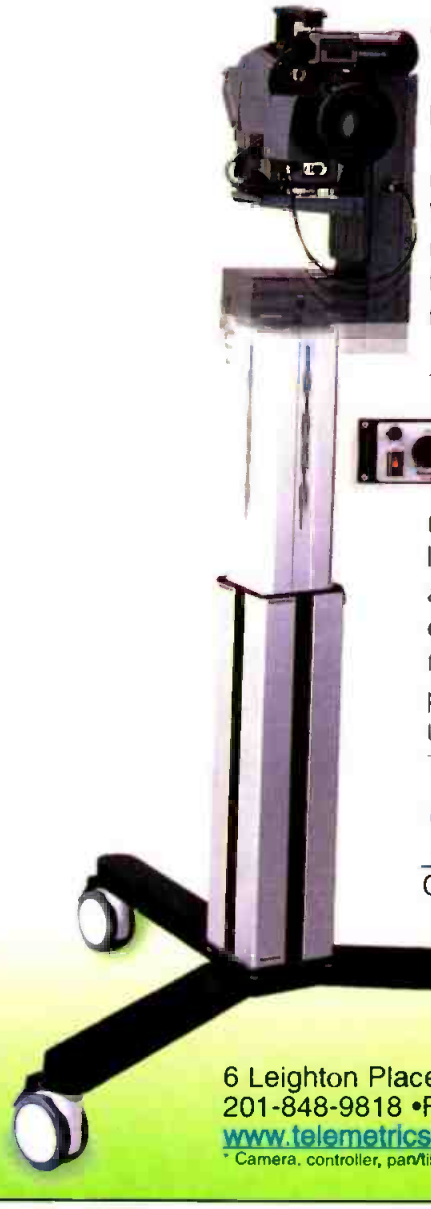

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ing the program one step further. We are using the power of the Internet to bring the maps directly to consumers and to retailers who have Web access. It's as easy as a few clicks to find the proper TV antenna, and retailers and consumers alike will have the benefit of this sophisticated mapping tool at their fingertips."

CEA also spells out what is expected of an indoor antenna in its Engineering Bulletin EIA/CEB-7. This bulletin discusses antenna types and characteristic, packaging and marking specifications, as well as providing minimum performance requirements.

The indoor antenna is a different breed of animal. CEA says that at this time, the indoor antennas do not correspond to the outdoor antenna maps or color-coding scheme. The reason given was because there are multiple factors involved in determining good reception in a specific location. The CEA does certify indoor antennas providing they meet or exceed minimum industry-wide performance requirements as related to indoor antenna exigencies. The CEA plans to begin displaying an "indoor mark" at the retail level starting May 1. This will give manufacturers not yet in compliance an opportunity to make improvements to indoor products so as to meet the CEA certification standards.

Neil Terk, president of Terk Technologies and chairman of CEA's Antenna Subdivision, commented, "So far we have had over 500 retailers and installers from all around the U.S. and even overseas who are currently participating in the color-coding system. Antenna manufacturers, retailers and consumers are all benefiting from this program which provides retailers with the tools they need to increase antenna sales and consumers with the tools they need to make the right purchasing decision." Terk continued, "As consumers continue to embrace digital satellite TV systems, and as they are becoming more excited about high-definition television, they are looking for today's antennas to provide them with that digital link — the reception of local off-air signals. The initial results of the CEA map program have been phenomenal and we expect it to grow given the cost-effective, space-saving technology solution that antennas offer."

Those wishing to receive a copy of any of the EIA standards may refer to the CEA website at www.cea.org. ■

DTV99 a success

The sixth annual *Broadcast Engineering* DTV conference was a virtual DTV answer book for attendees. At the recent Chicago conferences, editors from *Broadcast Engineering* magazine orchestrated three days of intense discussion on DTV issues.

The conference began Wednesday with half-day sessions on two leading edge topics; building digital studios and creating interactive television programming. *Broadcast Engineering* editor, Brad Dick, and industry author and consultant, Jerry Whitaker, moderated the workshops.

Broadcast Engineering also sponsored a Wednesday evening reception, allowing attendees to gather, exchange notes, meet old friends and make new acquaintances while sharing problem-solving tips.

Thursday keynote speaker

On Thursday, a full day of sessions began with the keynote address by CBS vice president of engineering, Robert P. Seidel. He challenged attendees to pursue digital television with vigor and conviction. He used the CBS experience as an example of how the challenges of implementing DTV can be overcome and the beneficial results to be obtained. The topic of his encouraging presentation was "Yes Virginia, there is HDTV."

Seidel noted the CBS experience, while challenging, was successful. All 19 CBS O&Os are on the air with digital transmissions. Seidel says more than 49 percent of the U.S. can receive at least six DTV stations. He focused on the successful DTV reception tests he was familiar with, all the while not mentioning the major detractor of the 8-VSB system, avoiding a political minefield. Those stations looking for encouragement to begin a digital transition found it in Seidel's talk.

The other Thursday sessions focused on the design and construction of digital studios. From infrastructure routing schemes to handing metadata, the speakers combined to help attendees understand both the basic design concepts and the importance of careful implementation of those concepts into a properly functioning TV station.

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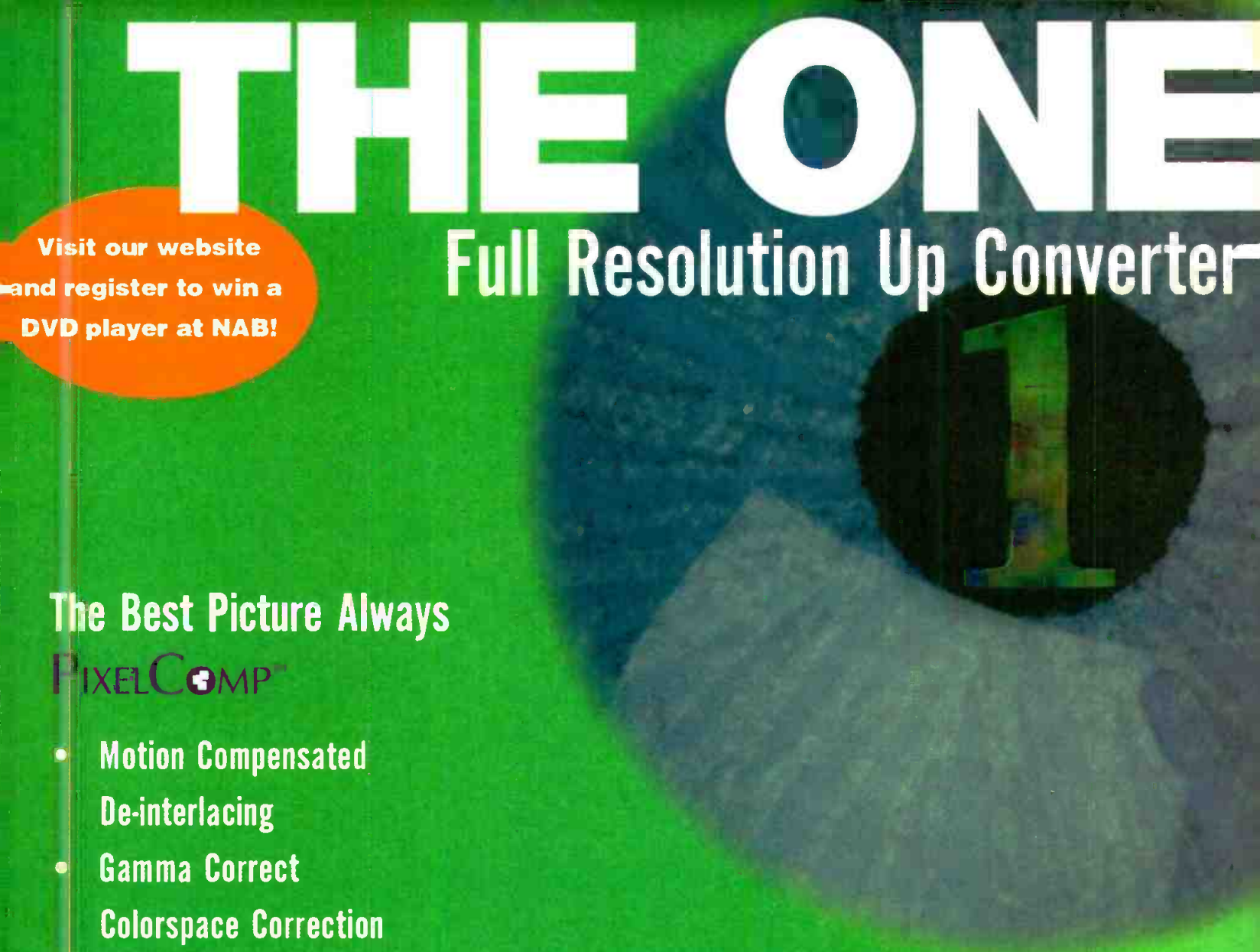

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Broadcast Engineering **columnist and industry consultant Don Markley trated DTV99 attendees to an inside look at the sophisticated project to install new DTV antennas on the Sears building.**

more personal discussions in smaller roundtable settings. This year, two well-attended Thursday evening sessions covered consumer issues and consulting engineering topics. The consumer roundtable was moderated by *BE* columnist and consultant, Brad Gilmer. Attendees sought answers to the other half of the broadcast equation — what are viewers doing and what will they be watching my signal on next year. The topic of formats and personal video recorders also received wide coverage in this meeting.

In the consultants' roundtable, *BE* columnist and consultant, Don Markely; *BE*'s Dr. Digital, Steve Epstein; DTV session organizer, Jerry Whitaker; and *BE* editor Brad Dick orchestrated a lively discussion on a variety of DTV issues. These evening sessions are typically described as some of the most "fun" sessions of the conference.

This year, an additional workshop was organized by Intertec Publishing's *Millimeter* magazine, The "HD Camera Workshop" focused on the selection, use and performance of HD cameras. Attendees were treated to an in-depth discussion of HD camera issues, and were allowed to question experts on the application of HD technology for acquisition.

New Friday sessions

Two new tracks were developed for Friday morning. *BE*'s sister publications *Video Systems* and *Millimeter* organized separate session tracks. The *Video Systems* track, "HD Production Tools and Formats" helped production attendees identify key factors in digital production tools for program creation. Format selection, acquisition and storage were covered.

Millimeter magazine organized the HDTV Business Opportunities" workshop. The goal was to show producers and production house managers how to leverage HD as a technology into a working business model. Both sessions were new to this year's DTV conference and highly successful.

Friday's traditional sessions were focused on RF issues. A common thread among the morning's presenters was the use of multistation antennas. It turns out that common sites can be achieved in a wide variety of ways.

Typically, stations will combine signals and use a panel array for transmission. Other techniques include stacking antennas to allow both DTV and NTSC operation from a common mast. Well-known industry consultant, Don Markley, reviewed how the stations on the Chicago Sears building worked to develop some unique solutions for DTV transmission despite shading and blocking issues. The technology involves the use of multiple radiators carefully phased to create nulls in less desired areas and extensions in patterns into those more important areas. If your station is in a challenged site, some of the solutions developed for Sears may be of interest to you.

The *Broadcast Engineering* DTV conference has now been a hit among engineers for six years. Mark you calendar now. Next year's DTV conference will again be held Dec. 6-8 in Chicago. See you there. ■

FCC demands standards for consumer electronics

Federal Communications Commission Chairman, William E. Kennard urged the cable industry and TV set manufacturers to develop standards for DTV reception or face governmental regulation during the 2000 Consumer Electronics Show in Las Vegas.

FCC Chairman William Kennard

"The American public will not let the commission wait much longer for you to agree on standards, and the law gives the Commission clear responsibility to act if you do not," he said.

Kennard told cable and set manufacturers that they must come up with a solution by April or face regulation. In his speech, Kennard also reprimanded the industry for creating bottlenecks that have slowed the rollout of digital television for five years.

Kennard expressed concern that the advanced model TV sets capable of both HD displays and data exchange were not able to plugged into cable because of the wrangling over technology compatibility standards and piracy issues.

He noted there are more than 100 digital television stations on the air and that these stations offer to over 50 percent of the American viewing audience the option of better quality, free over-the-air digital and HDTV signals. When these off-air digital signals are put through cable converters, picture quality is not much better than that in our current analog system. ■

SEND Send questions and comments to: larry_bloomfield@intertec.com

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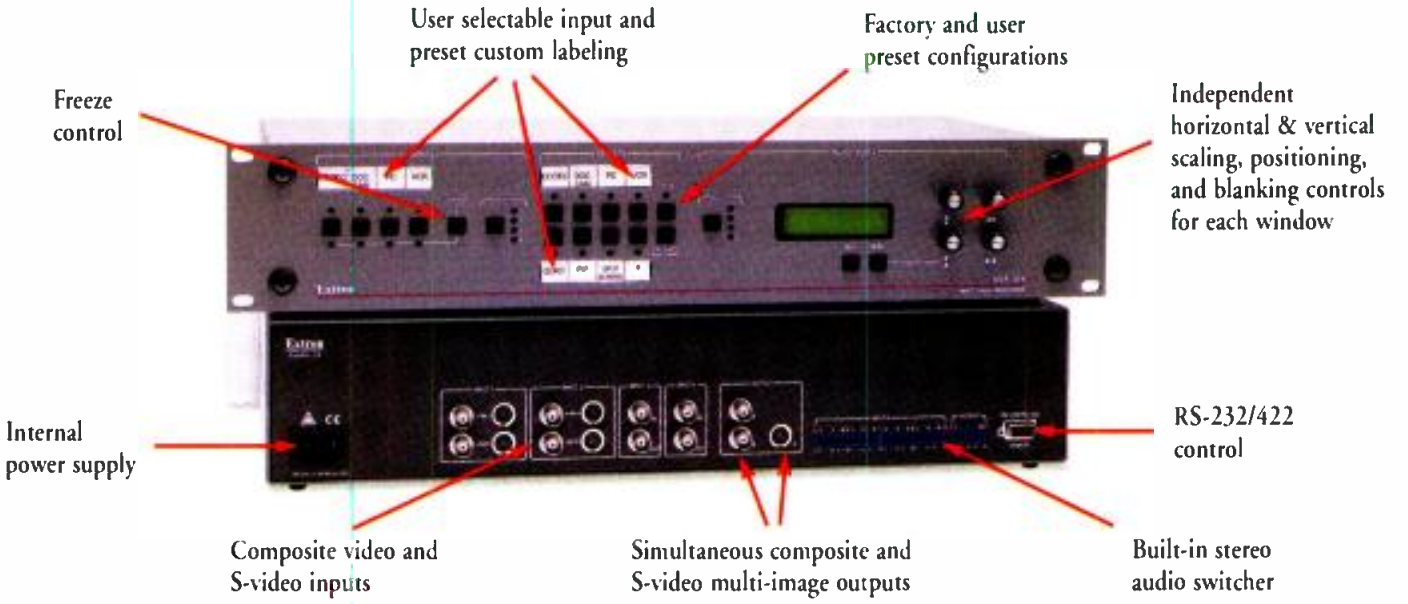

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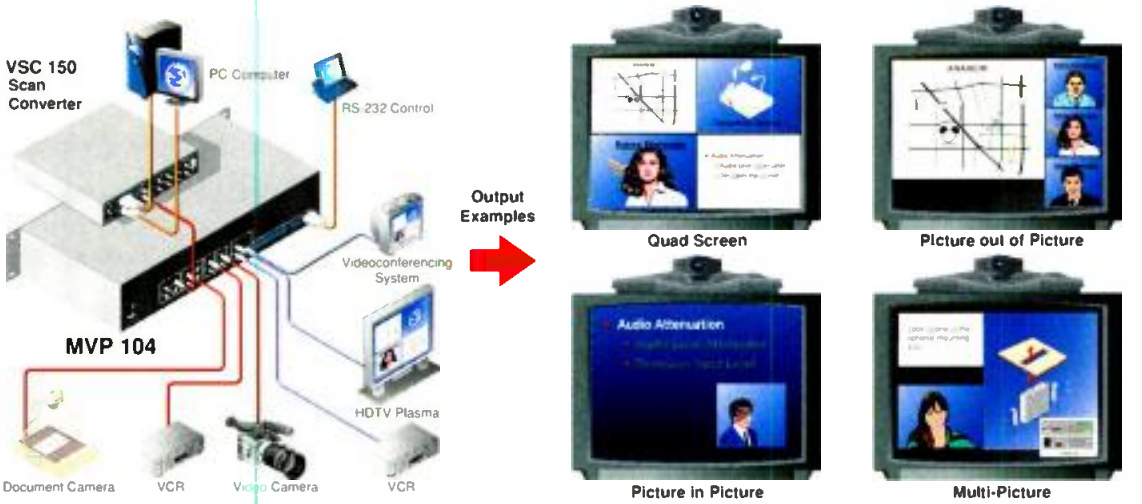

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FCC Update

Satellite Home Viewer Act

BY HARRY MARTIN

The new Satellite Home Viewer Improvement Act of 1999 provides for direct-to-home satellite transmissions of television broadcast signals within the station's market (local-into-local) and sets new standards for the transmission of distant broadcast signals into local markets.

Local-into-local

The new legislation gives satellite carriers a compulsory copyright license to transmit local TV signals into local markets. For these purposes, a local market is a station's designated market area as set forth in Nielsen's 1999-2000 Station Index Directory, or any successor publication. In order to maintain copyright licenses, satellite carriers must comply with all FCC rules governing television broadcast signal carriage and must also comply with reporting requirements. The reporting requirements state that satellite carriers who retransmit a network station's signal into the station's local market must submit to the network a list identifying all subscribers to such transmission and to update that list with adds or drops on the 15th of each month.

After Jan. 1, 2002, if an operator carries any station in a particular market, it must carry all stations within that market, subject to certain requirements. First, satellite carriers are to designate a "local receive facility" that is acceptable to at least one-half of the stations with must-carry rights in a particular local market. A station asserting its must-carry rights is required to bear the costs associated with delivering a good-quality signal to that local receive facility. Furthermore, satellite carriers are not required to carry a signal of any local station that substantially duplicates the signal of another local station already transmitted by the carrier within that market, or to carry a signal of more than one local station in a local market that is affiliated with a particular television network, unless such stations are licensed to communities in different states. Lastly, satellite operators are not required to carry a television station in that station's local market on any particular channel number, except that the operator is required to carry stations in the local market on contiguous channels, and to provide access to such signals at a non-discriminatory price and in a non-discriminatory manner on any navigation device or on-screen program guide or menu.

Carriage of distant signals into local markets

The new legislation revises the terms and conditions under which carriers may import signals of distant television stations into different markets. The general principle is (subject to certain exceptions and exemptions) that a satellite carrier may not deliver a distant network signal to a subscriber unless that subscriber resides in an "unserved household," the subscriber receives a waiver from the local affiliate of that same network, or that waiver is in effect due to the local station's failure to act on a waiver request within the required 30 days. An "unserved household" is defined as one that cannot receive, through the use of a conventional, stationary, outdoor rooftop antenna, a Grade B over-the-air signal of a primary network station affiliated with that network. In determining the boundaries of this Grade B service area, the legislation requires the Commission to use the Individual Location Longley-Rice (ILLR) model.

Waiver process

As was the case before, subscribers who do not live in unserved households who still wish to receive distant network signals must obtain a waiver from the affiliate of that network whose signal they can receive over the air. However, Congress has added complex new procedures to the waiver process to which stations must pay particular attention. Specifically, the network station must accept or reject a subscriber's request for a waiver within 30 days after receipt of the request. If the station fails to accept or reject the subscriber's request within that period, either of which actions must be made through the subscriber's carrier, the station will be deemed to agree to the waiver request. Accordingly, stations should immediately review or set up internal procedures to respond to waiver requests within 30 days. ■

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

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

Dateline

Television licensees and applicants have until March 17 to file the following types of NTSC applications or petitions: (1) amendments (other than channel changes) to pending applications for new stations on Channels 2-59; (2) petitions for rule making seeking new channels below 60 for NTSC Channel 60-69 applicants; (3) petitions for rule making for new NTSC channels to accommodate applicants in "TV Freeze" areas; and (4) amendments to pending rule makings to add new NTSC channels.

May 1, 2000 is the deadline for the DTV maximization applications which must be filed to ensure protection against new "Class A" LPTVs.

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PSIP: Looking for answers

BY JIM SALADIN, SENIOR ASSOCIATE EDITOR

Program and System Information Protocol, or *PSIP* as it's commonly called, has dropped from the radar of the average broadcaster. Most have relegated its implementation to the lower quarters of a mile-long digital to-do list.

The two most frequently asked questions regarding PSIP are, "What is it?" and "Does it work" Both questions are valid and both demand answers before PSIP can provide a comprehensive EPG and receiver tuning reference.

For answers, we turn to Thomcast for a short course on the first question, and to Philip Titus, chief engineer at KUED, Salt Lake City, for advice on the second. ■

SEND Send questions and comments to: jim_saladin@intertec.com

VENDOR

James A. Kutzner and Jean Macher, Thomcast Communications

Program and System Information Protocol (PSIP), is the ATSC's standard for carriage of basic information required within the DTV transport stream. The two basic goals of PSIP are to provide to the decoder basic tuning information to help parse and decode the various services within the stream, and information required to feed the receiver's Electronic Program Guide (EPG) creation system.

The PSIP data are carried via a collection of hierarchically arranged tables:

- The System Time Table (STT) is a small table that carries time information required by any application within the transport stream that may require synchronization.
- The Master Guide Table (MGT) provides information about the other tables except for the STT. It defines table size allocation that is needed during decoding.
- The Virtual Channel Table (VCT) lists all channels within the transport stream. Brief information is provided for each channel, such as tuning information and the channel name. The Terrestrial VCT (TVCT) is used for terrestrial broadcast.
- The Rating Region Table (RRT) defines rating rates for different regions or countries. The U.S. is defined as RRT 1.
- The Event Information Table (EIT) contain information for events on defined channels. Each EIT covers a time interval of three hours and those intervals begin at midnight of each day. The first four tables are required meaning the current three-hour block plus the next four must be transmitted. Broadcasters are allowed to carry up to 128 EITs or 16 days. The EIT of the current time span is called EIT-0, with the following EITs numbered from EIT-1 to EIT-127. Each EIT-k also has as many instances as channels within the transport stream.
- The Extended Text Table (ETT) contains additional information for a program or channel. ETTs can therefore be linked to any of the EITs or VCTs.

One PID (Packet ID), called the base PID, labels the MGT, the VCT, the RRT and the STT. The EITs and ETTs are labeled by PIDs that can be retrieved from the MGT. Those tables, however, shall not be thought as a unique entity. The MGT and the VCT are used for tuning, and the EITs and the ETTs provide content information for the different programs within the transport stream. If the RRT is unlikely to change frequently, the MGT and the VCT change whenever a change occurs in the multiplex configuration and, by nature, many changes occur in the EITs.

A broadcaster may only want to transmit the minimum PSIP information required by the standard for proper tuning plus the minimum set of EIT tables. In this case the MGT, the STT, the VCT, and the RRT plus the first four EITs are transmitted. As an example, four DTV channels are to be transmitted and a single rating region is defined. Typical sizes are then 150 bytes for the MGT, 450 bytes for the VCT, 900 bytes for the RRT and 20 bytes for the STT. Each EIT may have a typical size of 2Kb and therefore the 16 EITs (there are four sets of an EIT-k, since there are four channels) represents 256Kb/s. The total amount of data is approximately 268Kb/s. If the maximum time cycles for each of the tables are maintained and the broadcaster chooses to send EIT-1 to EIT-3 every two seconds, then the PSIP tables require a data rate of approximately 240Kb/s. The major portion of this payload is the EITs at 224Kb/s, whereas the MGT, VCT, RRT and STT contribute to the total rate with only 16Kb/s. In this example the bandwidth allocated for PSIP is about 1.2% of the total 19.39Mb/s bandwidth. If EITs are empty, then the PSIP bandwidth falls to around 0.1%.

PSIP generation is typically either performed within an integrated encoding and multiplexing system or in a standalone generator and then fed to the primary or emission multiplexer. Early implementations of PSIP generators created simple tuning information and in some cases created empty EIT tables. Since the early DTV receivers generally did not implement any EPG this was not an issue. However, as the industry quickly gains in sophistication, as do the viewers, PSIP generation needs to become more integrated into the station's infrastructure. The traffic and automation system data, or an external programming source needs to be provided to the PSIP generation system in order to correctly set the EITs, ETTs, and as applicable the VCTs. ■

James Kutzner is director of engineering for Comark Digital Services; Jean Macher is the product manager for Thomcast's CDS Divisionin Alexandria VA.

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EXPERT

Phil Titus, KUED

Having only recently been granted the status of "expert" in the field of PSIP, I thought it wise to gain a little more knowledge on the subject. After going through the usual manufacturers' promises and leafing through the newsgroup comments, I finally downloaded and read the latest version of the ATSC PSIP Standard. I must tell you, that was the best nap I've had since my daughter quit taking hers. Let's face it folks, while PSIP comes from great minds on the subject, it's gonna be tough to implement from scratch. Any new software or hardware will have its share of bugs to work out, and when you implement both at the same time, it's a lead-pipe cinch there will be problems. Before third party vendors can help us, they need to have tools that work and a station management willing to devote the resources to PSIP.

Many of us haven't added PSIP to our DTV facility, even though we know most receivers require it. And, those of us who have included PSIP in DTV plans have purchased generators that are not totally compliant. As a result, sets are crashing. The broadcasting industry is not alone in creating problems. Today's sets have a wide range of PSIP compliance and user interfaces, which further compounds things. I am the engineering director for a large rural market station and we have our own challenges with PSIP. Because one-third of our viewers live in rural areas served by over 100 translators and full-power relay stations, our challenge is to get rural TV sets to recognize a signal translated from its original frequency. This issue affects a large portion of the Rocky Mountain states and currently has no solution!

I've noticed that the door locks on my car seem to have a combined IQ better than mine. This will not necessarily surprise those who know me. Not only did the locks automatically engage when I moved forward and unlocked when wanted out. What would happen if I were to crash the car and confuse the program that controls the door locks? My guess is that without a program running to control them, I would be locked inside with no way to get out. That's why they prodived a mechanical door lock release. The point is, if for any reason, the DTV set gets a confused PSIP message, we need a failsafe that will allow the signal to be displayed. This can only come in the form of a routine located within the sets that will allow it to, at a minimum, display the DTV signal and channel number.

In the end, we will all need to be part of the solution. Broadcasters must devote the resources to ensure that current, compliant data is being sent to the multiplexer. Manufacturers must to develop generators, servers and multiplexers that are consistently, completely compliant. The ATSC must consider all circumstances under which broadcasters operate, then publish standards to meet those needs. Receiver manufacturers must build fully compliant receivers. Will this happen? Not for a while. In the meantime, let's put some old-fashioned, mechanical solutions in place. ■

Phil Titus is the director of engineering for KUED, KUIC and, KUER in Salt Lake City.

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Transition to Digital

Video compression

BY JIM BOSTON

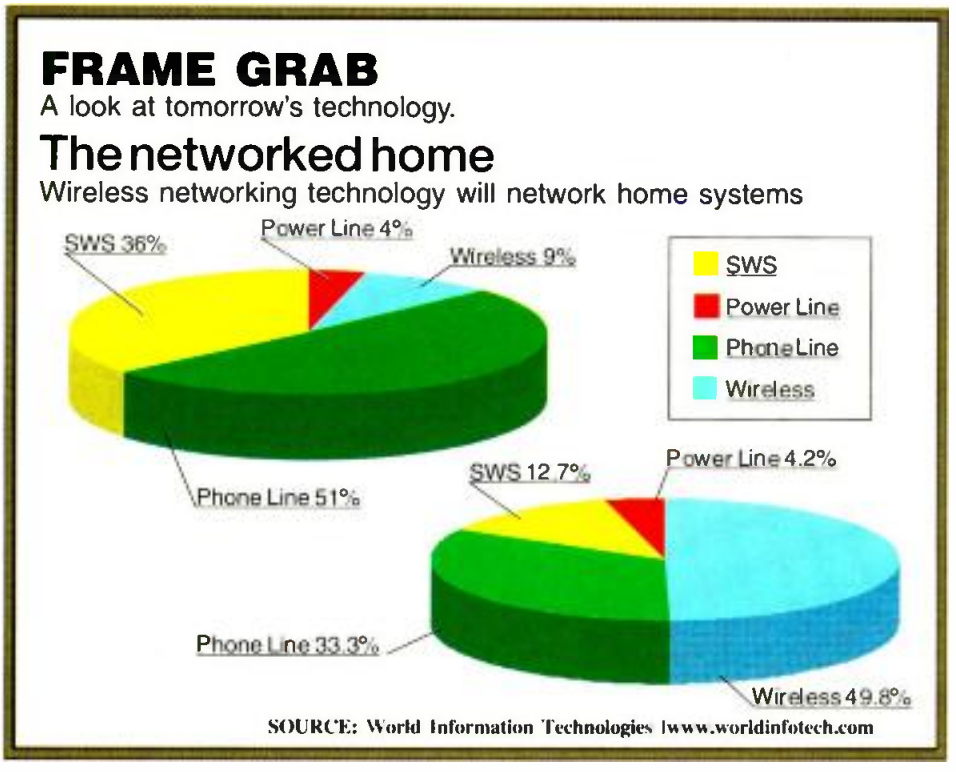
Remember when we used to build television facilities? We would string coax around and terminate it eventually in an AM transmitter. At the same time we would lay an audio web on top of the video. This audio layer would eventually terminate in a FM transmitter built into the same box that housed the AM half. Today, it seems we are building data facilities that happen to be used for television. Sure, the original two layers are still there, but now they are wrapped with numerous other layers. These new layers include SD and HD digital video paths, AES paths, and a web of data infrastructure. Because these new paths contain digital data, the bandwidth requirements have exploded. It is likely that digital would still be found only in a few niche applications today if JPEG (followed by MPEG) had not come along.

MPEG's place today

Not many have decided (yet) to move MPEG around their facilities. But MPEG can be found at most of the bandwidth choke points that digital creates. These points are generally any paths into or out of the facility, along with paths leading to or from digital video storage. Digital baseband video creates too many bits to cope with in some paths, at least from an economical standpoint. Methods were devised to create bit streams with just enough bits to adequately describe the video or audio content. This is done by throwing away some of the information in the picture, hence lossy compression. Compression is done in the spatial dimension (JPEG, MPEG I frames), and in the temporal or time dimension (MPEG B, P frames). Spatial compression is accomplished by converting video from the time domain to the frequency domain, and then eliminating frequency components that are not noticed (hopefully). (See Figure 1.) In reality, some lossless compression is also performed after the lossy compression. Temporal compression is accomplished by looking at differences between I (anchor) frames. These differences are used to create motion vectors. Video blocks from earlier frames that have moved are not sent again. Instead, motion vectors describing where this earlier video has moved are sent. Also a differential picture is created between the previous anchor and the current B or P frame. Both these data sets are then compressed. JPEG (I frame) spatial compression can deliver good quality video at up to eight times compression, MPEG temporal compression can increase the compression rate by another factor of five.

Digital baseband video creates too many bits to cope with in some paths, at least from an economical standpoint.

However, there are issues before any compression takes place that can play a great part in the final quality of the video in the compressed bitstream. Noise makes compression engines work very hard. Randomness breaks compression systems, and nothing is as random as noise. Some MPEG encoders provide an indication of DCT coefficient quantification. What does that mean? DCT is the process that takes blocks of video from the time domain to the frequency domain. The coeffi-



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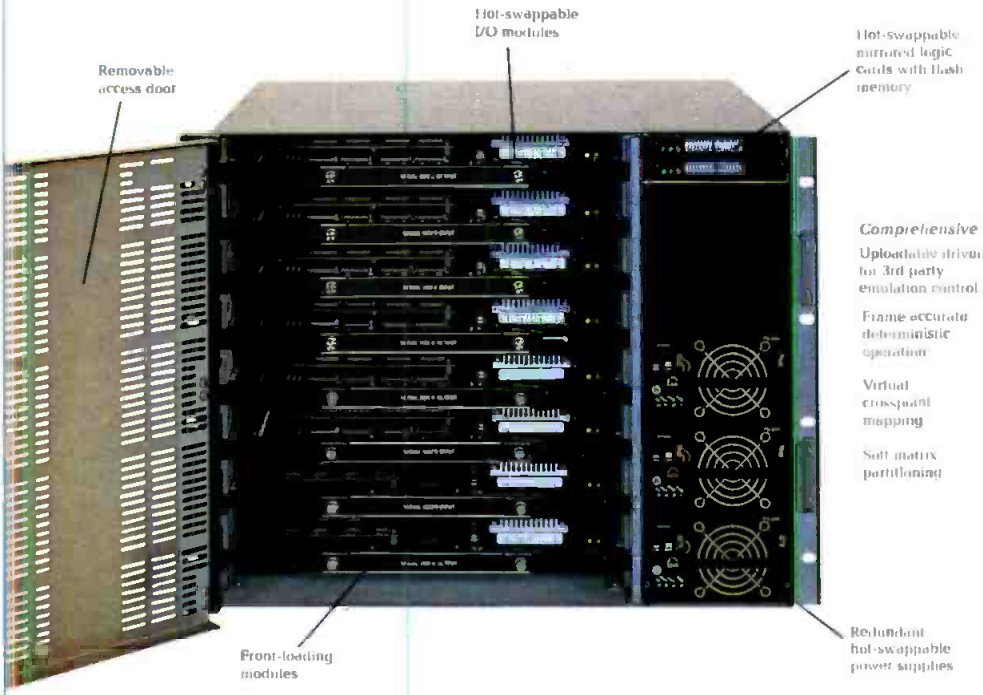

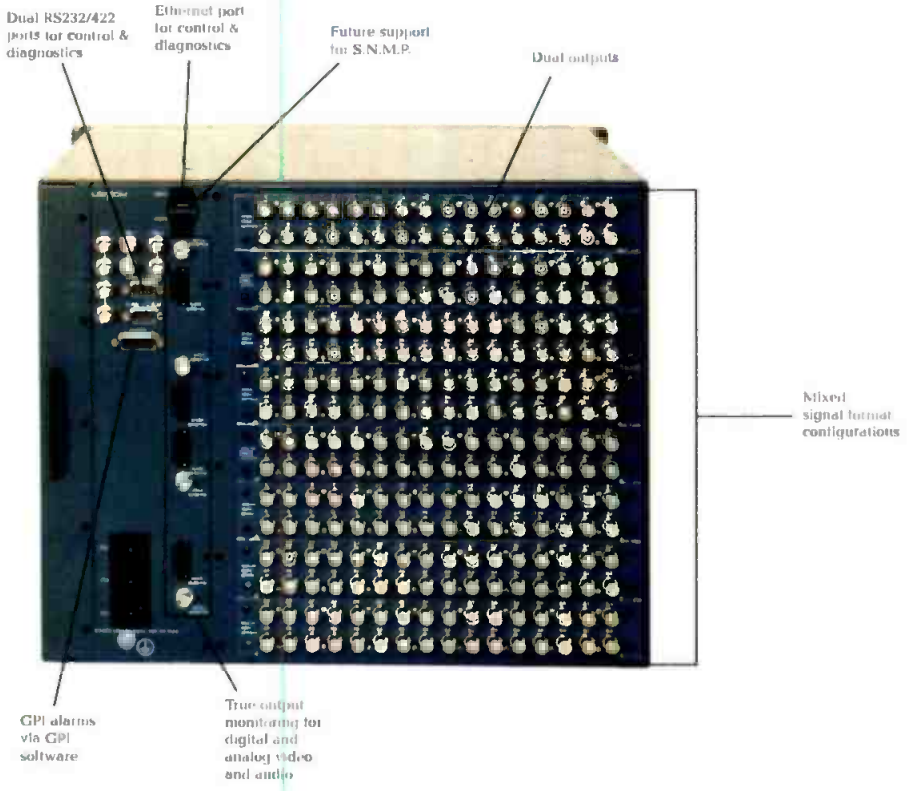

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Video bit rates (active video)
4:4:4 bit rate (720*486) = (720+720+720) * 486 * 30 * 10 = 315 Mb/s
4:2:2 bit rate (720*486) = (720+360+360) * 486 * 30 * 10 = 210 Mb/s
4:2:0 bit rate (720*486) = (720*486) + (360*243) + (360*243) * 30 * 8 = 126 Mb/s
4:1:1 bit rate (720*486) = (720+180+180) * 486 * 30 * 8 = 126 Mb/s
Note: 4:2:0 & 4:1:1 are eight bit only (to further reduce bit rate) whereas the other two are eight or 10 bits.

Table 1. The uncompressed bit rate is based on the number of samples, the number of bits per sample and the sampling structure used.

cients in essence are values that describe the values of frequencies needed to reproduce the video block. This is much like the frequency values produced by a Fourier transform. If the DCT process creates too many coefficients, the encoder increases the value by which all the coefficients are divided or scaled. The higher the dividing number, the more likely that coefficients will be rounded to zero after division. Noise increases these coefficient values, with the result being that everything must be compressed further to fit within a given bandwidth.

Randomness breaks compression systems, and nothing is as random as noise.

Sampling

Another issue that affects compression is chroma subsampling. SMPTE 259 subsamples the chroma at half the luminance rate. We have always sent less chroma information than luminance information. NTSC provides considerably less chroma info than luminance. This was done because our eyes are less sensitive to chrominance than luminance. SMPTE 259 digital component uses the 4:2:2 sampling scheme. This means that there are half the chroma samples of luminance samples per horizontal line. But vertically there is no chroma subsampling. To allow for chroma subsampling in both the horizontal and vertical directions 4:2:0 is offered. One method is a quincunx pattern in that on odd horizontal lines you throw away even chroma samples, and on even lines the odd chroma samples are dropped. This creates an interleaved 4:1:1 sample rate. (See Figure 2.) 4:2:0 sampling creates 25 percent less data than 4:2:2 sampling. So an argument arose as to whether it is better to under-sample the chroma information up front and therefore end up with less information (at least for chroma) to compress. Or is it better to have more chroma info to start with and to compress a little harder. The EBU and the CBC addressed that issue a couple of years ago. They found that picture quality was essentially the same (4:2:2 slightly better) unless the bit rates got extremely low. Then 4:2:0 had a slight advantage.

But what was borne out in the test was that with multiple compression/decompression cycles 4:2:2 became the clear winner. This illustrates that starting out with more is still better than starting with less. Sometimes we forget why we buy broadcast-quality equipment instead of industrial or consumer stuff. The transfer function, comparing the output to the input, is never 1 to 1 in any analog box. Each pass through a box creates a slight reordering of frequencies and phase, and usually some rolloff of the high end of the spectrum. The more information you start with means the more you will end up with. Now with digital, once we're in that domain and we make no changes, we should incur no change as we cascade through digital boxes. But it is at points were we make domain changes that we incur quality degradation. Analog to digital, digital to analog, composite to component (digital or analog), component to composite, baseband digital to compressed digital, and vice versa, all these domain changes impact the video.

When we talk levels in MPEG we mean sample structure and bit rate. Sampling structure and bit rate have a great effect on how many times we can compress and decompress before the quality gives out. MPEG profiles refer to the tool sets available for temporal (time) compression, including I, B and P frames. More B and P frames between I frames (long GOPs) means that frames towards the end of the

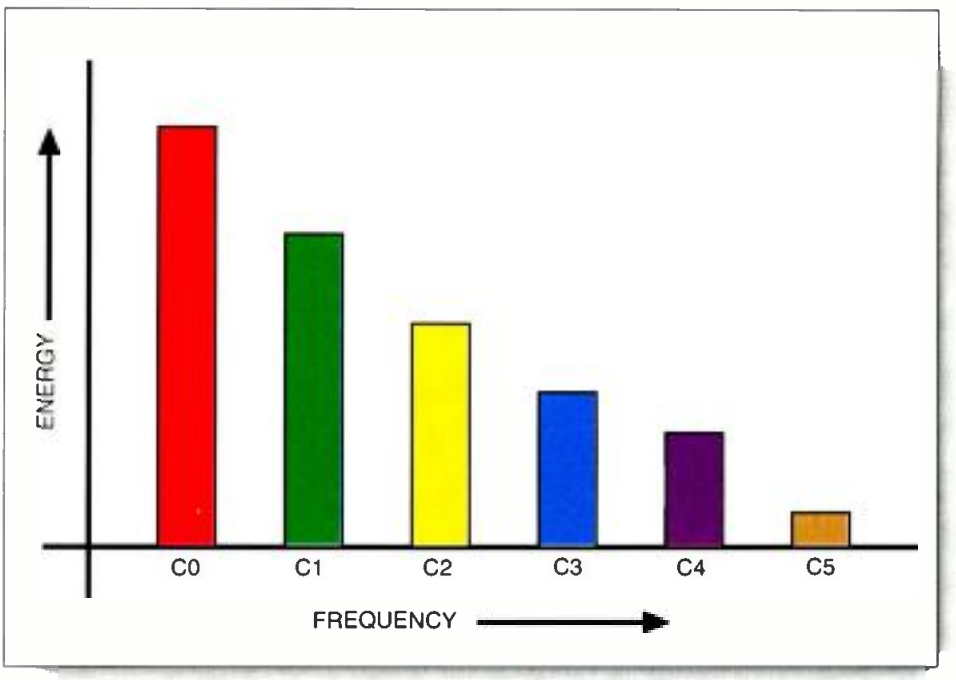

Figure 1. When discrete cosine transform (DCT) is performed on a signal, time domain information is transformed into frequency domain data. In a typical video image, a majority of the frequency components can be discribed by a single coefficient (C0), harmonics are then described using additional coefficients (C1-5). Each additional coefficient requires extra bandwidth.

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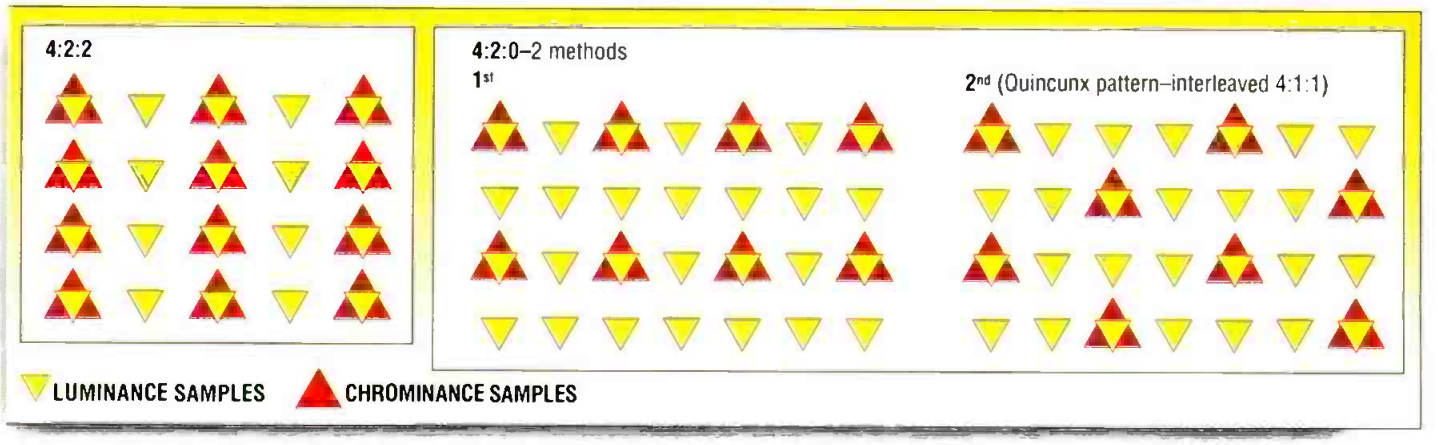

Figure 2. Not all sampling structures use the same techniques for sampling video. The arrangement of the co-sited Cr/Y/Cb samples depends on the way the sampling structure is defined.

GOP will become less exacting versions of the original video. Multiple compression/decompression cycles only exacerbate the situation. Required bitrates to get the job done are a rapidly moving target. Contribution rates are still generally high, 20Mb/s and above. These high bit rates insure that the received video can be acted upon, stored, taken to baseband and back a few times and stay reasonably intact. Bit rates sent to the end user can be quite a bit less because they are expected displayed by the user and discarded. What happens when DTV VCRs finally come on the scene is an unanswered question. Many are sending virtual SD DTV programs at 8Mb/s, while others think technology has reached the point where 6Mb/s is good enough. On the HD side 15Mb/s is often used, but some are starting to look to 12Mb/s as enough.

Many seem to think that working with digital video today means the technical quality judgements required in the past are no longer needed. This simply is not true. What you do in the analog, and digital domains, along with the decisions you make moving from the baseband to compressed domains will mean that your product will stand out from your competitors, either favorably or as an example of not what to do. ■

Jim Boston is a project engineer for Scripps Howard based in Cincinnati.

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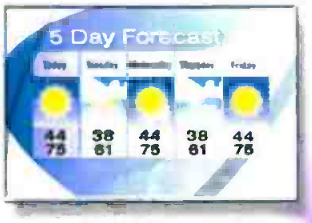

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Conditional access for DTV

BY BRAD GILMER

Conditional access technology, that is, technology that allows only authorized viewers to receive and view program content, has been around for many years. It has been widely employed in both cable and satellite delivery systems. Until the advent of DTV, there has been little reason to use the technology for terrestrial broadcasts.

As you may recall, Preston Padden of ABC spoke before Sen. John McCain's congressional committee, saying that subscription revenue would be one way to offset the cost of the transition to DTV. McCain and others on the committee were not at all impressed with the idea, and Padden got his head served to him on a platter. Because of this incident, many in the industry have been reluctant to publicly explore conditional access for DTV. However, conditional access provides business options that may be worth exploring.

There are several fundamental things you should know about conditional access. Conditional access is not an all-or-nothing proposition. If you are running a DTV multiplex of four program streams, it is possible to scramble any one of the program streams individually, or all of them. It is also possible to scramble the whole transport stream after the multiplex (see Figure 1).

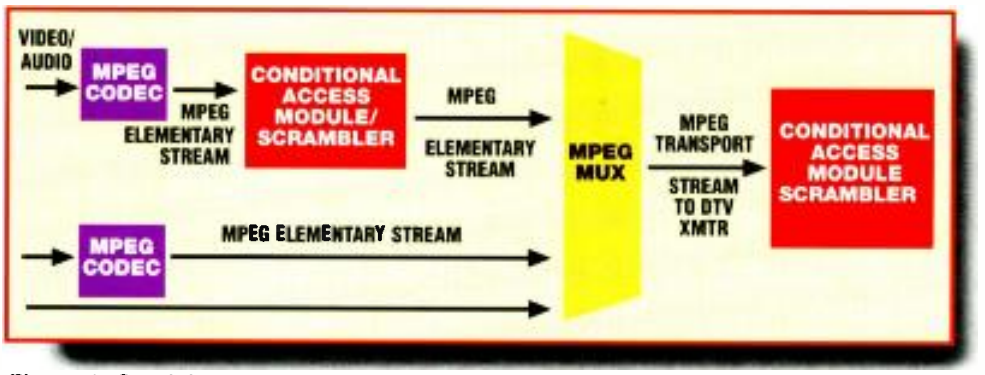

Figure 1. Conditional access modules can be located in a variety of locations in the output chain depending on whether you want to scramble one or more channels, or the entire output stream.

Scrambled signals

There have been many different scrambling systems over the years. Early analog methods removed the sync pulses from the NTSC signal, inverted the video, or scrambled the audio. These systems usually required a special decoder or set-top box to remove the scrambling. While they prevented most people from receiving the scrambled signal, the fact is that they were not very secure. Some of these systems did not allow unscrambling on a per subscriber basis.

Later, better scrambling methods were developed that addressed these problems. In some systems, the video was scrambled using a relatively weak scrambling technique, but the audio was scrambled digitally using an algorithm that was very hard to break. Additionally, conditional access vendors developed techniques that allowed individual boxes to be enabled or disabled.

All this work took place primarily in the area of cable television delivery, and to a lesser extent, the (Ku/C-band) backyard dish market. Over the past few years, substantial contributions have been made in MPEG scrambling and conditional access, in large part due to the satellite dish market. As a result, these advanced scrambling systems are available, and in most cases, directly applicable to terrestrial DTV broadcasting.

Current digital scrambling methods use two modes. The first is fixed-key mode. In this method, the signal is scrambled so that it cannot be received without some sort of processing. However, the key to descramble the signal is well known by every decoder box out in the field. As you can imagine, fixed-key mode is not very secure and is seldom used. However, a broadcaster may revert to fixed-key mode in the case of a conditional access system failure. Depending on what breaks in a conditional access system, it may be possible to keep the signal scrambled, but drop back to this less secure fixed-key mode.

The second method of scrambling is variable-key mode. In variable-key mode, the key has two parts. The first part of the key, the public key, is well known by everyone. The second part of the key is private. The private key generated by the encoder is sent via an Entitlement Control Message (ECM) as part of the MPEG stream. This key can be changed as often as the user desires, even changing several times per second.

Not everyone can read the key in the ECM however. Access to the key is controlled via a subscriber management system or database. Each conditional access decoder has a unique serial number that is recorded in this database. If the box is authorized to receive a particular service, this information is encoded in an Entitlement Management Message (EMM) which is also sent as part of the MPEG stream. When a scrambled MPEG signal is received by a conditional access decoder, the box first checks the EMM to see if it is

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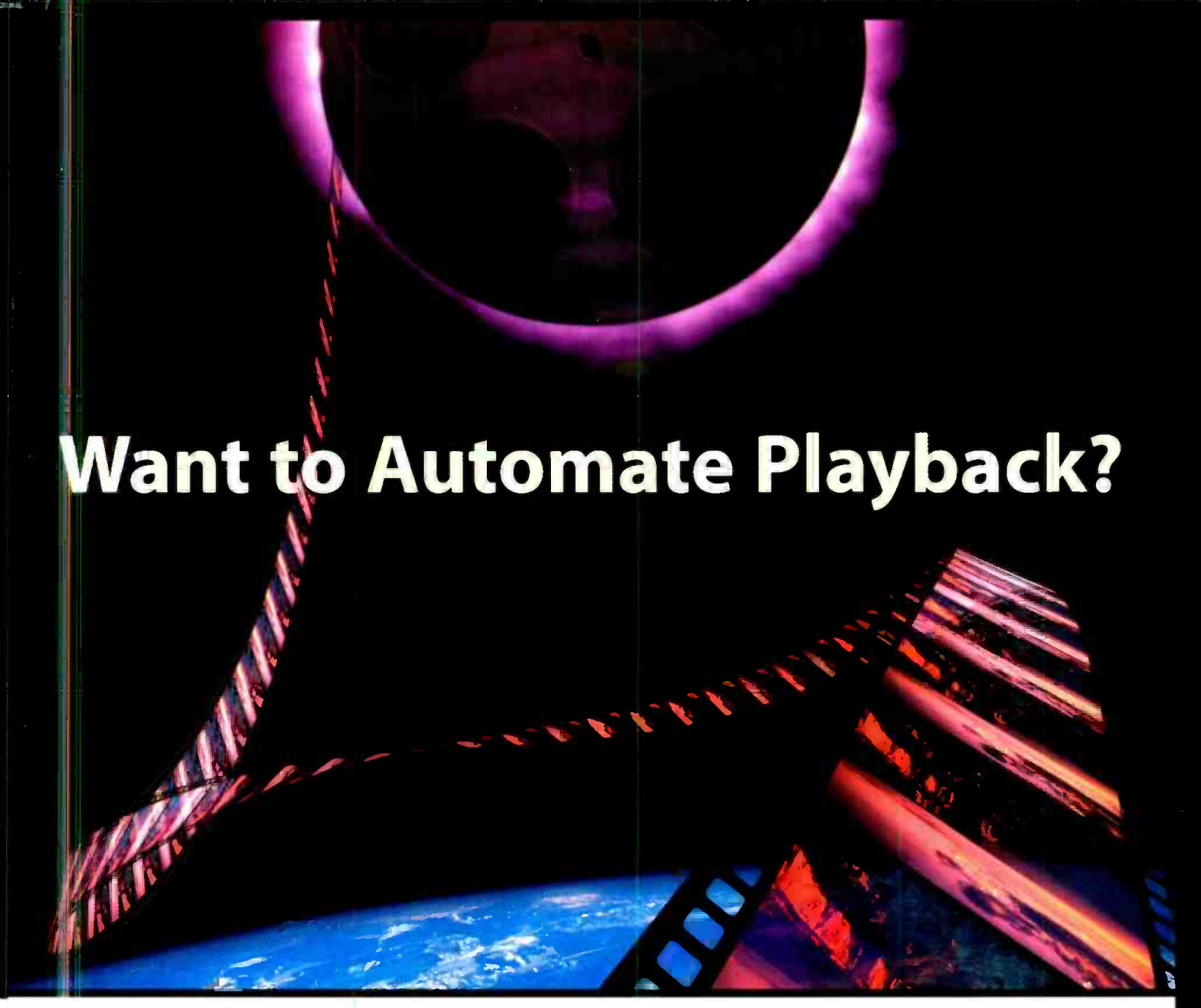

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So what out of all of this is of interest to you the DTV broadcaster? First, you should know that, technically speaking, you can scramble some or all of your DTV transmissions. Second, you can use either relatively simple fixed-key scrambling where everyone with a box is able to decode your signal, or you can use variable-key scrambling, giving you the capability of addressing each subscriber's box individually. Third, if you opt for a variable-key system, you will need to create and maintain a subscriber management database to keep track of who is authorized to receive what and when. From a management perspective, I can tell you that this can be a big deal, especially if half of your subscribers do not get the wrestling pay-per-view event they ordered.

Finally, it may be important to look at what the ATSC standard specifies and what it leaves open for interpretation or implementation. The ATSC standard specifies the Point of Deployment or POD interface for smart card technology. So far, so good. We will use smart cards, and one smart card will plug into another vendor's box. The ATSC standard specifies the scrambling method to be used as the DVD Common Scrambling Method, or Simulcrypt. Sounds good to me — we will use a common scrambling approach. However, that is as far as it goes.

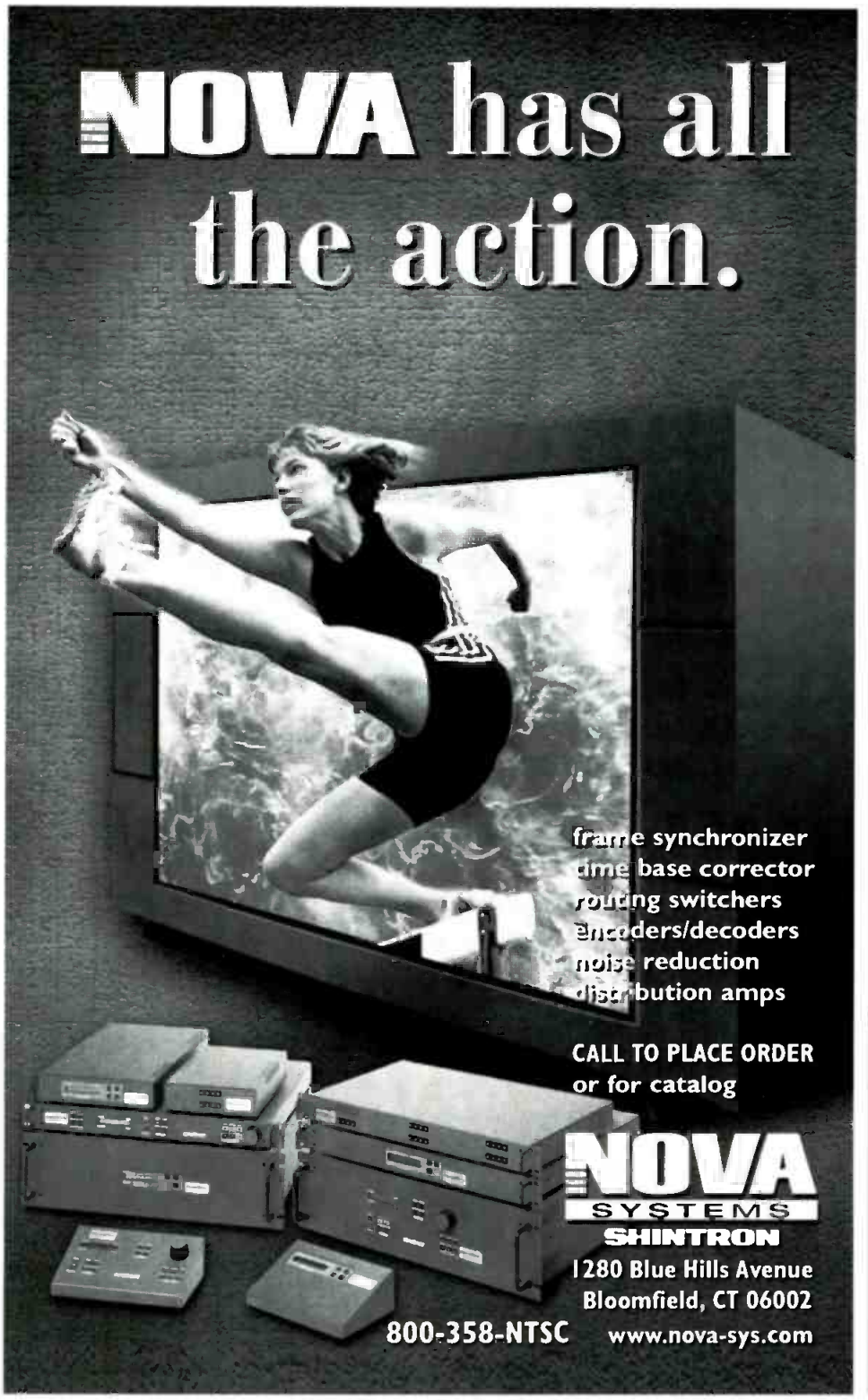
Where does this leave us? If one DTV station in a market selects conditional access vendor A, and another station selects conditional access vendor B, it is quite likely that viewers will have to swap smart cards as they change channels between the two stations. This could be good or bad depending on your position in the market. The average couch potato is not going to get up to swap the card. If you are the prevailing station in the market, your smart card is going to be the one left in the TV set. If you are the number two station in the market, it will be much more difficult to get viewers to watch your subscription-based programming. The good news is that there is nothing to keep stations in the same market from using the same conditional access vendor, thereby resolving this problem.

This can be a big deal, especially if half of your subscribers do not get the wrestling pay-per-view event they ordered.

Whether Sen. McCain likes it or not, it is likely that conditional access will play some part in the DTV rollout. There are many good sources of information on conditional access systems. The first place to start is to talk to your ATSC encoder manufacturer. Also, for general information, you can contact satellite IRD equipment manufacturers.

Brad Gilmer is president of Gilmer & Associates, a management and technology firm.

Send questions and comments to: brad_gilmer@intertec.com



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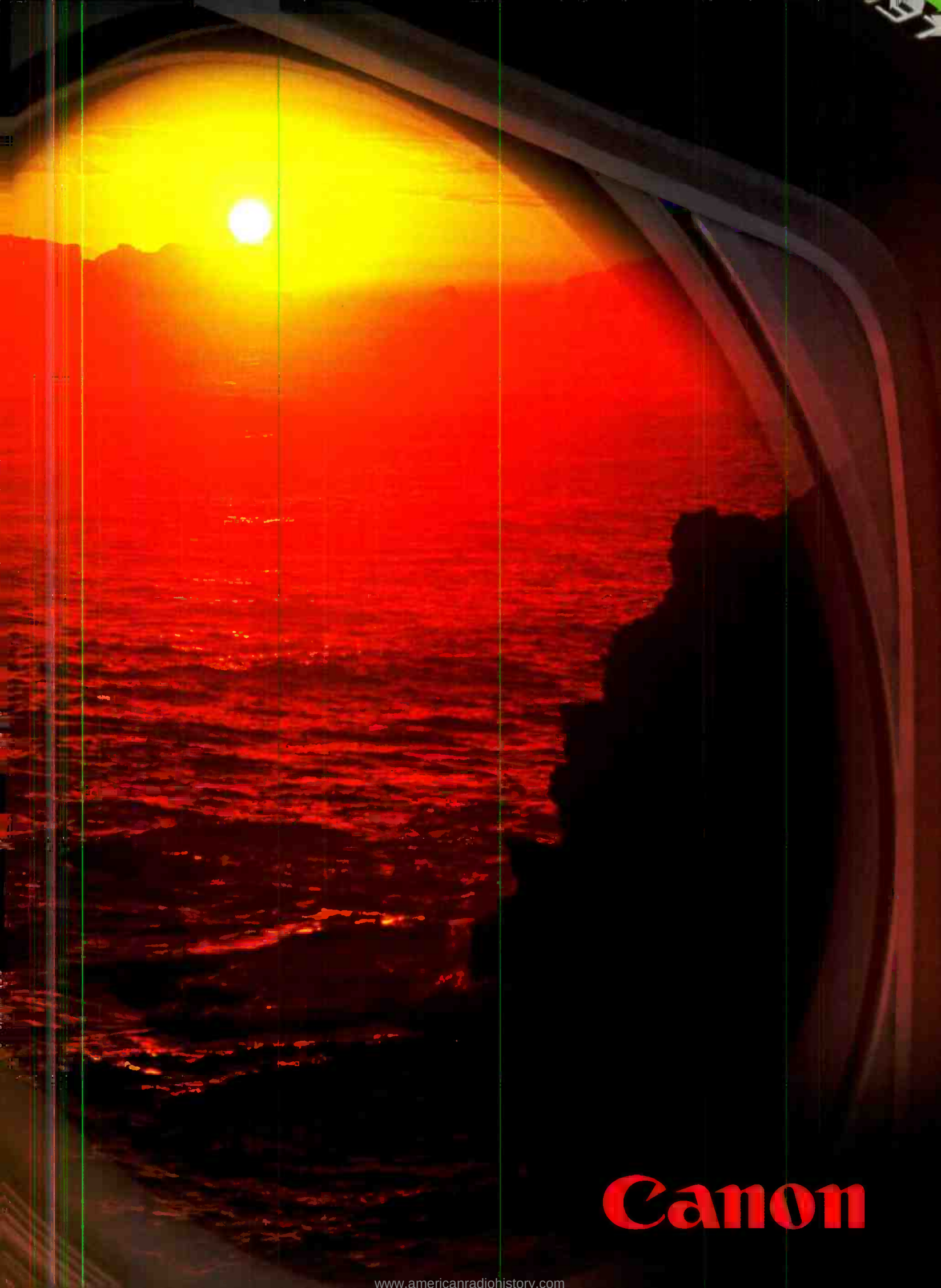

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Ask Dr. Digital

Defining the problem vs. the solution

BY STEVE EPSTEIN, TECHNICAL EDITOR

I work for Rose State College in Midwest City, OK. Among my responsibilities is the maintenance of the campus cable TV system as well as a feed to the local cable TV company. We are planning on upgrading our cable system to digital and fiber. However, we are finding it difficult to get a quote for the equipment needed to do the job.

I have contacted several companies concerning the availability of video servers that could be controlled from various classrooms as well as software packages that would allow selection of programs. The system that we envision would allow classroom instructors to access a central server from each classroom, request a program and have it played at the time specified. The software would have to search for an available channel and inform the instructor which channel would be used for playback. Access to the same program at different start times would be required. We have hundreds of programs and they would all need to be accessible. Of course, compatible televisions would be needed.

Can you put me in touch with a company or companies that could provide us with such equipment, software, fiber and quotes?

Harold L. Deitz
Audio/Visual Dept.
Rose State College
Midwest City, OK

That is quite a question. More than a single question; it proposes several answers — which is sometimes less than desirable. As I am less than an expert in fiber-based learning systems, I turned to Robert Slutske at National TeleConsultants, a systems integrator. Here is his reply:

While your question seems rather straightforward, the response is not as simple as it might appear.

The first thing that is needed is a design that takes into account what you are trying to do. Though it may seem that selection of equipment is the place to start, what's really needed is an in-depth discussion of your operational needs, followed by a system design, at least at the functional and software specification level.

There is a wide range of equipment available to meet your needs, but the real issue is making the equipment do what you want to have done operationally. This is where the software comes in to play and a "plug-and-play" solution is far less likely. This is no doubt why you are having trouble getting an equipment quote for a system to meet your needs.

At first glance it may seem that design is an expensive luxury. Nothing is further from the truth. Without solid planning you are less likely to achieve an effective solution and will likely wind up spending more, rather than less, money in the long run. This is particularly true where control and automation software is involved.

Our advice is to take the time at the beginning to define your functional requirements. Only then can you develop an appropriate system design and select the proper equipment with which to achieve the desired results. Planning is far from a luxury. It is, in fact, essential to develop the right solution to meet your operational and budgetary needs.

Robert Slutske
Vice President,
National TeleConsultants
Glendale, CA

Planning is far from a luxury. It is, in fact, essential to develop the right solution to meet your operational and budgetary needs.

Bob touches on something I have run across before. Many times the problem is presented to you along with a proposed solution. But, because you have been given a proposed solution, it may distract you from a clear understanding of the problem. For example, someone might say "The tire is flat, we need to change it." The problem might indeed be that the tire is flat, or it could be that the real problem is that someone needs to be somewhere soon and the flat tire is preventing them from getting there on time. In that case a better solution might be to offer them a ride. It doesn't fix the tire, but it solves the real problem. The next time someone has a problem and proposes a solution, make sure you understand the underlying problem. Consider their solution, it may be the best, but until you understand the problem you can't be sure.

If you have a problem, comment or a question, you know where to find me: *drdigital@compuserve.com.* ■

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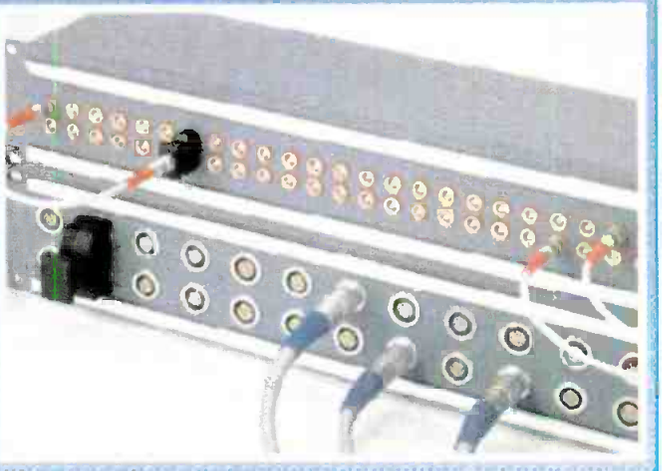

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SYSTEMS DESIGN SHOWCASE

WETA-TV builds new digital multichannel broadcast facility

Within master control, WETA's "virtual" monitor wall was designed to display 4:3 (SD) and 16:9 (HD) images.

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By Steve Lewis

Greater Washington Educational Telecommunications Association Inc., known as WETA Washington, D.C., to its public television and radio audience, has extended its digital transition with a newly developed broadcast origination facility. WETA acquired a six-story office building in Arlington, VA, in 1995 to expand its present television and radio capabilities after evaluating numerous facility alternatives for HDTV and digital broadcast transmission. The result is a state-of-the-art broadcasting facility that provides origination and transmission services for WETA's existing television (TV 26) and radio stations as well as its digital channel (TV 27). The WETA organization, a major producer of renowned public television programming such as "The NewsHour with Jim Lehrer," "Washington Week in Review" and "In Performance at the White House," will utilize the new digital facility to build upon its leadership role within the PBS community.

As an early producer of HDTV programming for local and national distribution (beginning in 1997), WETA also considered the development of new production studios and edit rooms as part of its digital television development plans. WETA assigned a high priority to the development of digital origination and transmission capabilities and is now considering the buildout of new studios and production areas. The nearby WETA production studios and control

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WETA-TV

control switching system and SMS routing. A multichannel SD and HD master control switcher is integrated with a Tektronix SMS-7000 digital video and AES audio routing system currently supporting one SD channel with plans to easily expand to additional broadcast channels. A Tektronix HD routing system is also integrated with the master control room to support WETA's HD channel 27.

• *Tektronix AES/EBU synchronous routing system.* The audio infrastructure is shared with WETA 90.0 FM with separate controls and matrix crosspoints for each independent operation. CEI designed and integrated a fully digital and synchronous audio plant with 75Ω AES 3 cable, instead of traditional 110Ω twisted pair for plant signals. The AES 3 cable plant allows higher sample rate digital signals and longer cable lengths within the plant and is outfitted with impedance-matched jackfield panels from ADC.

• *WETA's multichannel server and data tape library system.* Virtually all programming at WETA is originated from servers. The system is comprised of an ingest and playout servers utilizing Tektronix 4:2:2 Profiles. The server systems transfer data via fibre channel between Profiles, and to and from a StorageTek 9740 Timberwolf Automated DLT Tape Library system. The fibre channel data is converted to SCSI via Dell Data Mover computers for transfer to the StorageTek DLT library. This combination of technology allows for the ready access to over 1800 hours of programming with thousands more hours easily accessible. Additional components include an Odetics TCS-45 Cart Machine, and a high definition ATSC 19.39Mb/s server from Sencore.

• *Multichannel automation systems.* Louth automation systems located in the media prep area are used to create a database and prepare the program content for later playout. Louth is integrated with master control's technology systems to support automated on-air transmissions. Extensive RS-422 and TCP/IP data control signals are routed through the WETA facility utilizing switches from NVision and 3Com.

• *Shared infrastructure systems.* The HVAC, UPS and generator backup power systems in the facility were designed to support the television and radio technical spaces. The second floor space received substantial acoustic treatment to address the adjacency to noisy mechanical areas such as the elevators, machine rooms, etc., as well as the building location next to a major interstate highway and a helicopter flight path to and from the Pentagon. While sharing the global positioning system (GPS) time reference system, WETA television runs an independent clock system from the radio operation due to differences resulting from their respective satellite transmission paths from PBS and NPR signal sources.

WETA has been primarily broadcasting a single HDTV stream but has tested multicasting four channels of SD as well as one SD channel and one HD channel.

Keeping an eye on the future

WETA continues to follow the numerous DTV technical and business issues that have surfaced to date. Future considerations will evolve from many of the unanswered questions including:

• How will the public broadcaster manage the expected competing demands of multiple SDTV streams, HDTV and datacasting within the 19.39Mb/s bitstream?

• With DTV consumer receivers still in development and issues such as DTV must-carry still unresolved, how can the broadcaster plan for an uncertain DTV penetration timetable?

• How should future plant design reflect the needs to handle the both traditional video production and distribution and internet type content?

WETA has been primarily broadcasting a single HDTV stream but has tested multicasting four channels of SD as well as one SD channel and one HD channel. Datacasting has also been tested and WETA is exploring opportunities while awaiting further development and sales of DTV receiver cards for personal computers. Washington, D.C. has a significant population of DTV early adopter consumers who provide very useful feedback that has impacted WETA's DTV strategy. DTV is not only here to stay but is key to WETA's future and mission as a public broadcaster.

A key lesson learned by the WETA organization during its digital transition so far is the realization that traveling DTV's bumpy road involves many important choices that cannot be pre-ordained. It is also understood that the digital broadcasting transition resembles the phrase, "it's not over until it's over." WETA's initial pragmatic steps have prepared the technical foundation to reach audiences with superior digital services. However they plan to "stay tuned" for the next expected or unexpected event in the unfolding DTV and digital media marketplace. ■

Steve Lewis is director of marketing for Communication Engineering Inc., Newington, VA.

The Facility Design Team:

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Joe Widoff, Executive Vice President/Chief Operating Officer
N. William Jarvis, Executive Vice President for the Greater Washington Broadcast Group and General Counsel
Fran Trachtenberg, Vice President of Educational Services and Outreach
Lew Zager, Vice President, Technology
Bob Ham, Director of Engineering
Marilyn Pierce, Manager and Senior Technology Specialist
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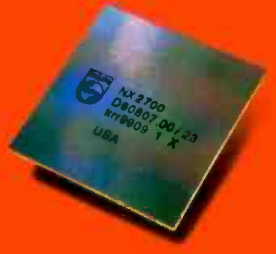

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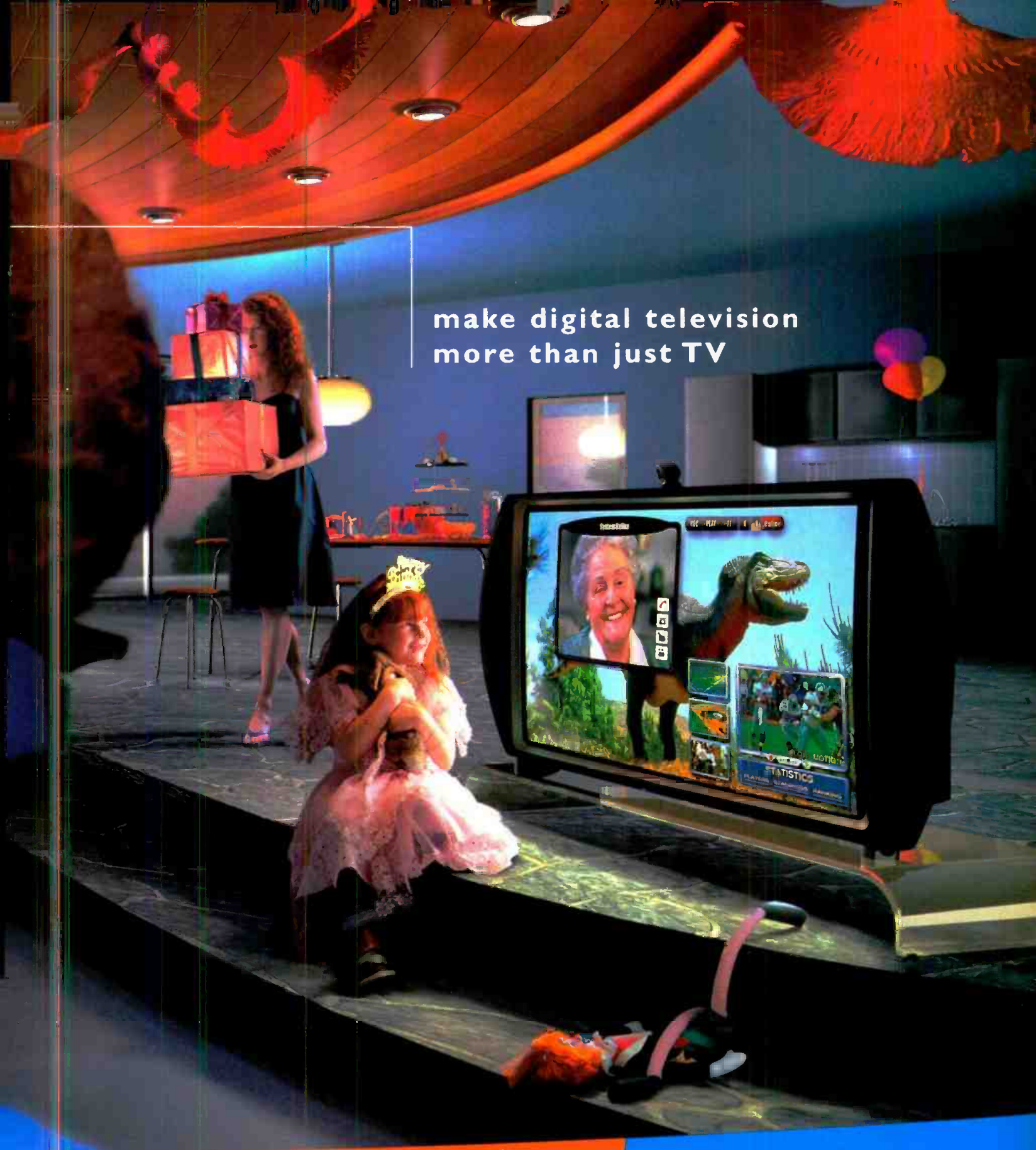

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Special Report

Media asset management: A primer

By David George, Jeremy Bancroft and Andy Ioannou

Although it may sometimes be difficult for those of us with roots in engineering to concede it, the business of broadcasting has much more to do with content than with technology. Business success or failure in broadcasting is rarely decided by the choice of equipment, but almost always by the choice of programming and the skill with which it is presented.

Likewise, the magnitude of the long-term cost of technology pales in comparison to the short-term investment broadcasters make in intellectual property. The achievements of a broadcasting venture are measured and rewarded, largely, by the skills the broadcaster exhibits in the choice of material and the decisions as to when and how it is displayed. In the ever-expanding universe of alternative delivery options, the ability to generate the greatest benefit from the media whose rights are owned or leased by the presenter of the programming becomes increasingly critical to success.

Media asset management holds the key to maximizing the returns on the investments in intellectual properties broadcasters make at the core of their business. Also referred to as *asset management*, or *digital asset management* when the media is limited to digital platforms, it is an umbrella term used to describe the objectives and underlying functions for maintaining and managing media, the assets stored on that media, and the metadata associated with those assets. It is more than automation,

Media asset management is increasingly a necessary newsroom utility at stations seeking to compete in a digital world. Stations that are able to repurpose content reap economic benefits. WSB photo courtesy Concept: Benson & Rice.

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though automation plays a crucial role in supporting operations and play-out; it also has to do with providing an ability to re-examine, manipulate and re-purpose the material, whose costs are already sunk, to maximize the return on that investment by the broadcaster.

Media-based assets are typically audio, video, still images, text, software code, or any other substantive "content," considered either alone or in combination with others elements within the asset category. The medium upon which content is stored is typically magnetic tape or disk, optical disk, or photographic film — virtually any medium where the neutral or native state of the storage device can be altered to permit the capture and subsequent regeneration of information substantially in its original form.

Data about data

Metadata is the associated, descriptive data related directly to the stored content. In a sense it's the data about the stored data. Examples of metadata range from contractual (rights and permissions) and financial (costs and value), to social (credits and language), format (aspect ratio, frame rate, version) and play-out or processing directions (edit transitions and color information).

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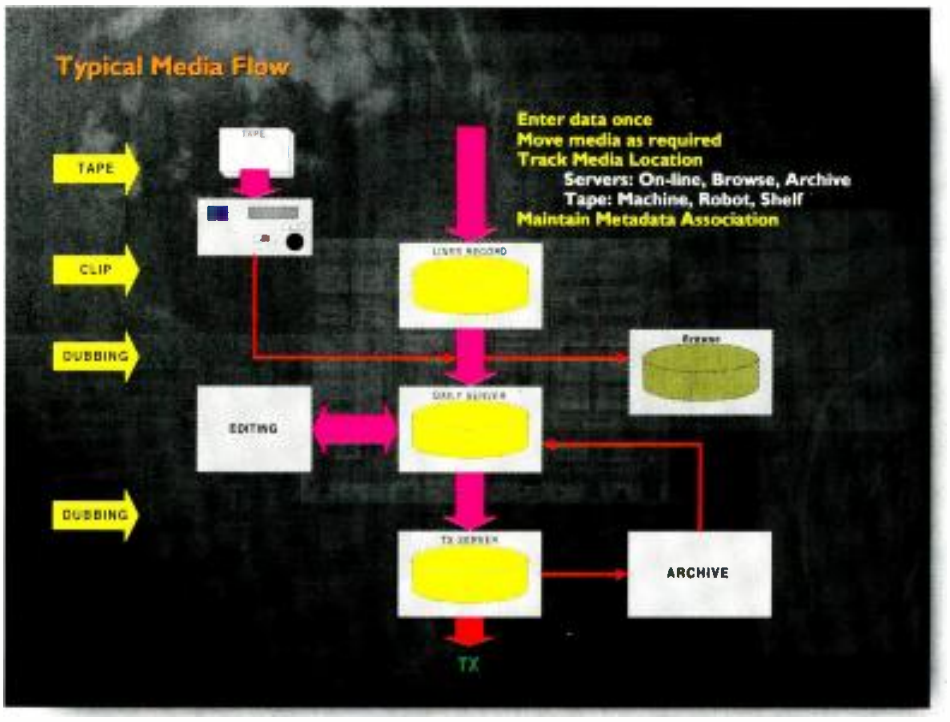

Typical media flow in a asset management environment. Content and associated metadata are entered into the system only once and are kept in the managed archive environment even after their originally intended use.

Historically, content and its metadata have been related to each other by rudimentary methods of association; relational storage was typically very difficult as conditions for co-mingling the two were haphazard and limited at best, if not physically impossible. Traditionally, content was stored on bulky or fragile media (video/audio cassettes, film/acetates, etc.) and it's associated metadata was printed on paper and then buried in file cabinets (or more recently, on local disk drives). Access to those records was limited to the few persons knowledgeable about its whereabouts, authorized to access it or located physically adjacent to the material. The development of more accessible and sophisticated databases allowed many elements of the metadata to become relational but, more often than not, they were limited to single functional areas such as legal, accounting, or programming, with data handshaking and transfer between departmental systems limited if at all. The migration of these departmental systems to wide area systems, either through large common databases, or through "modular" databases glued together with sophisticated management systems, has been a key objective for the media industry or has enjoyed some success.

Media asset management holds the key to maximizing the returns on the investments in intellectual properties broadcasters make at the core of their business.

The larger the media company, the more difficult it is to know exactly what is contained within its extensive program archives. They may be extremely well catalogued, but anyone needing reference material might have to spend hours pulling tapes from the libraries to find anything of relevance. Often programmers simply re-create the same or similar material rather than waste more time looking for the original footage.

In this environment re-purposing – taking existing material and re-using it for different programmes or audiences with different edits and approaches – is not really practical. This could, for example, happen within a multimedia operation where a television soundtrack could be used for radio transmission or offered on the Web. Any re-use affords greater cost effectiveness by getting the optimum use out of media and rights that already exist.

Ease of access

Effective access to valuable media becomes essential in this setting. In the earlier example, access to the pictures as well as the sound allows radio program people to get a better 'feel for the story so they can translate the images into additional, descriptive, and supporting words. Material for the Web can be selected for content and suitability. As such, media asset management is not only about being able to find the media and information about it, but also about providing the type of access that will support re-use in a variety of ways.

When archives were kept on videotape, programs could be taken off the shelf, put on or into a machine and shuttled to quickly find what was wanted. On the other hand, this 'old' approach involved the time-consuming process of restoring a large amount of data from a large archive and tying up some form of broadcast device to do it. Data tape, however, needs format translation and transfer to a readable format before it can even be used in a similar way. As such, it is not as easy go through an archive copy and pull relevant material for re-use.

Nevertheless, as TV stations began to reap the benefits of server-based technology, they soon also turned their attention to the advantages offered by data archiving over storage on tape. In turn, that posed other problems, namely how to know exactly what an archive contains, how to properly select that material and how to get the very best use out the archive itself

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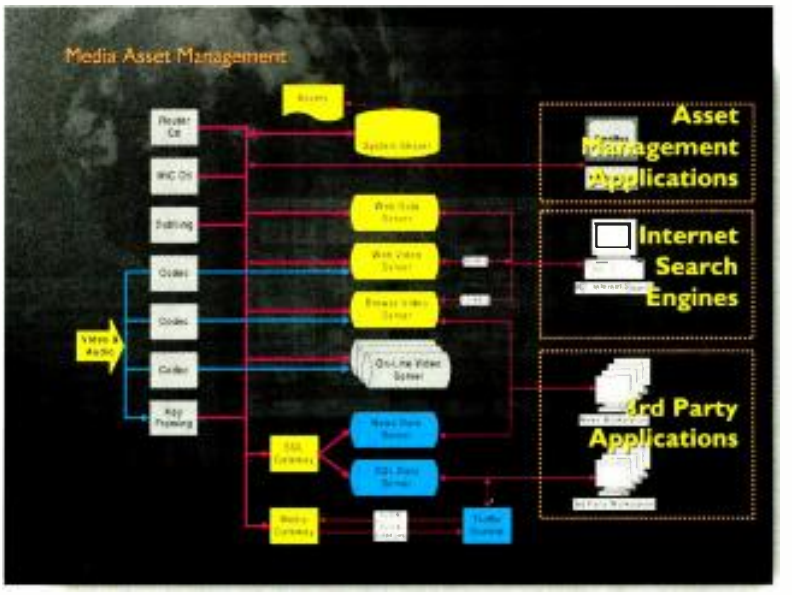
which, in the current broadcast environment, has become a potentially profitable resource?

Seeing what you have

Traditionally, broadcasting organizations kept archives and online media within the station itself and if someone wanted to see something that was stored that way – in order to make editorial decisions on the media or for research purposes – they requested a VHS copy. Copies of the relevant material were made and taken away for viewing. Later, a request would be made for selected material or a series of shots, and much later the material would eventually be assembled and presented. This can – and did – take weeks and any large-scale attempt at practical re-purposing was significantly frustrated.



An overview of a typical media asset management architecture. After the initial encoding process, content resides in a networked server array, allowing users to browse among like clips without wading through a library of tapes. Digitized clips can also be made available for Internet users and third-party content consumers.

It's much easier if the programmer knows exactly what lies in the archive before a search begins. Without that, gaining commercial – as well as editorial – advantage from the archive is restricted not only by the drawn-out process of accessing it, but also by finding somewhere suitable to view it efficiently.

The development of high-bandwidth computer infrastructure complemented by large capacity disk storage has encouraged the migration of content to digital platforms. In the case of content, more acute than with the metadata consolidation, this evolution also comes with a significant "emotional" cost: The loss of the content as a tangible, physical asset – the cassette containing a program that you could hold in your hand and say "here it is" has been replaced by bytes scattered among various disk drives. Individual elements of content are becoming invisible, raising the questions," where is it," and, "is it really there?" The translation of content to data significantly increases the need for a sophisticated, risk-averting, enterprise-wide management system to offset the loss of visceral, if not physical, control over content. The implementation of a media asset management system presents an opportunity to solve both the content/metadata relationship issue and the "what do we have and where is it" issue so critical to making the most fiscally efficient use of the media asset.

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Developing a competent browse capability is key to accessing large media archives and making intelligent use of the assets they contain. Suppliers of media asset management software provide browsing online with a range of browsers, including Internet versions that use the same sort of technology that everyday people use to watch everything from news bulletins to movie trailers on the Web. The Internet permits browsing of material off-site as well as on, and access to the wide-ranging archives of the media enterprise all over the globe.

Essentially, program browser users use similar technology to obtain access to media online. The same types of encryption, coding, viewing capability and database technology are utilized, though in a friendlier format that permits operators to view material virtually instantaneously, rather than having to wait several minutes for a few frames to download, as is common on the Web. But there's little radical or cutting edge about it; it's established, secure and in-use millions of times a day throughout the world. Media browsers just harness it for programmers to use in a more professional and more efficient manner. The underlying belief is that if you can give people adequate access to the online media without jeopardizing other online activities in the facility, you should do that. However, the browser should be sufficiently competent to be a primary rather than a secondary operational option.

To support that approach, the browse controller should be capable of showing people a broadcast-quality version of the media, if there are devices that are available and that have the media online. If you can provide a researcher with access to a broadcast server that doesn't tie-up scarce resources

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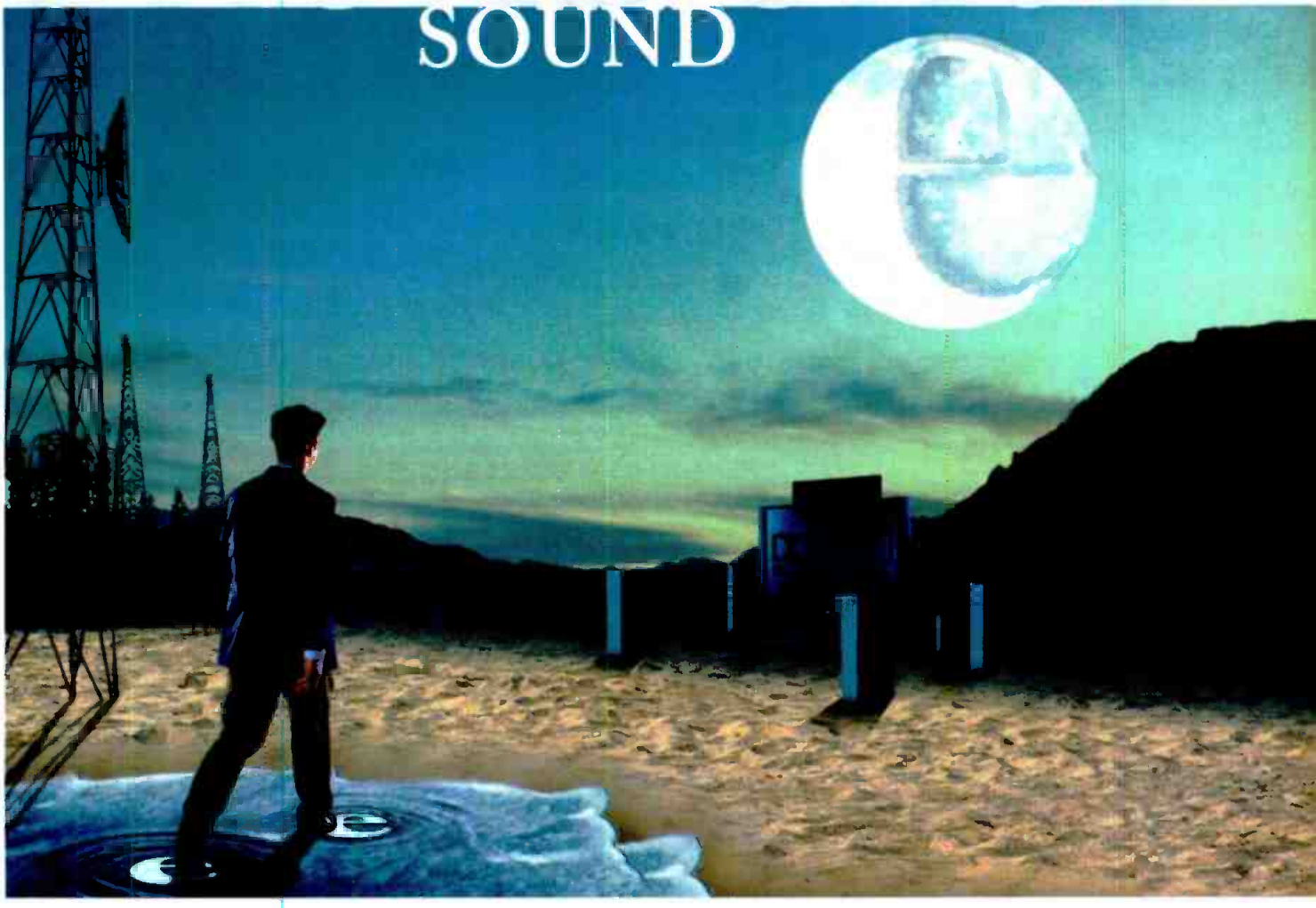

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needed for other purposes then the choice should be to do it. Resorting to a lesser, but still very respectable, browse-quality would take place if the media is no longer online on the server, or if there were no suitable server facilities immediately available for browsing.

Utilizing a browse quality with a data rate in the order 1.5Mb/s, MPEG-encoded and allowing 30 frames a second, frame-accurate play-out, including timecode, provides more than adequate spatial and temporal quality and allows programmers to make editorial and qualitative decisions on the material. While it is not possible to stream 1.5Mb/s video across a network –between London and New York, for example – that can be reduced to something like the Real Video technology, where it will encode material at any rate from 20 to 100Kb/s. The spatial quality is obviously reduced and frames can be dropped, but one can easily browse the media and make content decisions before ordering a broadcast version of the clip, also electronically and automatically. All this browse capability can be incorporated within a newsroom or a desktop system.

A foreign correspondent in Los Angeles, for example, can view the contents of the news archive in New Delhi and select a shot for the story he or she is compiling.

Server-based operations soon came to appreciate the need to view online material. Those that recognized the advantage introduced the bandwidth to allow many people simultaneous access to the server via LAN-based browse technology. However, that, by itself, did not fulfil the demands of a mass market and wider audience. The next step was to find the Internet equivalent of obtaining a VHS copy. Widespread Internet accessibility facilitates a process by which content providers grant access to their online and archive material. For example, a foreign correspondent in Los Angeles, for example, can view the contents of the news archive in New Delhi and select a shot for the story he or she is compiling. A request across the Internet causes that material to be played out of a server, de-archived and made available for play-out, automatically recorded on tape, or transferred a designated Internet site.

Servers, however, do not traditionally store the "heads and tails" of the media clip. In a tape-world, those tend to include a clock and identification to tell you what the material is, and include bars and tone references. This information has to be restored before the material returns to the linear tape environment at the other end. Using metadata, a system can accomplish this as part of its resource management operation in order to produce a complete package from the raw material.

Likewise, the machine and device control capability of the automation side of the media asset management package deals with activating the systems and services necessary to implement the program and re-purposing decisions that have been made, taking into account, also, the dictates of the operation's program, sales and traffic systems. In this fashion, the whole process of generating, re-purposing and presenting programming is incorporated into one integrated system that permits, controls and tracks the media assets, their manipulation and their effective use.

The implementation of media asset management is a key component in the continued evolution of broadcast operators as they strive to make the most of their investment in intellectual property, reduce overhead expense and shrink the incremental cost of providing new program offerings. The widespread digitization of entertainment media both demands and permits media asset management be considered a basic operating tool of the twenty-first century. ■

A system's browser interface allows users to select from a readily accessible palette of content clips. This is the heart of a managed asset environment; readily accessible content at the user's fingertips.

David George is a director and senior consultant with IMMAD ECVS, and past president of the SMPTE; Jeremy Bancroft is president of OmniBus Systems Inc; Andy Ioannou is vice president of OmniBus Systems Inc.

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Transmission & Distribution

When the lights go out

BY DON MARKLEY

There is one truth that must be observed by all of us. Regardless of how well we maintain or operate our systems, we still depend mainly on wires coming into the site to keep us in operation. With very few exceptions, stations don't make their own power in the U.S. When the big ice or windstorm hits, the station goes off the air. The only way to prevent this is to provide for backup power.

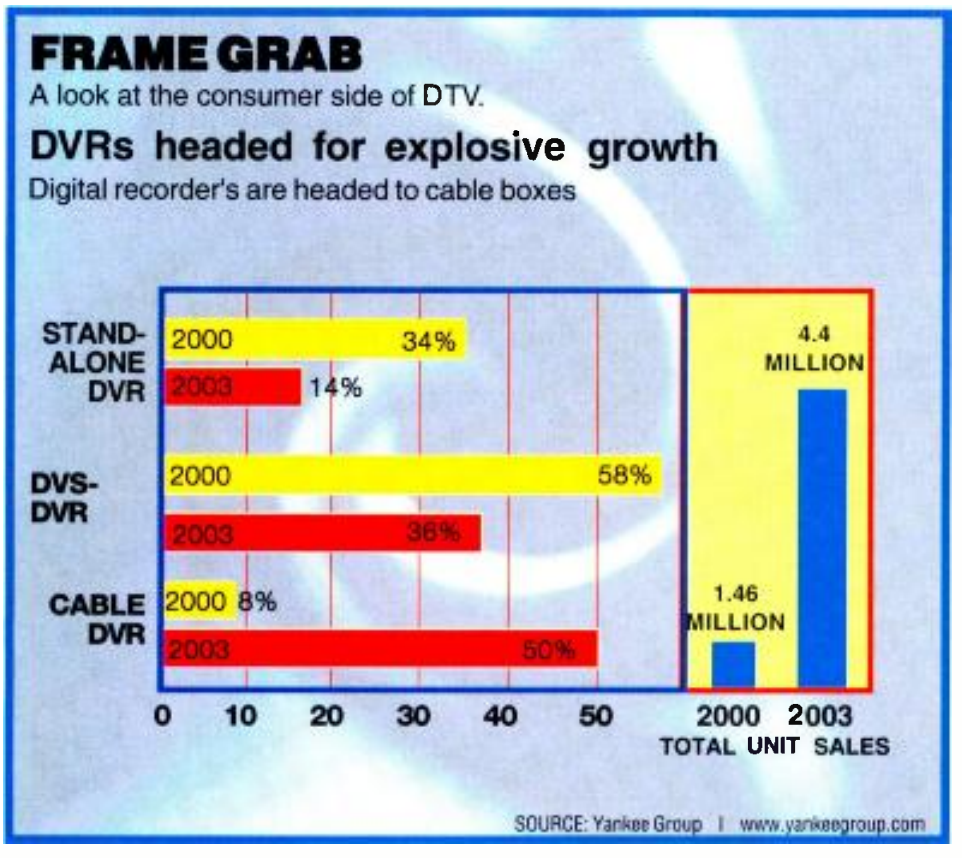
Generators and UPS

Traditionally, generators have been the sole source of backup power for large broadcast facilities. This is still essentially true, although the use of uninterruptable power supplies (UPS) is growing rapidly. The ideal situation is a combination of the two. At a minimum, such items as the microwave system and remote control equipment should be on a UPS. That equipment draws relatively low power and can be supplied by the type of UPS systems available from local electronics dealers. The PC revolution has made such equipment widely available at very low prices. The use of a UPS here will keep the control circuits and program source operating smoothly even during short-term power interruptions. In addition, the UPS acts as a line filter; assuring that the equipment receives a clean, filtered source of power at a constant voltage.

Going one giant step further, UPS systems are now available which will easily handle a large transmitter facility. Transmitters of 220kW or more are on UPS systems along with the associated heating and air conditioning systems, tower lights, terminal equipment and building needs. This assures no transients to the equipment, no brown outs and constant supply voltage for a short period of time. Theoretically, the UPS system could provide power for as long as is required, limited only by the number of batteries that are purchased. For practical purposes, it is adequate if the UPS maintains the system for two or three minutes of operation.

Most power failures are very momentary in nature. Lightning strikes a line, a circuit breaker trips at a substation, and everything goes dark. At that point the circuit breaker resets and the lights come back on – and maybe it repeats. That is the life cycle of most power failures and that is exactly the type of situation that is easily handled by a UPS system. If the power is down for more than a minute and the recycling seems not to be solving the problem, one of two things needs to occur: either shut the transmitter off or start up a generator. A good UPS will easily keep the facility on line while the generator starts and the load is transferred from the main service. Before the scream is raised, yes, a UPS will handle the instantaneous high-current demand for a crowbar trip in the case of a transmitter fault. According to the manufacturers, their normal protective circuit adjustments would shut things down. However, as experience has been gained with klystron type transmitters, they have been able to adjust the protective circuits to permit crowbar trips without melting down the UPS. Furthermore, modern UPS systems will easily handle the short-term high current draw that occurs as transmitters, motors, etc. are initially energized.

So, everything is great for a minute or two. The next step is to take care of the rest of the day or week. A majority of stations will need to work with a good electrical designer and contractor to select the right standby



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system and install it correctly. One nice thing about using a UPS in association with a generator is that it takes away all of the hurry about getting the system on line. In some very large data-handling systems and in many medical applications, the generator must be up almost immediately. In other applications where synchronous motors are in the system, the switching between systems must either be done very carefully or after the motors have come to a stop. Otherwise, massive destruction can occur. Such requirements don't occur in broadcast facilities with a UPS. A delay of a minute or so can be built into the system before the generator starts to eliminate responding to relatively short-term outages. Then, when the generator comes up to speed, a standard transfer switch can make the switchover with no unusual requirements. Again, work with an experienced designer in setting up the transfer switch equipment.

Fuel for the long term

The big question in determining the type of generator to use is the fuel source. Basically, the available fuels are gasoline, diesel, LPG and natural gas. Gasoline has an obvious major problem. It tends to blow up when leaks occur, so lets rule it out at the beginning. LPG and natural gas are wonderful except that they cause significantly higher cost for the generator itself. (In this instance, significantly means a whole bunch.) That leaves diesel fuel, which has problems of its own. Primarily, bugs grow in diesel fuel — mean, nasty and tough bugs to be sure to be able to survive in that stuff. They form all sorts of growths inside the tank causing fuel filters to clog to the point where the generator shuts down and the tank must be opened and cleaned out. There are chemicals that can be added to prevent the growth of such fungi but some steps should still be taken to rotate the fuel stock. The simplest thing to do is run the generator occasionally.

Fuel storage systems need to be installed in accordance with local regulations. These regulations vary, so check with local authorities and consultants to determine compliance.

One manufacturer of generators suggests that the fuel be totally cycled at least every two years. This shouldn't be a major problem. For example, if the station maintains a two-day supply of fuel, the generator only needs to be operated two hours per month to cycle through the fuel in the two year period. In reality, the system probably should be run more than that to keep it in good order. At least once a month, preferably more often, the system should be started and run under load for some time. This is good for the engine and ensures that the overall system will operate properly when needed. Of course, Murphy's law states that — on that terrible day when the system is needed — the starter switch will break.

Now as to what to do with all of that fuel. This will be greatly influenced by what the state and local regulations may be at each given site. In some cases, it will be possible to have an above ground storage tank (with an ice shield please). In others, a buried tank will be needed in which case some monitoring will probably be needed to meet EPA requirements. Again, this is best worked out with your local designer and contractor who will be familiar with the local restrictions. Oh yes, one more little thing. Put a good residential type muffler on the generator. If you think that the neighbors are upset about your strobe lights, just wait until you fire up that 500kW generator and dump it through a three-inch straight pipe pointed toward the nearest housing area.

One more suggestion: Check with the local power company to see if some load sharing is possible in your area. In some parts of the country, the power company will participate in the purchase and installation of a generator if they can put it on line during periods of very high power demand. This can even reach the point of having the generator paid for by the utility in reduced demand charges, etc. The result can be the installation of a good standby power system at no actual cost to the station. The suits will love you — they like free things. ■

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

Send questions and comments to: don_markley@intertec.com

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Effects and graphics: Merging of the terms

BY PAUL BLACK

In the early days of television, it was easy to define the difference between a *graphic* and an *effect*. The line between these had specific boundaries due as much to the technology available at the time as to the terminology adopted by the industry.

Graphics were pictures created from other than "live" shots, such as hand-drawn artwork that was shot with a camera under a key light. Because television pictures look better when the images are moving, techniques to create movement and action evolved early on. Tricks such as shooting a rear-projection screen with a camera or using two slide projectors to dissolve between different images sound crude today, but they were once considered state-of-the-art. These methods satisfied the most important need: to provide some action to keep the viewer interested in the program.

Effects were those methods used to alter a natural picture's look by electronic means. Early switchers had keying capability, which allowed titling and other word-related inserts. Higher-end switchers contained built-in effects generators that had certain predictable features, such as dissolves, split-screens, subject spotlighting or positioning a picture. Visually attractive techniques remained in general use. Distractive effects, such as certain "wavy" border effects around keys, fell into disuse.

Evolving technology ultimately caused the industry to come to a new realization about how the two terms graphics and effects are intertwined. To put a graphic on the air requires use of a video effect. Conversely, many effects require some form of graphic as the subject. As time passed, the differences between these two terms began to blur.

The arrival of the inexpensive computer blurred those differences even further. By necessity, a computer outputs video. The jump from using the video to merely monitor the computer's functions to using the computer to create images by means of its video capabilities was rapid. Today, the term graphics usually means computer-generated graphics. Other methods of rendering graphics gradually became obsolete.

In addition to being used as a creative tool, the computer also started to be used extensively as the executive tool. It would execute the effect by controlling the switcher or character generator's ability to do the keying, place the background, move the box, etc. In other words, the computer was now doing both the effects as well as the graphics. This last capability truly blurred the line between graphics and effects. Now a single machine did all the work or at least controlled the machines that did the work.

When considering purchasing graphics systems, production facilities, such as Bavaria Production Services in Munich, Germany, should carefully consider processing speed, ease of maintenance and interoperabilty. Photo courtesy of Chyron.

The editor, producer, director or other professional faces the challenge of choosing the right hardware and software. So much capability is available, from so many manufacturers, under so may different platforms, that obtaining the correct gear can be a serious problem.

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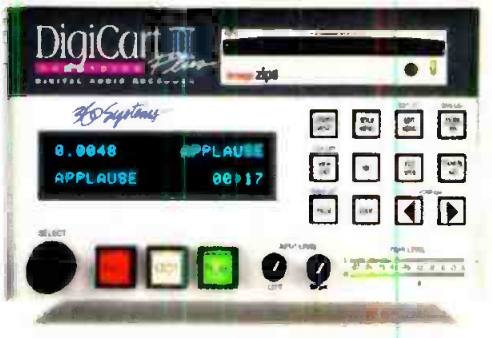

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Today, most manufacturers have dealt with defining the two terms by simply ignoring any difference. Many modern systems are touted as having "graphics and effects capability." An M/E (mix-effects) bus in a switcher may very well take all its data from a computer-controlled device. Many stations use a PC to collect data, output this data to a character generator, and tell the CG when to key in the data on the air. Some CGs can not be used without a PC connected to them.

This can be very helpful to the production specialist working to create elements. Now, thanks to the capabilities of these machines, the creation and execution can be done much faster and easier. When time is tight, a faster machine can mean the difference between getting a graphic on the air or not getting it there at all.

However, the editor, producer, director or other professional faces the challenge of choosing the right hardware and software. So much capability is available, from so many manufacturers, under so may different platforms, that obtaining the correct gear can be a serious problem. There are myriad opportunities but where should you start? The answer lies in taking the time to define the needs you have within your facility. Some of the major points to consider are:

· Speed: Are you always creating new material minutes before a show, or do you operate in a less frantic environment? If speed is important, then you need fast computers, short operational steps (such as one-key macros to move things around quickly) and lots of memory to store many things.

· Quality: You may not need that $100,000 system if you are working in a non-digital, NTSC-based composite video environment, and using the system mostly for simple key-ins, box inserts, etc. But if you're producing expensive promotional material or commercials for exacting clients, then the state-of-the-art, high-resolution, digital products may make the difference between keeping or losing a client.

· Maintenance: Some manufacturers make their products such that only they can provide spare parts. That disk drive from the CG may look the same as the one at the local computer outlet, but it might not work due to any number of subtle differences. The more economical systems use off-the-shelf parts, which can greatly reduce maintenance costs as the system ages.

· Interoperability: Will the system output files or data that can be used by other, similar systems or products? Will it network into, say, a 100BaseT system? More importantly, does the manufacturer encourage and support third-party software? This can be an important source of improved performance and capability.

No single product will do everything. To ensure you get the right equipment, define your needs, study the available products, create a budget. Then, once you are certain you are on the right track, go shopping. ■

Paul Black is an engineering supervisor for KPIX-TV, San Francisco.

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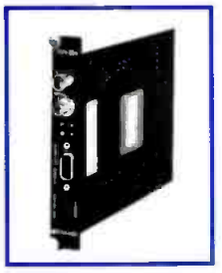
The system is available in a DTCR-X stand alone 24VAC or into a 19" rack mountable Universal CC-18 chassis.

Video FM with Simplex (Stereo) Audio or Data for PTZ Link



The Models FMV-563, 564, and 565 are Frequency modulated FM, LED or Laser based RS-170A NTSC, PAL, SECAM compatible simplex Video transmission systems, with optional combinations of (Stereo) Audio & Data RS-232/422. Status indications on Video, Sync, FM Data, carrier detect, voltage, temperature, & optical level are monitored via LED. Units transmit over one Multimode @ 865/1310nm fiber & over one or Single Mode @ 1310/1550 fiber. Units are available in a DTCR-X stand alone 24VAC or can be Inserted into 18 slots 19" rack mountable CC-18.

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The Models FMX-48000 is a Frequency modulated FM, LED or Laser based RS-170A NTSC, PAL, SECAM compatible Video multiplexer, with optional combinations of simplex Audio & Data RS-232/422/Rtn/485/530/TTL. The multichannel transmission is achieved by using (FM) Frequency Division Multiplexing techniques. For Video portion, only FM with a single wavelength is used, ideal for transmission of multiple Video with Audio &/or Data RE-232/422 in WDM on one fiber. DTCR-X 24VAC for stand alone, & CC-18 19" rack mount chassis.

DTCR-1, 2, 4, 7 Desk-Top Card Rack and 19" Rack Mount Chassis

The Desk-Top Card Rack can handle one, two, four, or seven cards. The 19" Universal Rack Mount 5000 series allows any Video/Data/Audio cards to be inserted. DTCR-X can sit on a flat surface as a stand -alone unit, or wall mounted.

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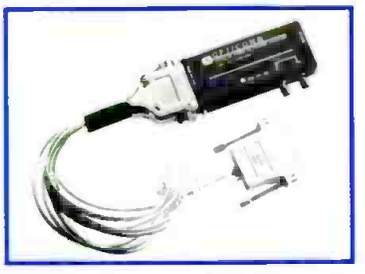
• DTCR-2 Two Slot	110/220VAC or +/- 9VDC
• DTCR-4 Four Slot	110/220VAC
• DTCR-7 Seven Slot	110/220VAC or RPS
• CC-18 18 Slot Chassis	110/220VAC or RPS

Micro Data 8 Channel MUX Data, Voice, TTL, Contact System



The Models DMX-781/Micro is a full duplex fiber optic link capable of transmitting between 4/8 channels of Async, Sync RS-232/422 W/O, full duplex voice, or Dry Contact Closure at a rate of up to 38.4Kb/s per channel. Data order comes in bank of four channel. One Bi-DIrectional Voice channel takes the place of 4 Data channels. Modules are flexible, easy to upgrade. Available in Multimode 865nm & Single Mode 1310nm. All unit cable versions require a 12 VDC PS. DMX-781 comes stand alone or in CC-10 19" rack.

Full Duplex T3 & E3 Fiber Optic Data Link

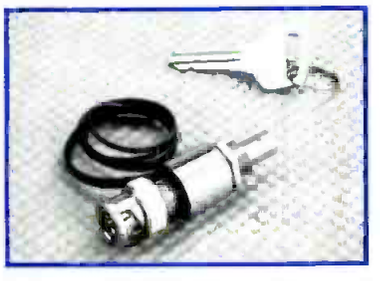
The Models DS-726/T3 CCITT & DS-726/E3 G.703 are full duplex T3-Carrier 44.735 Mb/s & E3-Carrier 34.688 Mb/s transmission system. Product using highly linear stage to transmit high data rate over a multimode 865nm or 1310/1550nm single mode fibers. A pair of DS-726/T3 or DS-726/E3 provides versatile, low cost, high speed, error-free data communication for: Radar, Line-Code Encryption, D4 channel-Bank & Military Band links. Available in stand alone unit or interface card for 19" rack mount chassis.

Fiber Optic Variety of Mini Modem

The Opticomm Models DS-150/XXX Mini Modem series family are designed to link data communication equipment through fiber optic multimode and single mode.

• DS-150/T1/E2	T1 & E1 AMI/B8ZS
• DS-150/422	EIA-422A, 530 Full Duplex
• DS-150/232	EIA-232C & V.35 CCITT
• DS-150/TTL	TTL Control Contact Level
• DS-150/485	Tri-State RS-485 Link
• DS-100/TR	Ethernet F/O Transceiver
• DS-120DR	Multi-drop system

CCTV Video Mini/Micro/Std Composite & Mono/Sync Link



The Opticomm MMV-110 Minl or Micro or standard consist of 15 Mhz video bandwidth. The MMV-110 Micro Is the smallest fiber optic video module able to transmit a computer-generated signal. These units can also transmit camera video signals that comply with RS-170, RS-170A standards. The MMV-110 is the latest in fiber optic design for short distances. Product using IM technique with AGC mode. MMV-110 support external TTL/Sync. A RGB color graphics system can be fully supported by combining three links.

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The advantage of digital technology

New features and better performance

HDTV, The Internet and the future of editing 86

MPEG Encoding 92

The Super Bowl in HD 98

In addition to keeping their SD skills honed, editors at the Creative Group, New York, have been steadily gaining experience on the HD front. The room shown above features a Sony HDS 7000 switcher and BVE 9100 editor, as well as a Pluto HyperSpace and a Chyron Duet. Photo by Concept: Benson & Rice, courtesy of Sony.

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HDTV, the Internet and the future of editing

Sometimes engineers are accused of not understanding the creative process or those with "talent." This dispositional thinking occasionally leads the technical staff to insufficiently consider the needs of those charged with creating and editing the very content that we transmit. In other words, we sometimes end up building too much capability into rooms, which wastes time and money, or even worse, don't build in enough capability, which limits creativity. Both mistakes eventually translate to the bottom line, and that affects everyone.

To help bridge this potential communication gap, *Broadcast Engineering* asked Richard Cormier, managing director of Riot, a high-end editing facility, to preview the future of editing for us technical types. The goal is to better understand where editing technology is going and what functionality editors may require as the demands for more content increase. With change on the horizon, should you build for HD or plan on working in DV and consumer formats? Is linear dead?

The answers aren't obvious, but with some careful planning, technical managers can ensure they are building rooms and suites that meet both today's SD needs but still provide the capability to support other formats when business and technology require it.

Finally, the author notes that as editing technology continues to evolve, editors will become increasingly dependent upon "skilled engineering staffs." Now that sounds like an opportunity to me.

Brad Dick, editor

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By Richard Cormier

Editing is editing. From the beginning of film production a century ago, through the present day and into the future, the skills required to assemble images have been, are and will be essentially the same. You have to know where to put a cut and where to put a dissolve.

Yet at the same time, the editor works in an industry where rapid change is the norm, an industry where new tools and technologies are continually being introduced, where the media the editor works with and the methods used to distribute that media are in an almost constant state of flux.

The Creative Group, New York, uses new digital technology to provide clients with the latest in performance enhancements and benefits. This production control room is features a Sony HDS 7000 production switcher and BE 9100 editor, supported by a Pluto HyperSpace video server and a Chyron Duet. Photo by Concept: Benson & Rice, courtesy of Sony.

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Nonlinear editing capabilities at Texas Cable News, Dallas, include Sony DNE-1000 editors networked to a central server system. This kind of arrangement allows non-technical staff to edit the news content they are producing. Photo courtesy Concept: Benson & Rice.

Today, the editor's world is changing faster than ever. The advent of HDTV marks a fundamental change in the way editors prepare media for broadcast. The emergence of new distribution channels, including the Internet, is creating additional outlets for the editor's work. High-speed networks promise to dramatically alter the way editors work with their clients and colleagues. The potential of interactive media may even change the way editors tell stories.

Where is technology going?

Today, the most highly anticipated event for editors working in broadcast media is the long-delayed arrival of HDTV. From the perspective of editors, HDTV will have little impact on the way they assemble imagery — it will still be cuts and dissolves, but HDTV raises several key issues that have an enormous impact on the periphery of the editor's role.

HDTV mandates huge recapitalization costs for post houses, but it is unlikely that HDTV will cause a major revolution in editing equipment. Manufacturers of HDTV equipment have done a good job in replicating the SD workflow so that, in terms of the editing process, the impact of the transition is low. For long-form programming, the linear bay is likely to survive for a long time; there is no reason for it to disappear. Platform-based tools will continue to dominate in commercial editing, although they will become more open. The biggest change will involve the convergence of computers and the Internet. Editors, for example, will have access via the Internet to an enormous variety of plug-ins. These new tools will be available quite cheaply.

Some may contend that today's editors lack depth, but that is not true.

The biggest issues in HDTV will be the existence of multiple formats and the growing need for versioning. Prior to editing a show, it will be necessary to determine if it is going to be 1080i, 720p or some other HDTV variation. The existence of both interlaced and progressive formats may mean editing twice, doubling the workload. This is a very important consideration as the cost is significant. Editors will also have to consider aspect ratio. Will it be 4:3 or 16:9? The choice impacts how the image is positioned as well as the placement of animation and graphics. Versioning will involve similarly complex choices. When posting television commercials in the future, editors may have to provide an HDTV version, an SD version and an MPEG-encoded version for the Internet.

Multiple formats and versions will have little effect on how editors go

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about their work. However, those issues will make it all the more important for editors to be associated with a large organization, one with strengths in all aspects of post production. Editors will become increasingly dependent upon skilled engineering staffs, duplication specialists, compressionists and a multifaceted technical infrastructure to support their clients' needs. If a producer asks for a 16:9 version, an SD version and an Internet version, the editor will need to be able to fulfill those requests quickly and accurately. The breadth of resources required will only be available through full-service post-production facilities.

Not having these services readily available will limit the market an editor can serve. The ability to compress video and compress it well will be as important in the future as it is today for a duplication facility to know how to make copies that conform to broadcast specs. An editor that cannot provide this expertise will, therefore, find it difficult to work in broadcast. The future, like the present, will be all about support and value-added services.

There will be good stuff, bad stuff and crazy stuff, but all of it will have to be edited in some form or another.

New tools for new programs

Along with HDTV, the other major development to affect editing will be the emergence of new distribution channels, including Internet and server-based mechanisms. The demand to fill those pipes will be enormous — so big, that it will lead to the birth of a new industry. The barriers to entry for this type of low-res production will be virtually non-existent, allowing many new players to emerge.

A lot of the content these new producers create will be reminiscent of the movie "Wayne's World." Someone hoping to become a superstar will buy a couple of cameras, shoot a show, edit it, encode it and put it on a server. There will be good stuff, bad stuff and crazy stuff, but all of it will have to be edited in some form or another. It won't, however, be edited in a high-end post house or editorial boutique; it will be edited by the producers themselves on Pentium IIIs.

Because the tools will be cheap and widely available, it will give rise to editors who will not come up through the usual path of apprenticing at a post house. And, these people will be focused totally on creativity. They will be less concerned with technical specs because there is no such thing as technical specs on the Internet. As long as the material

Because of the increasingly user-friendly nature of production equipment, the editor's learning curve is shortening drastically in places like Image Group Post, where equipment like Sony DVS-7250 digital switchers, DME-7000 digital multi-effects systems and Chyron's MAX! are in regular use. Photo by Benjamin Luzon, courtesy of Sony.

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can be encoded, it can be "broadcast." The tools will be very easy to use, they will be available at Radio Shack and they will work on a desktop computer. People will spend $300 on software and go for it.

High-end facilities may end up supporting a portion of this market as a service bureau. Producers will still require special gear or expensive equipment that they won't want to buy. Producers will come to post houses to have the resolution of their material lowered for the Internet or to have versions made for a variety of different media.

As seen on the cover, this edit suite at Riot, Santa Monica, includes Sony HD 24-frame, progressive, HDCAM equipment and HD monitors, as well as Panasonic HD5 and a G4 Macintosh computer.

Networked environments

The Internet will also make it possible for editors to collaborate in new ways. Already high-speed networking systems allow clients and artists to go beyond physical boundaries and work together without being together. Editors and clients can exchange ideas and comments from a continent away. One day, editors may be able to work from home while tapping into the resources of a full-service post house.

Although the technologies that make remote collaboration possible are important, useful and good, their value is limited. There will be a continuing need for the editor and client to work together under one roof. Working from home may provide editors with some flexibility, but it prevents them from fully engaging in the creative process. Because of this, most work will continue to be done in an environment that brings people together, and provides for interaction between the client and the artist. People need to be able to sit down and talk to each other. Collaborative work can be done remotely, but the best results will be achieved when people are in the same room.

The facility environment offers other, irreplaceable benefits to editors. It provides an environment for training, a place where artists are exposed to one another and have the technical infrastructure to support their work. There is great value in having a mass of artists in one place where they can interact, share ideas and experiment together. Large facilities are and will continue to be a must in order to consistently push the envelope, creatively and technically.

Editors will become increasingly dependent upon skilled engineering staffs.

Flexibility and adaptability will be key qualities for editors in the future. Editors will need the ability to quickly acquire new skills and become proficient in new platforms and new software. Editors will no longer be tagged a Flame artist or a Henry artist —such confining labels will not make sense. They will simply be *artists*.

New editing tools

In the commercial industry, it is very likely that the linear edit bay will disappear in a few years. Yet, there are some very talented people working in linear bays. They know where a cut goes. They know where a dissolve goes. They know editing. What they need to do is simply to move to the next platform. In fact, they will need to be able to do so consistently. It may be difficult to master five or six systems, but to be confined to one is no longer tenable. It limits an editor's capability and career potential because it is impossible to predict where tomorrow's software will come from.

Fortunately, tomorrow's tools will make it far easier to make this transition. Already tools have begun to appear with truly user-friendly interfaces. They do not require a long learning curve. In addition, a degree of consistency has begun to develop in how these tools function. Will editing tools eventually be as uniform as Microsoft Office? No, that is impossible because the tools come from all directions. But it is likely that further standardization will occur. Vendors will be obliged to satisfy the user's strong desire for a uniform interface because it will be the only way to sell their products.

Tools that are easier to use are a boon for editors. When I became an editor, the learning curve was tremendous. It took years to learn video signals, how to read the scopes, how to use complex VTRs and switchers. Now, the learning curve is six weeks, a month, a weekend. As a result, today's editors have less background than editors typically had in the past. Some may contend that today's editors lack depth, but that is not true. They are the MTV generation. They learn quickly. Give them a new piece of machinery and within minutes or hours they get it.

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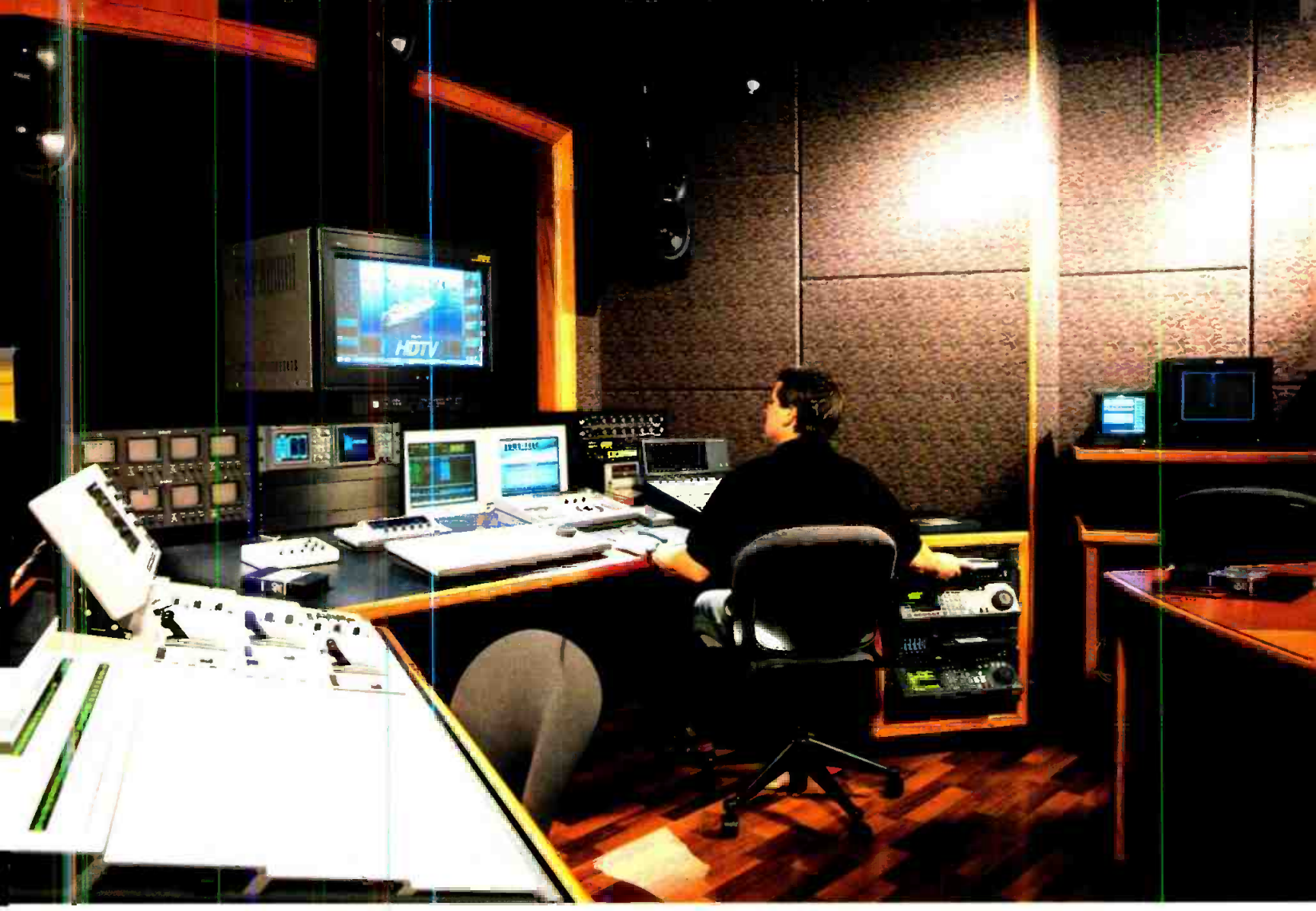

Edit Z at American Production Services in Seattle offers a Sony BVE-9100 edit controller, an HDVS-7000 video switcher, and an HDME-7000 video effects system with a Chyron Duet handling CG duties. This kind equipment offers users features previously seen only on wish lists. Photo by Concept: Benson & Rice.

When I became an editor, I had to go through a lot of pain in order to put my creative thoughts onto tape. I had to worry about thousands of lines of timecode. I had to worry about syncing 20 machines. I was carrying a ton of baggage every step of the way. It was very difficult to be creative at the same time. Today's editors don't have that burden and that is a good thing.

A truly revolutionary change in the editor's work will occur if and when interactive programming becomes a reality. Interactive storytelling could be a mystifying, and perhaps confusing, medium for editors used to editing and viewing material composed in a linear format. It will be difficult to say if something is complete and makes sense if it is compiled in a totally nonlinear format. Until the product is fully authored, the editor may have little clue as to how it holds up. The editor may have 50 minutes of images or a series of sequences, but how can he make sense of it, tell if it is well packaged or determine if it tells a story? It could be pretty disturbing for the editor.

A truly revolutionary change in the editor's work will occur if and when interactive programming becomes a reality.

The future, then, for editing will be a time of both challenge and opportunity. The challenges will include mastering the intricacies of formats and versions, acquiring new skills and providing additional value-added services to clients. The opportunities will come in the form of new markets to service and tools that extend and facilitate the editor's job. What will not change is the paramount importance of creativity in editing. The talent for assembling sound and images in a meaningful way will remain an editor's most valuable asset. ■

Richard Cormier is senior vice president/managing director at Riot in Santa Monica, CA.

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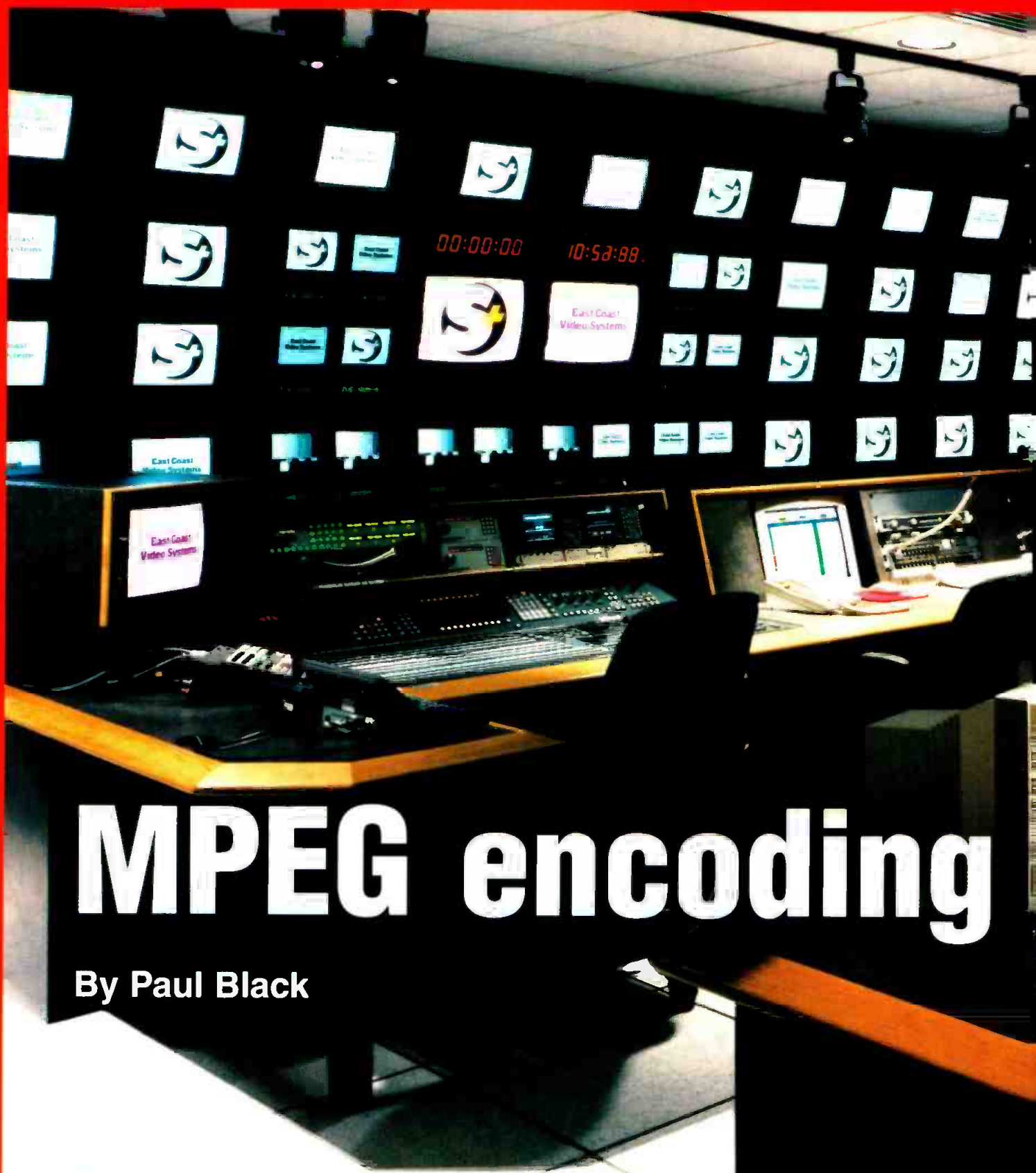

MPEG encoding

By Paul Black

In today's largely digital world, the demand for useful methods of transmitting, storing and manipulating digital data has greatly increased. For broadcast and professional video users, included in that digital data are large amounts of video and associated audio. These large amounts of data, combined with the need for high-speed transmissions, have led to the use of compression as a cost-effective solution. Many, including early HDTV adopters, have already had experience with compression encoding and decoding for RF transmission of digital data. Among other things, HDTV has introduced a requirement of substantially increased data throughput.

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With the proliferation of computer-based systems, MPEG has found its way into a variety of broadcast and production applications. Photo of S+ Studio E courtesy of IMMAD.

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MPEG encoding

Level	Max. sampling	Max. bitrate	Application
Low	352 x 240 x 30	4 Mb/s	CIF, consumer
Main	720 x 480 x 30	15 Mb/s	CCIR 601, studio TV
High	1440 x 1152 x 30	60 Mb/s	4 x 601, consumer HD
High	1920 x 1080 x 30	80 Mb/s	production SMPTE 240

Profile	Comments
Simple	Same as Main, B-frames. Intended for software applications.
Main	Most decoder chips, no cable, satellite
Main+	Main with spatial and SNR scalability
Next	Main+ with 4:2:2 macro blocks

Figure 1. The various profiles and levels of MPEG-2 define pixel counts, bandwidths and sampling structures.

Creating digital data through the standard methods of sampling analog information and digitizing it creates a problem; more bandwidth is needed to accommodate the digitized data than was needed for the analog information. Existing transmission bandwidths do not easily accommodate the higher data rates needed for transmitting higher quality or high-definition television. Over-the-air television is still limited to 6MHz, and STL systems, along with other microwave channel bandwidths, remain unchanged. So while the need to transmit digital data has increased, the available pipes remain the same. For many, the answer is compression.

Bit-rate reduction

The term compression actually describes what data specialists would call bit rate reduction, or BRR. To make the digitized data useable (so it can be efficiently stored and transported), the bit rate is reduced. Today's compression standards and implementations have allowed a variety of practical applications in professional and consumer devices. These devices include video servers, digital VTRs, and nonlinear editing systems to name but a few.

Compression schemes work because video tends to have considerable redundancy and the human visual system has limitations, especially in its ability to interpret motion. Were it not for the latter, even analog video and film reproduction wouldn't produce the illusion of moving pictures. When encoding (compressing) a series of images, the task becomes a tradeoff between image quality, bit rate, and the time it takes to do the encoding.

Currently, the BRR scheme of choice for the entertainment industry, television broadcasting, and computer applications is MPEG, named after the Moving Picture Experts Group that developed it. Properly, this is called ISO/IEC Standard #11172. MPEG differs from many standards in that it mainly defines bit streams and the way in which they are decoded back into video and audio. Specific algorithms are not defined, nor are specific encoding methods. Because of this, encoding methods can be improved over time, and manufacturers have a way to differentiate their products. The only real specification for MPEG streams is that they are decodable using the appropriate MPEG decoder.

Of the various MPEG standards, MPEG-2 is of the most interest to broadcasters, mainly due to its ability to accommodate the wide range of quality and bit-rate requirements that exist. Although other compression methods are available, MPEG-2 has the universality that is needed to allow the encoded transmission (or storage) and decoded recovery of video and audio to meet the requirements for SDTV, HDTV, production, and editing environments.

MPEG standards define characteristics common to many compression schemes. Among these are intraframe and interframe compression. Intraframe compression is basically a JPEG-type compression, where all of the information is based on a single frame. Intraframe-only compression is used for many editing applications and results in a limited amount of compression. To increase the amount of compression, interframe compression modes (those that span more than one frame) are used.

Interframe compression takes advantage of the redundancy found through a series of frames. Within MPEG, the series of frames is called a group of pictures or GOP. GOP sizes can vary; the longer the GOP, the more a signal can typically be compressed. In addition to the I (intraframe) –frames, B and P frames are used in the GOP. These frames consist of data that, when properly decoded, translate to pictures viewable by humans.

The I frame is the primary self-reference; it contains information to build a complete picture. Information from the I frame is used to reconstruct the subsequent P and B frames. The P frame is based mainly on forward motion estimation and compensation, while the B frame is based on bi-directional compensation information.

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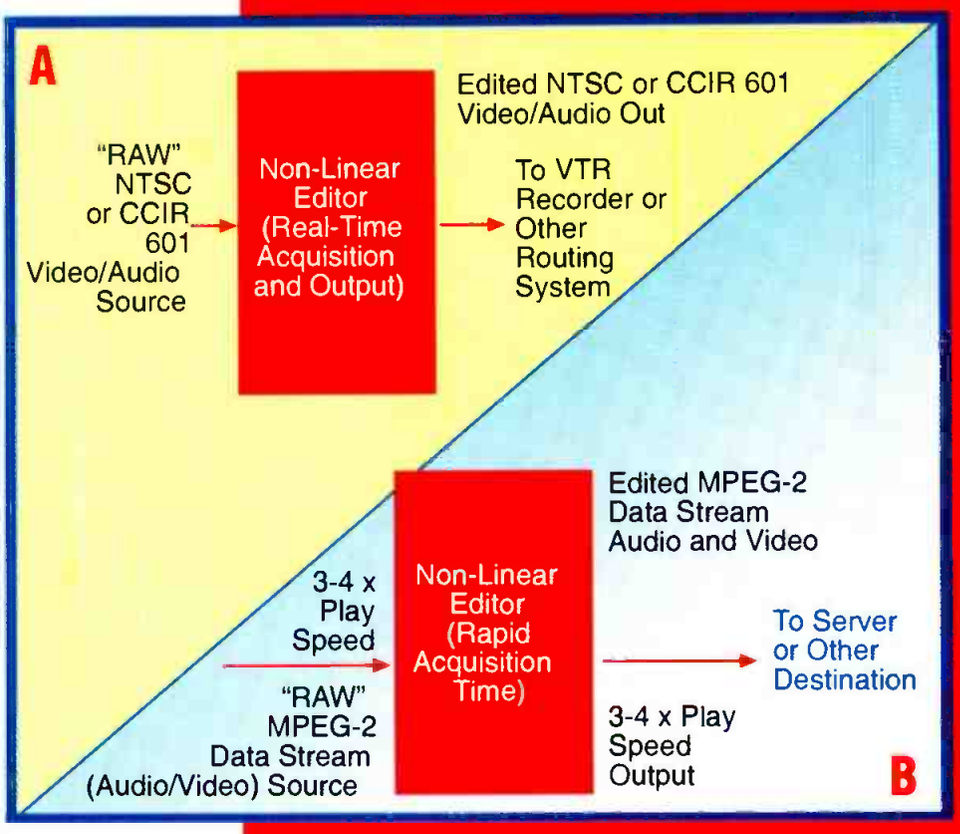
The toolkit approach

The first iteration of the MPEG standard, MPEG-1, was a big step forward for compression technology. It has been described as a toolkit approach, as opposed to the strict, regimented approach most standards demand. However, within the MPEG-1 standard, there exist some constraints, including only one sampling structure (4:2:0), a maximum picture size of 720 pixels by 576 lines, capability of only 30 pictures per second (these are frames only, interlaced fields are not supported), and a constrained bit rate on the order of 1.85Mb/s.

MPEG-2 corrects these difficulties in several ways. Other sampling structures are included (including 4:4:4 for very high quality). Both progressive and interlaced scanning are added, which allows motion prediction based on an analog frame, or combinations of interlaced fields that create a frame. Concealment techniques not available in MPEG-1 can be included in MPEG-2, with the drawback of adding to the overhead (which manifests itself in longer delays). Metadata is also allowable within MPEG-2. In storage and retrieval, it can be critical to proper operation. Transmission methods are less reliant on this information, however, there may be some application for it within receivers.

Interestingly enough, MPEG-1 is actually a subset of MPEG-2, as MPEG-2 standards were designed to include the MPEG-1 toolkit. This may sound illogical, but there is a good reason for it: it allows MPEG-1 to be decoded by MPEG-2 compliant decoders. MPEG-1 is therefore not made obsolete by its own extension.

As it is a toolkit approach, MPEG-2 has another interesting aspect to it. It is a layered data standard. The various layers are defined as profiles and levels (see Figure 1). The intention on the part of the Experts Group was to allow the standard to be useful in a variety of applications. For example, the level and profile needed to compress and transmit video and audio from a monochrome security camera would be much less than that needed to do



Figures 2A and B. Depending on the technology used, nonlinear editing systems may be capable of inputting/outputting footage in a compressed manner at (a) material might need to be loaded at real time or possibly even slower or (b) faster than real time.

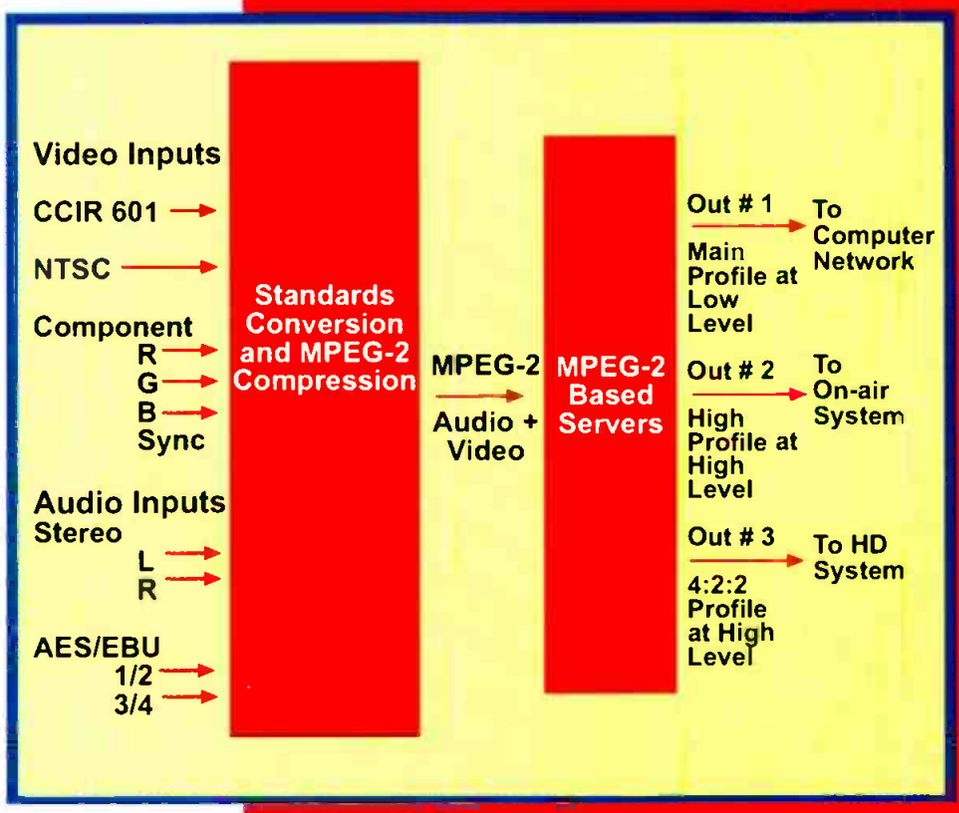


Figure 3. Within a broadcast facility, audio and video from a variety of sources can be compressed, stored on a server, and output as needed. Most, if not all, servers require additional storage space for each version stored, as transcoding from one profile/level is typicallay not done.

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the same for a movie mastered to 70mm motion picture film with multichannel audio tracks. MPEG-2's hierarchy allows it to be used for the least critical, lowest resolution needs, as well as the most demanding needs.

MPEG as a standard continues to evolve. The Pro-MPEG Committee, which charges itself with bringing the standard (and it's associated profiles and levels) into the future, has already defined further potential uses for this technology. The major thrust of the effort is to ensure that the standard will continue to evolve to meet the needs of the users and the capability of the hardware and software that implements it.

MPEG-2 today

Many manufacturers have turned to MPEG as a way to get digital video products into the marketplace. Some companies converted from proprietary compression and storage schemes, or upgraded from MPEG-1 to MPEG-2. Others struck out to tackle the challenge of integrating the needs of the existing marketplace with the capabilities of the existing hardware and software.

The four primary areas where video compression is useful in today's environments are:

- Storage and retrieval of un-edited programming (such as acquisition and playback of syndicated shows)
- Transportation of the video stream
- Low-resolution non-critical viewing (for content establishment)
- Editing/production

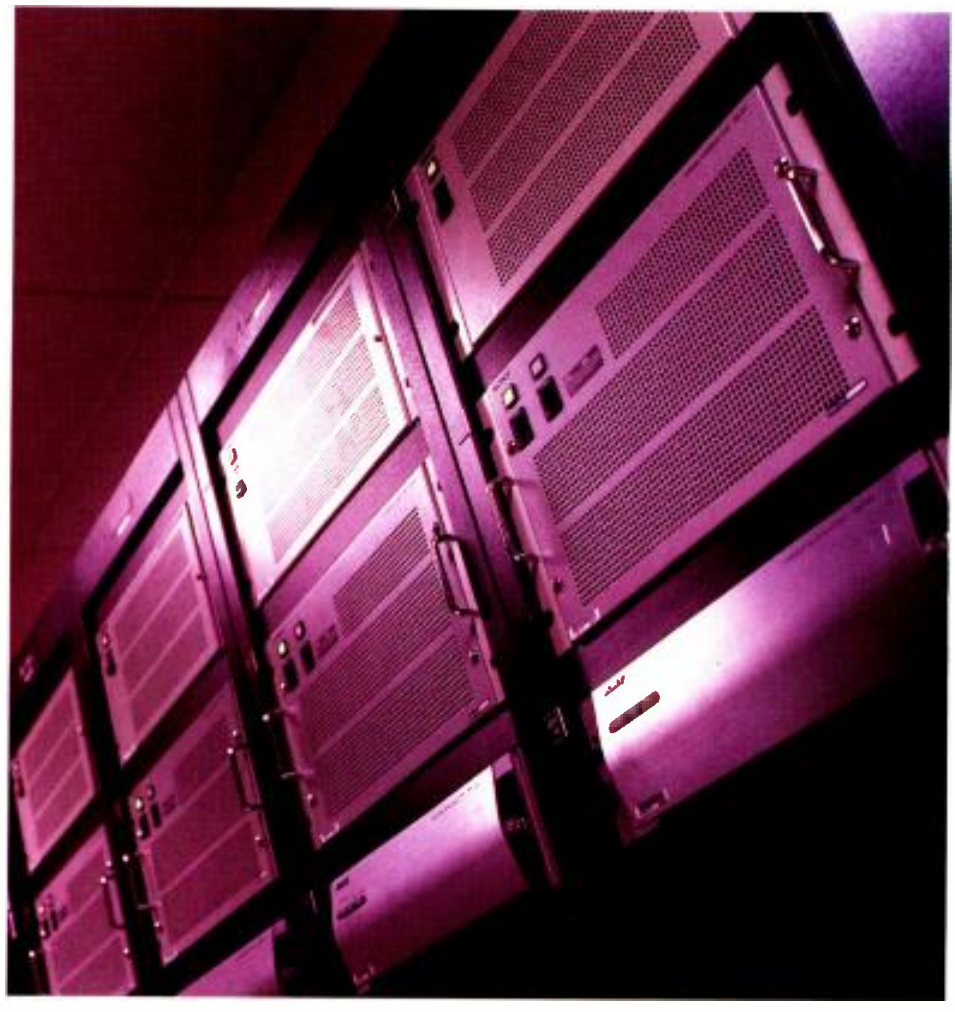
Each of these can take advantage of MPEG-2 to provide capability that otherwise couldn't be utilized.

Storage/retrieval: Compression allows a tremendous increase in disk drive storage capacity. Without compression, the huge amount of storage space (and bandwidth) needed for real-time record and playback would outstrip both the available space and the budgetary capability of even the largest facilities. MPEG-2 allows efficient use of computer-based disk drive storage and playback for current NTSC needs. MPEG-2, because of its flexibility, gives manufacturers the ability to allow the customer (facilities) to define what level of playback resolution and overall quality it wants to use on computerized video servers. Quality that is at least as good as the playback from a professional-grade analog cassette-based VTR format is readily achievable, under even one of the lower profiles.

Later, if desired, changing the profile to a higher one can allow for an increase in quality. The trade-off in this case is likely to be the reduction in overall storage time on a given set of disk drives. However, this may be a small penalty to pay for the resulting quality increase.

Transportation: Bandwidth availability in transit streams is similar to money; there never seems to be enough to meet the current needs. Any method that can increase a transit stream's capacity is useful.

Here, however, is where tradeoffs truly have to be carefully scrutinized. The reason is video delay. Any form of compression, even a mild one, will introduce some form of delay into the overall transit time (due to compression processing at



Servers, such as these Sony MAV-70s, use varying levels of MPEG compression, reducing the need for expansive tape libraries. Keeping large archives available electronically allows content can be recalled to individual workstations for use by working journalists and editors. Photo courtesy Concept: Benson & Rice.

While the need to transmit digital data has increased, the available pipes remain the same.

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both ends). When combined, delays can add up to anything from minor irritants (such as delay echo in talent IFB earpieces) to major challenges (such as massive lip-sync problems on-air). Careful application of compression schemes and appropriate fixes are necessary to avoid these pitfalls.

MPEG is uniquely suited to this purpose as it can be invoked to the level necessary to get the job done, but without violating the standard. Most other forms of compression don't have this advantage. This makes it difficult to implement them in an environment where the bandwidth can't be altered to fit the compression scheme. MPEG-2's toolbox approach is extremely useful in this situation.

Low-resolution viewing: Most stations have archival or acquisition needs that necessitate rapid checks for content purposes. The recent tendency of some people and organizations to sue the media over its reporting style has added to this need. Legal counsels now frequently want to view video clips so they can find items to use as court evidence.

Probably the largest need, however, exists in news operations. The ability to see incoming news stories from a journalist's workstation is more than just a convenience. It's a competitive necessity in some places, such as an all-news cable network.

Because compression by its very nature allows more data through less bandwidth, a LAN meeting the 100 BaseT standards (common in today's office environments) can be used to select and view real-time full-motion video from a personal computer. PCs can therefore replace VTR-based viewing stations. PCs can also have software capable of searching and cataloging video clips to lower the time necessary to find a particular clip (see the Media asset management Special Report on p. 66). After selection by a producer or writer, the clip can be marked for editing, or simply delivered for on-air playback, at full resolution, to an on-air video server.

An MPEG-2 based server is unique in its ability to perform this function, as different profiles and levels can be utilized for different purposes within the same hardware (but typically not without using additional storage space). Outputting of video in different forms is easily achievable when using MPEG-2, as it can be readily adapted to current needs (see Figure 3).

Editing/production: Most nonlinear editing systems ultimately output video in an NTSC-usable form, such as composite analog, or CCIR 601 (serial digital). Internal manipulation of the information put into the system is usually proprietary to a particular system. The need to utilize a compression algorithm within a nonlinear editor is usually a decision made by the particular software writers who wrote the code for that system.

Because compression by its very nature allows more data through less bandwidth, a LAN meeting the 100 BaseT standards (common in today's office environments) can often be used to select and view real-time full-motion video from a personal computer.

The challenge usually faced by users on nonlinear systems is the time it takes to digitize the audio and video (the data, that is) before the system can do any editing. Most editors require a show be input in real time, making the first requirement for editing a half-hour show to digitize all the elements in real time. Following the completion of the editing, a real-time playback has to be initiated to the final destination (frequently a VTR).

Using a compression scheme on the I/O of the editor allows the program to be input faster to the editor and output faster to the final destination. Taking this one step further, facilities that are equipped with some form of high-speed, high-capacity networking (such as a fiber optic link) can output from an editor to a server, and then to air, in a single operation.

However, within compressed environments, there is a risk of cascading algorithms. When different compression schemes are combined within a single facility, problems can arise. Differing methods of encoding and decoding can cause problems in both video and audio. The most common unwanted artifacts are similar to those seen in analog systems; white or black "sparkles" in the video, pixellation, chroma levels and qualities not correct. Sometimes, a complete lack of interoperability will keep streams or video files from transferring at all. This usually makes it necessary to fall back on a tape medium to transport the show to air. Dedication to a single compression scheme can eliminate this.

Down the road: MPEG's future

The need for high-speed transmission in today's world is well known. As audio and video is viewed increasingly as data, transmission of entertainment and information will tend to merge. This could result in something as unique as over-the-air distribution to the public of everything from home shopping information to purchase of power from utility providers, all via insertion into the DTV datastream. As mentioned, the Pro-MPEG Committee, composed of manufacturers, users, engineers and scientists from all over the industry are continuing to bring MPEG forward as time passes. MPEG in all its forms is likely to lead the way in the new millennium for compression of what today we call entertainment. Tomorrow, however, it's entirely possible that it will all just be referred to as data. ■

Paul Black is the engineering supervisor at KPIX, San Francisco, CA

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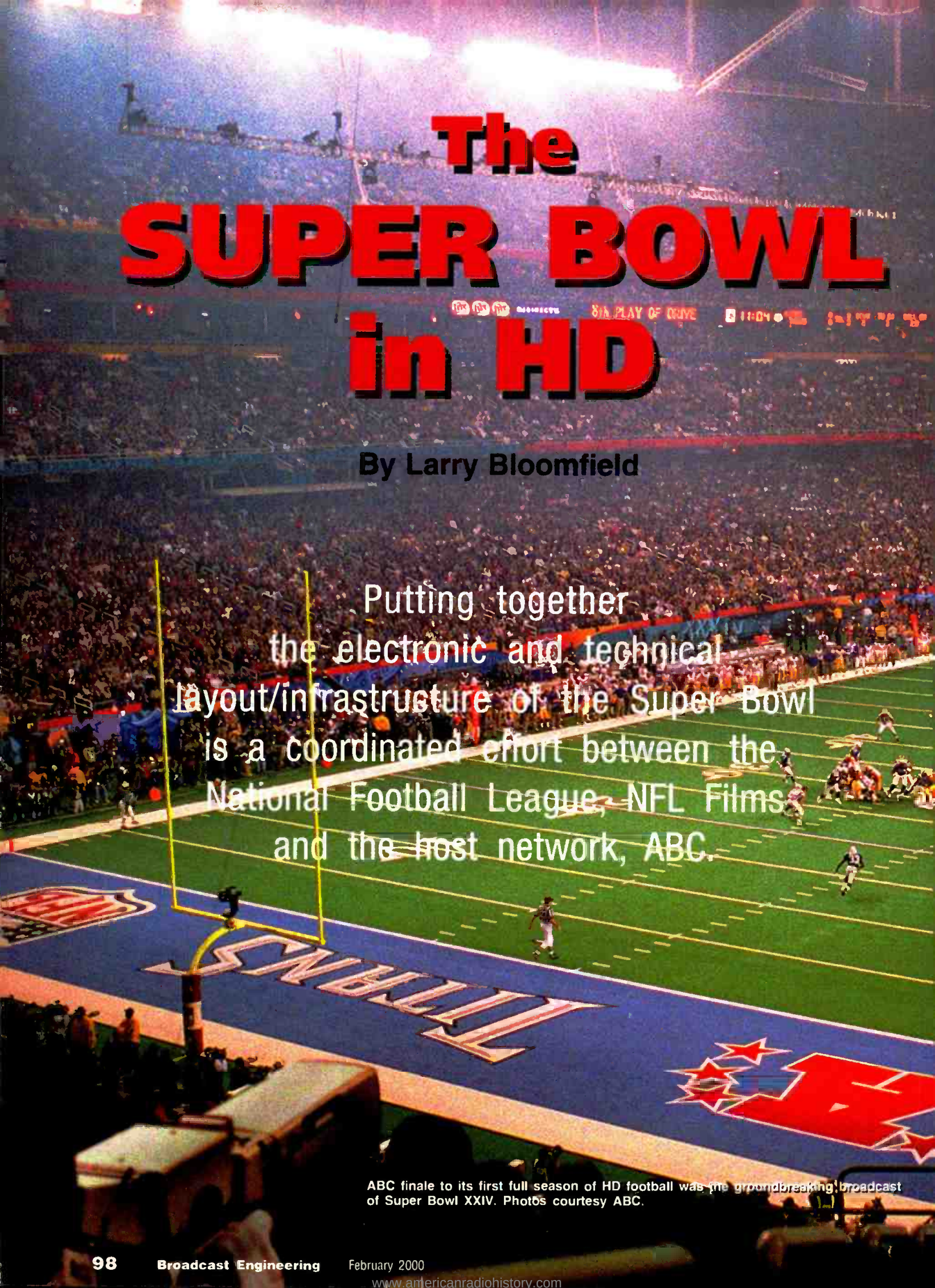
The SUPER BOWL in HD

By Larry Bloomfield

Putting together the electronic and technical layout/infrastructure of the Super Bowl is a coordinated effort between the National Football League, NFL Films and the host network, ABC.



ABC finale to its first full season of HD football was the groundbreaking broadcast of Super Bowl XXIV. Photos courtesy ABC.

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The SUPER BOWL in HD

Panasonic's HD truck, which also saw use during a full season of Monday Night Football broadcasts, features a complement of Panasonic AJ-HD2700 HD-D-5 multiformat VTRs.

Three venues

You can't put together an event of this size without significant planning. Gary Reed, assistant chief engineer at NFL Films, described the layout at this year's Super Bowl as being three compounds outside and adjacent to the Super Bowl/Georgia Dome: international, domestic (non-live coverage) and network live coverage. In addition to this there were 18 different production booths within the Georgia Dome, all feeding different audiences around the world.

Reed said of the three compounds, the international compound was where NFL Films was located and fed the world Super Bowl XXXIV in whatever format each destination needed. The Japanese television network NHK had its own NTSC truck in the international compound as well. NFL films provided NHK with feeds for its live broadcast in addition to its own preparatory cameras. NHK also did the game in HD.

The domestic compound is where everyone who was not involved in the "live game" coverage was located. It was in this compound that the "stand-ups" were done for the "non-live" coverage teams and where sports reporters for independents, NBC, CBS, FOX and the other outlets held court. Also competing for space in the domestic compound were "George Michael's Sports Machine" show and QVC Shopping Network, which did interstitial bits while hawking its wares.

The third compound is where the "live network" coverage of Super Bowl XXXIV took place. If asked, "Who has extensive experience at successfully televising football games in HD?" ABC-TV certainly would be a correct answer and it was here, in this third compound, that ABC-HD and its NTSC counterparts were located. With 30 years of televising the now legendary Monday Night Football, ABC-TV capped off its first season of doing football in high definition with Super Bowl XXXIV. There is no question that ABC brought a considerable amount of experience, talent and ability to the table and airwaves for its season's grand finale — and what a finale it was.

With 30 years of televising the now legendary Monday Night Football, ABC-TV capped off its first season of doing football in high definition with Super Bowl XXXIV.

Long equipment list

To preserve the integrity of the old fashioned 4:3 NTSC format and be able to offer digital television viewers all the advantages of the superior HDTV 16:9 format, without compromise, ABC actually did two football games simultaneously for each of the 17 games, including Super Bowl XXXIV. At each venue there were two television remote production trucks, one digital high definition, the other digital component 525.

Because of the number of venues involved in covering sports events in general and the ever-changing requirements of each, it isn't practical to have any permanent infrastructure in place, so the infrastructure equipment is rented on a "game-by-game" or "event-by-event" bases, according to the requirements of each.

A rental house provided a large amount of Telecast Fiber equipment so NFL Films could interconnect the compounds to the field, compound to compound, and so on. The mix of gear included a Viper-800 (eight-channel video card frame), a Viper Mussel Audio/Video System (four video, eight audio with dual-channel intercom and data), a DiamondBack (eight video channel multiplexer), an Adder-162 (32-channel audio frame with dual-channel intercom and data), and the Adder-161 (16-channel unidirectional audio frame). NFL Films was also provided with Sony ENG (DVW-700WS) packages, which included a full compliment of accessories.

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The SUPER BOWL in HD

organizational representation was truly impressive," says Reed. He counted a total of 48 cameras for ABC (this was both NTSC and HD), and NFL Films' "world feed" had five cameras. These 53 cameras were pooled, feeding all compounds and other authorized recipients. In addition to these 53 cameras, there were proprietary cameras as well: NHK had three cameras, as did Televisa (Mexico and South America), SatOne (Germany) and B Sky B (England, direct-to-home satellite). There were six ENG crews, of which three were exclusively Disney's.

Here in the U.S., more than 25 ABC affiliates, including O&O's, from KITV-DT Channel 40 in Honolulu, the nation's first commercially licensed DTV station, to WCVB-DT, Channel 20 in Boston, broadcast Super Bowl XXXIV in both HDTV and NTSC on their sister channels.

Producing in HD

The HD parts of these football games were made possible through a unique collaboration between ABC-TV and Panasonic.

Warren Allgyer, president of Panasonic Broadcast said, "Super Bowl XXXIV and the entire Monday Night Football season stand as a testament to the real-world performance that the Panasonic HDTV production truck and equipment can deliver.

"Game conditions, which included six inches of snow in Denver to heat that surpassed 120 degrees on field in Phoenix, attested to the ruggedness of Panasonic's HDTV equipment," Allgyer said. "Our partnership with ABC was pioneering and proved memorable, challenging and highly successful."

All 17 HD football games, including the Super Bowl, were produced using the year-old, 58-foot Panasonic/ABC-HDTV studio production truck, which was designed and engineered by Panasonic's system integrator, Synergistic Technologies Inc. (STI) of Canonsburg, PA. STI had staff on hand at each game to keep things in proper repair and to lend occasional technical support.

Heading up the engineering team for ABC-TV in the HD truck, was technical manager Kathleen Skinski, a veteran of HD Monday Night Football.

Calling the shots for ABC-TV's HD game was director Norman Samet, who was assisted by associate director, Valerie Fischler and production manager Beth Guilaini-Gatto.

The HD truck

The Panasonic/ABC remote production truck is crammed with feature after feature, including some television systems "firsts." Topping the list is the first all-widescreen 16:9 monitor wall that uses flat panel plasma and LCD displays. Up until now, HDTV trucks have done most production monitoring on less costly

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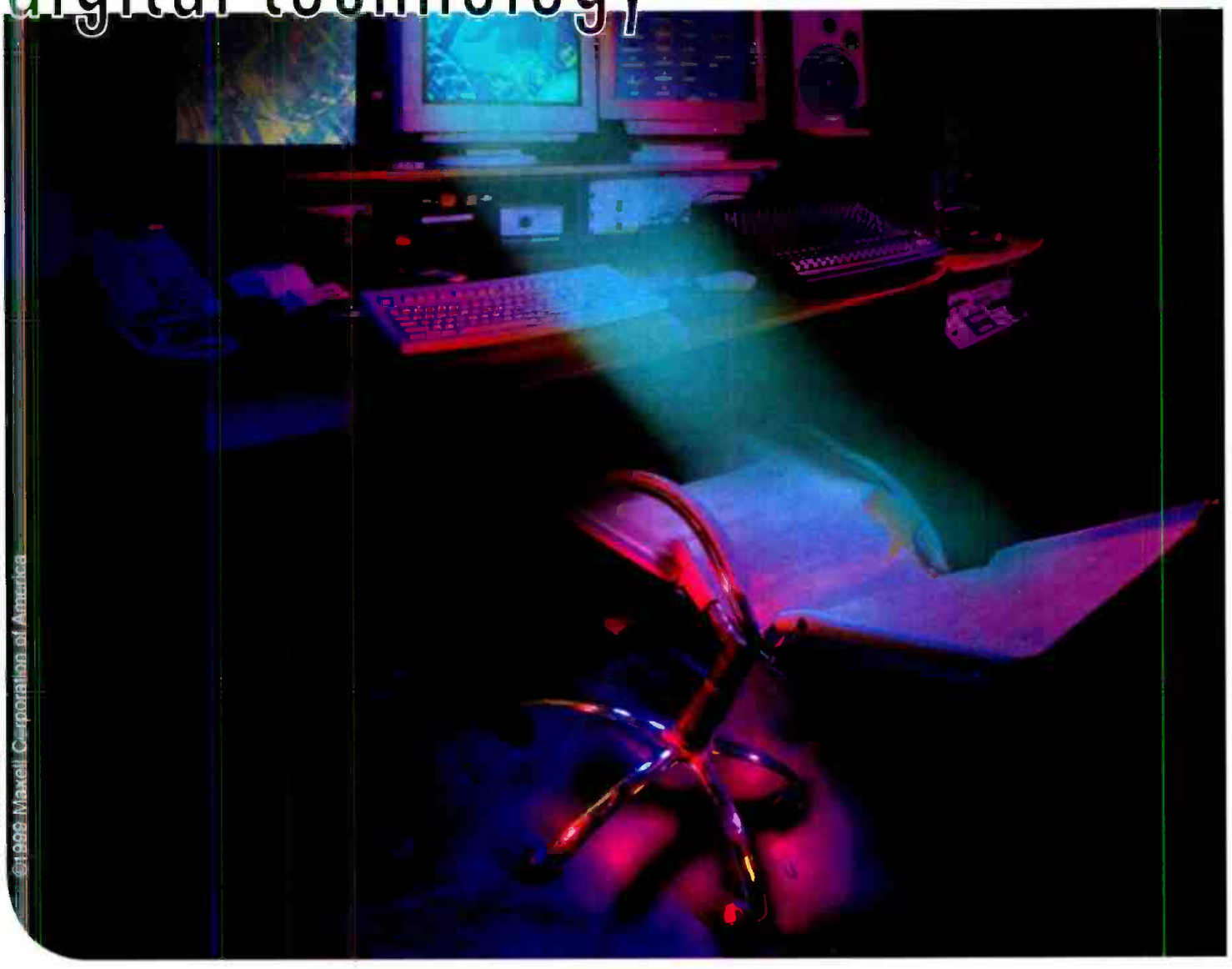

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The SUPER BOWL in HD

ABC's TD Michael Karman at the Snell & Wilcox HD 1024 production switcher viewing feeds on the all 16:9 monitor wall, which uses Panasonic PT-42P1 plasma and Panasonic BT-S915DA and SGI 1600SW HD LCD monitors.

4:3 NTSC monitors. Two Panasonic PT-42P1 42 gas plasma 480p 852x480 displays serve as the monitor wall's centerpiece. A third Panasonic 42" plasma display is used in the announcers' booth. The remainder of the monitors consisted of 10 Panasonic BT-S915DA 9" switchable color monitors, and 34 SGI 1600SW 17" HD LCD displays that were set to 1600x1024 resolution.The acquisition backbone and original compliment of the Panasonic/ABC HDTV production truck consists of four AQ-7200P 720p full-featured studio cameras and three AQ-720p hand-held cameras. This is the same equipment that was used to shoot the HD version all 17 regular season games. These are 720p cameras that operate at 60fps progressive. The pictures from the cameras were carried by Mohawk/CDT fiber optic camera cable running the several thousand feet to the HD truck.

The studio cameras were equipped with Fujinon HA66x9.5 BESN and HA66x13.5 BESN HD lenses. The handhelds were outfitted with both Canon HA20X7.5BEVM HH HD and HJ9X5.5B wide-angle lenses for handheld cameras.

The U.S. HD audio feed was every bit as good as the pristine 720p pictures.

In addition to this normal compliment of cameras, ABC added two Philips LDK 9000-720P cameras for Super Bowl XXXIV. One had a Canon HD 40X lens and the other had an Angeniux HD 18X, rounding out the camera inventory to a total of nine. Eight of these cameras were in the Georgia Dome and one was used for beauty shots from the Coca Cola Building. This feed was beamed to the compound by a Lucent Laser Link.

Technical director Michael Karman cut the HD version of Super Bowl XXXIV. Karman sat at a Snell & Wilcox HD 1024 production switcher that has 24 inputs, 1½ M/E banks, two DVE channels, four still stores, one effects deck with two keyers, and a program/preset deck that has one keyer. All 24 inputs to the HD 1024 are programmable. In addition to the Snell & Wilcox 1024 switcher already in the truck, Snell &Wilcox provided an eight-input 1010 switcher to act as a sub-switcher to carry the additional tape resources for the game.

Other feeds came from ABC-1, the NTSC remote truck. Samet said, "We got both a dirty (with Mattes) and a clean feed (no Mattes), which were both upconverted by a Leitch Juno. We also had an output from ABC-1's Sony router so that we could take any of their facilities direct: for instance, the show opening from their (NTSC) tape machine. These were, of course upconverted by a Leitch Juno also."

Graphics and tape

Graphics and character generators are always an intricate part of any sports event. The clock and "score bug" were upconverted by two Leitch Juno HDU-3800s. One Juno was used for video and the other for key. The Leitch Junos pre-set to position left and right so the bug would fly in and fly off the wider HD screen; otherwise the clock and score bugs flew in and out relative to the 4:3 screen instead of the 16:9 HD screen.

Instant replay and archiving are major parts of any sports event. Riding herd on VTRs and servers' storage devices were Ray Soroka out of ABC-New York, along with Lee Nowell and Allen Pierce.

The ABC/Panasonic HD truck has six Panasonic AJ-HD2700 HD-D5 multiformat VTRs, but can accommodate a total of 10 VTRs. Samet said ABC added an additional D-5 machine to record, do slow-motion replays and playback of other pre-recorded elements.

These VTRs were kept busy throughout the entire game and after. They were used for instant replays, editing and the integration of moving graphics. More VTRs would have been necessary were it not for the four Pluto Hyperspace HDTV disk recorders that were interfaced with Panasonic AJ-HDP510 720p HDTV processors. This interface allowed the truck's HD digital disk recorders to record their 720p signal.

In addition to this framework of VTRs, the short and long-term storage

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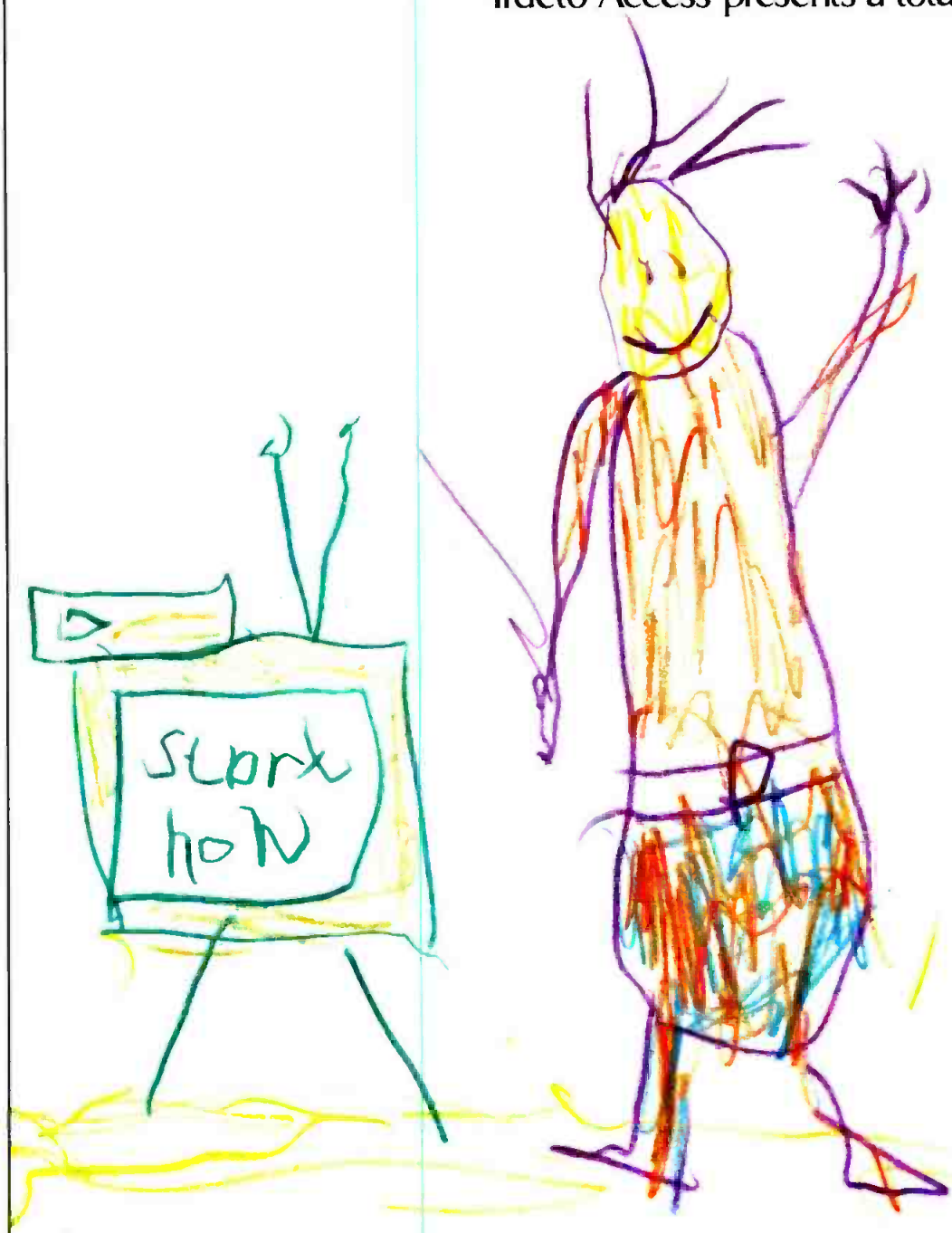

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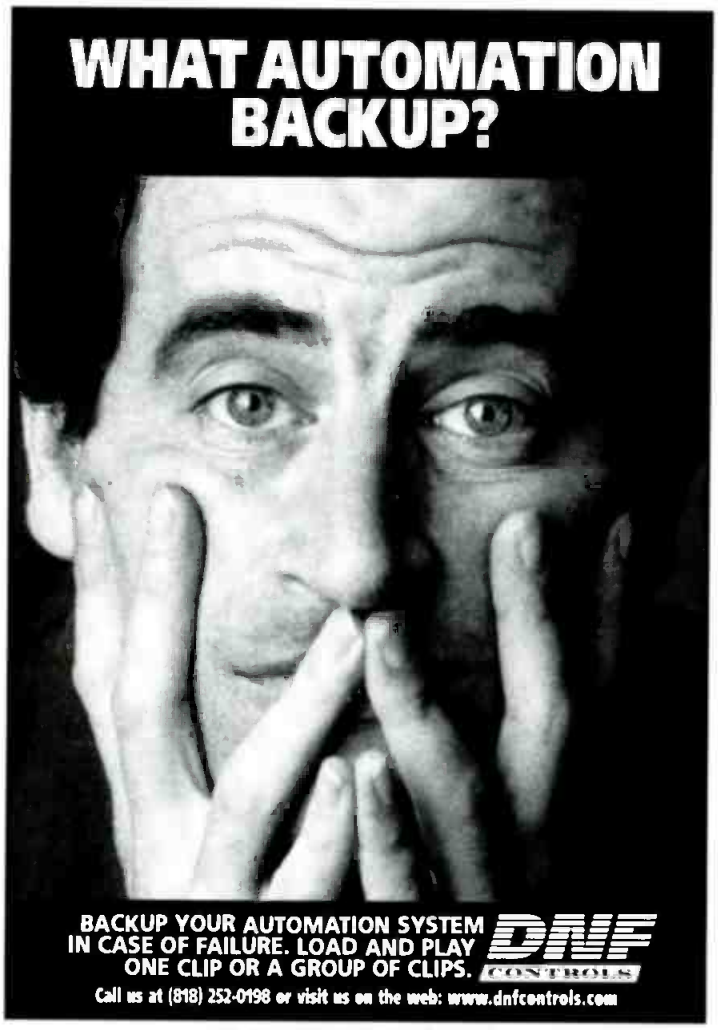

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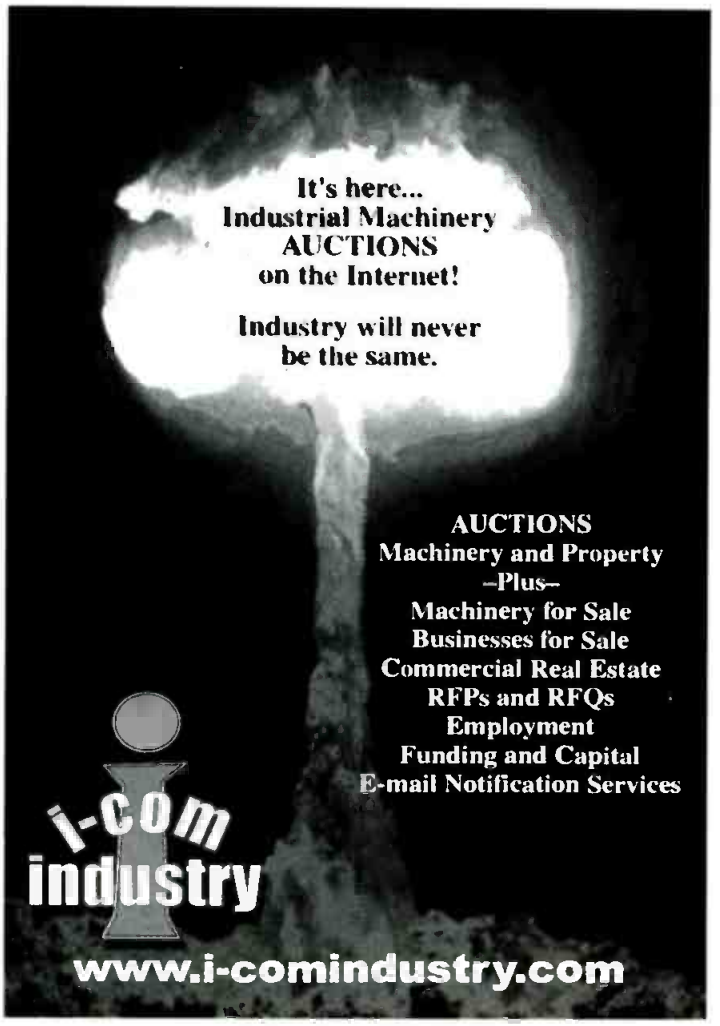

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The SUPER BOWL in HD

devices were rounded out by a pair of Panasonic DVCPRO progressive decks (480p) that were used for bumper clips shot by a DVCPRO progressive camcorder and upconverted to 720p by a Panasonic AJ-UFC1800 Universal Format Converter. The UFC-1800s can cross convert between all recognized ATSC standard digital video formats, and the truck is equipped with three.

NHK had two additional VTRs added to the HD truck for the purpose of recording the game in 1080i for air in Japan. NHK's NTSC audio was fed to these 1080i HD machines to round out that package.

The U.S. HD audio feed was every bit as good as the pristine 720p pictures. The production employed two Panasonic Ramsa WR-DA7V digital audio mixers that were linked together in the truck's audio suite. The pair of WR-D7Vs provided 64 input channels and 5.1 capability.

With multichannel audio, proper phasing is critical. ABC used a Holophone microphone to pick up five channels of audio to enhance the 5.1 channel audio experience.

Keeping track of the proper stereo polarities, was the Tektronix 764 serial/digital audio monitor, which gave not only level indications, but displayed the proper phasing as well.

A Leader LV 5836B was used for the all-encompassing 5.1 channels of audio. The LV 5836B provides a polar display of the five channels and a bar graph of the low-frequency effects channel.So the crew could hear what was going on, the ABC/Panasonic HD truck is equipped with Genelec's 1030/1031/1092 self-powered audio monitors.

An RTS ADAM Intercom is used throughout the system.

The intercom system was configured so that communication between the director, cameras, VTR, audio, TD, video operators, the production assistant, graphics operator, the AD in the NTSC truck and the AD in the HDTV control room in New York was possible. At the same time, technical staff members are able to listen only to the producer, director, production assistant and graphics operators in the 525 NTSC truck. The 525 NTSC truck directed the announcers.

Although Panasonic supplied the lion's share of the equipment, there were other equipment manufacturers whose gear was indispensable. Routing of the HD signals was handled by an NVision-ADC Envoy 6128 (64 channels in by 128 out) routing switcher. The Envoy is capable of carrying uncompressed 1.5Gb / svideo even in large configurations. This unit is expandable to 128x128.

Routing was supplemented by a Grass Valley Group SMS-7000 in a 64x64 configuration, which includes

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The SUPER BOWL IN HD

a serial-digital interface, analog audio and stereo audio I/O. Also under the category of routers is a purely digital product by Grass Valley Group, their 7500 NB, narrowband router, which is a 256x256 synchronous AES-digital audio device, that fits into a compact 12 rack unit space.

Digital television wouldn't be digital were it not for the encoders/decoders. Tiernan Communications THE1 encoder was used in its HD configuration. Complimenting the THE1 was Tiernan's TDR6H, a modular receiver/decoder.

Test and measurement

Even HD needs test and measurement equipment. Keeping things in time was a pair of identical Tektronix TG-2000 generators, with automatic changeover and an HDVG1 HD module, a multiformat test signal generator that provides three each 1.485 Gb/s serial/digital video outputs in 1080i/60, 59.94, 1080p/25 and 24Hz rates and 720p formats in 60 and 59.95 field rates. In addition to these outputs, analog feeds for NTSC, color black and tri-level sync were also available.

Keeping track of the SMPTE 292 signals was a Leader LV 5152DAs, a multiformat HD waveform/vector/picture/audio X/Y monitor. The LV 5152DA has automatic setup recognition and will display any of 14 ATSC video formats.

SMPTE 259 signals were monitored on Tektronix WFM-601M scopes permitting the technical types to drill right down to the bit level. The WFM-601M also has an arrowhead presentation that gives equivalent NTSC/PAL gamut limits, which lets the engineers know which colors will be "legal" in subsequent composite formats.

Mohawk/CDT fiber optic cable carried camera images fromthe field and broadcast booth to the truck. An additional camera feed was carried from the Coca-Cola Building via a Lucent Technologies Laser Link.

Feeding the network

The final hurdle in getting the Super Bowl to the world was to get the feed from the Georgia Dome to the New York HD release center where it was distributed to the affiliates of ABC's DT network. The ultimate responsibility for this feat rested with Richard Wolf, vice president of telecommunications at ABC. Wolf said: "We relied on the Williams Vyvx Services VenueNet, a 45Mb/s infrastructure at the Georgia Dome for continued DS3 conductivity into ABC-New York. ABC utilizes a Tiernan encoder 720p, Tiernan encode/decode hardware and Tiernan protocol conversion equipment that interfaces with the DS3 network."

Super Bowl Sunday is really several shows in one. There's the pre-game show, the game itself, the halftime extravaganza, the post-game wrap-up and, although not actually a part of the gridiron action itself, the commercials.

Samet said, "We (the HDTV truck) did nothing for the pre-game show due to all the clips that they used. It would have been impossible to duplicate them in HDTV." With regard to the Super Bowl's halftime and post game shows, that's a different story. Samet said "... nothing different in equipment. What we had is what we used. We covered the halftime show with our own HD cameras, where possible. Same with the post-game show."With regard to the commercials, the HDTV control room in New York, downconverted the HD commercials and fed them to the NTSC master control for insertion. Samet said, "NTSC spots were upconverted and mixed with the HD spots." Commercial integration was all done in New York at the ABC HD Release Center.

For more information about the ABC/Panasonic truck, log on to their web pages at www.panasonic.com/broadcast or www.STIDigital.com. The NFL also has a website at www.NFL.com. ■

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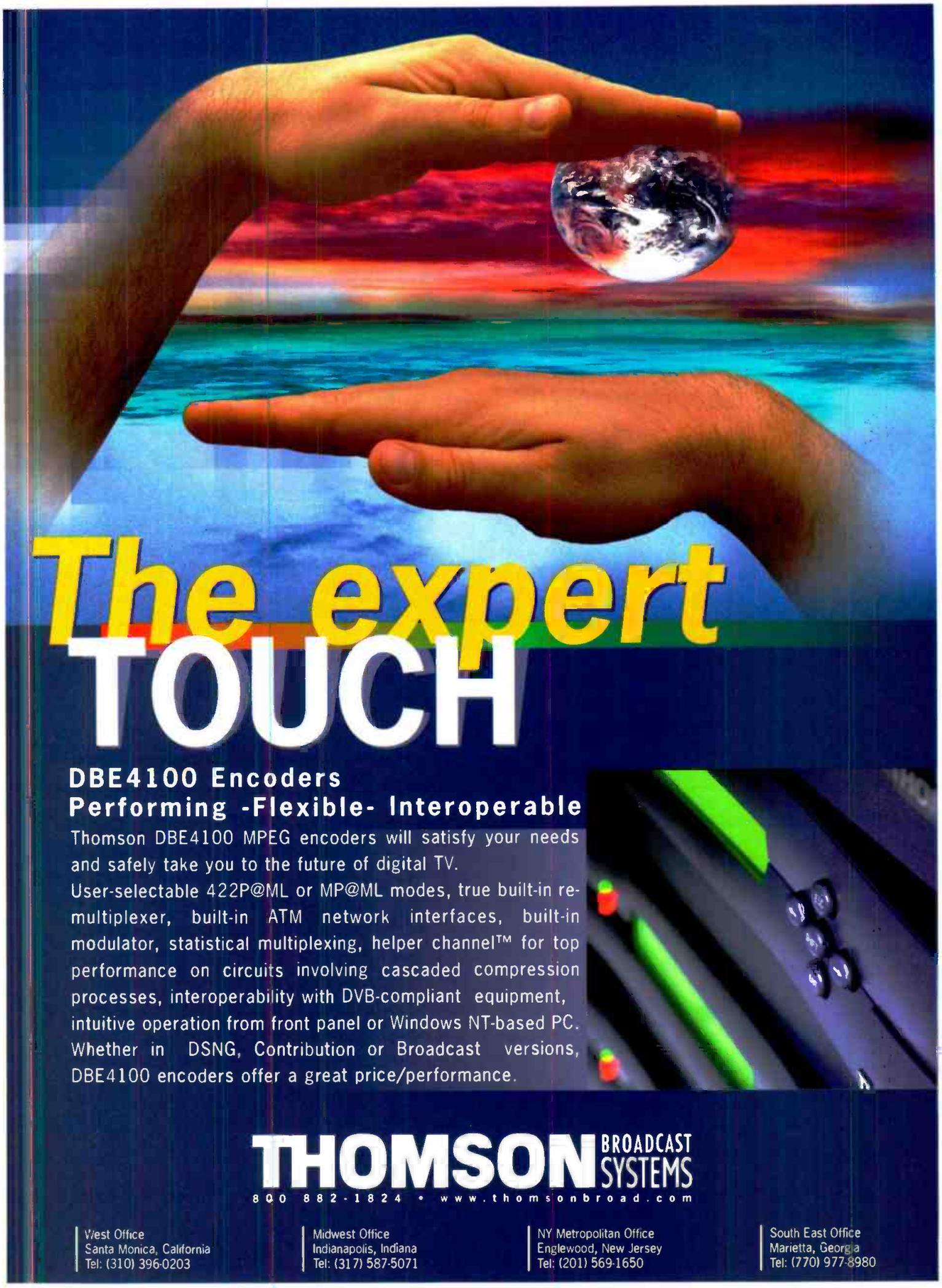

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Grass Valley Group's Profile XP video server

BY SCOTT LIBERT

In just one generation, information systems have evolved from centralized, monolithic mainframes to distributed, globally-interconnected computers. More important, these flexible, scalable, and inexpensive systems offer an ever-growing array of software — software that continues to decrease in cost while increasing in capability.

The development of similarly networked and application-rich systems for video is well under way. Simply put, these systems will make more content available to more people at a lower cost. And with less expensive, more integrated and more software-rich facilities, digital broadcasters and video professionals will realize greater profits that can be reinvested in even more content for traditional and new digital media distribution.

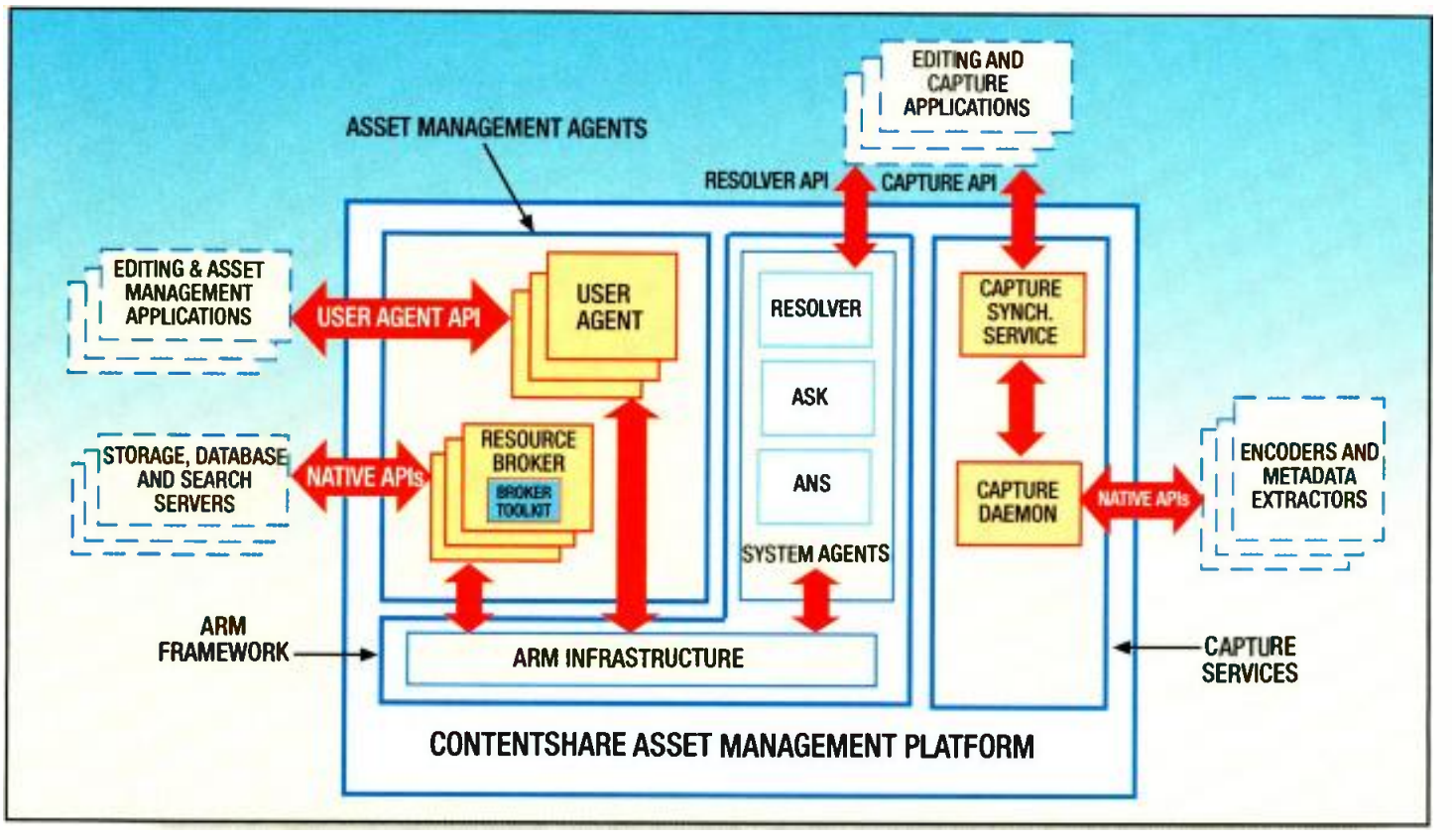
As these new video systems evolve to enable greater content creation and distribution opportunities, broadcasters, video production professionals, equipment developers and a new generation of system/software integrators must ensure that everyone in this highly networked environment keeps pace with a rate of innovation sure to be rapid. To do so, they must work together to develop open systems which address several challenges:

•To be competitive in the digital content era, production margins must be increased through comprehensive workflow management tools that efficiently link users and their digital media assets, including newsroom databases, video archives, the Internet, billing systems, traffic applications and more.

•Systems supporting broadcast facilities must be dynamically configurable to reduce support and maintenance costs.

•The return on investment in advertising and program content must be maximized by repurposing content for an ever-increasing number of digital distribution pipelines.

•Large computer networks incorporated into broadcast facilities must



The Grass Valley Group's user agent API allows applications to access ContentShare platform functionality.

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enable global scalability, security and support for numerous hardware and operating system platforms, as well as various high-powered computing devices.

Software bus speeds creation of complex applications

With the proliferation of digital storage technology, developers of broadcast and new media-oriented software are finding it necessary to create more complex and reliable applications in less time. Thus the servers and media storage platforms that provide the easiest application-development tools will become the most pervasive.

Building on the widely accepted Profile Application Programming Interface (API) and similar computer and software industry API models such as JAVA, the Grass Valley Software Bus provides an easy-to-use tool set designed to speed the design and delivery of new, richer server-based applications. This ability is made possible by providing low-level engines that developers can use to offload significant portions of their code development to the digital video server platform. Whether for news or other production applications, transmission, media management, or any other video application, the Grass Valley Software Bus supports the easy extension of existing applications and programmer-friendly creation of new ones.

The Profile Software Bus includes access to the current low-level API but also provides abstractions for managing movement of material to and from a data tape archive, event scheduling and timeline management, diagnostics, monitoring, and error reporting. Ultimately, the Profile Software Bus is a set of tools that provide various levels of abstraction. Since the API is format independent, developers need not worry about what compression format or definition their customers may choose, eliminating the need to develop different applications for each format type.

ContentShare offers Internet technology-based access to media assets

Complementing the openness of the Software Bus architecture is the ContentShare platform for media access. A horizontal layer of support software — sometimes referred to as middleware — it offers an open, Internet standards-based approach that lets applications communicate easily. Using the same core technologies that power portals on the World Wide Web, the ContentShare platform lets users easily access digital media assets without having to worry about geographic location, the formats in which they are stored, or the applications that created them.

As the broadcast industry embraces computer industry models, the emphasis shifts from hardware requirements to application capabilities.

The ContentShare approach has far-reaching implications for broadcasters and video professionals. It overcomes the need for — and eliminates the cost of — custom software to bind together different programs by offering standard tools for cross-platform, cross-application communication. It gives developers a common framework for media asset management, without compromising the features, integrity, or competitiveness of their individual applications. And it speeds the production process, increasing the amount of content that can be created and maximizing a user's creativity.

In other words, instead of trying to solve media-management problems one application at a time, it offers an industry-standard framework that any application can use.

Based on research performed under a grant from the National Institute for Science and Technology (NIST), the ContentShare platform is based upon an agent-oriented architecture. It provides a middle layer of software (including a few active processes known as system agents) for exchanging content and associated information between distributed computers. Each computing device runs its own proprietary software as well as a small ContentShare software agent known as either a broker, if the device provides services, or a user agent, if the software is an application that uses other services in the system.

At the same time, this revolutionary platform enables an evolutionary migration path—supplementing existing systems, not displacing them. The ContentShare platform is designed from the ground up for extensibility so that developers may quickly add new types of information and content and new services that operate upon them without affecting existing software. It also enables new versions of software to be integrated without impacting the entire system.

Key to success in an increasingly software-centric world are the Grass Valley Group's Software Bus architecture and ContentShare platform for media access. These two solutions enable the creation of greater and more sophisticated system and application-level software — programs that leverage open standards to work together and share information easily, and provide the ability to create more complex and reliable applications in less time. ■

For more information on Grass Valley Group's Profile XP video server, circle 450 on the Free Info Card.

Scott Libert is chief software architect for Grass Valley Group.

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Applied Technology

Panasonic's new 24-frame video production tools

BY DAVID WISWELL

The ATSC television system allows multiple frame rate and multiple image format video. Consumer Electronic Association (CEA) members have pledged that DTV receivers will have the ability to receive any of the ATSC image formats. A CEA-compliant DTV receiver will have the burden of converting the ATSC image formats to the display image format of the viewer's receiver. Most ATSC display devices will not be able to display all ATSC images without converting them to a "native" display image format.

When NTSC television is transmitted, baseband video is applied to an AM modulator, band shaped, amplified and combined with the FM modulated audio transmission signal to form the complete transmitted TV channel. In the ATSC television system, video and audio are combined in a 19.4Mb/s transport stream and transmitted using 8-VSB modulation of the broadcaster's transmission RF carrier.

The video portion of the ATSC transport stream can be high-definition or standard-definition, one program at a time or multiple programs. The digital video signal must be compressed using MPEG compression before it is combined in the transport stream. Data and audio can be transmitted which may or may not be related to the video program in a multiple-program-per-channel scenario.

Transmitting at 24fps

Because film is produced at 24 frames per second, transmitting the film images at 30 frames per second is a waste of bandwidth. 24-frame rate video is 4/5 of the data rate for 30-frame rate video. Repeated images, when 3:2 pulldown is added, contribute nothing to the process and should be eliminated, thus saving 1/5 the transmitted data rate. This freed-up bandwidth can be used to either reduce the required compression ratio or to make room for additional services to be multiplexed into the transport stream.

Panasonic's AJ-HD3700 D-5HD Mastering VTR

The conversion process from 24-frame film to 30-frame video involves the addition of a third field for every two frames of film (four fields). The process is, 3:2 pulldown, is a conversion ratio of 24/30 (4/5 – hence a bandwidth savings of 1/5). The term "pulldown" is left over from film projection: the film frame is flashed twice with a shutter to reduce flicker, then the next film frame is pulled down by the projector intermittent mechanism into the aperture gate and, in its turn, is flashed twice.

Restoring frame rate

When a consumer TV receives a 24Hz video signal, it must restore the signal to a higher frame rate to reduce the displayed image's flicker rate. To restore the 3:2 pulldown, all CEA-endorsed consumer DTV set-top boxes and receivers are capable of inserting the 3:2 pulldown sequence into video transport streams received with 24Hz video. The ability to receive a 24Hz video transport stream was included in the ATSC system to minimize the required transmission bandwidth, thereby optimizing the picture quality of film-originated material.

Conversion

In the future, devices will be capable of addressing pixels individually instead of scanning. These devices will be able to display any ATSC frame rate without the need for 3:2 pulldown. The decision to display the pixels directly or to add 3:2 pulldown is made in the viewer's decoder and depends on the viewer's display device capability. The MPEG encoder used to create the ATSC transport stream can automatically detect and remove the extra video in 3:2 pulldown. But, to do it automatically, the modulo 4 (four film frame) sequence of the 3:2 pulldown must remain intact. If in the video editing process an edit is performed in the middle of a video frame sequence, the MPEG encoder will suffer a disturbance because it is expecting a coherent sequence.

A better idea for production

The complexity of editing with 3:2 pulldown is the reason why interest is

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very mild filter is required compared to interlaced and segmented video).

Segmented frame video

48sF video created from cameras with CCD imagers designed for interlaced video sacrifice image performance for the convenience of using existing CCD imagers rather than designing new ones specifically for progressive video. If a 24p camera generates a progressive frame by combining two 48Hz fields, the video quality cannot be optimum. True progressive CCDs yield images with higher vertical resolution and fewer motion artifacts.

Is it true that stepping up 601 video with a line doubler and upconverting it to an HD image format is "good enough?"

When 48sF video is processed in a digital effects generator, penalties in motion quality and resolution will appear that are not present when progressive video is processed as a full frame. The effects generator will have to "re-interlace" back to 48sF, resulting in lowered image resolution. 24-frame HDTV mastering is intended to produce the highest quality HDTV image possible; video should not be compromised with artifacts or resolution reductions imposed by treating progressive video like interlaced video.

What does this all come to?

Is HDTV really just NTSC on steroids? Is it true that stepping up 601 video with a line doubler and upconverting it to an HD image format is "good enough?" Is it true that "good enough" is a great marketing ploy that will win the attention of DTV content providers? Perhaps time will prove once again that only true quality can survive the test of the critical eye. The performance and quality of consumer display devices will improve rapidly over the next few years. Studies show that consumers can see the quality of high-definition. In the broadcast and post industry, those who do not prepare for a future when there is a sophisticated and critical viewing audience risk having to start all over with the financial penalties that will result. ■

For more information on Panasonic's AJ-HD3700 and AJ-UFC1800, circle 451 on the Free Info Card.

David Wiswell is group manager, high-definition products at Panasonic Broadcast.

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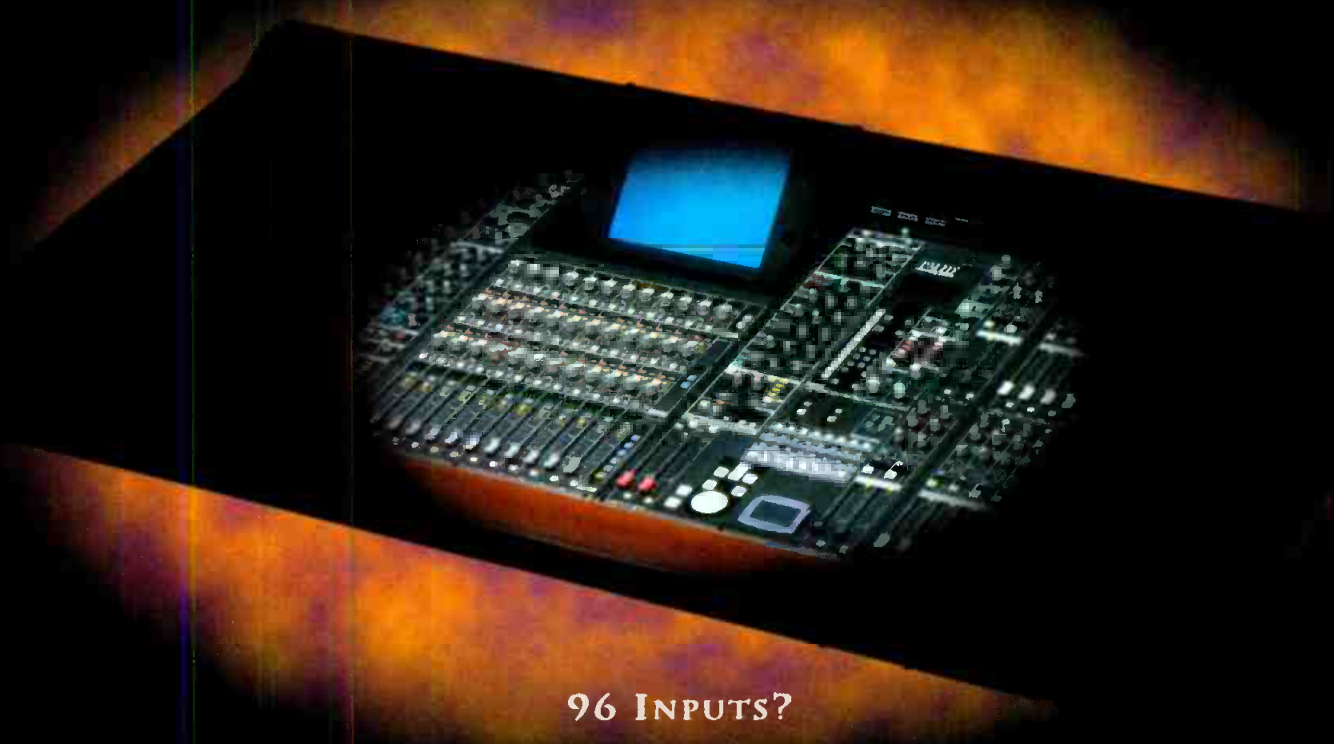
BALANCE OF POWER



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Video routing switchers

BY JOHN LUFF

Ask any chief engineer about the first component he picks when planning a new facility and I would bet that routing systems are high on the list. As systems become more complex a well thought out routing system will be a key link in stitching together a fabric that allows multiple signal types to be used in flexible ways.

Today, routing systems are becoming predominantly digital. Analog systems are still being installed, but as the universe of analog equipment continues to shrink in the next decade, we will see the development and sale of all analog products reduce to a very small percentage of our industry. Table 1 shows the most important digital data rates and the signals they carry. You should consider a variety of data rates and signals you may need to carry when specifying a routing system.

In general, it is fair to assume a routing system that works for analog will not pass digital signals, and digital routing systems will not pass analog signals. A few wideband analog routers can be used at lower data rates for digital signals. There also are classes of routing that handle data at the extremes of the range of data rates. For instance there are special purpose routing switchers available for AES signals, for compressed and uncompressed signals below 360Mb/s, and for HDTV at rates above 360Mb/s.

AES routing is available as simple crosspoint switching or with enhanced features. These might include the ability to reverse the channels in an AES pair or produce a mono signal from the two channels. You might also, in some manufacturers' equipment, feed the right (or left) channel of an input to both channels of an output. Some even allow the channels inside a pair to be freely swapped to the channels of nearby outputs, usually in blocks of eight outputs. This can provide considerable production flexibility. Similar capabilities exist in a few analog products where the stereo pair is processed on a single crosspoint card. One manufacturer achieves this by putting the two halves of an analog audio pair on the two sides of a crosspoint circuit card and combining hardware and control circuitry as necessary. In the digital domain at least one manufacturer does this by first decoding the AES signal into discrete signals and assigning them to individual time slots in a time domain processor system. Crosspoint selections are made by selecting the time slot and reconstructing the signal at the output, allowing total flexibility in reassigning signals.

Digital video routing is becoming less complex, with some routers capable of switching the full range from 19Mb/s to 1.5Gb/s.

This becomes a little more complicated when Dolby AC-3 and Dolby E signals are routed. These signals cannot be processed, and all of the information in the stream must be passed exactly as it is received if it is to be useable downstream. The AES header indicates when the signal is being used for data.

Digital routing, either video or audio, is often today coupled with analog routing. This can be done by using tie lines between the systems with analog to digital converters in the circuit. The management of these tie lines (sometimes called path finding) is done by the control system without the operator intervening. This is a very powerful technique when well executed. It is worth exploring carefully with any manufacturer you are considering.

Digital video routing is becoming less complex, with some routers capable of switching the full range from 19Mb/s to 1.5Gb/s. You should be cautious to ask a few critical questions when considering this class of system. Be sure reclocking is available at the data rates you will be processing and that the return loss for HDTV signals is not compromised.

It is probably most important to explore the control system fully before you make a decision. Installing routing in complex system can lead to a very lengthy exercise in programming the control system. Generally, manufacturers have beefed up the programming tools considerably in the last two years, and most are now available on Windows NT (or Windows 2000). Consider that the system could include layers for analog video, digital video, HDTV, AES, stereo analog audio, timecode, machine control and perhaps other layers in a production environment (key signals, component analog video, etc.). The selection of mnemonics that the operators will use in controlling the system is critical, and with the limited buttons available on most control panels the management of a complex matrix is a mind-bending task.

Control systems usually operate over either coax or CAT 5 cable, with some manufacturers choosing Ethernet and IP addressing to make system management easier. Some manufacturers have recently begun making the control system accessible through a standard web browser interface,

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It would take a lengthy scientific explanation to describe how "Pipeline" affects time. So let's stick to a subject we all understand: Money.

Sure. We could trot out our technical types to clue you in on the aspects of quantum physics and relativity theory that allow "Pipeline" to do its thing. (Which is delay both audio and video–together or separately, in the same or different amounts, for anywhere from one to ten seconds, in any worldwide standard, without data compression.) But that would soon become tedious.

However, when we say that it does so for a fraction of the cost of any device with comparable capabilities, your interest (and your ears) will perk right up. The Pipeline is currently being used to correct today's overprocessing problem of audio/video delay offset; multi-path transmission audio/video delay offset; censorship; and large screen sports and entertainment lip sync.

Call Prime Image for more information–the only company going that gives you top-of-the-line digital video equipment and improves your bottom line. We'd tell you more. But it would take some dry economics professor and lots of arcane financial language to explain it.

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both for programming and for control panel emulation.

Lastly, don't make the mistake of assuming a single monolithic switch will be the best option. If you have I/O for 25 HDTV signals, 75 SMPTE 259 signals and 10 DVB ASI signals you could choose a switcher with a 128x128 structure to leave room for growth. This would yield over 16,000 crosspoints, when the sum of three smaller matrices would only be less than 7000 crosspoints. The burden of higher-priced HD crosspoints in this case could be a budget buster. ■

John Luff is president of Synergistic Technologies Inc. in Canonsburg, PA.

Company	Model	Formats Supported	Video frame rates	Reclocking data rates	Analog I/O	Digital I/O	Controllable levels	Combine/ split audio pairs	Control protocols	Controls other products?	Free info#
Chyron Pro-Bel	Eclipse HD/SD	SMPTE 292/259M	525/60; 625/50	140Mb/s to 1.485Gb/s	NA	128x128	more than 16	NA	Win 9x/NT	Yes	401
	Freeway Series	Analog video; Analog audio; SMPTE 292/259M	525/60 and 625/50	140-360Mb/s	128x128	128x128	Eight	Yes	Win 9x/NT	Yes	402
Evertz	X-HD9504/12	SMPTE 310/292 AES; 9504 -AES	59.94, 60, 24, 25, 30	19.4Mb/s to 1.5Gb/s	NA	12x12	Two	No	Windows 9x, Linux, Windows NT	Yes	403
Extron	MAV, Cross-point/ Matrix Series	Analog video; Analog audio	NA	NA	64x64	NA	Six	No	RS-232; RS-422; NT4; Win 9x	No	404
Grass Valley Group	Series 7000	Analog video Analog audio; SMPTE 310/ 292	24, 50, 59.94, 60	143-540Mb/s, 1.485Gb/s	1024x1024	1024x1024	32	Yes	Win 9x/NT	Yes	405
Knox Video	Chameleon HD	Analog video Analog audio	Any	Any baud rate	256x128	NA	Seven	No	Win 9x/NT	No	406
Leitch	Integrator	Analog video; Analog audio; SMPTE 310/292	Any	143-360Mb/s; 1.5Gb/s	256x256	256x256	Eight	Yes	Win 9x/NT	Yes	407
Miranda	Digipath 16x / 32x	Analog video analog audio	25, 29.97	NA	32x32	32x32	Eight	No	Windows, Mac	Yes	408
Multidyne	DAS-1000	Analog video Analog audio; SMPTE 310/292	All formats	143-360MB/s 1.485Gb/s	10x3	10x1	Three	No	Terminal control	No	409
	VAS-100	Analog video Analog audio	All formats	NA	10x3	NA	Three	No	Terminal control	No	410
	SW10S	Analog video analog audio	All formats	NA	10x1	NA	One	NA	NA	No	411
NVision	ENVOY6064/ 6128/6256	SMPTE 310/292 259	All standard frame rates	143-360Mb/s;	NA	64x64	Four	NA	Win NT/API	Yes	
PESA Switching	Tiger	Analog video; Analog audio	Any	143-360Mb/s	144x144 (up to 1200x1200)	144x144 (up to 1200x1200)	16	Yes	Win 9x/NT	Yes	412
	Jaguar	Analog video Analog audio	Any	143-360Mb/s	64x64 (up to 1200x1200)	64x64 (up to 1200x1200)	16	Yes	Win 9x/NT	Yes	413
Philips	Venus 2001	Analog video Analog audio; SMPTE 310/292	All	270-360Mb/s, 1.5Gb/s	2048x2048	2048x2048	96	Yes	Standard communication protocols	Yes	414
Sierra Video Systems		Analog video Analog audio; SMPTE 310/292	25/30	270-360Mb/s	128x128	128x128	15	Yes	ASCII, DOS, Windows	Yes	415
Sigma Electronics		Analog video; Analog audio; SMPTE 310	60	143-360Mb/s	128x128	128x128	Eight	Yes	Win 9x/NT	No	416
Sony	HDSX-3400/ 3600/3700	Analog video; analog audio SMPTE 292/259M	59.94, 60	143-540Mb/s 1.5Gb/s	16x16	16x16	16	No	Sony, Automation vendors	Yes	417
Utah Comteck	AVS Series	Analog video; Analog audio SMPTE 310/292		143-360Mb/s, 1.485Gb/s	512x512	512x512	16	Yes	Router Management System	Yes	418

For more information on these products, circle the corresponding number on the Free Info Card.

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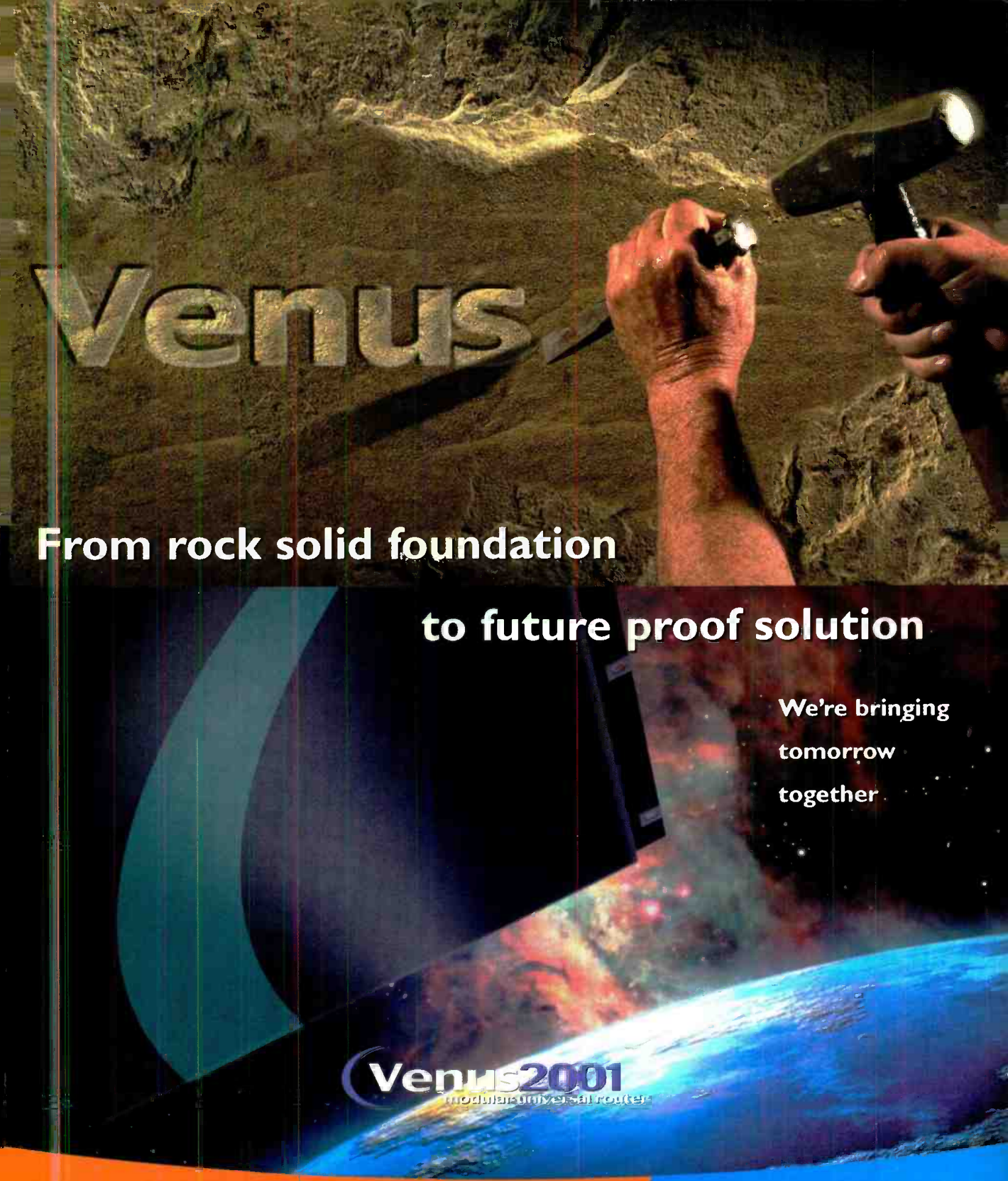

The new **Venus 2001** modular universal router is the next generation in routing switcher technology from Philips. It fits perfectly with any existing Venus system, so you are assured of instant compatibility. Mix and match your choice of new signal modules (SD/HD video, AES audio, data, etc.) all within the same chassis. Just plug in the card you want and build to any size. There are no limits with Venus 2001. To learn more, call us toll free at **1-800-962-4287**, or visit our web site at www.broadcast.philips.com.

For D2K information about Philips, BTS, and Alamar products, please refer to our website www.broadcast.philips.com

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New Products

Remultiplexer and PSIP processor platform

Thomcast/Comark Amber: this processing family supports remultiplexing of multiple input streams to create new customized services, the PSIP processor to the filtering, injection or extraction of PSIP tables with MPEG-2 ATSC transport streams; can input up to eight input transport streams with a payload bit rate of up to 50Mb/s; creates a fully MPEG-2 DVB or ATSC-compliant output multiplex and has the ability to scramble the output services; 413-569-0116; fax: 413-569-0679; thomcastcom.com

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Universal format converter

Panasonic AJ-UFC1800: this format converter enables broadcasters to convert TV signals between any two user-selectable ATSC-DTV formats; is a self-contained unit; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast

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Frequency agile demodulator

Videotek DDM-500 8VSB: demodulates an 8VSB off-air signal to SMPTE 310M serial and synchronous parallel LVDS transport streams; DVB/ASI output is optional; control can be achieved through the front panel or external communications remote control through the RS-232/RS-422-485 serial port; front panel LEDs display the current channel number, the SNR/SER and lock or error conditions for the signal received; 800-800-5719; 610-327-2292; fax: 610-327-9295; www.videotek.com

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Lipsync timing system

Queue Systems "What A Coincidence!": this lipsync timing system consists of a transmitter and a receiver; the transmitter is placed at the origination point and the receiver at the reception site; the transmitter is enabled and a signal path consisting of one video channel and four audio channels can be tested; any A/V timing discrepancy is displayed in less than a second; 818-895-8510; fax: 818-895-8510; www.queusystems.com

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Catalog

LeCroy T&M Catalog: this catalog features complete descriptions of LeCroy's latest digital and analog oscilloscopes, probes and accessories, signal sources, waveform digitizers and high-energy physics instrumentation, as well as informative application briefs that are references for engineers; 800-553-2769; 914-425-2000; fax: 914-578-5985; www.lecroy.com

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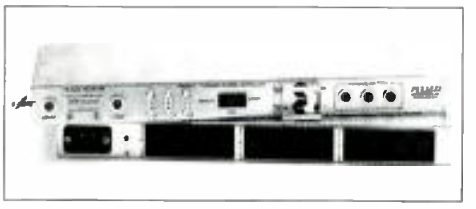
Power distribution system

Pulizzi Engineering TPC 2365/LT: this power distribution system automatically senses which voltage (115 VAC or 230 VAC) is being applied to the IEC 60320 C20 power inlet; internal circuitry auto-selects the appropriate components of the TPC 2365/LT, adjusting for the input voltage; 714-540-4229; fax: 714-641-9062; www.pulizzi.com



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Now Shipping

Real-time uncompressed digital editing system

Accom Affinity: a real-time uncompressed digital 601 editing, effects, compositing and finishing system designed for high-end broadcast television and video post production; compressed and uncompressed clips can be mixed in any project, allowing the user to optimize image quality vs. storage time for each job; 650-328-3818; fax: 650-327-2511; www.accom.com

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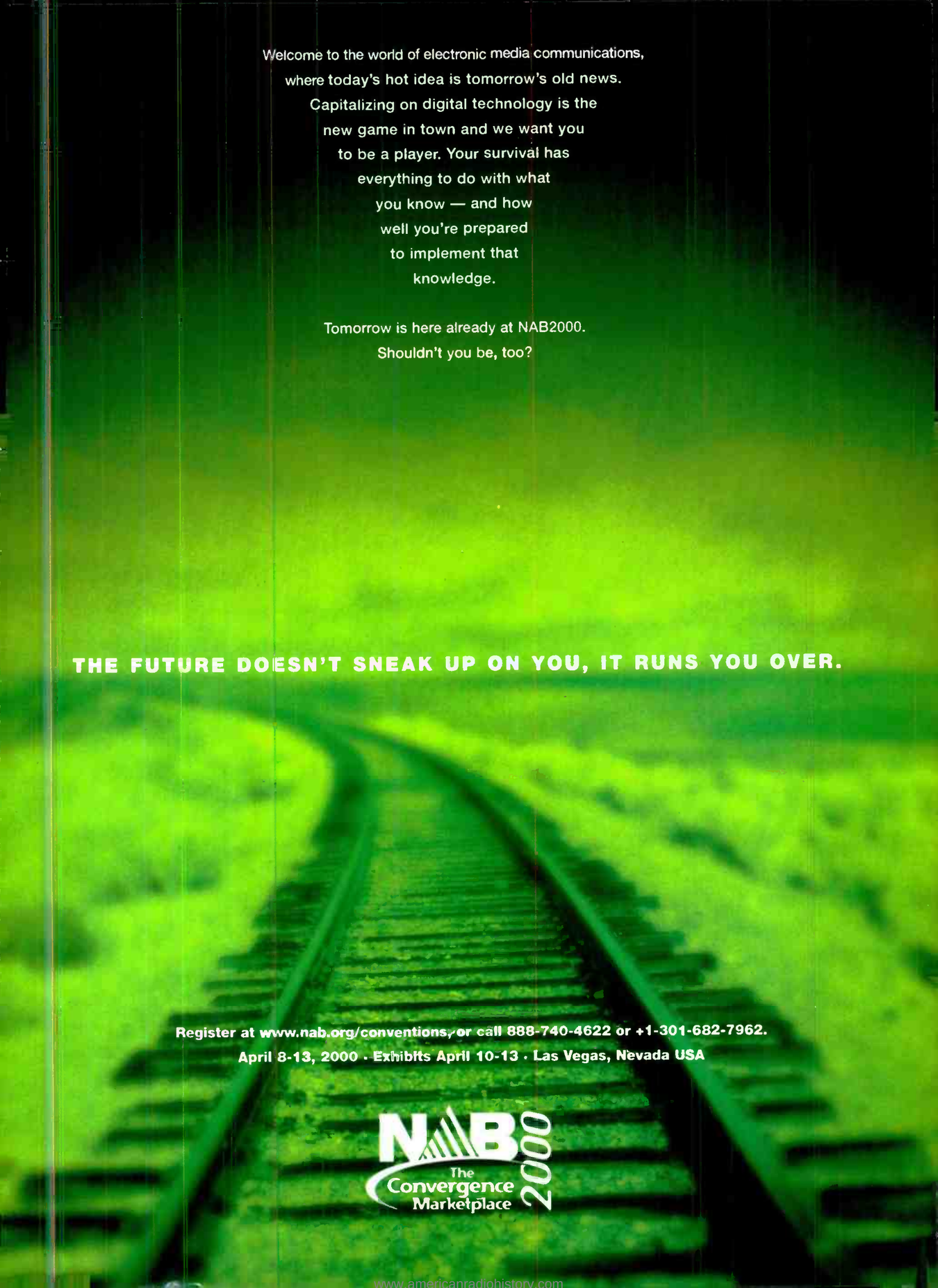

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Media platform

Grass Valley Group Profile XP: a new multiformat, high-bandwidth product designed to help broadcasters make the transition to becoming multimedium video providers;800-998-3588; 800-547-8949; fax: 503-627-7275; www.grassvalleygroup.com

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Digital nonlinear editing and finishing system

Avid Media Composer XL: includes first-time support for Apple's PowerMac G4 systems, offering customers performance gains including faster media management, transcoding and special effects rendering; includes the option of creating broadcast-quality productions with dual streams of real-time uncompressed ITU-R 601 video; 800-949-AVID; 978-640-6789; fax: 978-851-0418;www.avid.com

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Digital nonlinear and finishing system

Avid Xpresss Version 3.1: this broadcast-quality video editing system is designed for video and multimedia professionals; this release includes significant enhancements to graphics and titling, audio, effects, overall editing and interoperation with third-party products; 800-949-AVID; 978-640-6789; fax: 978-851-0418; www.avid.com

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Digital nonlinear editing and finishing system

Avid Symphony 2.0: a WindowsNT-based, high-end, uncompressed, nonlinear system for TV post-production; supports a highly collaborative environment through strong links to Avid's audio and effects products and to third-party applications; the user interface contains specific optimizations for higher-end finishing while retaining the familiar Avid interface; 800-949-AVID; 978-640-6789; fax: 978-851-0418; www.avid.com

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Media network

Avid Unity MediaNet 1.1: a set of open networking and central storage technologies based on an advanced media file system that enables real-time, concurrent sharing of high-bandwidth media; features Windows NT support that allows direct connection of all of Avid's professional editing applications; 800-949-AVID; 978-640-6789; fax: 978-851-0418; www.avid.com

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SCSI host adapter

ATTO Ultra3: this dual channel host adapter allows users in data-intensive environments such as digital video, pre-press, broadcast, digital audio and imaging to take advantage of new levels of speed, efficiency and reliability; employs next-generation SCSI technology offering data transfer rates of up to 320Mb/s (160 Mb/s per channel); 716-691-1999; fax:716-691-9353; www.attotech.com

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Interactive graphics software

Genetic Graphics GenShade Software: this interactive software application enables artists to create a large variety of shaders for Pixar's RenderMan and Side Effects Houdini v4.0 mantra photo-realistic rendering software; uses genetic algorithm techniques that are custom made for the shader generation, allowing artists without any programming background or awareness of the shader making process to create shaders; 912-898-5915

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The GALLERY

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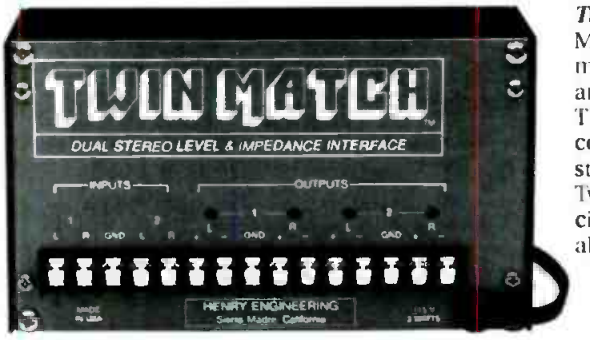

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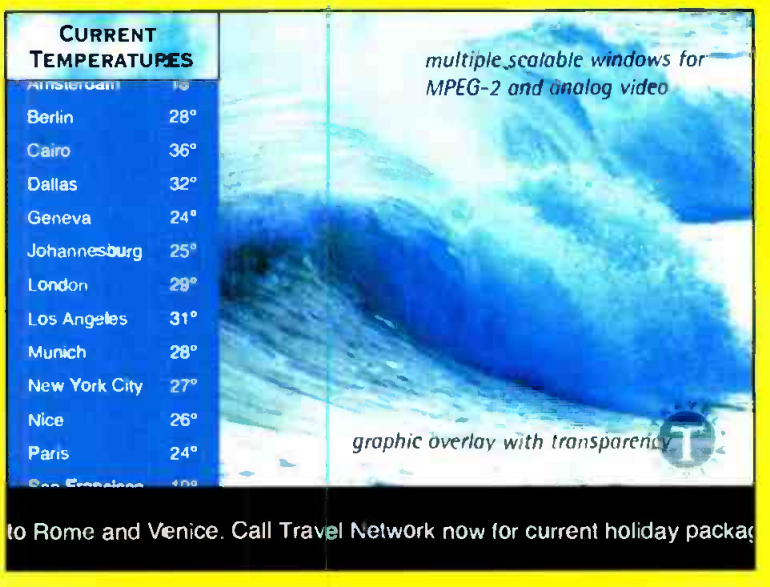

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Business Wire

Business highlights from broadcast and production

BY SANDRA FERGUSON, EDITORIAL ASSISTANT

McGraw-Hill Broadcasting Group selected Leitch's HDTV conversion and processing solutions for its stations in Denver, Indianapolis and San Diego. Cogeco Cable selected Leitch DigiBus synchronizers and noise reducers for its Quebec division. CTV Television Network, Toronto, recently purchased a Leitch VR Newsroom server.

Denver's KMGH selected an NVISION ENVOY routing system for its new digital infrastructure.

World Wrestling Federation Entertainment ordered a 48-fader Euphonix System 5 digital mixing console for its Stanford, CT, studio facility.

Rapid Broadcasting chose ADC to supply complete transmission systems for its Sioux Falls and Rapid City stations.

3i PLC recently purchased Solid State Logic. SSL will continue to concentrate on its core designing and manufacturing business.

Taiwan cable television network, SuperTV, purchased a SeaChange International Broadcast MediaCluster digital video server system.

WUTB - Baltimore

CNN placed an order with FloriCal Systems for new system-to-air commercials for CNN Headline News and the CNN Airport Channel. FloriCal Systems installed asset management and control at WWOR in New York and WUTB in Baltimore.

College Graphics sold and installed its first Clarity HD graphics systems to Complete Post in Los Angeles and to HD Vision in Dallas.

Harris provided a Sigma CD-II DTV transmitter with CD Eye to WPBT in Miami. Harris recently acquired Louth Automation.

The Outdoor Channel in Temecula, CA, invested in JVC's D-9 equipment.

360 Systems recently expanded its manufacturing facility in Westlake Village, CA.

Pesa recently entered into an exclusive agreement to sell MCI to a joint partnership between Dr. Paul D. Smith, MCI's director of product development, and the Rymsa Corp. of Madrid.

Fluke acquired Wavetek Wandel Goltermann's Precision Measurement division in addition to its Test Tools product line.

Orad and sports.com recently agreed to a deal composed of an annual license and an advertising revenue sharing model.

Cable News Network recently took delivery of a dual band flyaway antenna system from Advent Communications.

PEOPLE

Panasonic's Johann Safar, senior manager/ industry liaison and technology, was named a 1999 SMPTE Fellow.

DDG announced that Ron Bardach will join the company as director of sales.

Video Productions Group appointed Art Franco to vice president of operations.

Xyratex appointed Don Lefebvre as its director of worldwide sales.

Jeffers

Mark J. Jeffers is Orad's new senior vice president of sports sales and development.

Wilson, Jones, Mohajer

Matthey Microfilters recently made the following appointments: Preston Wilson as engineer; Justine Jones as sales office supervisor and Reza Mohajer as engineer.

RT-SET appointed Christopher S. Webster as its sales manager for the East Coast.

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Ed Glass was appointed as Crown Audio's vice president of engineering.

Glass

TASCAM recently appointed **Jace Nuzback** as its product specialist.

Nuzback

Highpoint recently appointed **Edward R. Boyd** as its exclusive representative nationwide.

Boyd

ScreenShot

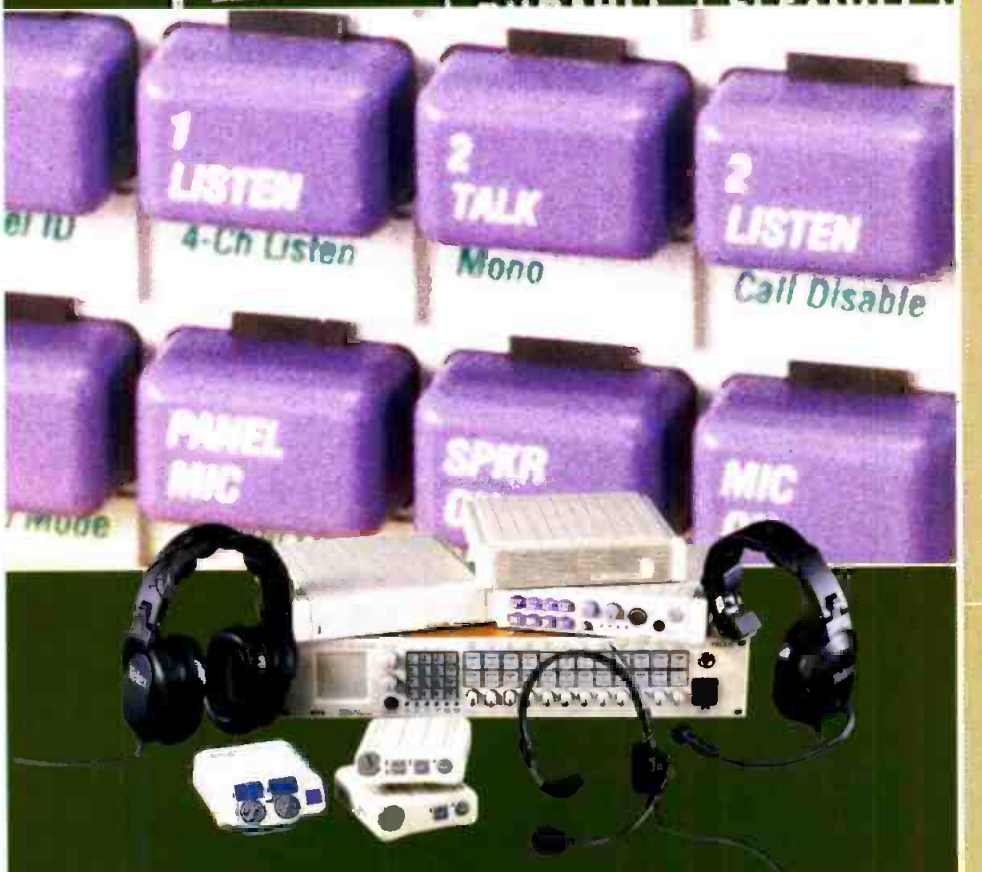
ABC O&O station WLS selects Canon lenses for digital, HD

Chicago's ABC O&O station WLS recently invested in a host of new Canon lenses for production. The lenses included four Digi Super XJ25x lenses, a new HDTV lens ideal for companies planning to upconvert to HDTV without straining their budget.

Currently in the process of converting WLS to an all-digital facility, the station chose the Canon Digi Super XJ25 for pictures provided both when shooting its high-profile newscast in SD and in the subsequent upconversion to HD. The Canon lenses are attached to Sony 900 Series studio cameras.

RTS TW

PROFESSIONAL INTERCOMS



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Pinnacle Systems: Pinnacle Systems' broadcast products give professionals the cutting edge tools needed to create dazzling productions faster and more affordably than ever before. These innovative digital video manipulation tools perform a variety of on-air, production, and post-production functions such as the addition of special effects, image management, capture, storage, and play-out, as well as graphics and title creation.

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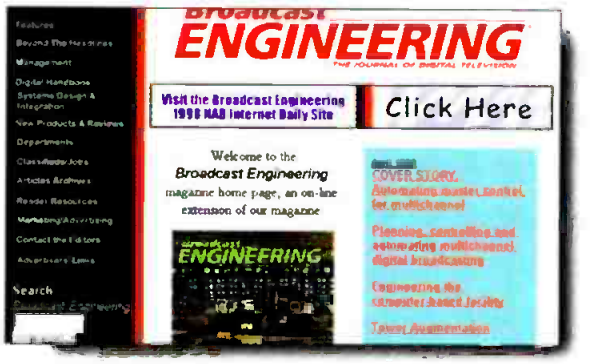

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Broadcast Engineering: *Broadcast Engineering* is the only technology-driven online magazine in the industry. Its editorial environment delivers practical, informative articles on digital technology, systems integration, management, how-to installation, and systems and equipment maintenance. It is a package geared toward TV stations, cable/telcom, production, post-production, business TV, satellite and interactive television.

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B&H

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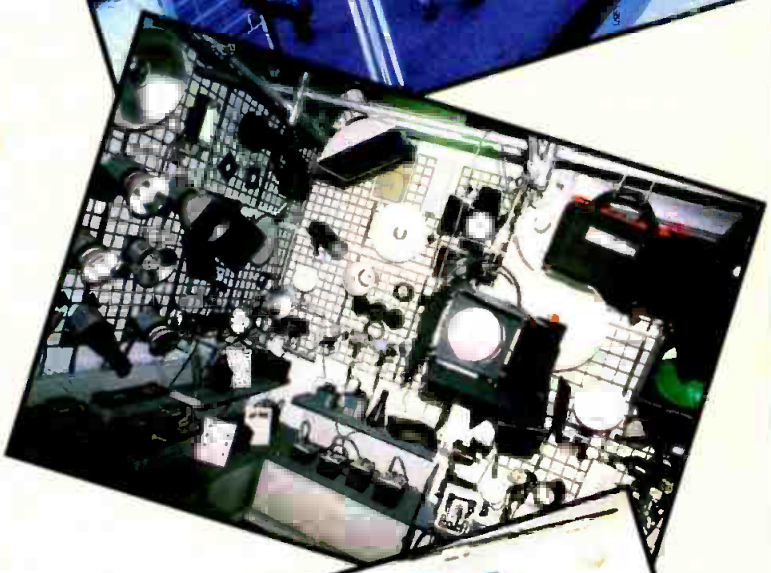

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SONY

CD Digital (DVCAM) Camcorder

...ior picture quality ... the DSR-200A is ...vedding videogra... ...zontal resolution, ...d minimum illumina... ...e 16:9/4:3 capability. ...le operation. ...or direct digital out... ...focus, iris, gain, white balance and shutter speed.

- Stores Photo, Date/Time, Shutter Speed, Iris, Gain and F-stop for easy recall. So if you have to re-shoot, you know your original settings for every scene and frame.
- Records Drop/Non-Drop Frame time code. Time code can be read either as RC time code or as SMPTE time code.
- Has a large 1-inch B&W viewfinder with 550 lines of resolution for easy focusing even in low contrast lighting situations. Separate information sub panel displays time code, battery time, tape remaining and other camcorder functions without cluttering up the viewfinder.
- Records 16-bit/48kHz audio on one stereo track or 12-bit/32kHz with two pairs of stereo tracks (L1/R1, L2/R2), so you can add stereo music or narration.
- One-point stereo electret condenser mic for clear stereo separation. Directivity can be selected from 0°, 90° & 120°.
- Automatic & manual (20-step) audio level record controls. Monitor audio with headphones or from the LCD panel which has an active VU meter.
- XLR input connectors for mics and audio equipment.

...camera ...adyShot ...s that allow it ...ving (even shooting ...ght conditions. ...audio and video fade, over... ...of focus, iris, shutter, gain and ...s is adjustable in 12 levels from F1.6 ...f from 1/4 to 1/10,000 of a second in 12 ...ain from -3dB to +18dB in 8 steps. ...Pattern indicator, built-in ND filter. ...Preset function lets you preset, store and recall ...settings for color intensity, white balance (bluish or reddish), sharpness and brightness.

DSR-20/40 DVCAM Player/Recorders

The DSR-20 and DSR-40 are versatile DVCAM VCRs with compact chassis and a variety of convenient functions for recording, playback and simple editing. They feature Auto Repeat Playback, Power-On Recording/Playback, multiple machine control interfaces and i.Link (IEEE1394) input and output. And, of course, they offer the stunning image and sound quality inherent to the DVCAM format.

i.LINK

- They both offer i.LINK (IEEE1394) input and output. In addition, in the "Digital dubbing including TC Copy" mode, full information of video, audio and time code of the original tape can be copied to another tape. Especially useful when making working copies of the original.

Inputs and Outputs

- They provide a full range of analog video inputs and outputs for integration into current analog-based systems. They both offer composite and S-Video input/output, while the DSR-40 (only) offers a component output as well. The DSR-20 is equipped with analog audio inputs and outputs (RCA), the DSR-40 with RCA inputs and XLR-balanced output. These connections in combination with their i.LINK interface allow a smooth transition to an all digital system in the future.

Record/Playback Functions

- Auto matic repeat function for repeated playback. After reaching either the end of the tape, the first blank portion or the first index point, the DSR-20/40 automatically rewinds the tape, then starts playing back the segment again.
- They are capable of searching for Index Points, which are recorded on the tape as "in-point" marks every time a recording starts. They can also search for photo data recorded on a DVCAM cassette by the DSR-200A/300/PD-100, or where the recording date has been changed.

Reference Input

- External sync input enables synchronized playback with other VCRs. Especially important in A/B Roll configurations. In addition, the DSR-40 only allows adjustment of H-sync and SC phase via the menu.

Control S Interface

- The DSR-20/DSR-40 have a Control S input allowing control via the optional DSRM-20 Remote Control.
- The DSR-20 adds a Control S output connector allowing two or more (up to 50) DSR-20s to be daisy-chained and controlled from one DSRM-20.

DSR-20 Only

- The DSR-20 can be powered by AC or DC.
- Equipped with Control L interface, the DSR-20 can perform simple Time Code-based editing when connected to another DSR-20 or other similarly equipped VCR/cameras.
- In addition to Control L, the DSR-20 also incorporates an RS-232 interface for remote control of basic VCR functions from a PC.
- Supplied with the RMT-DS20 Wireless Remote for control of basic VCR functions.

DSR-40 Only

- Equipped with an RS-422A interface, the DSR-40 can perform as the editing player in A/B roll or cut editing system.
- It also has a simple recording function which can be controlled either manually or via its RS-422A interface.
- The DSR-40 is not equipped with a synchronization capability, the editing accuracy is performed by pre-roll and play.

DSR-30 DVCAM Digital VCR

The DSR-30 is an industrial grade DVCAM VCR that can be used for recording, playback and editing. DV standard 4:1:1 sampling digital component recording with a 5:1 compression ratio provides spectacular picture quality and multi-generation performance. It has a Control L interface for editing with other Control L based recorders such as the DSR-200A DVCAM Camcorder or another DSR-30. It also has a continuous auto repeat playback function making it ideal for kiosks and other point of information displays. Other features include high quality digital audio, IEEE-1394 Digital interface and external timer recording. The DSR-30 can accept both Mini and Standard DVCAM cassettes for up to 184 minutes of recording time, and can playback consumer DV tapes as well.

- Records PCM digital audio at either 48kHz (16-bit 2 channel) or at 32kHz (12-bit 4 channel).
- Equipped with Control L, capable of SMPTE Time Code based accurate editing even without an edit controller. Built-in editing functions include assemble and separate video and audio insert.
- By searching for either an index point or Photo Data recorded by the DSR-200A camcorder, the DSR-30 dramatically cuts the time usually required for editing. The DSR-30 can record up to 135 Index points on the Cassette Memory thanks to its 16K bits capability.
- Auto lock ensures audio is fully synchronized with the video for absolute precision when doing an insert edit.
- Built-in control tray has a jog/shuttle dial, VCR and edit function buttons. The jog/shuttle dial allows picture search at ±1/5 to 15X normal speed and controls not only the DSR-30 but also a player hooked up through its LANC interface.
- DV In/Out (IEEE 1394) for digital dubbing of video, audio and data ID with no loss in quality.
- Analog audio and video input/outputs make it fully compatible with non-digital equipment. Playback compatibility with consumer DV tapes allows you to work with footage recorded on consumer-grade equipment. Tapes recorded in the DSR-30 are also compatible with Sony's high-end DVCAM VCR's.

Panasonic

Broadcast & Television Systems

AG-EZ1 3-CCD Digital Video Camcorder

$1695

- Digital recording delivers 500 lines of horizontal resolution with no noise. (S/N ratio is 54dB).
- 10:1 power and 20:1 digital zoom lens. Both zooms are adjustable in four speeds (3.5-15 sec.) For extreme close-ups the lens can focus up to 1/4" from the subject.
- Audio is also digital, using PCM (Pulse Code Modulation) for quality that rivals CDs. Choose between two-channel 16-bit recording or two sets of 12-bit stereo, with the second set reserved for uses such as narration.
- Huge 1.5" 180,000 pixel color viewfinder provides 400 lines of resolution and displays all automatic and manual functions on demand.
- Variable speed shutter from 1/60-1/8000 of a second.
- Built-in SMPTE time code generator.
- Digital Electronic Image Stabilizer (DEIS) compensates for jittery video—especially when the digital zoom is employed.
- Digital Photo-Shot lets you record a still-frame for six seconds, while audio continues as normal. 290 still pictures can be recorded on a single 30-minute tape.
- Three ways to easily find previously recorded scenes:
  - TopScan plays back the first few seconds of each segment, providing a handy way to review an entire tape.
  - Record/Review rewinds the camcorder and plays the last 10 seconds of the last recorded scene.
  - Indexing encodes the first scene shot on a given day, to quickly find the starting point of each day's shooting.

SONY DSR-300

3-CCD Digital (DVCAM) Camcorder

The most advanced DVCAM camcorder, the incredibly affordable DSR-300 incorporates three 1/2-inch CCDs. DSP digital technology and is the only one-piece camcorder in its class with 100% total digital transfer between the camera section and the VCR section.

High Performance:

- Three 1/2-inch 410,000 pixel PowerHAD CCDs provide high quality acquisition with increased sensitivity plus "FIT like" reduced vertical smear of -110dB.
- Delivers high quality, artifact-free images. Offers an outstanding 800 lines of horizontal resolution, a sensitivity of F11 at 2000 lux and a true minimum illumination of 0.5 lux. It also features an advanced LSI Digital Signal Processor (the same one used by the DXC-D30) for a high S/N ratio of 62dB.
- Hyper Gain mode using DPR (dual pixel readout) allows shooting in extremely low light with virtually no noise.

Digital Signal Processing:

- Skin Tone Detail and Correction- Offers a more natural appearance by smoothing details in the picture. A feature normally found in much higher priced cameras. Skin Tone Detail and Correction reduces and controls wrinkles in the selected skin area without changing the other areas of the image.
- TruEye and DynaLatitude- Just like in the DXC-D30, this feature allows the camera to reproduce natural colors with a wide dynamic range of contrast.
- Black Stretch and Compress: Emphasizes the contrast in dark areas of the picture without any color changes that would require color correction in the editing process.

Digital Functions:

- Very similar to the DSR-1, the VCR section includes SetupLog, FreezeMix and EditSearch functions. SetupLog automatically records status of the camera settings onto the DVCAM cassette throughout the shooting process. FreezeMix and EditSearch allow you to search for a certain scene and retake if necessary by superimposing the recorded image to the live image in the viewfinder.
- ClipLink logging is also available using the optional DSBK-301 interface board. ClipLink records index pictures on the tape as well as, shot list data, logging function (reel #, time code, take # and OK/NG (No Good) shot information.

NEW!

JVC GY-DV500

1/2-inch 3-CCD Professional DV Camcorder

The world's first DV camcorder designed from the ground up for professional ENG work, the GY-DV500 combines the convenience and cost-effectiveness of Mini DV with the performance and features you need. It incorporate three 1/2-inch 380,000 pixel IT CCDs for superior picture performance (equivalent to 750 lines of resolution) superb sensitivity of F11 at 2000 lux and minimum illumination of 0.75 lux (LoLux mode). Ruggedly constructed with a rigid diecast magnesium housing providing the durability professionals crave, the GY-DV500's compact design and light weight (less than 11 lbs. fully loaded) makes it extremely portable. Additional features like the menu dial and Super Scene Finder assure ease-of-use and shooting flexibility, while the IEEE1394 and RS-232 interface allow integration into various non-linear and post-production systems. A professional camcorder in every sense, the compact, lightweight GY-DV500 redefines acquisition for corporate, educational, cable and broadcast production, as well as wedding videography and multimedia applications.

Professional Specifications

- Applies JVC's DSP with advanced 14-bit video processing to bring out more natural details, eliminate spot noise, accurately reproduce dark areas, and restore color information in dark areas.
- CCDs are equipped with advanced circuitry to virtually eliminate vertical smear when shooting bright lights in a dark room. Ensures efficient light conversion with a sensitivity of F11 at 2000 lux.
- CCD Defect Correction function evaluates white defects with the lens closed and then stores their addresses in memory. When the camera is turned on, the data is sent to the DSP for storage and real-time correction.
- Black Stretch/Compress function ensures accurate reproduction of black areas on the screen. Advanced color matrix circuits give even difficult images a very natural appearance.
- Multi-stream parallel digital pipeline processing at 40 MHz creates an ultra-smooth gamma curve, calculated using a true log scale algorithm. The result is a dynamic range of 600% to accurately reproduce fine details and colors in shadows or highlights.

Professional Performance

- Multi-zone iris weighting system gives priority to objects at the central and lower portions of the picture for accurate auto exposure under any condition, even if a bright subject moves into the picture.
- Adjustable gamma for adjusting the "feel" of the picture according to taste. Adjustable detail frequency for setting picture sharpness for a bolder or finer look.
- Viewfinder status display uses characters and menus to display selected information, including audio indicator, tape and battery remaining time, VCR operation and warning indicators. Camera settings and setup parameters can also be checked at a glance. A built-in menu dial lets you quickly navigate through the viewfinder menu.
- Highlight Chroma Processing maintains color saturation in highlights. The result is natural color reproduction, even in bright highlight portions of the picture.
- Smooth Transition mode ensures a smooth transition with no jump in color or light level taking place when manually changing gain or white balance settings.

Professional Audio

- To complement its superior video performance, the GY-DV500 offers outstanding digital PCM sound. You can choose between two 16-bit 48-kHz channels or two 12-bit 32-kHz channels with a dynamic range of 85 dB.
- In addition to camera mounted mic, has two XLR-balanced audio inputs with 48v phantom power and manual audio control. Phantom power can be switched off when not in use.
- Side-mounted speaker lets you monitor audio in playback and recording modes without headphones. The speaker also delivers audible warnings.

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anton bauer

HyTRON 50 Battery

Weighing a mere 31oz (880 grams) and packing 50 Watt-hours of energy - enough to operate a typical ENG camcorder for two hours, the HyTRON 50 is the most advanced lightweight battery in the industry.

- Made possible by recent advancements in a cell technology originally designed for the mobile computing industry, it incorporates nickel metal hydride cells that provide the highest energy density of any rechargeable cylindrical cell available. High performance is further assured through the integration of Anton/Bauer InterActive digital technology.
- Equipped with an on-board "fuel computer" which monitors energy input and output as well as critical operating characteristics and conditions. This data is communicated to the InterActive charger to ensure safety and optimize reliability.
- In addition, remaining battery capacity information is available by means of an LCD display on each battery and in the view-finder of the most popular broadcast & professional camcorders.
- Special low voltage limiter prevents potentially damaging overdischarge.

Specifications: 14.4 V, 50 WH (Watt Hours)
5-3/4" x 3-1/2" x 2-1/4", 1.9 lbs (88kg)
Typical runtime: 2 hours @ 25 Watts 3 hours @ 17 Watts

QUAD 2702/2401

Four-Position Power/Chargers

The lightest and slimmest full featured four position chargers ever, they can fast charge four Gold Mount batteries and can be expanded to charge up to eight. They also offer power from any AC mains in a package the size of a notebook computer and weighing a mere four lbs! The 40 watt 2401 can charge ProPacs in two hours and TrimPacs in one. Add the Diagnostic/ Discharge module and the QUAD 2401 becomes an all purpose power and test system. The 70 watt QUAD 2702 has the module and is the ultimate professional power system.

STEADICAM VIDEO SK

Steadicam Video SK2

Incorporating the same design principles as its larger Oscar and Emmy winning Steadicam cousins, the Video SK 2 is designed for cameras weighing from 9-19 lbs. Far more compact and less complex, the complete SK2 system -sled, stabilizer arm and vest- weighs a mere 21 lbs. and fits neatly into the trunk of a car.

Balancing is easier than ever and a single battery operates both camera and Steadicam. In fact, the SK2 is the only Steadicam simple enough to be operated without workshop training. A comprehensive instructional video will have you up and running in hours. But make no mistake, the lightweight Video SK2 performs like a true heavyweight.

Shoot on the move effortlessly, without cranes, booms or dollies. The sled-mounted monitor offers a crystal-clear picture, so your eyes are no longer glued to your camera's eyepiece. And with the weight spread comfortably over your torso you can shoot on the run, climbing stairs or even from a moving vehicle. With one smooth tracking shot capture what used to require five or six setups. An optional low-mode bracket can further enhance your creativity. Whether you shoot commercials, industrials or documentaries, the SK2 lets you offer more flexibility than ever before. If you can imagine a shot, you can shoot it more efficiently, more economically and more creatively than with any other other equipment.

GLIDECAM INDUSTRIES

V-16 AND V-20

Camera Stabilization Systems

The V-16 and V-20 allow you to walk, run, go up and down stairs, shoot from moving vehicles and travel over uneven terrain without any camera instability or shake. The V-16 stabilizes cameras weighing from 10 to 20 pounds and the V-20 from 15 to 26 pounds. They are both perfect for shooting the type of ultra-smooth tracking shots that take your audience's and client's breath away—instantly adding high production value to every scene. Whether you are shooting commercials, industrials, documentaries, music videos, news, or full length motion pictures, the Glidecam "V" series will take you where few others have traveled.

QUICK DIAL 74

sachtler

Tripods and Fluid Heads

DV Systems—Digital Support for Every Budget

Today's compact digital cameras require light, fast and highly versatile camera support systems. Starting from the DV2 all the way up to the DV12, Sachtler has a solution tailored for just about every conceivable digital camera package available today. All feature Sachtler's patented counterbalance system and Touch and Go wedge plates. And all except the DV2 feature sliding camera platform to ease in the balancing of your camera.

DV2 System

- The smallest head of the Sachtler's line.
- Sachtler Touch and Go quick release with automatic camera lock and safety lever/drop protection
- One step of dynamic counterbalance
- Frictionless leak proof fluid damping with one levels of drag
- Vibrationless vertical /horizontal brakes
- Built in bubble for horizontal leveling
- Single Stage 75mm tripod DA 75 Long
- Lightweight floor spreader SP 75

This system (021D) consists of:
Fluid Head (DV-2), Long Tripod (DA 75), floor spreader (SP 75)

DV4 System

- Sliding balance plate
- Touch and Go quick release with automatic camera lock and safety lever/drop protection
- One step of dynamic counterbalance
- Frictionless leak proof fluid damping with one levels of drag
- Vibrationless vertical /horizontal brakes
- Built in bubble for horizontal leveling
- Single stage 75mm long tripod DA 75
- Lightweight floor spreader SP 75

DV4 System (0410) consists of:
Fluid Head (DV-4), Long Tripod (DA 75), floor spreader (SP 75)

DV4XD System

Same as the DV4 PLUS —

- Five step of dynamic counterbalance
- Five step of vertical and horizontal drag

DV4XD System (0610) consists of:
Fluid Head (DV-6), Long Tripod (DA 75), floor spreader (SP 75)

DV8 System

Same as DV6 PLUS — • Greater load capacity

DV8 System (0810) consists of:
Fluid Head (DV-8), Long Tripod (DA 75), floor spreader (SP 75)

DV12

Same as DV8 PLUS — • Great Load Capacity • Fits 100mm tripods

qtv

15" and 17" On Camera Prompters

The 15" and 17" On Camera prompter is the industry standard and designed for use with any camera, for any application. The high contrast, high resolution monitor, created by QTV, is the result of state of the art components and design. The monitor permits a much greater degree of tilt because of its cutaway feature. Its VPS Eyeline feature superimposes copy over the camera lens, enabling the reader to maintain maximum eye-to-eye contact. It's easy and comfortable to read. QTV's On Camera prompter will make sure the talent has clear access to the prompter. The 17" model has a viewing area of 123 sq. inches, 39% more than the 15" model. The 15" On Camera prompter is also available in a free standing pedestal model, which can be utilized both in the studio and in remote situations.

MVP-12

The MVP-12 incorporates QTV's latest design technology for studio and EFP prompting. The MVP-12 features the most advanced circuitry for a prompter of this size. Fully self-contained, it offers high brightness and high resolution that ensures unmatched ease of readability for the speaker. The MVP-12 is powered by AC or DC current utilizing the Sony type NP-1 or Anton Bauer 13-14 volt batteries, allowing on-location as well as studio prompting. It weighs only 19 lbs. including the quick release roller plate for fast mounting and balancing. Below the lens mounting is utilized resulting ideal counter balancing for ease of operation.

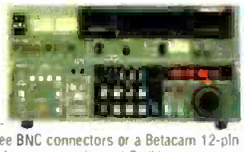
MVP-9 Mini Videoprompter

The MVP-9 mini videoprompter is designed for use with smaller cameras and small spaces. The same level of performance is achieved as the larger CRT based units but in a smaller configuration that is powered by AC or DC current (as above). Created for the new generation of smaller, lighter cameras, the MVP-9 weighs only 17 1/2lbs and both the monitor and camera mount set up quickly and easily. As with the other units the VPS Eyeline feature assures maximum eye contact with lens while easily reading the script. It packs up very tightly, making it easy to take anywhere.

SONY

PVW-2600/PVW-2650/PVW-2800

Betacam SP Pro Series



Whenever versatility and no compromise performance is needed, there is only one choice. Legendary reliability and comprehensive support for its many users has established the PVW series as the standard in broadcast and post production. The PVW Series includes the PVW-2600 Player, PVW-2650 Player with Dynamic Tracking and the PVW-2800 Editing Recorder. They feature built-in TBCs, LTC/VITC time code operation and RS-422 serial interface. They also offer composite, S-Video and component video inputs and outputs. Most important they are built for heavy, every day duty.

- Built-in TBC's and digital dropout compensation assure consistent picture performance. Remote TBC adjustment can be done using the optional BVR-50 TBC Remote Control.
- The PVW-2600, PVW-2650 and PVW-2800 (generates as well) read VITC/ LTC time code as well as User Bits. Ext/Int time code, Regen/Preset, or Rec-Run/ Free-Run selections.
- Built-in character generator displays time code or CTL data.
- Set-up menu for presetting many functional parameters.
- Two longitudinal audio channels with Dolby C- type NR.
- Recognizable monochrome pictures at up to 24X normal speed in forward and reverse. Color at speeds up to 10X.
- Two types of component connection: three BNC connectors or a Betacam 12-pin dub connector. They have composite and S-Video signals as well.

PVW-2650 Only

- Dynamic Tracking (DT) playback from -1 to +3 times normal speed.

PVW-2800 Only

- Built-in comprehensive editing facilities.
- Dynamic Motion Control with memory provides slow motion editing capability.

800 SERIES UHF WIRELESS MICROPHONE SYSTEMS

Consisting of 5 handheld and bodypack transmitters and 6 different receivers, Sony's UHF is recognized as the outstanding wireless mic system for professional applications. Operating in the 800 MHz band range, they are barely affected by external noise and interference. They incorporate a PLL (Phase Locked Loop) synthesized control system that makes it easy to choose from up to 282 operating frequencies, and with the use of Sony's pre-programmed channel plan, it is simple to choose the correct operating frequencies for simultaneous multi-channel operation. Additional features, like space diversity reception, LCD indicators, reliable and sophisticated circuit technology ensure low noise, wide dynamic range, and extremely stable signal transmission and reception. Ideal for broadcasting stations, film production facilities, and ENG work.

QUICK DIAL 71

PRO

PG-30 2.39

Broa

BGR-30 3.29 BG

H471S S-

ST-30 6.69 ST-60

M221 Hi 8

Metal Particles

P630HMP 4.99

P660HMP 6.29

P6120HMP 8.29

M321SP Metal Betac

05S 11.99 10S 12.49

30S 14.99 60L 24.95

DP121 DVC PRO

12M (Med.) 7.49 23M 8.79

63M 19.99 64L (Lg.)

94L 30.99 123L

maxell

Hi8 Metal Particle (XRM)

P6-120 XRM

Broadcast Quality Hi8 Metal Particle

P6-30 HM 8Q 5.39 P6-60 HM 8Q

P6-120 HM 8Q 7.9

P/I PLUS VHS

T-30 Plus 1.69 T-60 Plus 1.99 T-90 Plus 2.09

T-120 Plus 2.19 T-160 Plus 2.69

HGX-PLUS VHS (Box)

HGXT-60 Plus 2.69 HGXT-120 Plus 2.99

HGXT-160 Plus 3.99

BQ Broadcast Quality VHS (Box)

T-30 BQ 3.89 T-60 BQ 3.99 T-120 BQ 5.99

BQ Professional S-VHS (In Box)

ST-31 BQ 6.79 ST-62 BQ 6.99

ST-126 BQ 7.45 ST-182 BQ 13.99

Betacam SP

B30MSP 13.49 B60MLSP 19.99 B90MLSP 29.95

Panasonic

Mini DV Tape

AY DVM-30 6.49 AY DVM-30 (10 Pack) ea. 5.99

AY DVM-60 7.99 AY DVM-60 (10 Pack) ea. 7.49

AY-DVM80 12.99 AY-DVM120 20.95

DVCPRO

AJ-P12M (Medium) 6.99 AJ-P24M 9.99

AJ-P33M 11.19 AJ-P66M 19.49

AJ-P66L (Large) 20.99 AJ-P94L 29.99

AJ-P126L 38.95

SONY

Hi-8 Professional Metal Video Cassettes

P6-30 HMPX 4.59 P6-30 HMEX 7.99

P6-60 HMPX 6.49 P6-60 HMEX 10.99

P6-120HMPX 8.49 P6-120HMEX 14.99

PR Series Professional Grade VHS

T-30PR 2.39 T-60PR 2.59 T-120PR 2.79

PM Series Premier Grade Professional VHS

T-60PM 3.99

BA Series Premier Hi-Grade Broadcast VHS (In Box)

T-30BA 3.59 T-60BA 3.99 T-120BA 4.79

MQ Master Quality S-VHS (In Box)

MQST-30 7.49 MQST-60 7.79 MQST-120 7.99

BRS 3/4" U-matic Broadcast Standard (In Box)

KCS-10 BRS (mini) 8.69 KCS-20 BRS (mini) 8.99

KCA-10 BRS 8.19 KCA-20 BRS 8.69

KCA-30 BRS 9.60 KCA-60 BRS 13.39

XBR 3/4" U-matic Broadcast Master (In Box)

KCS-10 XBR (mini) 8.79 KCS-20 XBR (mini) 10.59

KCA-10 XBR 9.29 KCA-20 XBR 10.69

KCA-30 XBR 11.99 KCA-60 XBR 15.69

KSP 3/4" U-matic SP Broadcast (In Box)

KSP-S10 (mini) 9.59 KSP-S20 (mini) 11.09

KSP-10 10.09 KSP 20 11.59

KSP-30 12.99 KSP-60 16.99

BCT Metal Betacam SP Broadcast Master (Box)

BCT-5M (Small) 12.29 BCT-10M (Small) 13.09

BCT-20M (small) 13.29 BCT-30M (small) 13.99

BCT-30M (small) (50 Pack) ea. 13.49

BCT-30ML 18.99 BCT-60ML 21.99

BCT-90ML 27.95

Mini DV Tape

DVM-30EXM w/Chip 12.99 DVM-60EXM w/Chip 17.99

DVM-30EX "No Chip" 11.99 DVM-60EX "No Chip" 13.99

DVM-30PR "No Chip" 7.99 DVM-60PR "No Chip" 9.99

Full Size DV Tape with Memory Chip

DV-120MEM 24.99 DV-180MEM 26.99

PDV Series Professional DVCAM Tape

PDVM-12ME (Mini) 15.25 PDVM-22ME (Mini) 16.25

PDVM-32ME (Mini) 16.99 PDVM-40ME (Mini) 15.99

PDV-94ME (Standard) 33.49 PDV-124ME (Standard) 37.99

PDV-184ME (Standard) 44.95 PDVN-64N 24.95

PDVN-124N 31.95 PDVN-184N 39.95

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FUJINON ENG LENSES

While ENG camera technology evolves faster and is faster, delivering ever higher performance in ever small bodies, it has been increasingly difficult for lens manufacturers to improve quality while keeping size and weight to a minimum until recently. With Aspheric Technology (AT2) Fujinon has succeeded in manufacturing superior quality lenses that are both smaller and lighter than lenses of conventional spherical design. From the widest angle to the highest telephoto, Fujinon's Broadcast hand-held style lenses offer unparalleled features and performance. In fact, they are so advanced and so optically superb they will reshape your thinking about how well a lens can perform.

Fujinon's broadcast hand-held lenses feature the very latest in optical and mechanical design, and manufacturing techniques. New EBC (Electron Beam Coating) reduces flare and improves contrast, while AT2 Aspheric Technology improves corner resolution and reduces chromatic abberation. And all except the 36:1 Super Telephoto offer the exclusive "V-Grip" and Quick Zoom.

A15X8EVM Standard Zoom Lens

A versatile performer in a compact package, offers AT2, inner focus, Quick Zoom and the "V-Grip" 7495.95

A20X8EVM Standard /Telephoto Zoom Lens

Combines additional focal length with AT2, inner focus, Quick Zoom and the "V-Grip" 11,499.95

CHYRON PC-CODI & PC Scribe

Text and Graphics Generator and Video Titling Software

PC-CODI incorporates a broadcast quality encoder and a wide bandwidth linear keyer for the highest quality, realtime video character generation and graphics display. A video graphics software engine running under Windows 95/NT, PC Scribe offers a new approach and cost effective solution for composing titles and graphics that is ideal for video production and display applications. Combined, their a total solution for realtime character generation with the quality you expect from Chyron.

PC-CODI Hardware:

- Fully-genlocked displays • Display and non-display buffers
- Less than 10 nanosecond effective pixel resolution
- 16.7 million color selections • Fast, realtime operations
- Character, Logo and PCX Image transparency
- Variable edges: border, drop shadow and offset
- Full position and justify control of character and row
- User definable intercharacter spacing (squeeze & expand)
- Multiple roll/crawl speeds • Automatic character kerning
- User definable tab/template fields
- Shaded backgrounds of variable sizes and transparency
- Software controlled video timing
- User definable read effects playback: wipes, pushes, fades
- NTSC or PAL sync generator with genlock
- Board addressability for multi-channel applications
- Auto display sequencing • Local message/page memory
- Preview output with safe-title/cursor/menu overlay
- Composite and S-video input with auto-genlock select

PC-Scribe Software:

- Number of fonts is virtually unlimited. Also supports most international language character sets. Fonts load instantly and the level of anti-aliasing applied is selectable.
- Adjustable wide range of character attributes. Wide choice of composition tools.
- Character, words, rows and fields can color flash
- Character rolls, crawls and reveal modes. Speed is selectable and can be auto timed with pauses. Messages can be manually advanced or put into sequences along with page transitions.
- Multiple preview windows can be displayed simultaneously
- Transitions effects include: cut, fade, push, wipe, reveal, peel, zoom, matrix, wipe, spiral, split, weave and jitter.
- Import elements to build graphics. This includes OLE objects, INFINIT RGBA and TGA with alpha channel. Scribe also imports and exports TIFF, JPEG, PCX, TGA, BMP, GIF, CLP, ASCII, IMG, SGI, PICT and EPS formats.

PC-CODI and PC-Scribe Bundle 2995.00

TRUEVISION/Avid

Professional Video Production Workstation

Incorporating the award-winning TARGA 1000 video card and Avid MCXpress NT non-linear editing software, this fully-configured workstation meets the needs of production professionals, corporate communicators, educators and Internet authors.

TARGA 1000 Features:

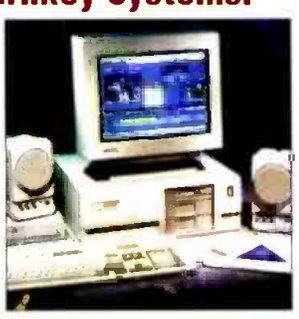
The TARGA 1000 delivers high processing speed for video and audio effects, titling and compositing. Capture, edit and playback full-motion, full-resolution 60 fields per second digital video with fully synchronized CD-quality audio.

- Compression can be adjusted on the fly to optimize for image quality and/or minimum storage space. Has composite and S-video inputs/outputs. Also available with component input/output (TARGA 1000 PRO).
- Genlock using separate sync input for working in professional video suites
- Audio is digitized at 44.1KHz or 48KHz sampling rates, for professional quality stereo sound. Delivers perfectly synchronized audio and video

MCXpress Features:

The ideal tool for video and multimedia producers who require predictable project throughput and high-quality results when creating video and digital media for training, promotional/marketing material, local television and cable commercials, CD-ROM and Internet/intranet distribution. Based on Avid's industry-leading technology, it combines a robust editing functionality with a streamlined interface. Offers integration with third-party Windows applications, professional editing features, powerful media management, title tool and a plug-in effects architecture. It also features multiple output options including so you save time and money by reusing media assets across a range of video and multimedia projects.

TARGA 1000/MCXpress Turnkey Systems:



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- Pentium ATX motherboard with 512K cache
- Pentium III- 450 MHz Processor
- Matrox Millenium II AGP 4MB WRAM display card
- 128MB 10ns 168-Pin (DIMM) S-DRAM
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- Seagate Barracuda External 9.1GB SCSI-3 ultra-wide capture drive
- Adaptec AHA-2940U2W Ultra Wide SCSI-3 controller card
- Teac CD-532e 32X EIDE internal CD-ROM drive • 3.5" floppy drive
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- Truevision TARGA 1000 or 1000 Pro Video Capture Card

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With TARGA 1000 Pro (component input/output) $6495.00

KNOX VIDEO

RS4x4/8x8/16x16/16x8/12x2 Video/Audio Matrix Routing Switchers

Knox's family of high performance, 3-channel routing switchers are extremely versatile, easy-to-use and very affordable. Housed in an ultra-thin rackmount chassis they accept and route (on the vertical interval) virtually any video signal, including off-the-air and non-timebase corrected video. They also route balanced or unbalanced stereo audio. The audio follows the video or you can route the audio separately (breakaway audio). Each of the switchers offers manual control via front panel operation. They can also be controlled remotely by a PC, a Knox RS Remote Controller, or by a Knox Remote Keypad via their RS-232 port. Front panel LEDs indicate the current routed pattern at all times. Knox switchers are ideal for applications such as studio-feed control and switcher input control, plus they have an internal timer allowing timed sequence of patterns for surveillance applications as well.

- Accept and routes virtually any one-volt NTSC or PAL video signal input to any or all video outputs.
- Accept and route two-volt mono or stereo unbalanced audio inputs to any or all audio outputs.
- Video and audio inputs can be routed independently - they don't need to have the same destination.
- Can store and recall preset cross-point patterns. (Not available on RS12x2.)
- Front panel key-pad operation for easy manual operation.
- Can also be controlled via RS-232 interface with optional RS Remote Controller or Remote Keypad.
- Front panel LED indicators display the present routing patterns at all times.
- An internal battery remembers and restores the current pattern in case of power failure.
- Internal vertical interval switching firmware allows on-air switching.
- Housed in a thin profile rackmount 1" chassis.
- Also except the RS12x2 are available in S-Video versions with/without audio.
- Models RS16x8 and RS16x16 are also available in RGB/component version.
- With optional Remote Video Readout, the RS16x8 and RS16x16 can display active routes on a monitor at remote locations, via a composite signal from a BNC connector on the rear panel.
- The RS4x4, RS8x8 and RS16x16 are also available with balanced stereo audio. They operate at 660 ohms and handle the full range of balanced audio up to +4 dB with professional quick-connect, self-locking, bare-wire connectors.

LEADER

Manufacturing test and measurement equipment for over 40 years, Leader Instruments is the standard which others are measured against for reliability, performance, and most important—cost effectiveness.

5860C WAVEFORM MONITOR

A two-input waveform monitor, the 5860C features 1H, 1V, 2H, 2V, 1 s/div and 2V mag time bases as well as vertical amplifier response choices of flat, IRE (low pass), chroma and DIF-STEP. The latter facilitates easy checks of luminance linearity using the staircase signal. A PIX MON output jack feeds observed (A or B) signals to a picture monitor, and the unit accepts an external sync reference. Built-in calibrator and on-off control of the DC restorer is also provided.

5850C VECTORSCOPE

The ideal companion for the 5860C, the 5850C adds simultaneous side-by-side waveform and vector monitoring. Featured is an electronically-generated vector scale that precludes the need for fussy centering adjustments and eases phase adjustments from relatively long viewing distances. Provision is made for selecting the phase reference from either A or B inputs or a separate external timing reference.

5100 4-Channel Component / Composite WAVEFORM

The 5100 handles three channels of component signals, plus a fourth channel for composite signals, in mixed component / composite facilities. Features are overlaid and parade waveform displays, component vector displays, and automatic bow-tie or "shark fin" displays for timing checks. Menu-driven options select format (525/60, 625/50, and 1125/60 HDTV), full line-select, vector calibration, preset front-panel setups and more. On-screen readout of scan rates, line-select, preset numbers, trigger source, cursor time and volts.

5100D Digital Waveform/Vectorscope

The 5100D can work in component digital as well as component analog facilities (and mixed operations). It provides comprehensive waveform, vector, timing and picture monitoring capabilities. Menu driven control functions extend familiar waveform observations into highly specialized areas and include local calibration control, the ability to show or blank SAV/EAV signals in both the waveform and picture, the ability to monitor digital signals in GBR or YCbCr form, line select (with an adjustable window), memory storage of test setups with the ability to provide on-screen labels, flexible cursor measurements, automatic 525/60 and 625/50 operation and much much more.

5870 Waveform/Vectorscope w/SCH and Line Select

A two-channel Waveform/Vector monitor, the microprocessor-run 5870 permits overlaid waveform and vector displays, as well as overlaid A and B inputs for precision amplitude and timing/phase matching. Use of decoded R-Y allows relatively high-resolution DG and DP measurements. The 5870 adds a precision SCH measurement with on-screen numerical readout of error with an analog display of SCH error over field and line times. Full-raster line select is also featured with on-screen readout of selected lines, a strobe on the PIX MON output signal to highlight the selected line, and presets for up to nine lines for routine checks.

5872A Combination Waveform/Vectorscope

All the operating advantages of the 5870, except SCH is deleted (line select retained), making it ideal for satellite work.

5864A Waveform Monitor

A two-input waveform monitor that offers full monitoring facilities for cameras, VCRs and video transmission links. The 5864A offers front panel selection of A or B inputs, the choice of 2H or 2V display with sweep magnification, and flat frequency response or the insertion of an IRE filter. In addition, a switchable gain boost of X4 magnifies setup to 30 IRE units, and a dashed graticule line at 30 units on screen facilitates easy setting of master pedestal. Intensity and focus are fixed and automatic for optimum display. Supplied with an instruction manual and DC power cable.

5854 Vectorscope

A dual channel compact vectorscope, the 5854 provides precision checkout of camera encoders and camera balance, as well as the means for precise genlock adjustments for two or more video sources. Front panel controls choose between A and B inputs for display and between A and B for decoder reference. Gain is fixed or variable with front panel controls for gain and phase adjustments. A gain boost of 5X facilitates precise camera balance adjustments in the field. Supplied with a DC power cable.

Designed for EFP and ENG (electronic field production and electronic news gathering) operations, they feature compact size, light weight and 12 V DC power operation. Thus full monitoring facilities can be carried into the field and powered from NP-1 batteries, battery belts and vehicle power. Careful thought has been given to the reduction of operating controls to facilitate the maximum in monitoring options with the operating simplicity demanded in field work.

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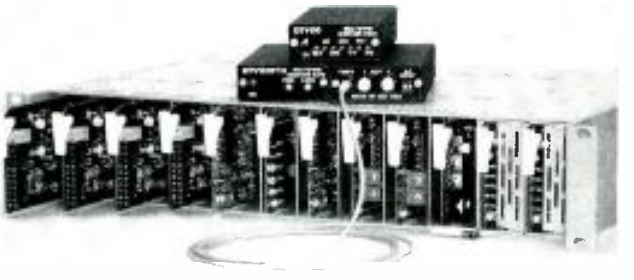

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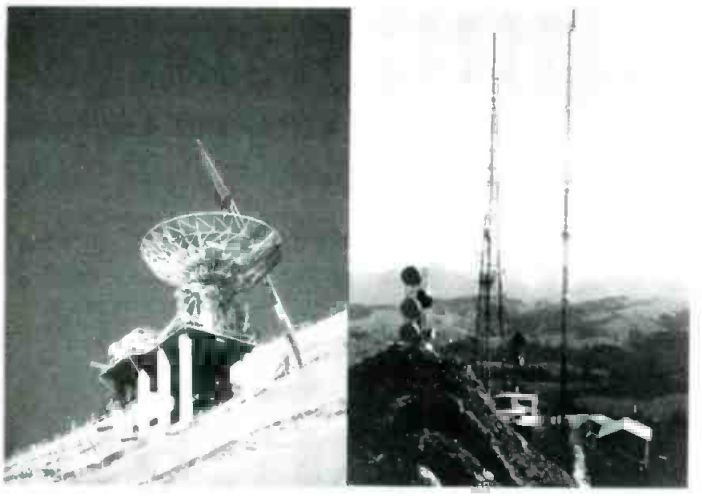

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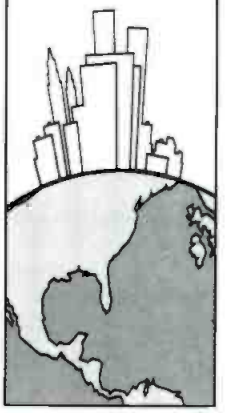

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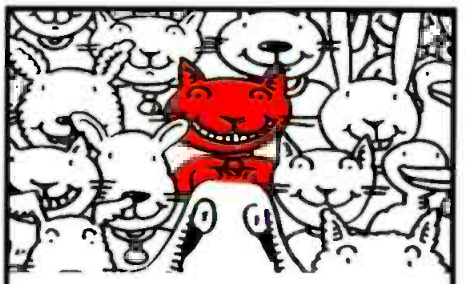

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Classifieds Help Wanted

ASSISTANT CHIEF ENGINEER: Univision KDTV 14 in San Francisco the Spanish language television station is seeking a highly skilled individual for a full-time hands-on supervisory position in the maintenance and operation of a television broadcast facility. This position requires knowledge of satellite reception, digital and analog audio and video, and RF distribution systems. The successful candidate will have strong communication and leadership skills. The candidate must be customer service oriented and will service the News, Production, and Sales clients of the station in a fast-paced environment. To qualify, a candidate should possess a Bachelor's degree in a related field (or commensurate experience). A minimum of five years experience in the maintenance and repair of electronic systems and video equipment is required. Excellent people, technical, and computer skills a must. The ideal candidate will have strong organizational skills, and be capable of maintaining administrative systems, parts inventories, and compliance records. The candidate will have demonstrated knowledge and experience in the following areas: • High-power UHF transmitter operation and maintenance • Computer systems and computer based video production equipment • Digital video systems • Studio and field news operations • FCC and/or SBE certification • A degree in Electronics • Component-level troubleshooting and repair experience • Experience with AutoCAD • Salary commensurate with experience. Please fax resume to Human Resources Manager 415.538.8053 E/O/E M/F

Major Westcoast production/distribution company seeks a **NETWORK AFFILIATE ENGINEER.** Responsibilities include working directly with affiliates pertaining to resolution of problems both site related and transmission related, develop operational procedures as required, and implement changes in technology as required. Must be experienced in operation and installation of VideoCipher II+IRDs and stand alone descramblers, Affiliate Management System and Channel Control Computers for the VideoCipher II+ encryption system, PowerVu IRDs and PowerVu Authorization Computer system. Must have knowledge of RF transmission systems and application of satellite link budgets in analog and digital domains. Candidate must have an intermediate level of experience regarding baseband analog video and audio signals, as well as, operations in both analog and digital playout facilities. Must also have knowledge of operational reference levels and subcarrier deviation. Please fax resumes to 310-235-5898.

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This position requires hands-on maintenance, as well as employee supervision and training. The Systems Engineering Staff is responsible for the maintenance and support of all master control and post-production suites, as well as core equipment. We are looking for a self-motivated team player with a minimum of 5 years' Television/Broadcasting systems experience, including significant experience in a digital environment; ability to diagnose to the component level; and familiarity with test signals and equipment. **This is not an IS position.** Minimum of 3 years' supervisory or management experience. Excellent communications skills, both written and oral, are a must. SBE certification and/or general classes license and knowledge of Spanish and/or Portuguese is a plus.

Systems Engineer

Be part of a team of engineers responsible for, but not limited to, the preventative and corrective maintenance of all television equipment in regards to the Television Center. Requires a minimum of 3 years' Television/Broadcasting systems experience, including significant experience in a digital environment; the ability to diagnose to the component level; and familiarity with test signals and equipment. **This is not an IS position.** SBE certification and FCC general class license and knowledge of Spanish and/or Portuguese is a plus.

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BROADCAST ENGINEER: Position requires a minimum of 2 years broadcast experience trouble shooting studio equipment to component level, also needed experience with computer networks and Windows NT. Must be able to operate independently as well as part of a team under pressure and deadlines. FCC license or SBE certification a plus. This position would require being on call 24/7, and some travel. NO CALLS PLEASE. Send resume and cover to Frank A. Glowacki Chief Engineer, NBC News Channel, 925 Wood Ridge Center Dr., Charlotte, NC 28217. Email: frank.glowacki@nbc.com EOE

ENGINEERING: C-SPAN is seeking an **Engineering Director** to manage daily activities of engineering department. Primarily responsible for project management and staff supervision and direction. Department involved with digital and analog television technology including installation, repairs and maintenance of television origination and transmission equipment; support of radio facilities and transmitters; and plant HVAC operations. Bachelor's degree with 6 years related work experience and 2 years supervisory experience with emphasis on management skills including problem solving and effective communications. Send resume and salary requirements to C-SPAN, Human Resources/BE, 400 N. Capitol Street, NW, Suite 650, Washington, DC 20001, FAX 202-737-3823 or e-mail human_resources@c-span.org. EOE

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EOM

The Internet genie is free

BY PAUL MCGOLDRICK

Now that TV station consolidation is a reality and the industry is about to enter into a feeding frenzy, it's nice to see other commentators agree that it's going to happen. I felt alone there for quite a while. Still on the horizon is a move toward multicasting as a business model for that 6MHz of DTV bandwidth. That's not a surprise in an era where no other moneymaking opportunity is visible. Of course, transmitting two or three digital video signals in one channel condemns stations to a non-HD future.

But even with consolidation and the movement away from the transmission point for the program source, there are factors that broadcasters consider. The path to profits for a terrestrial TV station is ever narrower. Whether a station multicasts or not, other media will be a force to deal with.

Many broadcasters are confused as to their position in the entertainment food chain. When they regard themselves merely as purveyors of programming through an affiliate chain, they are dooming themselves. They should be thinking only in terms of program production. Consolidation may well change affliations as we know them; multicasting, satellite broadcasting and cable will further provide alternatives to today's conventional networks; the Internet may end up being the killer application.

Squashing the competition

Each jump in delivery technology has resulted in broadcasters declaring the newcomer a competitor who must be squashed. The wars with cable over the years have left the networks as the old guard with expensive programming, defending the castle with fewer viewers to pay for it. The re-invention of cheap-to-produce game shows can hardly be thought of as an advance for cultural entertainment, but today that is where the industry is presently pointed. Cable probably wouldn't even exist if the broadcasters had provided viewers with reliable signals quickly enough; they did, after all, have nearly two decades in which to do it.

The wars with satellite have been a similar disaster; how can you possibly succeed as a business if you insist that a customer can only get your product if he goes through one particular distributor? It's the basics again: You are supposed to be delivering a product not a channel.

This is a genie that the networks will not be able to push back into the bottle.

Now we have the Internet. Movement of streaming video to the Internet is not esoteric any longer, with the arrival of iCraveTV.com on the Web. The company (TVRadioNow Corp.) was rebroadcasting several networks, local U.S. stations and Canadian channels from its offices in Ontario, Canada. While claiming that the action is legal in Canada, the site is fully accessible to viewers worldwide, provided you know a Canadian telephone area code and lie twice when clicking in.

Not surprisingly, the networks are miffed and have filed lawsuits to stop the practice. Whether it is legal to rebroadcast the signals is not in my purview, but it is interesting that the Internet was specifically mentioned in the initial Satellite Home Viewer Act signed into law at the end of last year. The original words specifically excluded the Internet as "not being eligible for the compulsory-license right" to rebroadcast. After a lot of lobbying from the computer world that language was removed, but a more generic "nobody else" clause was inserted.

This is a genie that the networks will not be able to push back into the bottle. Whether or not they succeed in frightening off iCraveTV.com, there will be copycats. Opinion is that the rebroadcast in Canada is legal, and the company has placed a four-page terms of use in the access path to actual streaming reception to protect itself. At the moment it would seem that the only legal direction the networks can go in — although they may of course try actions in Canada — is to act against any viewers in the U.S. That is, against every individual user. Even if they do, these services will be mirrored by those who believe in total information being available to all at no cost.

Any retransmission sites in the U.S., would certainly be targeted for legal action and tat might simply increase the number that spring up. Instead of entering into another war, one that they will lose, the networks need to completely re-address their distribution agreements, just traditional vendors already have with the Internet. A product manufacturer who insists that a customer go to one of his brick and mortar stores instead of an Internet supplier will lose that sale. The broadcast industry and its products are no different, and the anachronism of such a huge business trying to defend its old-guard position while being backed off a cliff is almost funny.

The Internet is a medium of distribution that the broadcast industry needs to embrace so as not to lose that revenue source — and, just as importantly, to maintain control of the key products of these networks and stations: program material. ■

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

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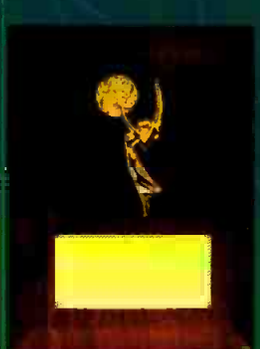

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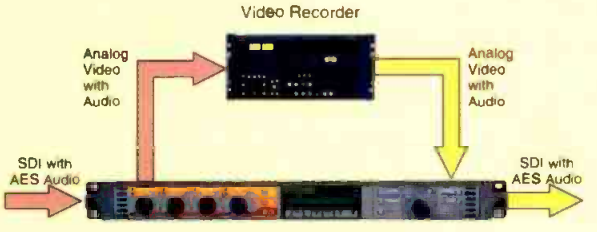

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