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Broadcast ENGINEERING
THE JOURNAL OF DIGITAL TELEVISION™

IN THIS ISSUE

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Beyond the Headlines

Digital Handbook

(continued on page 8)

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ON THE COVER: *This month's cover design by* Broadcast Engineering *senior art director Stephanie Kastelan and art director Andrew Brown.*

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Questions? Contact:
Dana Githerie
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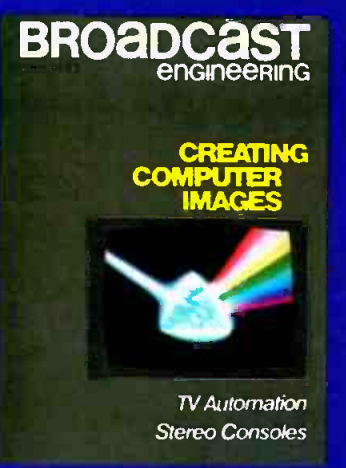
FREEZE FRAME

A look at the technology that shaped this industry.

Do you remember?

This October 1978 cover illustrating "Graphics and animation" was electronically created at Dolphin Productions in New York. The photo below shows the six racks of equipment needed to produce the image.



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Editorial

Drop those peanuts!

Washington bureaucrats have been hard at work again. The result is that they've taken another one of life's pleasures from us; this time it's peanuts. That's right — peanuts. The U.S. Department of Transportation recently issued an edict requiring airlines to provide *peanut-free buffer zones* on airplanes. In fact, if even a single passenger requests a peanut-free flight, some airlines will completely eliminate peanuts from that flight.

Uncle Sam is now telling us we can't even have peanuts on airplanes. From Kansas City to New York without peanuts? I can't stand it! Consider this scenario. You're on your way to the *Broadcast Engineering* DTV '98 seminar in Chicago. And, you just happen have a small package of those salted wonders in your briefcase and a Snickers candy bar in your coat pocket. You breeze pass check-in and approach the gate. Ahead of you are the metal detector and the carry-on baggage x-ray machine. You place your briefcase on the machine and walk through the metal detector. Alarms go off! The security guard accosts you and demands that you empty your pockets. You place your keys and coins in the little plastic tray. The old guy looks at you suspiciously then takes the tray. You again pass through the metal detector. The alarms go off! You're whisked away from the detector, and a second guard scans your body with an ominous black wand.

"Do you have any coins or metal objects in your pockets," he asks.

"No," you reply.

Undaunted, he continues to sweep the wand across your body. Suddenly, the wand begins to chirp. He stops, moving the wand near your coat pocket. The wand chirps like mad. You look for a place to hide.

"Please empty your pockets on this table, sir," the guard says.

You pull out the Snickers bar. The guard glares at the Snickers bar.

"Sir, don't you know that you can't take peanuts onboard a plane? That's a violation of federal regulations," he says.

"That's not peanuts, it's a candy bar," you shout.

"Doesn't matter, it *contains* peanuts," he replies. "It's against federal regulations to have peanuts on airplanes. You might make someone sick," he growls.

You surrender the candy bar and return to pick up your briefcase. There, next to the x-ray machine is your briefcase — and another guard. She asks you to open your briefcase. As you open it, you realize you're carrying more of the dreaded contraband — peanuts.

"I'll have to take those from you," she says as she removes your favorite snack from your briefcase.

Embarrassed, you slink toward a chair, as far from the crowd as possible. All this embarrassment because of a few peanuts. Could this happen to you?

Out of 650 million airline passengers, there is not one documented case of a peanut-induced illness on an airplane. Yet, under the banner of the American with Disabilities Act of 1990, our government has banned peanuts from airlines. It turns out that the new anti-peanut regulations were based on complaints from three peanut haters. What's next? Chocolate?

I've had enough of these worthless Washington regulations, so I'm going to protest. I'll be bringing pounds of peanuts to give away at the *Broadcast Engineering* DTV conference in Chicago this December. I'll teach those dumb bureaucrats not to mess with a peanut lover. So come to the Digital Television '98 conference. You'll learn a lot of new technology while munching on an American snack tradition — peanuts! Together we'll be taking a stand for personal freedom and peanut lovers everywhere.

Brad Dick

Brad Dick, editor

direct: brad_dick@compuserve.com
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Reader Feedback

This month's winner

The question in the August Freeze-frame (see Broadcast Engineering, *Aug. 1998, p. 8) concerned the camera on the cover of the November 1976 issue of* Broadcast Engineering. *Only one person responded with the correct answer. Congratulations to Dale E. Smiley, CPBE, WTHR-TV, who had the correct answer: Norelco (North American Philips) LDH-1, complete with a Canon lens with mechanical zoom and focus. Dale wins a deck of* BE *playing cards.*

You too could win prizes by answering Freezeframe questions, which appear on each issue's table of contents page. Or, check the BE *web site, www.broadcastengineering.com and answer our monthly survey question.*

Dale also wrote:

For a prize, how about *freedom from subscription audits*? As a loyal subscriber since 1963, I am sick and tired of being told every other issue (so it seems) that it is time to renew! I expect to receive *BE* until I fall over dead (20 or 30 years from now, I hope) and these renewals drive me nuts! Sorry, just my pet peeve about "free" subscriptions.

DALE E. SMILEY, CPBE
WTHR-TV
SENIOR MEMBER, SBE

The BE circulation director replies:

Dear Mr. Smiley,

Once a year, we ask for an updated industry profile from each of our subscribers. As soon as we receive a completed form and it has been processed, no additional request is made of you until the following year. Our requests may seem more frequent, but they are really only annual.

Thank you for your continued loyalty to Broadcast Engineering *magazine. If you have questions or concerns, please call customer service at 800-441-0294.*

LEANN SANDIFAR
CIRCULATION MANAGER

Computer arrogance

Brad,

Your comments on the computer industry's *arrogance* in your editorial "Letter from Camp" (See *Broadcast Engineering*, Aug. 1998, p. 10) reveal a profound misunderstanding of the software development process. When a piece of software is an *alpha* version, it generally means that the feature-set and underlying technology are still under development and may be added to or subtracted from at any point. Alpha is primarily a decision-making process.

Software such as NT 5.0 enters *beta* when the feature and tech decisions have been substantially completed and

the process has evolved making it all work. The so-called *Wintel* computing platform is an extremely diverse collection of hardware and software components in limitless combinations. Hardware manufacturers and software developers work through the beta process with Microsoft to resolve such things as driver conflicts and compatibility with existing software.

As bugs are found and fixed, an interim "build" of the operating system is issued for testing. These builds are distributed to the testers experiencing and reporting the problems that these fixes are meant to solve. Testing continues to determine if the fixes are complete and have not introduced new problems. Interim builds may be conducted in parallel, that is, a given interim build may or may not contain all the latest code in all the areas of the operating system.

Periodically, the beta process brings together all the fixes from all areas into a major beta release — a *refresh*. This second (or even third or fourth) beta release gets everyone involved in the process on the same page for continued testing.

The final phase of beta test is the distribution of release candidate. The operating system is now believed to be ready to ship to manufacturing, but testers are given a final opportunity to find and fix problems before general release.

The days of a single beta build before release, if they ever existed, are long gone. The testing of complex software is a complex process. A large high-profile company like Microsoft is no more or less capable of perfection on the first try than any other human enterprise. They just have to put up with more sniping from the sidelines.

ROBERT O. CRAIG, ENGINEER
WKRC-TV

Robert:

Being a beta tester must be like playing Russian roulette. Every time you press the enter key, you hope the damn thing doesn't blow up in your face. Concerning the correction of WIN 95 errors: cars, TV sets, even toasters are recalled for mistakes. So when will Microsoft recall my copy of WIN 95 to correct the mistakes?

BRAD DICK
EDITOR

Send your comments to:
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CATCH THE WAVE WITH THE LEADER IN DIGITAL TELEVISION

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News

Copy protection — déjà vu

BY LARRY BLOOMFIELD

According to Joel Brinkley, author of *Defining Vision*, the outgrowth of the encryption work that General Instruments did led to our migration to digital television. It seems, though, that every attempt to define an encryption system or a copyright protection scheme has been met, head-on, by a basement savant's efforts at cracking the scheme and making public the results of his or her labors.

Just prior to one of the executive committee meetings of the Advanced Television Systems Committee (ATSC) in August, Fritz Attaway, senior vice president of government relations (and Washington general counsel) of the Motion Picture Association of America (MPAA) sent a *friendly* letter to ATSC chair Robert Graves.

The first part of the letter included the usual niceties about ATSC's work. This was really a cover for the second part of the letter — the MPAA's concern about copy control, which included the following statement, "In order for DTV devices to respond properly to such copy control information, MPAA supports the standardization of the MPEG Copy Protection Descriptor tag. Without standardization, downstream devices cannot effectively recognize and interpret copy control information."

This raises several burning questions. It is unlikely that any of the new breed of DTV receivers will have any such capability when digital delivery of television signals begins on Nov. 1. Could these snivelers further delay the delivery of DTV receivers? I think not. But what happens if receivers come out that don't comply?

Keep in mind that the bulk of HDTV programming is expected, at least initially, to originate on film, and MPAA's members control the bulk of U.S. feature films. Does that mean the possibility of no programming?

The letter goes on to read, "We expect on-demand premium movie services to require a high level of copy protection, whereas we anticipate that conventional advertiser supported broadcast and basic cable services would not require copy protection at all." It would appear that network and local broadcast programming is okay. But even if such programming includes movies? Or will the receivers need to be *told* it's okay? Conditional access has long been a feature of the software included in such services as DirecTV, PrimeStar and EchoStar. If you didn't pay for it, you don't get to see it.

I've got the feeling that MPAA will be beside itself when Direct Cinema is a reality and movies are delivered to theaters via satellite. This project is moving right along and will eliminate the need to send heavy reels of film to theaters. The scan system is completely different than the system for HDTV, which does not measure up to the quality Direct Cinema demands in making the TV system it uses transparent to the viewer. Encryption will be a big factor in this system, to which I say good luck.

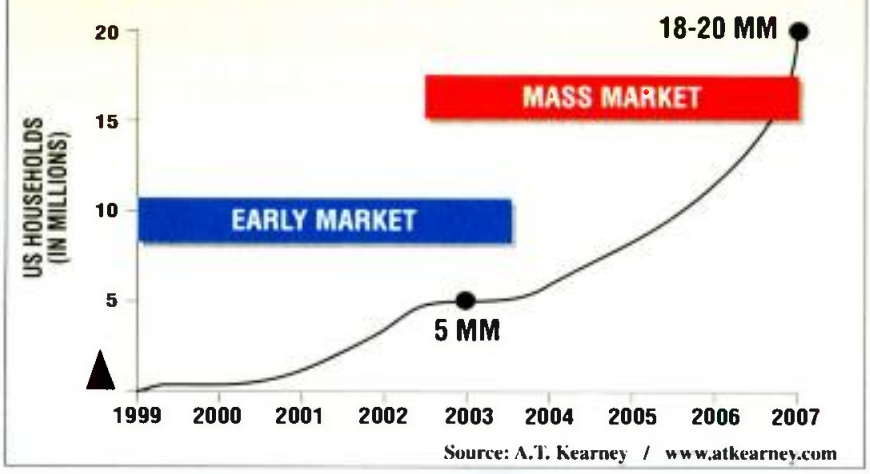
Reactions to MPAA are varied. One author described reactions in Washington as ranging from "I think we're okay" to "Aaauugghh!!" But no one said, "Attaway, Fritz!" It seems that everyone wants to put their fingers in the pie. According to a Consumer Electronic Manufacturers Association (CEMA) newsletter, on July 24, the MPAA asked the FCC to postpone the Nov. 1 date because of the problems mentioned previously. In the same report, it said the FCC declined, but quoted Attaway as saying MPAA wants to "create an environment where we can release copy-protected movies." He added, "Without that, studios are not

FRAME GRAB

A look at the issues driving today's technology.

Knowing when to jump into the DTV pool.

Knowing when to begin DTV broadcasts is crucial to a station's financial survival. The 5 million household penetration point is considered a key decision point for most stations.



Source: A.T. Kearney / www.atkearney.com

Down by the Bitstream
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likely to release movies [but] the studios make their own decisions."

Responding to Senator McCain's letter of inquiry about whether DTV receivers will work with cable, CEMA president Gary Shapiro said, "Early adopters are willing to accept certain limitations." I hope not; now is not the time to compromise anything, or we won't have the fine system that was originally designed.

There doesn't seem to be a problem with respect to signals delivered terrestrially. Most concern is over what cable is going to do, and the general opinion is that if DTV sets can't display HDTV programming received by cable, it will be cable's fault. ■

Remember the Krell?

Someone had to be first. Benjamin Krell has the distinction of being the first person in the nation to buy a digital, high-definition TV set. The HD-compatible television was sold to Krell at SoundTrack in Littleton, CO, on July 31. Another report says that Edward Davis of Claremont, CA, was first. They both bought Panasonic 56-inch widescreen rear-projection TV sets. But Krell has a time advantage, being in the Rockies. His new digital-format set was delivered to his residence in Golden, CO, at approximately 10 a.m. on August 6, 1998. Neither can watch DTV signals (or HDTV) on the sets, yet.

"Ultimate Electronics is very excited to have sold and delivered the very first HD-compatible television in the United States to one of our customers," claims David Workman, president and chief operating officer, Ultimate Electronics. "We are proud to be the first to make HDTV a reality for consumers. We have heard for years that digital is quickly approaching, and we at Ultimate Electronics are thrilled to be a part of such a historic point in the evolution of television. The future of television is here today in Denver."

The Panasonic television, which retailed at $5,500, was brought to Krell's home via truck from the Ultimate Electronics headquarters in Thornton, CO. The television was first seen at an HDTV demonstration held in Denver. Krell was in attendance during the first public unveiling of digital TV in the Ultimate Electronics store. According to store executives, more than 2,000 people from around the state of Colorado stopped by to see what digital television had to offer. One customer reportedly said, "This is by far the most extraordinary thing that my senses have ever experienced." ■

What are his "stats"?

If you're like many Americans, Monday night football is a ritual. The guys get together at the pub or in front of someone's big screen to make sure each and every play is carried out to perfection. The discussion on the various players' abilities is often left to guessing and rusty memories. At the risk of reducing the number debates that can take place during a game, how about a way to immediately access information about the players and their teams rather than waiting for some errant director to flash the information up on the screen. Just click on a player to get his stats or bio? Well, it might not be too far down the road.

A group that calls itself the Advanced Television Enhancement Forum (ATVEF) recently announced that it is developing protocols for what might be described as HTML for video. The group and its supporters are a pretty impressive bunch: CableLabs, CNN, DirecTV, Disney, Intel, Microsoft, NBC, NCI (Network Computer), PBS, Sony, Sun-Up Design Systems, Tribune, Warner Bros. and in a supporting role, Wink Communications.

According to an industry financial analyst and venture capitalist, who wished to remain anonymous, "It will be impossible for any start-up not to support a standard from such a powerful series of market leaders." It would appear that the ATVEF has trumped any competing technical innovations that may be in the pipeline. One interested party said that, to remain competitive, purveyors of the electronic entertainment media must continually improve and enhance what they have to offer the public. It's obvious that this feature would be most beneficial and useful to all aspects of television and is a natural for the data aspects available in the bitstream of DTV. For further information see their web page at www.atvef.com. ■

The experts agree...
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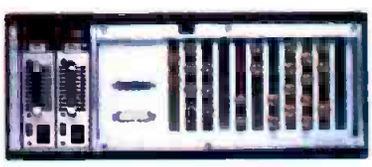

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A wet remote

In the old days of TV, a remote, or outside broadcast, wasn't as simple as driving a truck filled with cameras, cable, a switcher and a link to the remote site. You'd also hoped that the link would get your signal back to the studio. The world shrunk as satellites became available, but doing a remote from 60 feet below the surface of the ocean would still be a challenge that the most seasoned of remote engineers would cringe at taking on. Such were the circumstances when NBC did just that for a segment of the *Today Show* in August.

Support buoy connected by cable to the Aquarius undersea research laboratory.

Six aquanauts were just completing their first six-day mission in and around the Aquarius undersea research facility located in the Atlantic Ocean off the coast of Key Largo, FL. To get the signal back, a continuous wireless data and voice communications link, designed and manufactured by Harris and InTalk, bridged the electronic gap to an operations shore station nine miles away. The radio link allowed the aquanauts to conduct videoconferences with NBC's Today Show hosts and fellow scientists at universities and associated research organizations around the world.

The wireless link was located aboard a large support buoy floating above, and connected by cable to the Aquarius undersea research laboratory anchored on the ocean's floor 60 feet below the surface. The other end was located onshore, at Aquarius' operations center in Key Largo, a distance of about nine miles over open water. By employing Harris Semiconductor's new Prism radio technology, built by InTalk, the link between the undersea aquanauts and ground-based support personnel was established.

The digital wireless link operates in the 2.4GHz radio band and provides transmission at 2Mb/s. To illustrate, the data passed over this one wireless link about equals that carried on 36 telephone lines with 56Kb/s modems on each end.

"That data rate allows the operations center to continuously monitor life support systems in the habitat," says Dr. Jack Brady, the scientist responsible for the design and implementation of the wireless system. He added, "In addition, it allows real-time transmission of research data, video conferencing with colleagues anywhere in the world, and Internet access of real-time information by students interested in the ecology of our oceans and the health of coral reefs."

Aquarius undersea research laboratory cab.

The *Today Show* remote went without a hitch, and no one got their feet wet either. ■

Is nothing sacred?

The Internet just might be going postal. Can you imagine Newman from *Seinfeld* delivering your e-mail? There's a scary thought. But it appears that the U.S. Postal Service is considering doing just that. The scenario they are considering will use the ".us" domain, a block of Internet addresses set aside for use solely in the United States. If you have received e-mail with any two letters like ".xx" on the end of it, chances are it didn't originate here in the good old United States. I get e-mail from folks all over the world. Examples of some are ".uk," which originated in the United Kingdom, ".jp" for Japan, ".in" for India and ".mx" for Mexico. The proposed .us domain is just one of many two-letter national top-level domains (TLDs) assigned to each country.

To date, the .us domain has held little appeal; it's mostly been ignored here in the United States, where we have instead used popular names or catch abbreviations in the ".com," ".net" and ".org" domains. For example, only one million computers are hooked up to the Internet with names in the .us domain, compared with eight million in .com. As I understand it, the two-letter suffix is assigned to the location of the user's "originating" mail server. (I know of at least one U.S. company that uses a server located in the Caribbean, with its two letter suffix, simply because it is not as loaded with traffic, thus it's faster.)

Snail mail didn't get its name because it's fast and efficient. I shudder to think what the U.S. Postal Service could do with e-mail as we now know it. As if figuring out how to get a piece of mail across the street in less than a week weren't a big enough task, they now want to mess with the Internet.

Now here's some typical bureaucratic hogwash: According to my sources, the U.S. Postal Service sees

PERFECTION.

Perfection is a word used to describe Ikegami's HK-388 which consistently performs beyond expectations, holding resolution and colorimetry even in very low and "colorful" lighting conditions.

Featuring Skin Detail (an Emmy Award winner), the Ultra-wideband HK-388 and HK-388P hand-held companion are full digital cameras that combine Ikegami's vast studio experience with today's digital technology. Wide screen models, HK388W and the portable HK-388PW, offer instant switching between 16:9 and 4:3 aspect ratios. These cameras feature New Generation ASICs for Ultra-High Density 640,000 pixel, 2/3" FIT CCDs; Skin, Slim and Diagonal Detail; Ultra-Wideband Component Triax or Optional Digital Fiber Transmission Systems; Analog and Serial Digital Component Outputs; Modulation Depth of 80% at 5mHz; Sensitivity of f8 at 2000Lux; S/N ratio of 62dB; and now with 12-Bit A to D conversion.

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control of e-mail as a natural progression into the digital age. They plan to take over the Internet and build an infrastructure that would ultimately give anyone with a physical address a corresponding link into cyberspace. There's no doubt the concept is good but, judging from the government's track record of having the not-so-Midas touch (and not just with the mail), our horse may well end up a camel.

The Postal Service claims it can brand .us as the universal domain for the United States, while bringing its expertise and reputation for protecting the privacy of mail to the Internet. Both claims remain to be seen. Susan Brennan, spokeswoman for the agency, says, "This would be an infrastructure that would make sense for us to put together because of our experience managing address systems."

The implementation of the Postal-Service e-mail concept could, potentially, give everyone with a street address access to e-mail. Brennan says that people without computers could have their messages printed out and delivered via the regular mail stream. (I can't help wonder if this includes junk mail, as well. I think this would be the postal equivalent of Spam.)

Having moved recently, I can identify with the concept of a new address on my house and of a corresponding e-mail address. But, after being at my new address for several months, I'm still having trouble getting my regular mail forwarded. I hate to think what the Postal Service would do with my e-mail if charged with forwarding that address, as well.

The Postal Service offers an example of what the e-mail addresses of the future could look like: instead of "ibm.com," the address in .us might be "ibm.white.plains.ny.us." Somebody else could have the domain "ibm.manhattan.ny.us."

The Department of Commerce (DOC) is debating and taking public comment on future administration of the domain, which (according to them) has generally been used by state and local governments and schools. One of the 11 questions the DOC has issued in its request for comments is whether the domain should be run by a public or private body. Many countries, especially small nations like Tonga and Turkmenistan, have already established or contracted with companies to handle the registrations for their country codes.

Indications are that the Clinton Administration plans to hand control of the Internet Domain Name System to a private, international, non-profit corporation later this year. This raises questions about the future of .us.

Ironically, the person who currently administers the registration functions for the .us domain is a guy named Jon Postel. A private company, Network

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Solutions, currently handles all the registration functions for .com, .net and .org. Just to keep who does what straight, the Internet Assigned Numbers Authority is the entity that gives domain names the IP numbers that turn these names into addresses on the global network. Although the Postal-Service plan is broad in concept, Postel said it sounds promising.

As of this writing, no other formal plans have been suggested for the future of .us. Some private organizations, like Network Solutions and NetNames, which have agreements to handle registrations for several foreign country domains, are also expected to make bids for control of the domain. Network Solutions is currently negotiating with the Clinton Administration on how to end its cooperative agreement and begin opening the registrations of .com, .org and .net to competitors. Network Solutions spokesperson Chris Clough says the future of .us is part of those negotiations.

When all is said and done, if we do switch over to all-electronic mail, I'll feel sorry for the neighborhood dog, Sparky. He won't have the postman's leg to bite anymore, and the thought of him going after telephone poles — well, he has them covered in a different way. ■

Cable gets a wake-up call

With all the trouble the FCC, cable companies and Consumer Electronics Manufacturers Association (CEMA) are having getting their acts together to bring HDTV to the American public, it would seem most appropriate that the cable companies' biggest competitor would step up to bat and hit the first home run by announcing that they'll carry HBO-HDTV.

August could not have ended on a more positive note. From the heart of this great nation, Minneapolis/St. Paul, the home of U.S. Satellite Broadcasting (USSB), came the announcement that they plan to offer Home Box Office (HBO) high-definition television (HDTV). USSB will distribute HBO-HDTV nationwide by leasing transponder space from DirecTV at the 95 degree-west longitude fixed-satellite location.

It stands to reason that if the satellite belongs to DirecTV, and it is at a new orbital location, both DirecTV and USSB will deliver HDTV programming. Keep in mind that both USSB and DirecTV, along with the other direct-to-home (DTH) and direct broadcast satellite (DBS) folks, have been delivering digital standard-definition signals of the conventional type, via those small dishes popping up all over the countryside. Anyone who's seen pictures on a good, working TV set delivered by the current system, would have to agree that these pictures are better than anything currently available terrestrially or via cable. I've heard the picture quality described as studio quality.

Keep in mind that, as good as the current digitally delivered DBS or DTH signals are, the HDTV material will be far superior. A USSB spokesperson said that USSB will initially preview HBO-HDTV programming in retail showrooms later this year and, when HBO begins providing residential HDTV, USSB will carry it for its digital satellite system subscribers. According to the same USSB source, HBO plans to deliver HDTV content early next year.

With little or nothing in the way of HDTV format material available in film libraries, one can't help but wonder what HBO has in mind to offer the public. This same concern has been expressed by many of the 40 stations that are mandated to be on the air, digitally, in the not-too-distant future. This seemingly good news for proponents of HDTV brings up a different issue as to what format they all plan to use. We know the format has to be either 720 or 1080, but will it be interlace or progressive scan, and at what frame rate, 24, 30 or 60? The folks I spoke to didn't have the answer.

In a press release tied to the announcement, USSB president and CEO Stanley E. Hubbard had a right to crow when he said, "The digital satellite system continues to be on the cutting edge of the movie and entertainment industry. With HDTV being the biggest technological entertainment revolution since color television and HBO being America's premier premium movie provider, it's a perfect fit for the digital satellite system. We're delighted to be able to offer HBO-HDTV to our customers and the national television viewing public." ■

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The pecking order

It has long been apparent that the cable companies have lost their perspective as to where they fit into the pecking order of the broadcast industry. Unlike the chicken-and-egg quandary, there is no question about which came first: the broadcaster or the cable company. Cable's charter has been to pass the signals of broadcasters on to homes, unaltered. It was as an added incentive to potential subscribers that cable companies began to provide services like HBO, ShowTime and other programming, some with local commercial inserts and avails.

Compared with broadcasters, cable companies have had little or no regulation. The only competition that cable companies have experienced are the several direct-to-home satellite services that transmit digital TV signals to the backs of their subscribers' TV sets. It is beyond comprehension why it has been necessary for the chairman of the Federal Communications Commission, Bill Kennard, to ask the cable industry and TV manufacturers to resolve technical problems involving the new digital TV sets. "Compatibility concerns must be resolved quickly to ensure that American consumers are able to enjoy the benefits of digital television starting this fall," Kennard said in a recent letter to both the chiefs of the National Cable Television Association and the Consumer Electronics Manufacturers Association.

FCC officials are concerned that cable customers who buy the expensive, digital high-definition TV sets may not be able to see TV shows via cable in the "razor-sharp HDTV format" because of technical and copyright issues that need to be resolved. Although the cable companies have promised to deliver the signals in a quality similar to what they see on regular TV sets, that is not the intent of DTV. You have seen the scenario many times before: If a particular cable company can't get its act together to get the job done, it should be made to step aside so that one that can step in and provide the service.

Kennard's Nov. 1 goal puts pressure on all the players to get their acts together more quickly to ensure compatibility among new digital TV sets, digital cable boxes and other consumer electronics equipment. We will see if this is just a bark or if it has some serious bite for a change. In the past, the FCC has never hesitated to make rules for broadcasters to follow. Perhaps it's time the commission did its job and reminded cable companies where they stand in the pecking order. ■

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Starship engineer or snake-oil salesman?

Walter Cronkite has been billed as the most trusted anchor in TV history. Trust in a salesperson doesn't make a new DTV set work any better, but if you were going to buy one, you'd probably be more willing to do so from someone you trusted. Cue the transporter — in steps the chief engineer of the Starship Enterprise. To kick off its promotion of HDTV receivers in New York, Circuit City Stores pulled out all the stops. Actor James Doohan, "Scotty" from television's original *Star Trek*, was on hand to discuss the digital technology and sign autographs. Take Scotty's advice or the regular salesman's? Captain Kirk trusted Scotty for many years, right?

The demonstration took place at the Westbury Circuit City Superstore earlier this year. Circuit City has been involved in the strong promotion of the new digital TV formats and was part of the first live professional sports broadcast of high-definition television this past spring in Dallas. Circuit City officials say nearly 2,000 consumers crowded the Dallas superstore to see this compelling technology. "High-definition television represents the best quality picture and sound television viewers can experience," said Alan McCollough, Circuit City president and chief operating officer.

From other reports, it seems that local hi-definition demonstrations of this kind usually draw about 2,000 spectators each. Assuming no repeat attendees, just think, we've only got several thousand left before we reach everyone here in the United States.

You can expect much more of this kind of thing in the future if we are going to convince the public to spend the big bucks to bring these high-quality pictures into their living rooms. Me, I'm holding out for Da-lyn from *Babylon 5*. ■

Daddy, I want a new one

When your toys break and you have to get a replacement, where do you go? To daddy, of course. If you happen to be DirecTV and daddy happens to be Hughes Space Communications Company, all the better and oh, so much easier.

On July 4, not all the fireworks were at the local parks. DirecTV's DBS-1 experienced a failure in its primary spacecraft control processor 22,300 miles in space. Not to worry though, DirecTV was able to automatically switch to an onboard back-up unit, which enabled the company to continue providing service to its more than 3.8 million subscribers.

The new bird DirecTV has asked daddy for is an HS-601 HP model Ku-band device that has 20 channels more capacity than the failed DBS-1 spacecraft they use today. The folks at DirecTV say the additional capacity will be used for new programming services and to expand basic and premium subscription services.

"This new satellite will provide the extra insurance DirecTV needs to provide our subscribers with long-term, uninterrupted subscription entertainment services," said Eddy Hartensetein, president of DirecTV. "The extra capacity will also enable us to create additional revenue opportunities and provide new services to our subscribers, which will increase the appeal of our service and further strengthen our leadership position in the market."

It is expected that the new satellite will be launched in mid-1999 and positioned at 101 degrees among the three existing DirecTV spacecraft. All this, of course, is pending Federal Communications Commission approval. ■

Tektronix provides format independence

Tektronix announced the latest addition to its Profile product family, the PDR400. It provides full DVCPRO compatibility to the broadcast-quality Profile video server. Tektronix becomes the first video server manufacturer to support the three leading broadcast industry compression formats: JPEG in the PDR200, MPEG-2 4:2:2 in the PDR300 and DVCPRO in the PDR400. The company has shipped more than 13,000 digital channels. Key Profile installations include CNN and Paxson Communications in the United States and BSkyB and TV4 in Europe.

Features of the PDR400 include a highly configurable video server with up to six video channels and 16 or 32 audio channels; analog or digital audio/video interface options; two SDTI ports for compressed transfers from/to DVCPRO VTRs; scrub audio for fast and accurate cueing; and optional internal mix/effects board and RAID or non-RAID storage.

The PDR400 will ship in two phases: DVCPRO codecs will ship in phase one, allowing customers to create archives of material in the DVCPRO format. Phase two will introduce an add-in board for high-speed SDTI interfaces for compressed transfer to the system. Phase two will ship following NAB '99.

Customers who purchase a basic Profile will receive a free DVCPRO upgrade kit when it becomes available in the first quarter of 1999. ■

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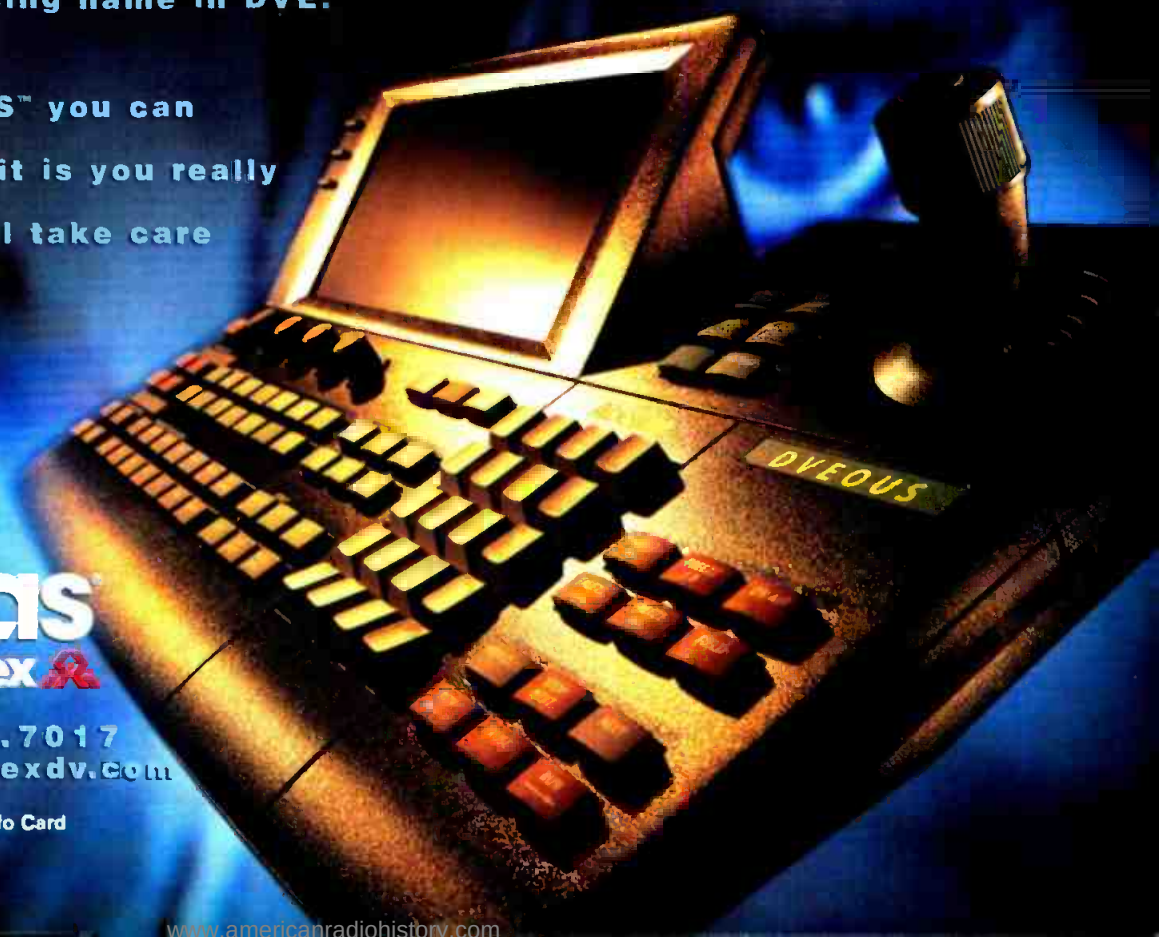

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FCC Update

New studio and public file rules

BY HARRY MARTIN

The FCC has issued a Report and Order altering the guidelines for the location of main studios and changing its public file rules. The modifications to the rules include:

• Studio rules. Licensees now may select a main studio location that is either within (a) the principal community contour of any station of any service (i.e., radio or television) licensed to the community, or (b) 25 miles from the reference coordinates of the community of license.

• Public files. Licensees now will be required to keep the public file at the main studio. Previously, the public file was required to be located within the city limits of the community of license, notwithstanding the location of the main studio.

Members of the public now may make telephone requests for documents in the public file. Telephone requests must be honored within seven days. The licensee must assist callers and provide information about what documents are in the public file. The licensee may charge a fee to cover the costs of copying other documents requested from the public file and may withhold sending the documents to the requesting party until payment is received. The licensee is responsible for postage.

The commission is rewriting its handbook, titled *The Public and Broadcasting*. Once the revised version is available, licensees will be required to keep a copy in the public file as well as to provide copies free of charge to members of the public who may call the station.

The FCC also has added some new record-keeping requirements. A copy of the current station authorization and a copy of the current service contour map, together with any other information showing service contours and/or main studio and transmitter location, must be maintained. Additionally, licensees now are required to place in the public files copies of all applications filed with the FCC rather than only those requiring local public notice.

The commission also made changes to its public-file retention requirements. Under the new rules, issues/programs lists must be kept for a full license term, i.e., until approval of renewal is final. Certain documents, such as contour maps and authorizations, must be retained until there is a change. Political file documents must be kept for two years. However, outdated ownership reports and granted applications for renewal, assignment, transfer or technical modifications (except contour maps and information about studio and transmitter location) no longer have to be retained in the file.

Casino gambling ads legal in more states

The U.S. Supreme Court has declined to overturn a lower court ruling that a ban on state-sanctioned casino gambling is unconstitutional. Last year, the U.S. Court of Appeals for the Ninth Circuit found that banning gaming ads in states where gambling is legal is a violation of commercial free speech. The Supreme Court has now declined to hear the appeal of the Ninth Circuit's ruling, thus allowing that ruling to stand. Meanwhile, a U.S. District Court in New Jersey also has concluded that the prohibition on broadcasts of gambling ads is unconstitutional.

Additionally, the plaintiffs in the New Jersey case, which include the National Association of Broadcasters and Players International, have filed a petition with the District Court there urging that the federal ban be eliminated nationwide. The U.S. Department of Justice has opposed this petition, and the matter is pending. A conflict among circuits exists, however. In New Orleans, the U.S. Court of Appeals for the Fifth Circuit recently affirmed its earlier decision disallowing ads for riverboat gambling, which is legal in New Orleans. The conflict between the Fifth and Ninth Circuits' treatment of this issue sets the stage for a further appeal to the Supreme Court, where the issue will have to be decided.

The FCC's reaction

In the wake of the various court rulings, the FCC has announced that it will not enforce the rules against gambling advertisements in the nine Western states that make up the Ninth Circuit (California, Arizona, Nevada, Idaho, Oregon, Washington, Montana, Hawaii and Alaska) or in New Jersey. The commission's rules remain in full force in all states outside of the Ninth Circuit and New Jersey. Furthermore, the federal cases do not have any impact on state laws governing lottery and gaming ads. Those laws currently remain fully in effect. ■

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

Dateline

TV, LPTV and TV translator stations in Connecticut, Maine, Massachusetts, New Hampshire and Rhode Island, and LPTVs and TV translators in Minnesota and North Dakota must file their renewal applications by Dec. 1. Commercial TV stations in the following states must file their annual ownership reports on or before Dec. 1: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.

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DTV Update

The impact of DTV implementation

BY LOUIS LIBIN

As all of us on the technical side of the TV industry know, the introduction of color television approximately 40 years ago was the last major advancement in the NTSC standard.

Now broadcasters and equipment manufacturers are beginning to move toward digital. It is a traumatic but necessary move for the broadcasters. The following is an update on some of the issues impacting the implementation of DTV in the United States.

Conflicting results from field tests

Now that the results from field tests in four major cities have been completed, a better analysis of the data yields new information. Yes, the statistics for outdoor, as well as indoor, were much better for Chicago than they were for Washington, D.C. Broadcasters can take heart that, when transmit power and height are taken into consideration, reception statistics for outdoor reception of DTV remain high.

For indoor reception of the DTV signal, the statistics are rising as the technology level in the receiver rises. The adaptive equalizer is one of the most important modules in the new receivers. The equalizer compensates for many channel distortions, including ghosting, other multipath interferers and spectrum tilting.

We will continue to see improvements in receiver technology. The variations in the reception statistics for the various field tests can be directly correlated to transmit power and height. Consumer receiver manufacturers, as well as the Consumer Electronics Manufacturers Association (CEMA), expect that the first batch of DTV receivers to come off the assembly line will be 8-VSB friendly only, as opposed to other, non-ATSC standard modulation schemes.

The much-needed cable-ready digital TV receivers with QAM demodulators and set-top descramblers will undoubtedly be in the second phase of products.

The cable industry is continuing to develop the standardization that is required of the DTV signal that they will be delivering to homes.

Border station agreements

The FCC has signed agreements with the Canadian and the Mexican governments that allow for the coordination of the channels necessary for the establishment of DTV service in joint, overlapping areas as well as areas considered interference areas.

These agreements will allow at least 21 U.S. stations to meet their required deadlines for DTV implementation established by the FCC. The impacted areas extend 275 km from each side of the border. In the case of the U.S./Canadian border, the agreement provides DTV channels rights to Canadian and U.S. stations.

The agreement on the Mexican side provides broadcasting clearance rights to U.S. stations to broadcast DTV within close range of Mexico.

Certain DTV implementations face delays

In San Francisco, broadcasters took an early lead in planning out their DTV strategy. The broadcasters plan on using their existing community tower and antenna system to support the new DTV antennas. The San Francisco broadcasters will be using a channel combiner to broadcast multiple DTV signals off a four-antenna stack. The potential problem is the weight of the antenna. Local homeowners groups are questioning the feasibility of the new 10-ton antenna structure's ability to withstand an earthquake. The issue is before the zoning board.

In New York City, probably the most difficult among the early build-outs, negotiations with the Port Authority, the owner of the World Trade Center, are slow and unsteady. Only two individual stations, WCBS and WNYW, are proceeding with their plans to transmit from the Empire State Building. This solution is not, however, a permanent one. New York City remains an extremely challenging location for terrestrial transmission of DTV transmission, and there is no solution at hand. We will see other, similar situations in various parts of the country.

Measuring the DTV signal

Up until now, broadcast engineers were able to get by with saying, "I am only an analog engineer." However, those days are over. Throw out that statement, and get ready to buy and train on new test and measurement equipment.

The new test instruments available today are not at all similar to those of the analog, NTSC past. The new DTV system uses a motion-compensated discrete cosine transform (DCT) algorithm for compression of video signals. DCT exploits spatial redundancy, and motion compensation exploits temporal redundancy.

Engineers need not be concerned that measurement and monitoring equipment will be not be available. Manufacturers are rushing to fill the gaps with an impressive array of new types of equipment. ■

Louis Libin is a broadcast/FCC consultant in New York and Washington.

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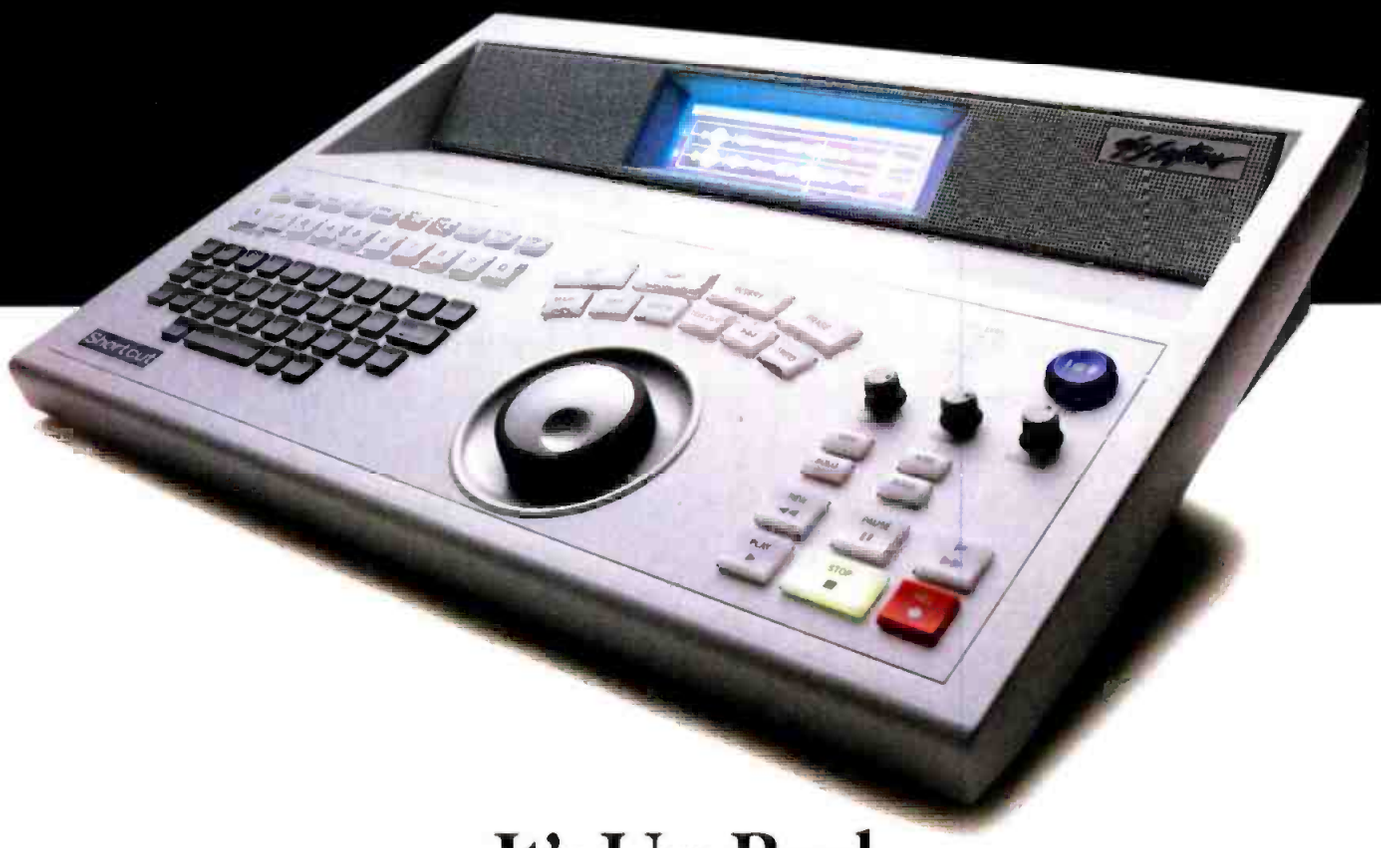

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Tape-based editing lives on, part 2

With an ever increasing emphasis on non-linear editing, is there still a place for tape-based editing? If so, where and for how long?

(Last month's column explored this topic. Because of overwhelming response, we will look at two more views on the subject this month.)

VENDOR

Symon Hammacott, Product Designer/Manager, Eidos Technologies.

It is not simply a question of whether tape-based systems will be quickly abandoned for the next wave of new digital technology. Many factors will ensure tape remains in editing bays for some time to come.

As a video and film producer, my goal is to make more video output for less money, while retaining or even improving the production values. I see many clear ways to streamline my working practices by using new digital technology. The right investment can quickly increase my output volume with shorter production cycles. The time saved through workflow efficiencies will reduce project budgets and free up more time for other creative footage.

What is stopping me from making this investment is that the new digital technology jigsaw puzzle is not quite complete. The missing piece, which concerns me greatly, is ready access to massive archives of existing tape-based material commonly used to complement original footage.

Perhaps I am being harsh in the face of amazing technological advances that the digital revolution presents. But before I can even begin to think about abandoning tape, I need a cheap and effective acquisition solution combined with the treasures of the world's archives available digitally to complete this equation.

Acquiring moving pictures and sound, at good quality, for relatively low cost, is what tape does best. It can be budgeted on a per-program basis and requires minimal changes in hardware or working infrastructures. Additionally, most of the archive that re-purposed productions rely on is currently stored on tape and is therefore easily accessible.

New digital technology is closer to being a reality, but many of the manufacturers who possess the engineering skills to make it a reality are enjoying vast revenue streams from tape production. The revenue replacement will presumably occur somewhere in the upgrade path to tapeless acquisition, and the investment required to convert may be daunting. Perhaps even more daunting may be the cost of updating some of the huge television and film archives to embrace these new working practices. ■

EXPERT

Ed Fraticelli, Director of Engineering, Production Masters.

Tape-based editing still has its uses in the production world. In news production, tape-based editing will continue. But in the area of program and spot editing, non-linear is the standard operating procedure. Off-line edits on a non-linear disk-based system are followed by on-line of the final master in a tape-based suite. This model allows a creative freedom that tape-based editing could never match. The inherent ability to make quick changes and multiple versions with a random access disk-based system allows editors to do what they do best — edit.

But as software development increases and disk technology costs decrease, the line between off-line and on-line editing becomes blurred. We can foresee a time when the same system that is used to off-line edit a spot or program, using compressed video data, will then automatically "assemble" the final product, using uncompressed data. There are several systems on the market today that can already realize this model, but their cost, for the most part, prohibits their use as off-line edit systems.

Tape itself, of course, is used all through these processes. From acquisition, either directly from a video camera or via a telecine transfer from film, to final master and distribution dubs, tape is still the best way to store large amounts of digital data inexpensively and reliably. This will remain so for a long time, by all indications. Even digital data backups of disk systems are done, mostly, onto linear tape.

The battle lines will finally be drawn between disk-based editing and tape-based editing based on the way operators are used to working. I have found an increasing number of younger operators coming into the industry who only know non-linear systems. And be assured that as time continues to march on (and it always does) these "new" editors will transform standard procedures and could completely eliminate tape-based editing. ■

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Transition to Digital

Digital 4:2:2 VTRs

BY MICHAEL ROBIN

ITU R 601, formerly CCIR Recommendation 601 Encoding Parameters of Digital Television for Studios, was the result of North American and European digital video standardization efforts. This recommendation established a component digital approach compatible with both the 525/59.94 and the 625/50 standard definition scanning standards. It is the root of all subsequent component digital developments, its major achievement being the specification of a set of sampling frequencies common to both scanning standards (for more information, see "The CCIR-601 component digital standard," *Broadcast Engineering*, January 1998, p. 46). The selected frequencies are common multiples of the horizontal scanning frequencies (F_H) as well as 3.375MHz.

The 4:2:2 concept

In the 525/59.94 scanning standard, F_H = 15734.25Hz. The 4:2:2 concept refers to sampling the luminance (Y) component at 13.5MHz (858 x F_H or 4 x 3.375MHz) and each of the color difference components (PB and PR) at 6.75MHz (429 x F_H or 2 x 3.375MHz). This results in 858 Y samples per line and 429 (each) P_B and P_R samples per line for a total of 1,716 time-division-multiplexed digital words per total line. If only the active line is considered, the number of samples is reduced to 720 for the Y component and 360 each for the P_B and P_R components, for a total of 1,440 time-division-multiplexed digital words per active line. To satisfy Nyquist sampling requirements and avoid aliasing, the bandwidth of the three analog component video signals is limited before A/D conversion to 5.75MHz for the Y component and 2.75MHz for PB and PR. This limits the horizontal resolution but does not alter the number of samples per line.

4:2:2 component digital signals can be distributed in a bit-parallel format, long since abandoned, or in a bit-serial format. The serial bit-rate is given by the formula:

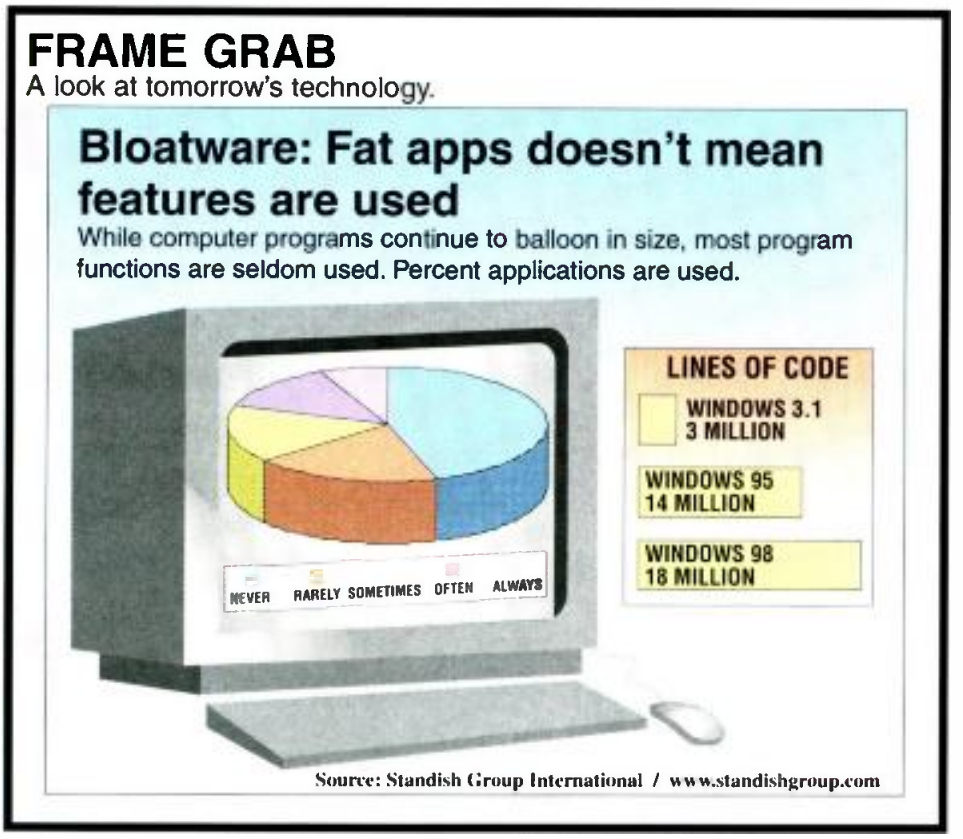
Total serial bit-rate (Mb/s) = T_W x T_T x n x F_V
where
T_W = Total number of words per line = 1,716
T_T = Total number of lines per frame = 525
n = Number of bits per digital sample = 8 or 10
F_V = Number of frames per second = 29.97

Depending on the number of bits per sample, the serial bit rate may be 216Mb/s (8bits) or 270 Mb/s (10bits). Recording these high bit-rates requires a large bandwidth, and large recording bandwidths require high tape-to-head speed. To allow for relatively long recording times on reasonably sized cassettes, high-speed rotary heads are used. There is, however, an ever-changing technological limit beyond which the recording of high bit-rate signals is impractical, uneconomical, or both.

One solution is the use of digital signal compression to reduce recorded bandwidth. Various recording technologies use different means of bit-rate reduction.

Compression

In the 4:2:2 format, only 83% of the each horizontal line contains picture information, with the rest of the line being used for horizontal blanking. The samples that occur during horizontal blanking do not vary, and thus can be eliminated, resulting in a considerable reduction of the bit-rate. The lines during vertical blanking can also be removed. The reduced bit-rate obtained by removing this redundant information is the essential bit-rate required for the perfect reconstruction of the original signal. The essential bit-rate can be calculated by substituting Aw



(active words per line = 1440) for T_W and A_L (active number of lines per frame) for T_L in the previous formula. While A_W is generally agreed upon, the active number of lines per frame is a manufacturer's choice. Values from 480 to 507 are encountered in practice, which affects the essential bit-rate.

Data compression systems combine various tools to reduce the bit-rate of digital signals to an acceptable value. Many *lossless* and *lossy* techniques have been developed over the years, some of which are acceptable for video applications.

Lossless compression, also known as reversible compression, loses no data. Compressed video data can be decompressed, and each pixel is an exact duplicate of the original. Lossless compression allows only a modest amount of bit-rate reduction, rarely exceeding 3:1. Usually a Discrete Cosine Transform (DCT) is applied to Y, P_B, P_R blocks of 8x8 pixels. In the 4:2:2 format, the blocks are combined into macroblocks consisting of four Y blocks and two-each P_B and P_R blocks. The blocks are zig-zag scanned, and the resulting DCT coefficients are subjected to Variable Length Coding (VLC) and Run Length Coding (RLC). The result is intraframe or intrafield compression

Lossy compression is not reversible. It allows for higher bit-rate reductions at the expense of distortion and artifacts. By carefully selecting compression techniques, these artifacts can be made invisible to the eye. However the original signal cannot be restored. The techniques used are DCT, VLC and RLC complemented by interframe compression obtained by using intraframe compressed (I) frames as a reference to generate predicted (P) frames. A further process generates bidirectionally predicted (B) frames from both I and P frames. An I frame followed by a sequence of P and B frames results in a group of pictures (GOP), where the P and B frames consist of predicted values rather than actual digital values. This process is complemented by motion prediction and results in a variable bit-rate, depending on the complexity and temporal change (movement of objects) of consecutive pictures. A buffer is used to restore the data to a constant bit-rate, resulting in a variable picture-quality rate. Lossy compression results in much higher compression ratios, from 3:1 to 100:1.

Lossy compression is not reversible.

Formats

Table 1 shows some characteristics of contemporary 4:2:2 component digital videotape recorders as obtained from manufacturers' published data. All formats use the 4:2:2 video sampling frequencies, but the essential and recorded bit-rate varies, depending on the number of recorded lines, the number of bits per digital sample and the type of compression used. All models have a choice of in/out ports. The table presents data with all options included. Some items require further explanation:

PARAMETER	SONY D1	SONY DIGITAL 8ETACAM	SONY BETACAM SX	PANASONIC D5	PANASONIC DVC PRO 50	JVC DIGITAL S	AMPEX DCT 700d
VIDEO							
Y Sampling rate	13.5MHz	13.5MHz	13.5MHz	13.5MHz	13.5MHz	13.5MHz	13.5MHz
Pb,Pr Sampling rate	6.75MHz	6.75MHz	6.75MHz	6.75MHz	6.75MHz	6.75MHz	6.75MHz
Sample resolution	8 bits	10 bits	8 bits	10 bits	8 bits	8 bits	8 bits
Y Bandwidth	5.75MHz	5.75MHz	5.75MHz	5.75MHz	5.75MHz	5.75MHz	5.75MHz
Pb,Pr Bandwidth	2.75MHz	2.75MHz	2.75MHz	2.75MHz	2.75MHz	2.75MHz	2.75MHz
Y SNR	56dB	62dB	>60dB	62dB	>60dB	>55dB	55dB
Recorded lines per frame	500	507	507	510	487.5	480	504
Compression ratio	1:1	2.34:1	10:1	1:1	3.3:1	3.3:1	2:1
Compression type	None	DCT Intra-frame	MPEG2 4:2:2	None	DCT+VLC	DCT Intra-frame	DCT
Tape data rate	225Mb/s	127.76Mb/s	40Mb/s	300Mb/s	100Mb/s	99Mb/s	124.7Mb/s
Video bit-rate	172Mb/s	95Mb/s	18Mb/s	220Mb/s	50Mb/s	50Mb/s	88Mb/s
Analog I/O interfaces	Y/G,Pb/B,Pr/R	NTSC,CAV	NTSC,CAV	NTSC,CAV	NTSC,CAV	NTSC,CAV,SVIDEO	NTSC,CAV
Digital I/O interfaces	SMPTE 125M	SMPTE 259M	SMPTE 259M	SMPTE 259M	SMPTE 259M SMPTE 305M	SMPTE 259M SMPTE 305M	SMPTE 259M
AUDIO							
Sampling rate	48kHz	48kHz	48kHz	48kHz	48 kHz	48 kHz	48kHz
Sample resolution	20 bits	20 bits	16 bits	20 bits	16 bits	16 bits	20 bits
Bandwidth	20Hz to 20kHz	20Hz to 20kHz	20Hz to 20kHz	20Hz to 20kHz	20Hz to 20kHz	20Hz to 20 kHz	20Hz to 20kHz
SNR (dB)	90dB	90dB	90dB	90dB	90 dB	90 dB	90dB
Audio channels	4	4	4	4	4	4	4
Analog I/O interfaces	Balanced XLR	Balanced XLR	Balanced XLR	Balanced XLR	Balanced XLR	Balanced XLR	Balanced XLR
Digital I/O interfaces	AES/EBU	AES/EBU	AES/EBU	AES/EBU	AES/EBU	AES/EBU	AES/EBU
OTHER							
Tape speed	28.66 cm/s	9.67 cm/s	5.9575 cm/s	16.7228 cm/s	6.764 cm/s	5.78 cm/s	13.17 cm/s
Maximum playback time	76 min.	124 min.	180 min.	123 min.	93 min.	124min	208 min.
Tape witdh	3/4 inch	1/2 inch	1/2 inch	1/2 inch	1/4 inch	1/2 inch	3/4 inch
Playback compatibility	None	BETACAM SP	BETACAM SP	D3	DVC PRO	SVHS	None

Table 1. Characteristics of 4:2:2 component digital videotape recorders.

Recorder lines per frame. As mentioned previously, the number of recorded lines is a manufacturer's choice. The analog NTSC 525/59.94 standard assumes 485 active lines per frame. Most manufacturers meet this

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requirement. However, JVC's Digital-S records only 480 video lines. It is important to note that the ATSC recommendations are based on 480 active lines per TV frame. In all likelihood, this will become the de facto standard for SDTV. The number of recorded lines determines the essential bit-rate. As an example, based on information in Table 1, the essential bit-rate of Sony's Digital Betacam can be calculated as follows:

Essential bit-rate = Aw x Ar x n x Fv =
1440 x 507 x 10 x 29.97 = 218.8Mb/s

One method of determining compression system performance is to compare the compression ratios. Compression ratio is given by the following formula:

Compression ratio =
Essential bit-rate/Recorded video bit-rate

With the Sony Digital Betacam format:

Essential bit-rate = 218.8Mb/s
Recorded video bit-rate = 95Mb/s
Compression Ratio =
218.8 Mb/s / 95 Mb/s = 2.3

Tape data rate. The tape data rate is usually considerably higher than the recorded video bit-rate. The headroom, the difference between the tape data rate and the recorded video bit-rate is used for digital audio recording and error correction purposes. In the Sony Digital Betacam format, the tape data rate is 127.76Mb/s, resulting in an overhead of 32.76Mb/s.

A review of the currently available 4:2:2 format videotape recorders reveals an ever-expanding choice of formats.

A review of the currently available 4:2:2 format videotape recorders reveals an ever-expanding choice of formats. Each format uses proprietary tape specifications, compression schemes and channel coding. As such, the formats are, generally speaking, incompatible. A certain degree of interconnect compatibility is available through a choice of analog (composite and component) and digital component interfaces. In the interest of preserving the original digital recording quality, it is recommended that various format videotape recorders be interconnected using the SDI format as specified by the SMPTE 259M standard. ■

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

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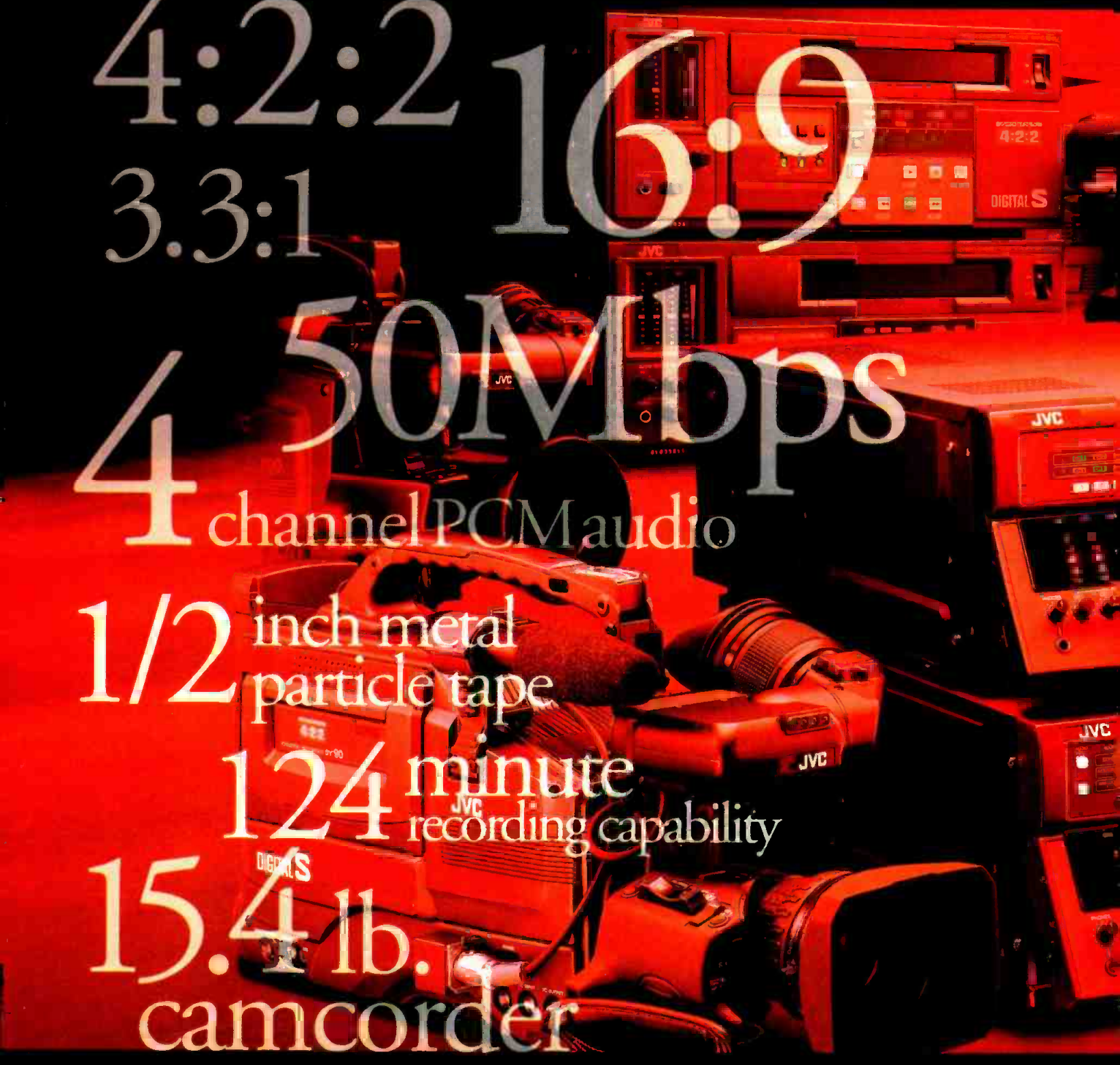

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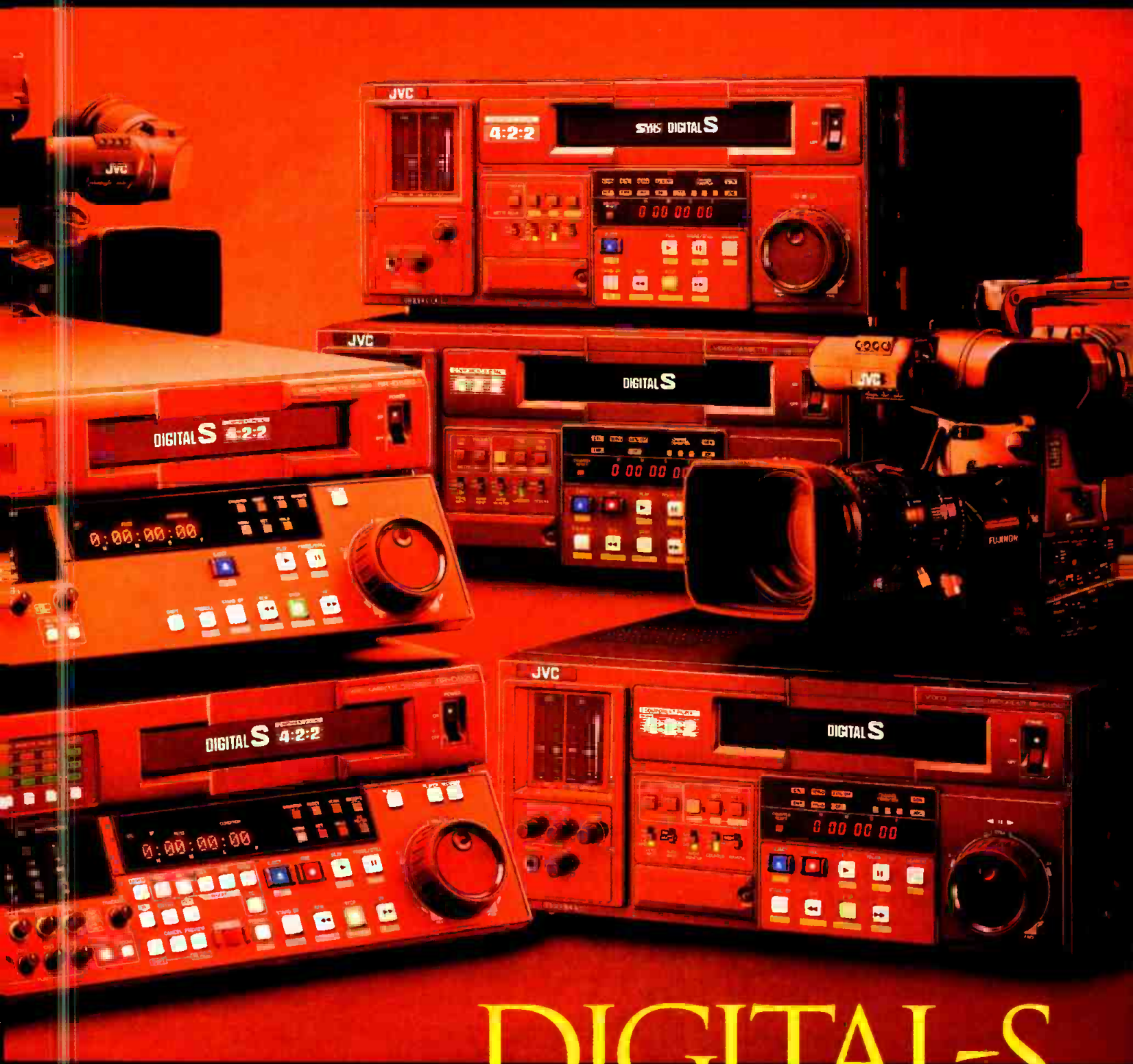

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Fibre Channel vs. SSA

BY BRAD GILMER

Much has been written over the last few years concerning the battle between Fibre Channel and serial storage architecture (SSA). This month we will look at these technologies and provide some insight into where they are headed.

Frequently, deciding between competing technologies is difficult. Both SSA and Fibre Channel have desirable traits. Fortunately, it appears they will be merged into a single product called Fibre Channel-Enhanced Loop (FC-EL). FC-EL products take the best of both technologies and are backward compatible with Fibre Channel-Arbitrated Loop (FC-AL) and SSA. While the exact specifications of FC-EL are yet to be determined, it will likely be a full-duplex system that employs *spatial reuse* and will not use SCSI bus arbitration. FC-EL should also allow networking between loops, although the introduction of this feature may be delayed.

Spatial reuse is a clever arrangement that allows SSA devices to communicate in two directions. It makes the loop self-healing if the cable is uncoupled to remove or add new storage units. FC-AL does not support spatial reuse. In loop configurations, a second cable is required to transmit data in both directions and enable uncoupling of storage units without shutting down the network. Differences between these technologies are summarized in Table 1.

Technical considerations

Both SSA and Fibre Channel allow for loop topologies (see Figures 1 and 2). Note that SSA employs one loop rather than two. One of SSA's strengths is that it allows bidirectional communications with one loop. The Fibre Channel drawing illustrates two different networks connected by a Fibre Channel switch. One of Fibre Channel's strengths is the ability to switch between loops, much like Ethernet.

FC-AL employs a bus arbitration scheme that closely resembles SCSI. Simultaneous I/O is not supported in single-loop applications, which can be a limiting factor in the system's overall performance. Assume that a device requests a 40kB file; if the block size is set to 4kB, the devices involved must go through the bus arbitration/connect and disconnect sequence 10 times to complete the transfer. If this sequence is repeated many times, the result is a loss of overall bandwidth. In a single-loop system where simultaneous transmission is not permitted, the effect may be a significant decrease of effective network throughput.

To address devices, SSA uses a concept borrowed from SCSI: hop count. A device receives a message and looks at the address. If the address is not zero, it decrements the address count and passes it to the next device. When a device receives a message with an address of zero, it knows that the message is intended for it. On the other hand, FC

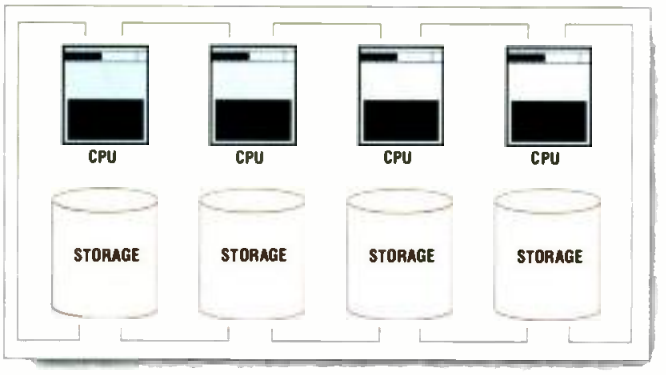

Figure 1. Serial storage architecture (SSA) uses a self-healing loop configuration.

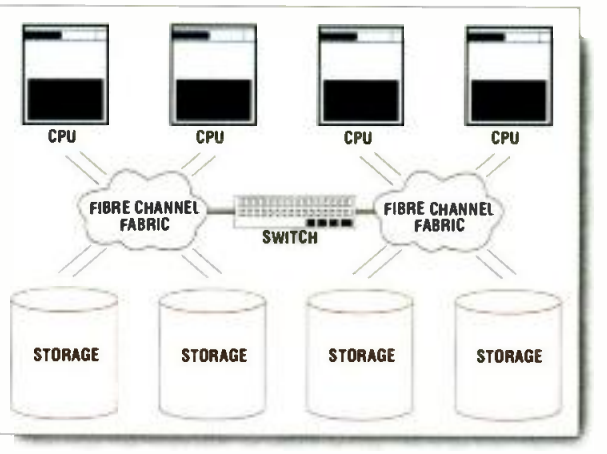

Figure 2. Fibre channel architecture can employ loop or fabric topology and can be switched.

SSA	Fibre Channel
Employs loop topology	May employ both loop and fabric topology
Allows simultaneous I/O without bus arbitration	Requires SCSI-like bus arbitration with non-simultaneous I/O unless dual loops are employed
Is a storage interface and supports the creation of "domains" that allow mixing RAID and JBOD storage on a single bus	May be used as either a storage interface or a network topology
Upper limit is 128 devices	Upper limit of 127 devices per loop; however, with network switching between multiple loops, total number of connected devices can be higher
Device addresses established using a hop-count	Uses absolute addressing
Performance decreases as distance increases	Performance remains constant as distance increases
Has been available for some time	Native FC equipment is just becoming widely available

Table 1. Summary of the differences between SSA and Fibre Channel.

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employs absolute addressing where the address of the box is set. Therefore, it is possible to directly address FC-AL devices, whereas messages in an SSA loop rely on other devices to get to their intended recipient. Opinions differ as to which is better.

As discussed, bus arbitration can adversely affect system throughput. Another factor contributing to throughput performance is distance. SSA operates at a rate of 80MB/s (dual loop) over a cable length of one foot. At a distance of one mile, performance drops off to 30MB/s, and at a distance of 1.5 miles, performance is down to 15MB/s. In contrast, Fibre Channel gives full performance at its maximum distance (see Table 2).

When configuring storage, SSA allows connection of RAID and JBODs (just a bunch of disks). Loops can be partitioned into multiple *domains* that can contain multiple RAIDs or JBODs. Each domain can function independently of others. I/O can occur independently for each domain. FC-AL supports RAID or JBODs, but they cannot be mixed on a single loop; however, they can be built on separate loops and interconnected with fabric.

	SSA	FC-AL
Maximum Speed	40MB/s*	100MB/s*
Maximum Distance	25m copper differential 2.4km fiber	47m copper 10km fiber
Maximum Devices	127	126**

* Assumes single loop configuration. Dual loop configurations result in a two-fold increase in speed. Much higher speeds are going to be possible in the near future

** Note that multiple loops can be interconnected using fabric topology

Table 2. Performance maximums for SSA and Fibre Channel.

One strength of SSA has been equipment availability. To date, IBM has shipped over 800TBs of SSA storage. Native Fibre Channel drives and other equipment have only just begun appearing in quantity over the last year or so. Before that, vendors were producing Fibre Channel devices using SCSI drives and with FC interfaces. However, Fibre Channel volumes are increasing rapidly, and it should not be long before large quantities of native Fibre Channel equipment are deployed in the field.

Fibre Channel has a lot of mind-share in the industry while SSA has slipped. However, it is still early to predict the end of SSA. IBM has shipped a lot of product. SSA has been the more readily available high-speed disk storage technology, and SSA devices have been shipping for over one and one-half years. Further, IBM is making SSA subsystems for PC servers, including NT, NetWare and OS2. Other manufacturers also have SSA subsystems available for UNIX. Both systems have clear advantages — it seems likely that FC-EL will provide a solution that uses the best from both. ■

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

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The Design Goals for HDCAM™

HDCAM was born of a long experience in HDTV program origination that spanned 1981 to the mid-1990s. This involved both the development of core technologies relating to HD imaging, recording, processing, and display, as well as a broad global experience working with many pioneers in HDTV program production. The latter encompassed broadcasters, independent producers, and pioneers from within the motion picture industry. Some clear and important imperatives were soon identified from this extensive experience:

- HD acquisition equipment must be as mobile as contemporary battery-operated 525-line production counterparts.
- All contemporary editing and operational facilities must be preserved in HD studio VTRs.
- HD systemization must be as convenient as present SDTV.
- Above all, HDTV equipment must be affordable.

The period 1993–1997 saw the climax of the protracted FCC process of working with industry to finalize the U.S. plans to transition to an era of DTV broadcasting. It was in anticipation of the dawn of this actual transition that Sony launched the development of a new generation of HDVS™ (High Definition Video System) products to support the early creation of HDTV program material. A central part of that new production and post production system was the new HDCAM recording format. A pivotal design goal was to bring to the marketplace a complete HD acquisition system and associated editing VTR that would cost not much more than the equivalent Digital Betacam® System.

HDCAM was unveiled at NAB'97, mere months following the final definition by the FCC of the DTV transmission standard and the associated DTV transition plan for the United States.

HDCAM as an HD Recording System

The design of the HDCAM format was based upon a strategy that sought a recording Digital Data Rate that would facilitate all of the following:

- A very high picture performance of real-world HDTV programming that included: 1) live HD origination in the studio and OB truck, and 2) HD telecine transfers
- An HD camcorder—for reliable and mobile field acquisition—with 40-minute record capability
- An HD studio VTR with high picture quality and 2-hour recording (to support movie transfers)
- HD video routing through existing 270 Mbits/s systems
- Efficient HD storage on disk
- System cost-effectiveness—both basic HD equipment and associated recording media

Elements of the HDCAM Acquisition System

HDCAM follows closely in the footsteps of our design approach to the two earlier SDTV digital recording formats of Digital Betacam and Betacam SX®, in that a recording format was optimized to include:

- High-quality and high-reliability 1/2-inch camcorder acquisition
- Attendant fully featured studio-editing VTR

The key elements of the HDCAM system are shown in Figure 1:

- The HDW-700 one-piece camcorder
- The HDW-500 editing VTR
- The HDW-250 portable VTR
- The System Digital Interfaces

This flexible system supports a wide range of applications in HD program production for DTV broadcasting. As shown in Figure 2, these can range from highly mobile field acquisition to studio and OB truck, and also include the very important transfer of motion picture material (both movies and prime-time television origination) to HD.

The HDCAM Digital Recording Format

The key governing factors that decided the ultimate design criteria of the HDCAM recording format are summarized as follows:

- The camcorder mobile recording imperatives.
- Multigeneration capabilities in post
- Digital HD interfacing
- Disk storage efficiency
- The crucial system cost issue

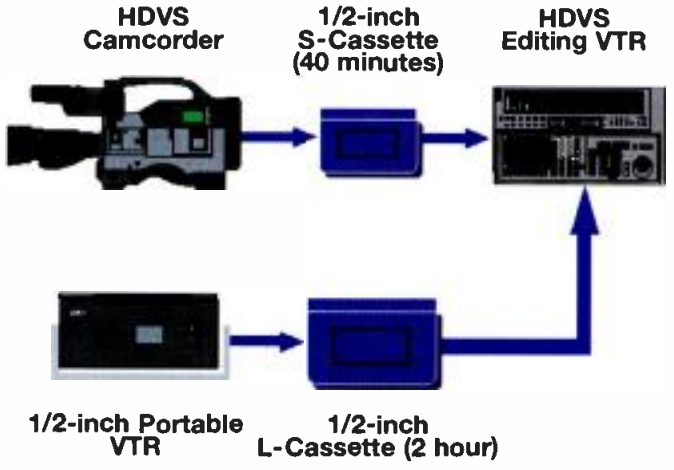

Figure 1 The core elements comprising the HDCAM recording system.

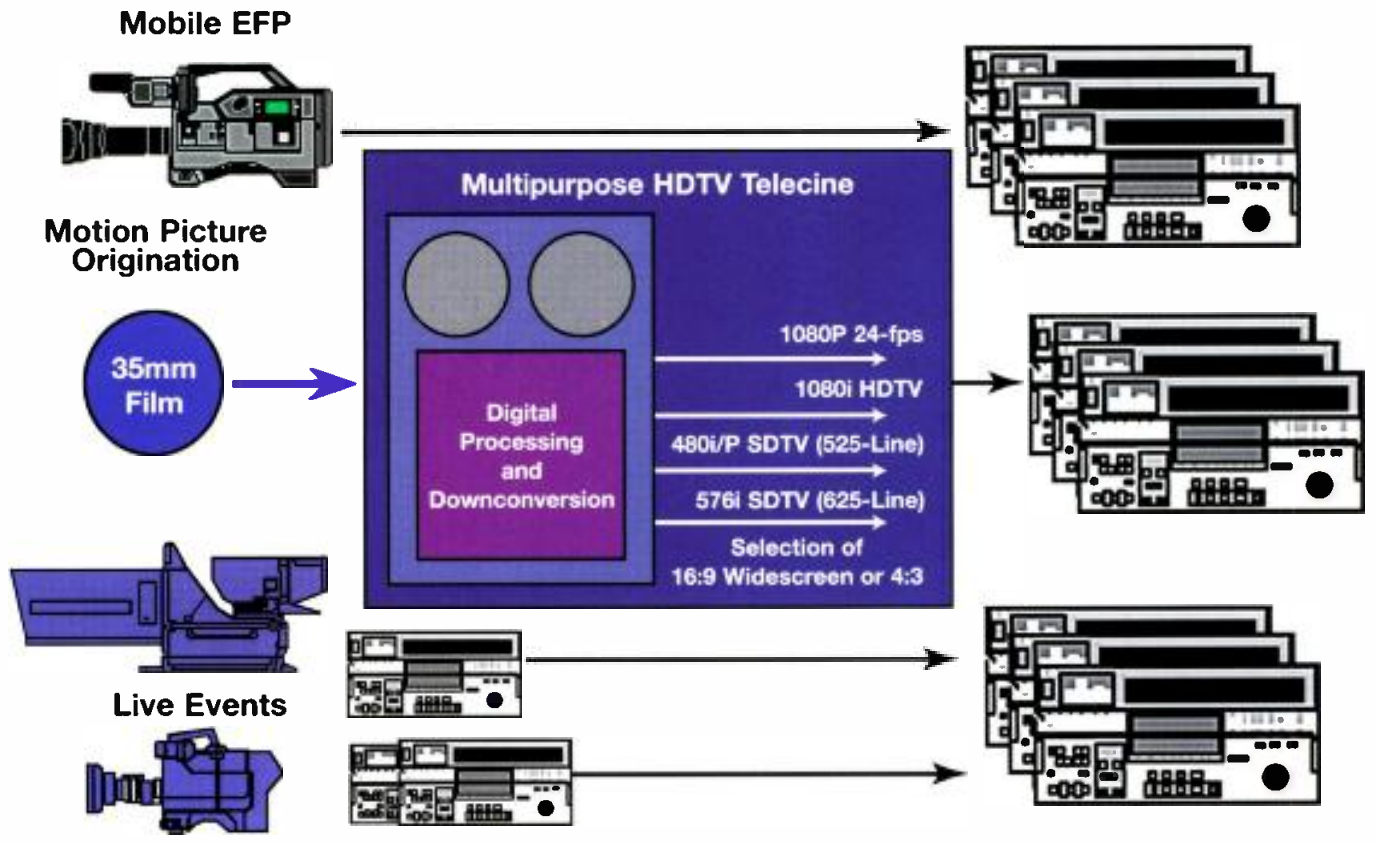

Figure 2 The flexible role of the HDCAM in DTV program creation.

Figure 3 summarizes all of the many considerations that entered into the final choice of the recording format.

A design target was set early to develop a high-definition recording system that would be priced as close as possible to the current Digital Betacam system. Standard digital 1/2-inch metal particle tape was a pivotal decision, predicated on maintaining similar modest tape costs. A decision to utilize, to the degree possible, as many of the key mechanical components of the Digital Betacam camcorder, portable VTR, and studio editing deck was a further cost controlling strategy–one specifically aimed at achieving economies of scale that would benefit both recording systems.

The use of all three of the standard 1/2-inch cassettes (small, medium, and large) was considered important to maximize the recording flexibility of both the camcorder and the studio editing VTR. The recording times were a vitally important part of the decision-making on a recording format. A basic decision to achieve the same 40-minute recording time in the same size 1/2-inch small cassette in the HDCAM camcorder as in the Digital Betacam DVW-700 [1] laid the key design "foundation stone"—the digital recording data rate. This would also facilitate two-hour recording in the large cassette—an important consideration for long-form recording in the portable VTR and for recording movies in the studio VTR.

HDCAM Digital Recording Data Rate

The requisite video data rate to achieve the degree of robust recording integrity in a camcorder that was likely to be used in extremely hostile physical environments (heat, cold, humidity, dust, smoke, and so on) was, thus, fairly well-predetermined. It would be somewhere in the neighborhood of 100Mbits/s (Digital Betacam is approximately 90Mbits/s). Recent improvements, however, both in head and tape technology, were capitalized upon to extend this to a somewhat higher video data rate of approximately 140Mbits/s (while still preserving an equivalent raw bit error rate as low as that of Digital Betacam). Clearly, therefore, the HD camcorder became the "great dictator" in determining the recording system data rate.

The task now turned to a the determination of an appropriate bit rate reduction (BRR) strategy that could reduce the awesome 996Mbits/s of the baseband HD video component set created in the camera. There are two classic elements to contemporary BRR strategies:

- Digital prefiltering
- Compression

Either technique, or both techniques, can be mobilized to achieve a desired level of BRR commensurate with a desired picture quality (with further criteria of multigenerational recording in post production constituting a key consideration in protecting the HD picture performance).

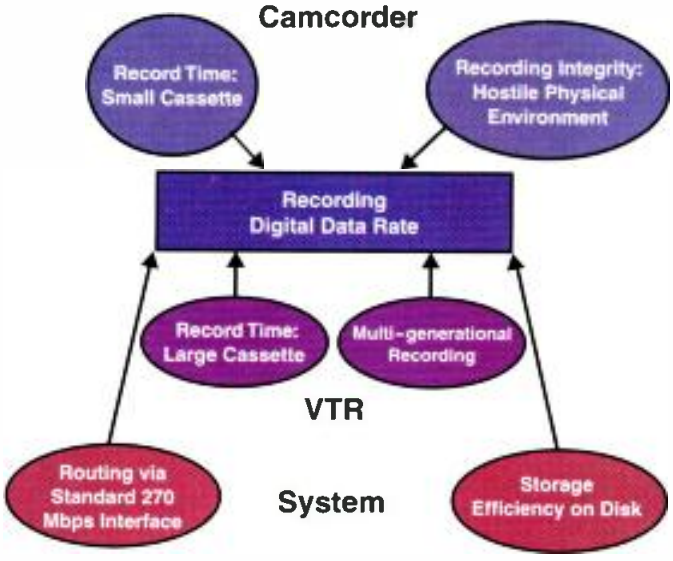

Figure 3 The three primary considerations—camcorder, studio recording/editing, and systemization—that bore on the recording format.

Following extensive research that employed close examination of a broad range of taxing HDTV imagery (still and full motion), it was decided that an optimum combination of both techniques would indeed preserve very high subjective HD picture quality while yielding the required 7:1 data reduction. The total video data is reduced to 5/8 of the original 996Mbits/s by digital prefiltering, and this is then followed by a relatively modest degree of 4.4:1 video compression, using a sophisticated adaptive field/frame DCT-based algorithm [2].

HDTV Sampling Structures

The HDCAM recording format has been labeled by some as the "3:1:1" format (to distinguish it from a full bandwidth format depicted as "4:2:2"). This refers directly to the degree of digital prefiltering employed. Sony has no quarrel with helpful labels—as long as they don't mislead. In the case of HDTV, however, neither 4:2:2 nor 3:1:1 constitute helpful shorthand to the sampling structures actually employed. These integers are intended to identify sampling frequencies actually employed and they refer to the multiplying factor applied to the common quotient 13.5/4. For example, for "601" SDTV:

$$4x\frac{13.5}{4}:2x\frac{13.5}{4}:2x\frac{13.5}{4}=13.5:6.75:6.75\ \text{MHz}$$

And, for SMPTE 274M HDTV:

$$22x\frac{13.5}{4}:11x\frac{13.5}{4}:11x\frac{13.5}{4}=74.25:37.125:37.125$$

For the HDCAM recording system it is first important to note that:

- The camcorder camera originates digital RGB video according to the full 1920 x 1080 sampling structure—a structure that is formally classified as 22:11:11 (SMPTE 274M HD production standard)
- A digital input signal to the HDCAM editing VTR is also full baseband 22:11:11 (SMPTE 292 HD SDI serial interface)
- The output HDTV signal from the VTR playing back an HDCAM recorded tape is also 22:11:11 (SMPTE 292M)

There is, however, a departure from this baseband digital sampling structure internally—within the actual recording process. The digital prefiltering that is a part of the BRR strategy is a process of downsampling the incoming digital HD video prior to application of the DCT-based compression algorithm. This is done with a sampling set of approximately 17:6:6. In analog terms, this filters the luminance signal down from the full 30MHz to 24MHz. Upon playback, the video is first decompressed, and then upsampled again to restore a baseband 22:11:11 signal format, fully compliant with the SMPTE 292M serial digital interface standard (but one whose very high- frequency content has been curtailed).

HDCAM Prefiltering in the Context of Real-world HDTV Imaging

HDCAM is a very pragmatic recording format that fully capitalizes upon the fact that present-day HD cameras produce very little video spectral energy above about 25MHz. The 1920 sampling of the present-day CCD coincides with the digital sampling of 1920. Note this is not the case with SDTV—where CCD horizontal sampling is in excess of 1000 while the digital sampling is only 720. Thus, HDTV cameras are expected to see a gain in horizontal resolution in the future. Also, current HD lenses strike a pragmatic compromise between performance (especially resolution) and pricing, in recognition that these are the early days of HDTV. They, too, will improve significantly in the ensuing years as HDTV becomes more established.

The camera DSP video processing system is not subsampled. It is 74.25MHz-sampled RGB video according to the SMPTE 274M HD standard and, thus, produces a high MTF video across the useful HD video passband. The prefiltering system in the recorder has the effect of abruptly truncating the luminance video signal at 24MHz, but this does not at all attenuate the higher energy video below that frequency. The BRR strategy described previously gave full weighting to the useful video energy below that frequency. Thus, by far the greater portion of the HD video originated in the camera is faithfully captured on tape in the HDW-700 camcorder.

Figure 4 The world's first all-digital, one-piece, battery-operated high-definition camcorder, the HDW-700.

Figure 5 The HDW-500 digital cassette studio-editing VTR.

The Real MTF of Present-day HD Telecine

The HDCAM VTR has proved to be a very high-quality recording system for HDTV transfers from motion picture film. Again, the recording BRR system is particularly well-tailored to the realities of contemporary HD telecines. The output of present telecines actually have less high-frequency energy than their live camera counterparts (a not surprising fact given that there are more concatenated MTFs involved—the film camera lens, the film negative itself, film processing, and finally, the telecine's optical system and CCD scanning). Yet again, the recording format faithfully captures all of the transferred high MTF below 24MHz.

HDW-700 The HDCAM One-piece Camcorder

This remarkable one-piece camcorder is contained within the same shell as the DVW-700 Digital Betacam camcorder, and it utilizes many of the same physical components. This allowed the challenging cost goal to be met, with this new HD camcorder (shown in Figure 4) list-priced where the DVW-700 was a year or two ago.

The salient features of the HD camcorder are:

- Forty-minute digital high-definition recording in a standard small 1/2-inch cassette provides a significant advantage over film for underwater shooting, documentary work, and many wildlife shooting environments
- Two channels of digital 16-bit AES/EBU audio recording—full sync-sound capability is very advantageous for documentary and natural history shooting
- Tape cost approximately $1.50 per recording minute
- Full HD quality color playback directly from the camcorder—a significant boon to viewing "dailies" on remote shoots
- Miniature plug-in setup cards facilitates instant pre-alignment of a complex "look" for a given type of shoot or for a specific scene, which also allows copying of one camcorder picture setup to precisely match another, and allows emulation of the image "look" of known film stocks by pre-programmed cards
- Operational sensitivity is equivalent to approximately 500 ASA at nominal gain and Iris setting (f 8.0) with no visible "grain"
- Operational sensitivity can be switched to in excess of 2000 ASA with low "grain"
- Various electronic shutter modes exercise a wide degree of control over imagery

HDW-500 The HDCAM Studio Editing VTR

A carefully planned design goal of the HDW-500 was to make this as familiar and as user-friendly as the present well-established Digital Betacam studio decks. As shown in Figure 5, it actually looks like a Digital Betacam deck, apart from the color. The operational controls are virtually identical.

The salient operational features of the HDW-500 Studio-editing VTR are:

- Two-hour recording with the standard large 1/2-inch cassette, also, it will record and play back on the small (40-minute) and medium (64-minute) cassettes
- Four channels of 20-bit uncompressed digital AES/EBU audio (each separately editable)
- Field-accurate editing
- Field freeze/Program freeze
- Auto tracking
- Pre-read (read before write)
- Confidence (read after write)
- Crossfade features, including: cut in, fade in, and cross fade of variable duration
- Digital jog audio
- Fast search
- Extensive I/O for audio and video

HDCAM System Interfaces

The HDW-500 editing VTR constitutes the primary interface to the HD post production system or the HD broadcast plant. The machine has been made rich in digital interfaces all according to established SMPTE serial digital interface standards to greatly extend the various signal interconnect options required to implement a range of DTV systems. Figure 6 shows the primary digital HDTV interface signals. There are three separate HD SDI interfaces provided, and one input.

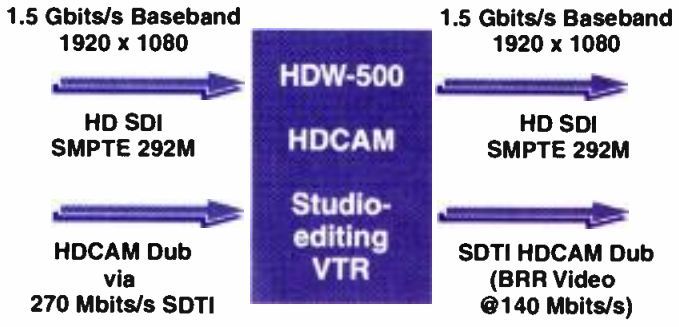

Figure 6 The serial digital input-output interfaces on the HDW-500.

270 Mbits/s Routing of the HD Recorded Signal

A novel feature of the VTR is the digital dub interface. The original intention was to provide a direct digital link between two VTRs of the bit rate reduced video (as directly recorded on the tape) to implement transparent dubbing (avoiding the "footprint" of a decode-encode process). However, because the HD video data rate is as low as it is (140Mbits/s approx.), it very comfortably fits within the new Serial Data Transfer Interface (recently standardized as the SDTI transport, according to SMPTE 305M). Sony elected to format the unique HDCAM digital dub signal as a special mapping within the SDTI protocol, thus producing a digital interface signal that can be transported through any standard 270Mbits/s "601" system. This greatly facilitates the routing of the HDCAM high-definition video (and its accompanying audio) via already in-place SDTV routing switchers and distribution equipment, as illustrated in Figure 7.

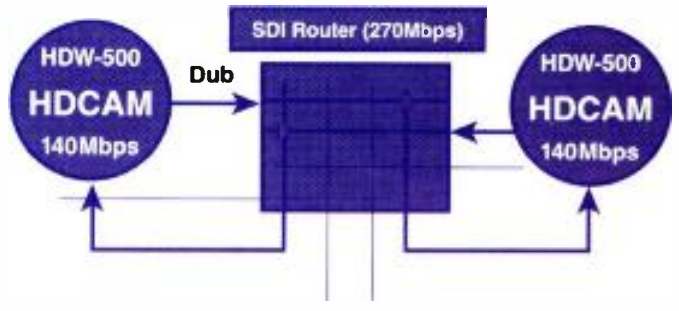

Figure 7 The 140Mbits/s digital dub video is mapped within an SDTI protocol to provide a convenient means of routing the HD signal within a standard 270Mbits/s system.

The Multipurpose HDW-500 Studio VTR

In full recognition of the dual HDTV/SDTV nature of the North American DTV agenda, Sony carefully designed the HDCAM system to facilitate dual operation in either of these digital formats, or an orderly two-step migration from SDTV to HDTV (if the latter constitutes a later second step in DTV implementation). Figure 8 shows how SDTV has been incorporated within the HDW-500 VTR.

The HDW-500 is a multipurpose studio deck in that it can separately, and simultaneously, deliver a digital standard definition television (SDTV) output in parallel with its primary digital HDTV output. Optional plug-in downconverter boards can offer a choice of either 480 interlace (standard 4:2:2 "601" component video or switch-selectable to digital composite NTSC), or alternatively, a 480 progressive SDTV output, as depicted in Figure 8.

The VTR has an optional remote control panel that allows remote creative choices to be made in the SDTV domain. The video can be selected as downconverted 16:9 widescreen (identical to the HDTV parent video), or it can be re-sampled and re-timed to produce a standard 4:3 raster. In the latter case this output is derived by "cropping" from the widescreen signal (in which instance a variable pan control can move that selected portion from across the 16:9 video). Alternatively, the remote panel can select a "letterbox" version that preserves the entire widescreen image but formats that inside a standard 4:3 raster.

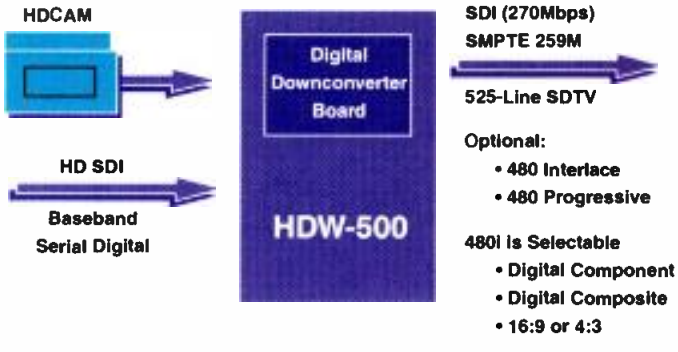

Figure 8 The optional plug-in downconverter boards endow both the HDW-500 with a multipurpose capability to service both HDTV and SDTV.

SONY

24-Frame Progressive Extension of HDCAM

The pioneering work by Sony in Digital Electronic Cinematography over the past four years—using the Digital Betacam camcorder DVW-700—has ignited a broadening interest among the independent film community as well as producers of television documentaries, prime-time programming and television commercials. Increasingly, the advantages of direct digital origination of television programming (over the traditional film capture with subsequent telecine transfer to video) are being widely recognized. This has a whole new importance in the era of DTV.

Likewise, there is growing interest in originating movies (or portions of movies) using electronic cinematography that is subsequently transferred to 35mm film for theatrical release. As a consequence of this broad applicability of HD program creation, Sony is extending the HDCAM system to include a second "track" that will flank the present 60Hz based system, illustrated in Figure 9.

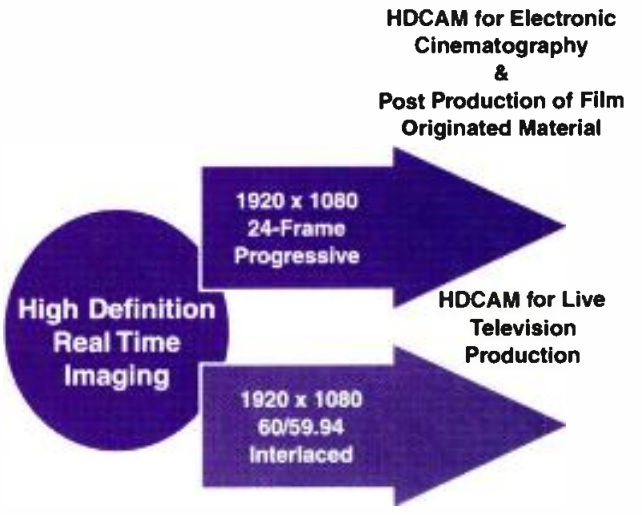

Figure 9 The HDCAM recording system is being expanded into two "tracks" to facilitate a novel approach to managing multiformat DTV.

24-Frame Progressive HD Mastering system for Telecine Post

An extension of the present 60/59.94 2:1 interlaced HDCAM recording system is in a final stage of development, as an all-progressive scan system operating at 24/23.97 frames per second. The system will be introduced at NAB'99 with product deliveries planned to begin the following June. A priority is being given to the post production portion of this total 24P system to support DTV program production for the Fall '99 season—programming that is based upon motion picture film-originated material.

Figure 10 outlines the basic system. It starts with the 24-frame motion picture film acquisition being transferred within the Sony FVS-1000 HD Telecine to a 24-frame progressively scanned HD video. Following post production (which is done entirely in this 24-frame progressive video format), the HD master is subsequently digitally converted to any of our U.S. DTV digital formats, and the international digital formats.

The advantages of the system are many:

- The HD video master is at the highest HDTV resolution with all of the advantages of progressive scan
- Digital downconversion from that singular "super-sampled" master will produce very high-quality (high horizontal and vertical MTF with very low aliasing) distribution format videos to service any of the DTV transmission formats: 1080i, 720P, 480P, or 480i
- The entire post production system, being 24-frame-based, is not burdened with 3:2 tracking issues throughout the post process

Figure 11 outlines the essential elements of that post production system.

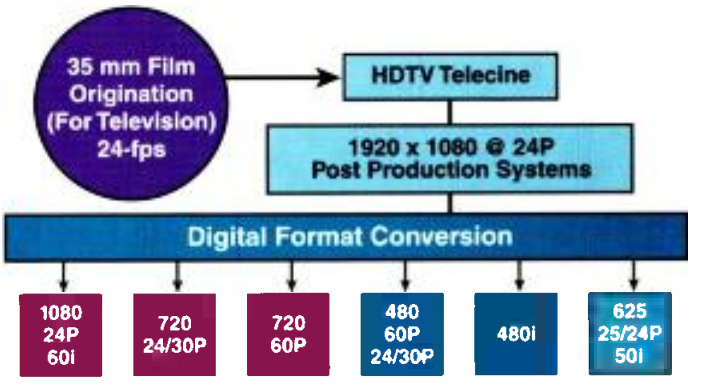

Figure 10 The 24-frame progressive HDCAM system provides a "super-sampled" HD master that downconverts with very high quality to multiple distribution formats for DTV broadcasting.

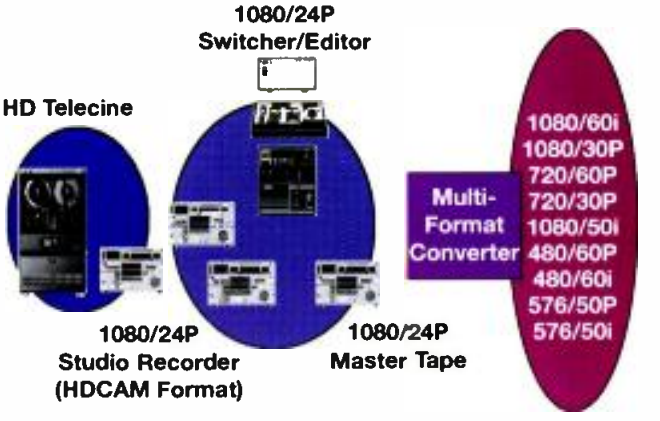

Figure 11 The key system elements comprising the 24-frame post production system.

Experiences with HDCAM

A considerable number of HDCAM systems are presently owned by an interesting cross-section of program producers. These range from independent production facilities, post production houses, rental houses, to some enterprising broadcasters now seriously engaged in HD program creation for the DTV era. The following vignettes illustrate the superb flexibility of the HDCAM system in HD program creation.

HDCAM in the Field

HD Vision

HD Vision

HDVision recently used the HDW-700 camcorder to shoot wildlife and scenery around Jackson Hole, Wyoming, during the Jackson Wildlife Symposium. The portability of the HDW-700, the world's first one-piece high definition camcorder, allowed videographers the ability to move, unencumbered, to the most remote locations. The wide angle capability is perfectly suited for shooting panoramic landscape shots while still delivering unbelievably clear images for close in shots. During a recent trick waterskiing event, HDVision set up a three-camera shoot using the HDW-700 camcorders. Critical to capturing the fast-paced action, with skiers moving upwards of 30 mph through the water, the ease of handling the HDW-700 ensured crisp and dramatic imagery.

HD Vision

Pitcairn Productions

Specializing in underwater videography, Pitcairn Productions travels the globe with their two HDW-700 camcorders. The high definition resolution of the HDW-700 is creating unparalleled underwater images. The 40-minute recording time is a major advantage over film for underwater shooting. Direct HD playback from the camcorder supports screening of "dailies" on remote locations.

Photo Credit: Bob Cranston

Pitcairn Productions

NASA

Sony and NASA have entered into a Space Act Agreement for the purposes of exploring HDTV imaging aboard the Space Shuttle. Here two astronauts are shown in training with the HDW-700 camcorder.

Use of astronauts in this picture does not imply the endorsement of any product or service.

NASA

HDCAM in the Field

Plus 8 Video

Plus 8 Video is one of the largest digital HD rental facilities in the United States. Since the rental of their first HDW-700, which went directly to a project in Baghdad, Plus 8 Video's four HDCAM camcorders have racked up thousands of hours of use—much of these in remote locations around the world. Here, one of Plus 8 Video's clients, filmmaker James Lipscomb, shoots a curious moose with the HDW-700 xamcorder on Alaska's Kenai Peninsula, for the REBO/NHK/Turner Original Production, *Moose on the Loose*, an hour show to be aired this spring as apart of the Wild!Life Adventures high definition series.

Photo Credit: Karen Straus

Plus 8 Video

ESPN

ESPN used the HDW-700 for a variety of events during *ESPN's Summer X Games*. Because the HDW-700 is physically identical to the Digital Betacam camcorder and utilizes familiar feature-sets, ESPN's crews were able to immediately use the camcorder without the downtime usually associated with adapting to new equipment.

Photo Credit: Scott Garfield

ESPN

HDCAM in the Broadcast Station

KCTS-TV

KCTS has become renowned for the aerial footage they have produced using the HDW-700 camcorder with a Tyler mount attached to the nose of a helicopter. Their HD footage can be seen in such programs as *Over America*, *Over Ireland*, and *Over New England*. KCTS plans to use this aerial set-up to create a program in Australia to coincide with the 2000 Summer Games.

KCTS-TV

WRAL-TV

WRAL-TV in Raleigh, NC is currently using HDW-700 camcorders to create a documentary on lighthouses along the Atlantic coast. When completed, the documentary will be shown in full high-definition thought its beta test station, WRAL-HD and also shown downconverted to NTSC.

WRAL

WMVS/WMVT-TV

WMVS/WMVT Public Television in Milwaukee, Wis., have used the HDW-700 camcorder to shoot hundreds of hours of high definition material. Here, the HDW-700 is shown being used in the WMVS/WMVT studios to shoot the program "Dollar Signs". Some of their other high definition projects include: local ballet, various local sporting events, the annual Milwaukee Circus Parade, episodes of "Tracks Ahead", a show featuring model railroads and a recently completed project using the HDW-700 on location in Italy to tape a series of cooking shows.

WMVS/WMVT

HDCAM in the Studio

COLOSSALVISION

COLOSSALVISION is a pioneer of the high definition medium. Here, President David Niles is using his HDW-700 camcorder on location in New York's garment center for a Federated Department Stores corporate image production. COLOSSALVISION utilized its HDCAM system for a variety of recent clients, including Macy's, WLIW Channel 21, United Way of New York, and Madison Square Garden Networks.

COLOSSALVISION

Talisman Crest Limited/Filmline International Inc.

Currently are shooting *The Secret Adventures of Jules Verne*, using four HDW-700 camcorders rather than the previously planned 35mm film. This 22-episode television series is set for worldwide distribution and will be extremely special effects-intensive. The camcorders are used exclusively by film cinematographers and are now working on large green-screen sets and a wide range of interior and exterior sets. The portability and mobility of the HDW-700 is proving a boon to the many location shots.

Jules Verne Productions

Roland House

A high-end production facility that has worked with film and video for many years, Roland House has pioneered the RealFilm process in support of digital electronic cinematography. It has recently done extensive comparative tests between their HDW-700 and both 35mm and Super 16mm film as a prelude to planned feature length HD projects.

Roland House

Laser Pacific

Continuing its pioneering efforts in mastering programs for television, Laser Pacific has recently incorporated Sony's HDVS post production system. Outfitted with Sony's HDCAM editing VTRs, HDS/HDME-7000 production switcher/multi-effects unit, Laser Pacific is doing HD telecine transfers of dailies and online HD conforming.

Photo Credit: Scott Garfield

Laser Pacific

Summary

Cost Benefit Advantages of the HDCAM System

HDCAM is wonderfully tailored to supporting a vigorous lift-off of HDTV within the context of the new broadcasting DTV agenda. It has definitively brought HD production and post production squarely within the realm of contemporary SDTV equipment—in operational functionality and product costs.

The HDW-700 allows unfettered HD shooting in the most remote of locations—a whole new ability to bring back the spectacular HD imagery that will lure the consumer to this important new television system. The 60Hz interlaced version is ideal for all high definition television shooting of sports, special events, magazine shows, documentaries, drama, and a multitude of other programs. The flexibilities of HDCAM will be dramatically extended with the addition of the 24-frame progressive system, currently planned for introduction in 1999. This "film-friendly" system will allow the post production community to master in one single HDTV standard, yet support all of the DTV distribution formats now being embraced by the broadcast and cable industries. The future 24-frame progressive camcorder will be an important new alternative to 35mm and Super 16mm film origination, bringing an entirely new cost-effectiveness to high-end television program and commercial production.

The HDW-500 is a superb HD workhorse—for HD telecine transfer, HD editing and post production, and for HD play-to-air in a broadcast facility. Its highly flexible digital system interfaces support a wide variety of HD systemization within studios, mobile EFP and outside broadcast trucks, and post production suites. Its multipurpose dual HDTV/SDTV functionality is tailor-made for flexible operation in either (or both) domains of DTV.

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HDCAM in Post Production

American Production Services

American Production Services

Taking full advantage of Sony's new generation HDVS equipment, American Production Services is one of the first production and post production facilities in the United States to offer fully digital high-definition capabilities to its customers. Among its current HDTV projects, APS is presently producing Whidbey Island Films' award-winning six-part *National Desk* series for PBS.

For more information, contact your Sony Account Manager:

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Ask Dr. Digital

Twisted-pair or coax?

BY STEVE EPSTEIN, TECHNICAL EDITOR

I'm the systems design engineer at WDIV/TV4 Detroit, and we are converting our facility to an analog/digital hybrid with HD thrown in to boot. Currently, we are debating which type of AES3 to install at our facility, 110Ω twisted pair (AES3-1992) or 75Ω coax (AES3-ID). I'm sure embedded audio will eventually find its way in there as well. If you have any suggestions or thoughts on the subject, I'd love to hear them.

Thanks,
Don Adzigian
WDIV/TV4, Detroit

Rx

Depending on your point of view, that can be a loaded question. However, there are a number of things to consider, for instance:

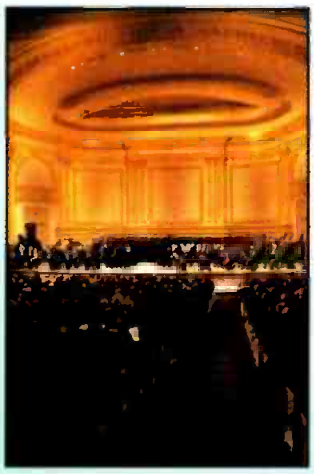
With twisted-pair, you can get by using existing cabling. However, unless you have very short runs or already have high-quality 110Ω audio cable in place, doing so is not recommended. Soldering (and purchasing) a large number of XLRs can be time-consuming and expensive.

Using coax may allow some use of existing wiring, but again this is somewhat dependent on the quality of the wiring in place. Using coax means distributing unbalanced signals, therefore, baluns will be needed for conversion wherever balanced signals are required. The overall cost of transformers (baluns) and BNC connectors may not be much different than the XLR route above. Extra (read "older") video DAs can be used for distribution if desired. Using coax, rather than 110Ω twisted-pair may have some benefits down the road, depending on how you intend to implement multichannel capabilities (for more information, check out Ken Hunold's article, "Digital and audio routing," on p.92).

One alternative is using the new MediaTwist from Belden for all of your cabling. MediaTwist has four sets of twisted pairs in a crescent-shaped jacket and can be used for video,

The Long Lens Standard From The Super Bowl To The Hollywood Bowl.

From the playing field to the concert hall, Canon's DIGI-SUPER 70, the first true 70X lens, continues to build on its reputation as the standard in long lenses.



A fixture at almost every major sporting event, the DIGI-SUPER 70 has been the long lens of choice for the past three Super Bowls (since the lens was introduced), the World Series and several other major sporting events. Now major entertainment companies, like BET, are discovering the unique advantages of this lens including Canon's exclusive Digital Servo System. The System features: Fast, but quiet control speeds (zoom full range 0.6 sec, focus 0.8 sec); Extra servo functions not available with analog servo systems; 13 bit repeatability; and 10 bit iris.

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audio and data. Because it can be used for all of these signals, the entire facility can be wired with it. Purchasing cable in large quantities leads to a cost savings that will offset the additional cost of transformers and connector blocks. Because of the large amount of cable required, this approach works best when building from the ground up.

You might also consider taking inventory of the desired equipment to determine which standard the majority of equipment supports, then go that route. The problem here is that, as you move forward, new purchases may support the other standard.

In the end, the decision may come down to personal preference. In an audio facility, technicians are usually more efficient at installing XLRs rather than BNCs. In a video facility, it is probably the opposite. Personally, I'd rather strip and crimp 100 BNCs than strip and solder 100 XLRs. On the other hand, of those 100 XLRs, nearly all can be reused on new cables in a few years if needed. Removing crimp-type BNCs is not possible.

You are probably familiar with sequential video switchers, like those used for CCTV applications. Have you come across any sequential audio switchers? I am looking for one with a user-selectable delay (up to 10 seconds). It will be used for recording monitor audio feeds. Push-buttons for selecting individual channels would be helpful.

Satvindar
Project Engineer
Jebsen & Jessen Communications
Malaysia

Rx

I've looked around and haven't found any suitable audio sequential switchers, but here are a couple of ideas that might work:

One possibility is to get a remote controllable 10x1 audio routing switcher and build a small sequencer to control the router through its remote port. A 555 timer chip along with a counter chip and an encoder chip could handle the task easily. Nearly all small routers are available with front panel push-buttons.

The second suggestion is to use a video sequencer and run unbalanced audio through it. Make sure the sequencer doesn't have any fancy circuitry, such as clamping, that would require a video source. In terms of bandwidth, vertical sync is 60Hz and horizontal sync is 15.7 kHz, so a video switch should not have a problem handling audio. Amplitude is somewhat of a concern in that the video circuits probably will begin clipping at 2Vpp. A rough calculation says that -10dBu should pass through just fine. You might want to use transformers on the input and not use the 75Ω video terminators. Consider bandwidth limiting the output to about 20kHz using a 100pF or so capacitor. Crosstalk may be a problem, but for monitoring purposes, a video switch should work fine. ■

If you are having a tough time solving a problem, let me help. Send me an e-mail at drdigital@compuserve.com.

Transmission & Distribution

So you want a roommate on your tower?

BY DON MARKLEY

As we move closer to DTV, several factors are encouraging joint tower use. The first and most obvious factor is the need for DTV antenna space . Next might be the continuing growth of the number of NTSC stations. The situation is aggravated by an apparent increase in zoning problems, which tends to force more and more stations onto existing towers. And even that is becoming a problem, as witnessed in San Francisco, where neighbors are fighting an increase in the number of antennas on the Mt. Sutro Tower (for more info, see "Lousy DTV PR," p. 146).

Historically, U.S. broadcasters have had the impression that to compete, they each needed their own tower. This belief is contrary to most of the rest of the world, where multiple station towers are customary. Although, to be fair, in many cases all the stations are owned by the government. Still, the macho position of "my station, my tower" may no longer be viable in many markets.

Problems and solutions

The fundamental problem that must be addressed in multiple-station facilities is allocating space and costs fairly. This can vary, depending on how the deal is structured. The two most common multiple-user environments are where the tower is owned by one of the stations or where the tower is owned and maintained by a separate entity. The separate entity is typically a corporation jointly owned by the originating stations or a non-broadcaster owner, such as in the case of large building sites.

For sites owned by a single station, the situation is often like *Animal Farm* in that all stations are equal, but one station is more equal than the others. This is usually reasonable, given that one station is ultimately responsible for the cost of the facility and its maintenance. In other words, the golden rule applies: The one with the gold rules. That usually means that the owner gets the best space on the tower, which may still leave good sites for others, especially if a candelabra structure is used.

The best situation is often one where the facility is jointly owned and a manager is hired to oversee it.

Where possible, the best situation is often one in which the facility is jointly owned and a manager is hired to oversee it. The manager can be a direct employee of the combined ownership or a separate tower management company. In any case, several common problems must be addressed in the lease documents. Beside the obvious issue of antenna placement, specifics pertaining to the location of the transmission line runs and equipment areas are primary.

Each user should be provided equipment space with reasonable security and access. Separate buildings are nice, but they can result in an unnecessary duplication of facilities. One large building can be configured with multiple bays, each with its own entrance. The heating and cooling of the individual bays is often best handled by separate systems, as the needs will vary, especially during maintenance periods. The common areas can be handled by the main building system. This approach also permits the heating and cooling necessary for each transmitter space to be metered and billed to the appropriate stations.

FRAME GRAB

A look at the consumer side of DTV.

TV & PC: Related but not ubiquitous

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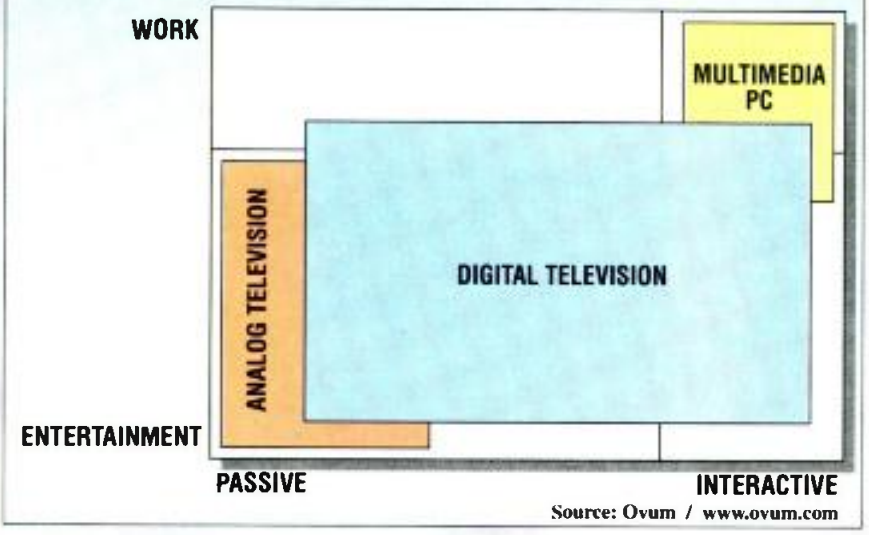

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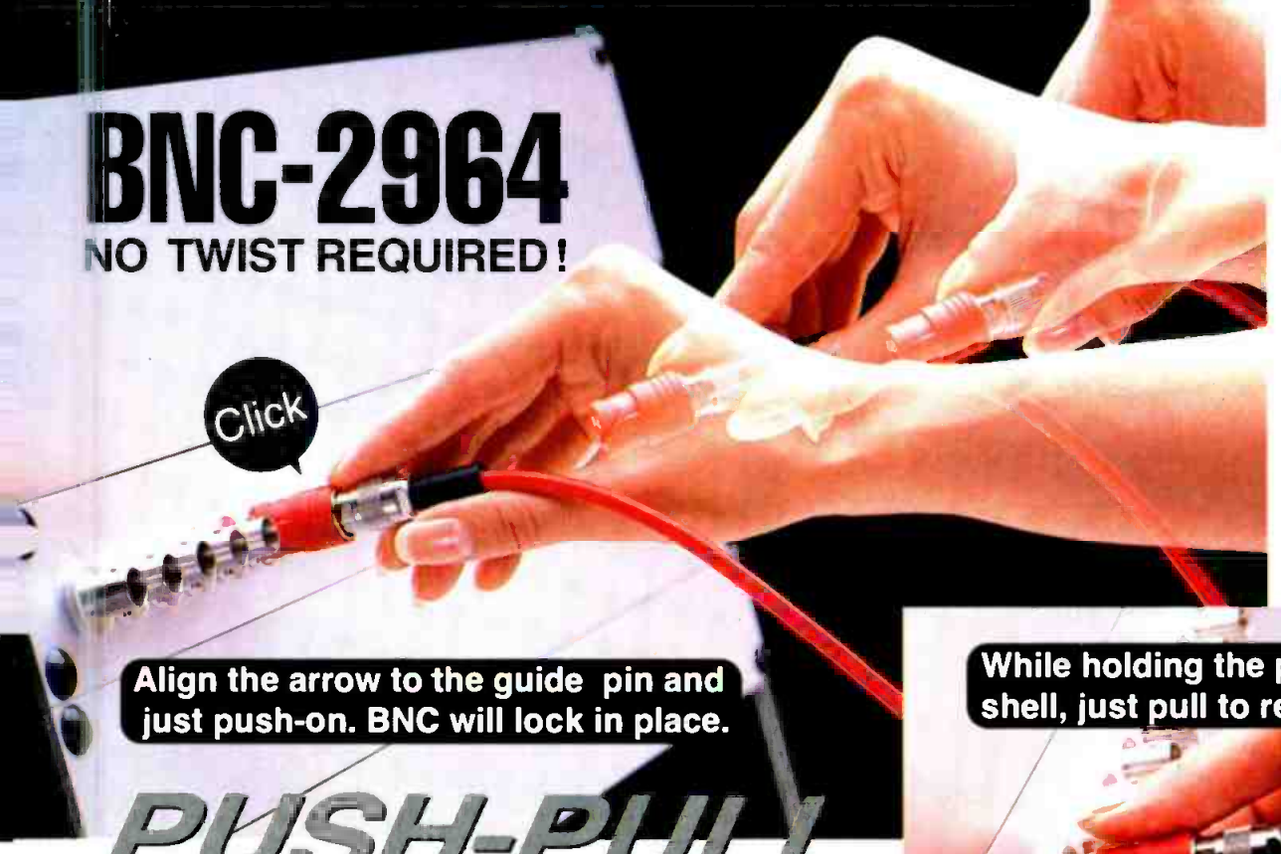

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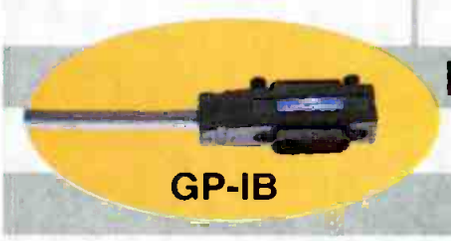

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Questions concerning power availability and standby power are always critical. When multiple stations are located in a single building, it may be possible to obtain a favorable rate from the local utility company. This will vary among providers and may also require purchasing a transformer to get the best possible rate. In such cases, the utility will normally allow only one meter for their billing purposes. However, additional meters can be purchased and installed in the building distribution system to allow each station to be properly billed. Again, this will vary among service providers. Standby power can be most economically provided to all users with a large, central system if everyone can agree on their desire for such a facility. Otherwise, those requiring standby power must be provided an area for their generators and fuel storage. In high-rise buildings, conforming to building codes can complicate this further.

A variety of details must be covered when planning multi-station towers and facilities, including antenna and transmission-line placement, as well as dividing the costs among those involved.

A major problem is making provisions for stations to stay on the air during periods of construction and maintenance. An obvious solution is a standby site somewhere else. In many cases, that can be the primary site used before moving to the new tower. Otherwise, standby antennas need to be installed at a location well down from the top of the tower. That allows workers to climb, or ride, to a location well above the standby antennas while the stations operate on the main antennas. Operation can then be switched over to the standby systems and the workers can proceed to the top of the structure. This calls for careful monitoring and the full cooperation of all stations. The FCC requires all stations on such facilities to cooperate. Still, some stations feel that their market position will be destroyed by going to a standby antenna for a few hours. This requirement needs to be treated in detail in the lease documents.

The single-most important point to remember is that joint use of a structure is possible. It can work well if everyone's responsibilities are defined and agreed upon fully in the lease documents and if everyone shows a little patience and cooperation. There is no reason for such situations to become horror-filled, especially if the technical staff is allowed to run the project. If you are planning such a project, visit a similar existing facility and discuss how it is handling problems and how the joint use has been formally structured. You may also want to contact one of the site management firms, such as Lodestar, to see if professional site management is the best solution for your project. ■

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

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Wireless mics and IFBs

BY BENNETT LILES

The good news is wireless mic technology has come a long way. Today's units work much better than their low-VHF, single-antenna ancestors. The bad news is they are now used almost everywhere, and many people expect them to perform as reliably as their hard-wired cousins.

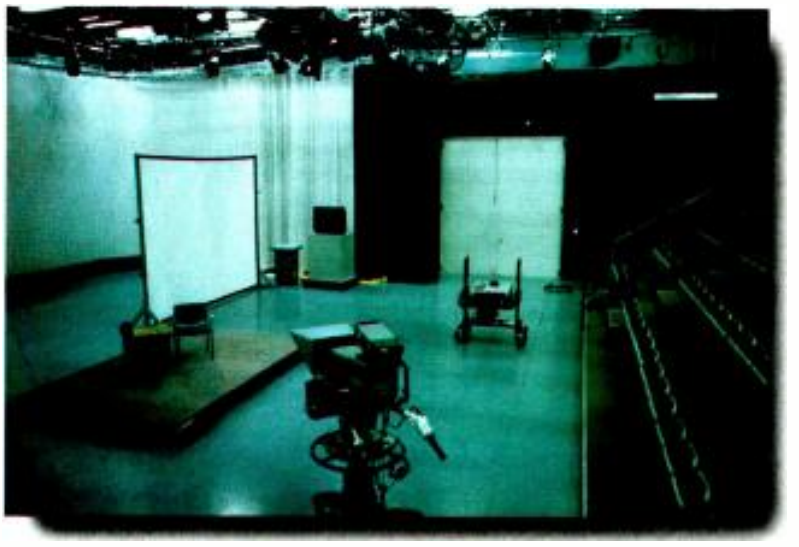
When working with wireless units, there are several tried-and-true production methods. Experience has shown that successful operation of these systems is still as much art as science. Despite advanced circuitry and new reception techniques, the first rule of wireless microphone usage remains: Never use a wireless mic when a wired mic will do.

Two significant advances in newer wireless systems are frequency agility and diversity reception. Despite changes due in the near future, frequency-agile systems allow operators to avoid interference and take their RF mics on the road with little fear of mixing it up with local transmitters. Diversity reception has changed the status of these devices from toys to tools. With the transmitters, there is little leeway in technique, however on the receiving end, much can be done to improve results.

Dueling antennas

Diversity reception comes in several flavors, but they all use multiple receiver antennas. In phase diversity, as antenna A's signal varies in strength, antenna B's phase is adjusted to reinforce the signal from antenna A. In space diversity, the antennas are located some distance apart and combined so that both are unlikely to be encounter simultaneous signal dropout. What some refer to as *true diversity* is a technique where signal strength is compared and the receiver switches to the antenna with the strongest signal. This switching must be fast and quiet.

For best results, antennas should be placed more than one-half wavelength or at least three feet apart; in crowded studio situations, twenty feet of separation is better. A good rule of thumb in TV studio applications is to mount the antennas above camera height but below the level of the lighting grid. Lights and cameras can cause shadows in the RF coverage. They can also cause reflection which may result in multipath.



The antenna's view of the studio should be unobstructed. The best placement is usually above camera height, but below the lighting grid.

To keep antenna cable as short as possible, receivers can be placed in the studio. One drawback is the receiver's RF lights can provide some level of diagnostics. If these lights cannot be seen from the operator's position, determining the cause of a sudden audio loss may require extra time.

Impedance matching between the antenna and the receiver is absolutely critical in wireless mic setups, especially in permanent installations where antenna cable length may be stretched to the limit. Most systems today use 50Ω antenna systems. This requires either RG-58U, or for longer runs, RG-214U. RG-214U is a low-loss cable (7.6db/100ft @ 900MHz, Belden 8268), but it is also expensive, large and difficult to work with. RG-214U is about half the diameter of a garden hose and requires special BNC connectors. Its large turning radius requires additional consideration. If the antenna connection requires a sharp angle, get right angle connectors.

With installations involving more than a 200-foot run, special RF preamps may be required. Some vendors offer systems that have pre-amps built into the antennas that are powered by DC from the receiver by way of the antenna cables, similar to phantom powered mics. These preamps however, are solely to preserve impedance matching and do not offer any significant signal boost. As handy as it is, never use 75Ω RG-59 for 50Ω wireless mic antennas. With multipair antenna installations, feeding many receivers, an antenna divider must be employed and any unused outputs on the divider must be properly terminated to preserve the overall system impedance. Mismatched impedances anywhere along the signal path can significantly degrade performance.

Going the other direction

Most wireless IFB units used today operate in the VHF band, but there are UHF models here, too. Many IFB receivers offer two frequencies with a three-position switch. This switch, as with the ones on hand-held wireless mics, should be turned on by the sound op and then taped over to prevent the talent from switching it — accidentally or not. In installations, it is vital to

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have the transmitter antennas mounted in the studio and controls that balance the relative levels between program and interrupt levels to be located within reach of the operator.

The last step in any wireless installation is experimentation.

The last step in any wireless installation is experimentation. Put the mic on and roll a recording tape as you walk around the studio announcing your exact location. Then go back to the control room and listen to the tape. Verify proper operation and make adjustments as necessary. Today's wireless systems are more reliable than ever, but they do require special care and feeding in installation and operation. ■

Bennett Liles is an audio engineer at Georgia Public Broadcasting, Atlanta

Frequency changes

With the coming of DTV, the FCC has made significant frequency allocation changes, some of which affect wireless microphone operation. Some frequencies now used for microphones will be reallocated to the public safety band. These new transmitters will have authorized power outputs of up to 500W. Current mic channels that will be affected are those within TV Channels 63, 64, 68 and 69 and some VHF systems in Channels 7-13. If you currently operate a system within these channels, contact your vendor for information on modifications, upgrades or replacements. As for the FCC's rather fluid intentions, try their web page at **www.fcc.gov**. ■

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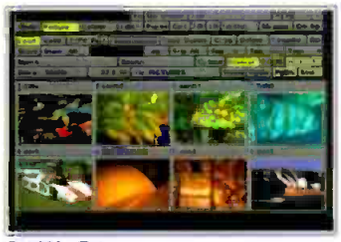

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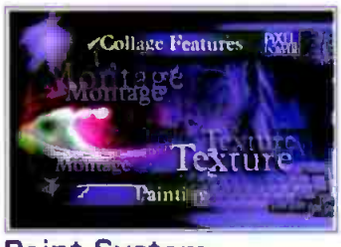

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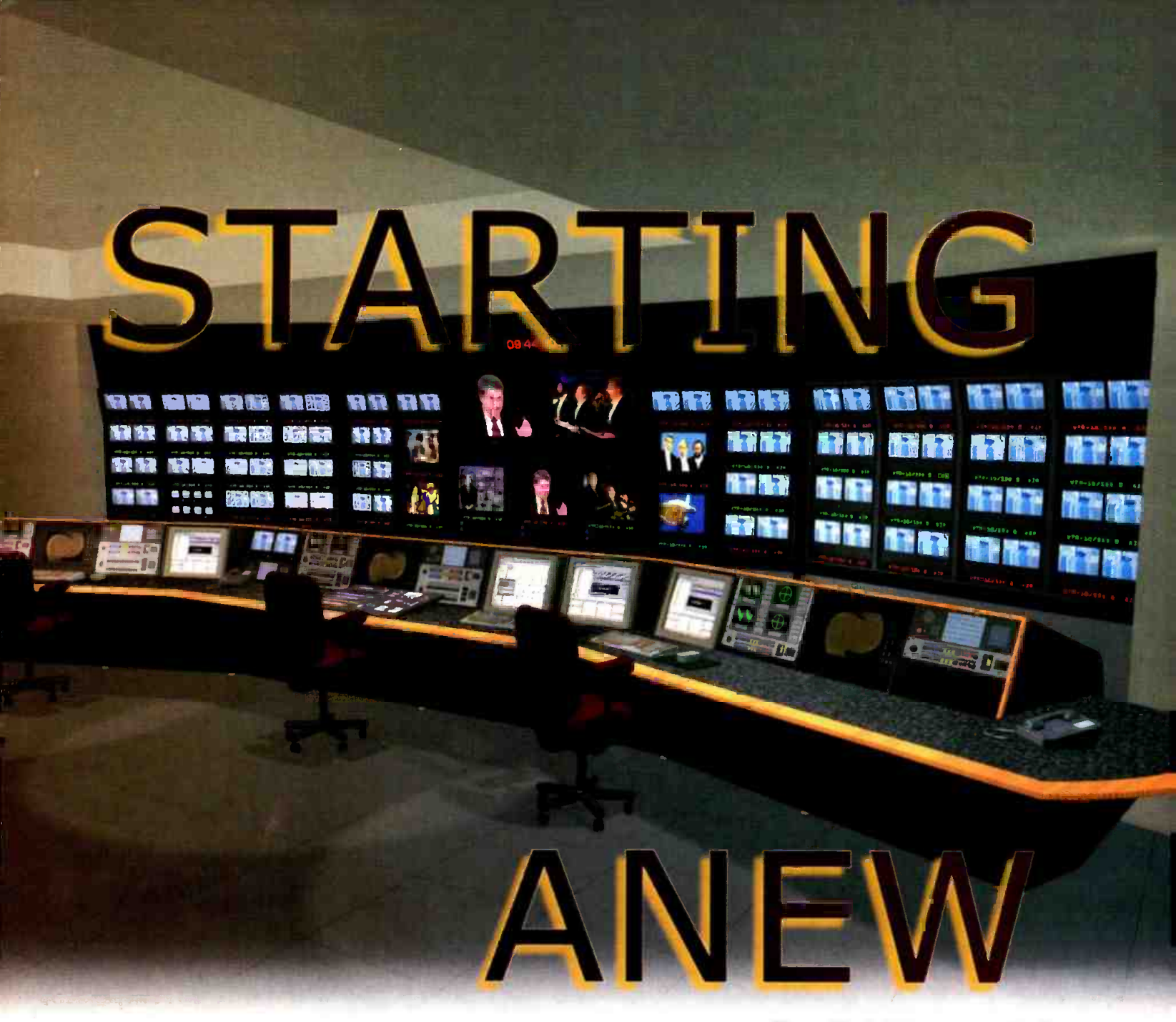

By Ed Heresniak

Timebase Consoles master control design rendering.

WNET gets to start anew with relocation.

When WNET completes the move to its new facilities on West 33rd Street in Manhattan, NY, this December, it will finally begin to enjoy the fruits of an exercise that many stations dream about but few experience. WNET is building new production and broadcast facilities from scratch, without being burdened by a transitional phase or the need to support legacy technologies. By early 1999, WNET will occupy more than 50,000 sq. feet of new all-digital, fully integrated, high-definition-ready facilities.

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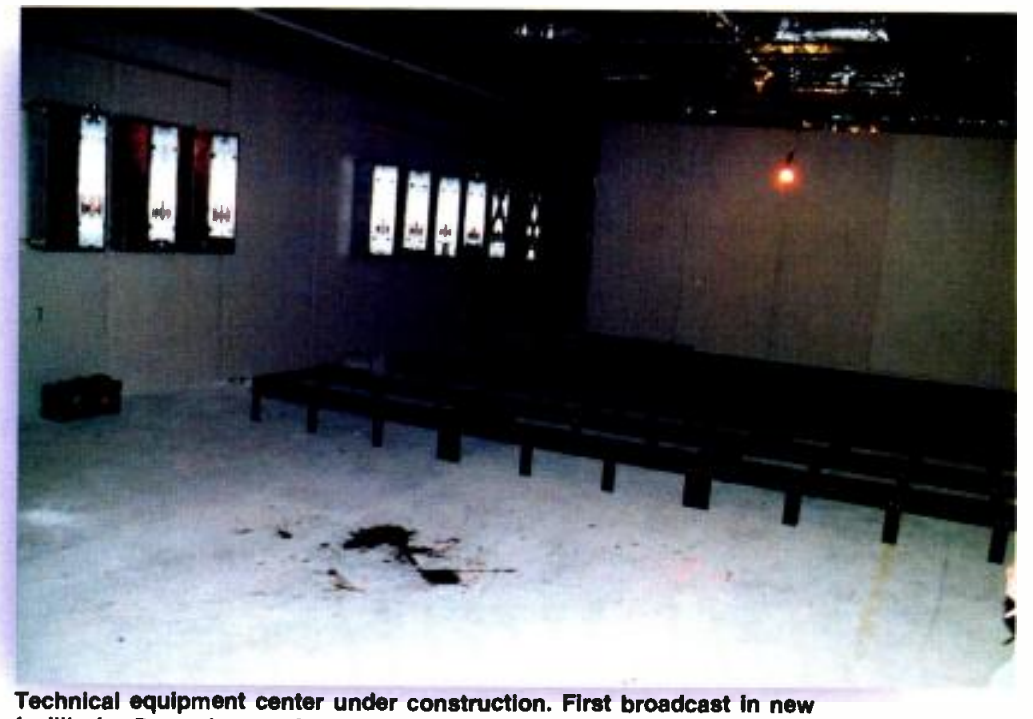
Starting anew



Technical equipment center under construction. First broadcast in new facility by December 1998.

The opportunity came about when the station opted to take a 21-year lease on a new corporate headquarters, thereby accelerating its embrace of digital and HDTV technologies. The decision to move was made in August 1997, and the staff hopes to be finished by the end of the year. The original schedule called for cut-over in early fall, but delays with construction, budgets and design changes have moved the staged cut-over to late this year.

Ken Devine, managing director for facilities, engineering and broadcast operations, would have preferred to wait longer before building new facilities to take advantage of lower price points and more product maturity in the new digital and HDTV equipment. However, the advantages of making a fresh start and leaving legacies behind were too compelling.

In its soon-to-be-vacated building on 58th Street in Manhattan, WNET has a mix of old and new equipment, some so old that the station had shut down a few of its editing rooms due to equipment obsolescence. A plan to refit the master control room in 1997 was deferred once the move to the new facility was proposed. And, unlike many moves, in which you have to figure out how to keep the operation running while you move, Devine will simply walk out of his old studio facilities and into new ones with all-new, thoroughly tested equipment that has been designed to fit his needs.

The plan

Given the rapid changes in digital technology and a high probability for false starts and quick obsolescence, design goals were critical to the facility's success. The engineering staff wanted the new facility to be able to support current and yet-to-be developed digital technology. Indeed, the selected design point creates a high-bandwidth, device-independent, networked environment capable of supporting present and future production and equipment needs.

The new floor plan includes a centralized technical operations area and a multifunction room that serves as the main studio. There is a boardroom and a nearby meeting room. A flash studio is coupled with 28 edit rooms. There is a high-definition edit room and two rooms for audio mix and production. Rounding out the facility are the master control room and the control room for the multifunction room.

The facility's design integrates broadcast, production, editing and control with centralized and shared resources. The design allows much of the support equipment to be located in the central equipment room rather than spread throughout the facility. Compressed serial digital video is routed around the facility, allowing the Avid editors to share resources. The $20-million project will allow WNET to bring post production in house and will set the stage for an all-digital facility.

Strategic partners and special requirements

There were several special requirements for the new facility, including *soft* factors like having to rely on the freelance production community for staffing studios and edit rooms. These requirements not only helped determine the overall technical design and desired equipment, but also influenced the selection of potential suppliers.

The design allows much of the support equipment to be located in the central equipment room rather than spread throughout the facility.

Because the facility will be new, with no legacy equipment or other inherited systems, virtually every room had to be equipped from scratch. That included broadcast, production, support and office areas. Devine and VDO president Gary Olson agreed it was best that the final design be advanced, but technically conservative.

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Starting anew

Principal equipment suppliers selected were Sony for desktop and broadcast systems, and Tektronix for routing, distribution and master control. Vendors were approached as strategic partners with the intention of acquiring as much from a single vendor as possible to reduce risk, strengthen the partnership, gain strategic alliance, and showcase prominence in the vendor's plans.

Sony, for example, is providing the high-definition edit laboratory and has committed to keeping the system current and the staff trained in the latest HD camera technology. In exchange, the company will have access to the facility for training and customer demonstrations.

A system integrator was chosen by competitive bid, and the final selection was made at the NAB convention. VDO Ltd. developed a detailed design and technical bid specification and helped the station select a system integrator from the New York area who had big-project experience. After a round of interviews, A.F. Associates of was awarded the contract.

A networked, fully integrated approach

VDO designed a networked system linked with fiber, Ethernet and coaxial SDI communications paths using a Tektronix coax SDI switch, a Cisco 100Mb Ethernet router and a Tektronix fiber switch. The entire environment, from master control to the nonlinear edit rooms, finishing and new media areas, are connected by SDI and high-speed (100Mb/s) Ethernet backbones. Equipment in the nonlinear edit rooms relies on Fibre-Channel interconnection. An SDI interconnect is used for the broadcast video servers. Ethernet is used for automation control, telemetry and control protocols.

Sony DigiBeta machines are used in the edit rooms and studios. Because the format supports analog and digital tape formats, the station can maintain its existing analog library without conversion.

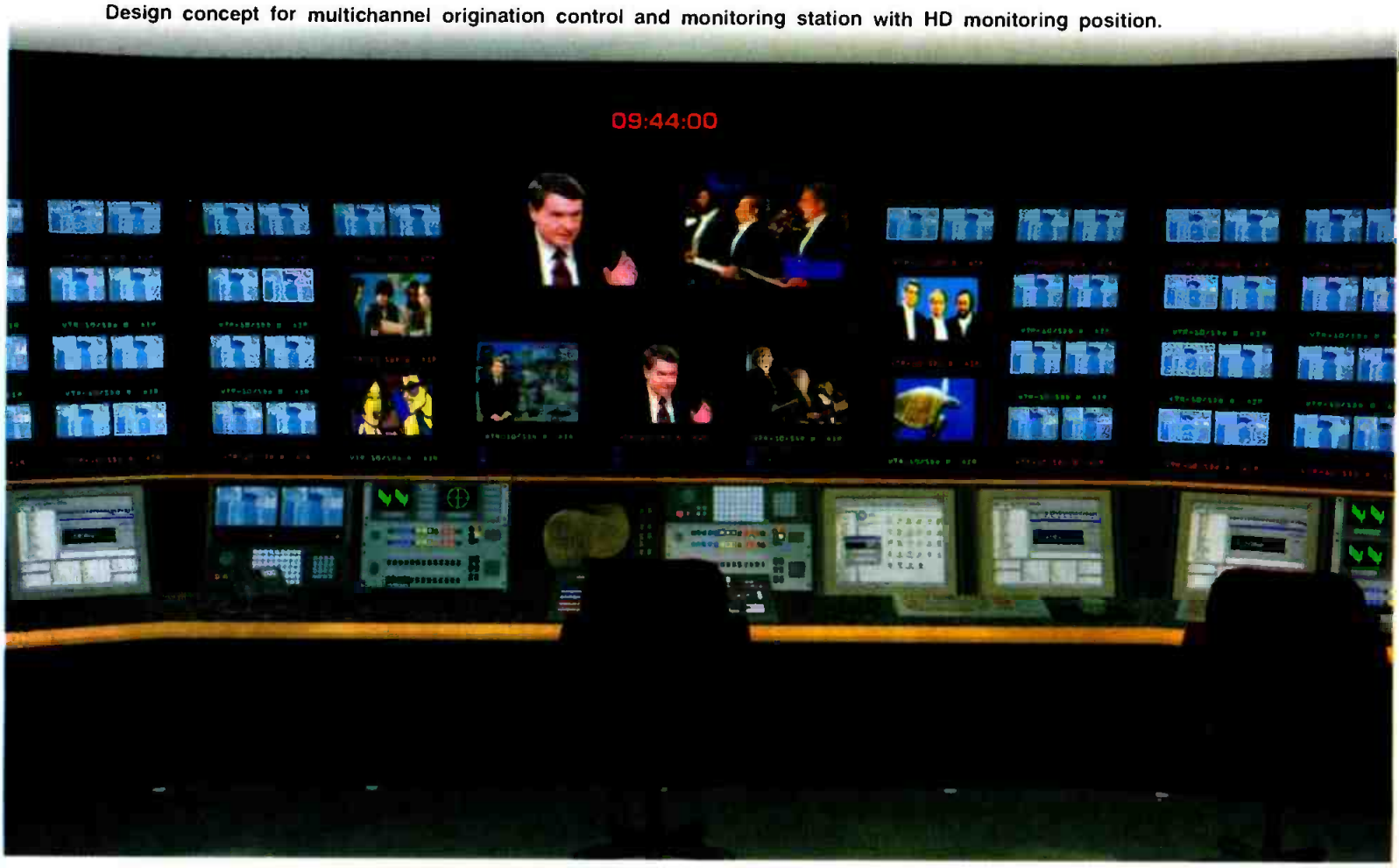
Design targets and equipment detail

The master control origination facility is a hybrid of tape and servers with an Odetics TCS-45 robotic tape system and Tektronix Profile video servers with RAID and a SCSI interfaces to Fibre Channel and SDI. Long-form programs are played from DigiBeta tape. Short-form and interstitial material originate from servers.

Master control is constructed with six-channel playout capability and supported by 10 monitoring racks. Two channels will be installed initially, and the room has expansion space for 16 more racks. The facility is designed to permit migration to a complete server environment as benefits increase and prices decrease. The entire master control system, close to a million dollars of hardware, will be automated by a Louth. The master control room uses a Tektronix HD switcher and two Sony HD monitors. A complete HD router can easily be added later.

The edit rooms include two linear

Design concept for multichannel origination control and monitoring station with HD monitoring position.



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rooms and 26 non-linear or digital workstations. Each room has a Sony VHS, and all are similarly fitted with consoles and connections to the facility's Ethernet, SDI and fiber networks.

There are six on-line, non-linear edit rooms. Three are equipped with Tektronix Lightworks VIP systems, and the other three feature Avid media composers in an on-line configuration. Two non-linear rooms are assigned to a 24-channel, Avid Pro Tools non-linear audio production system. Another room is equipped with a Quantel HAL graphics composition system and workstations with both 2-D and 3-D capabilities. The remaining 18 non-linear edit rooms are equipped with Avid Media Composers in an off-line configuration. These are assigned as needed to promotions, continuity and production for Metro Arts, a cable channel that uses WNET's technical facilities.

The 2,300 sq.-foot main studio and multipurpose room combines studio, boardroom, screening and event-room functions with HD and surround-sound capabilities and has its own dedicated control room. The facility will use existing Ikegami cameras, but will upgrade them to digital control with Radamec robotics. The room is equipped with a separate, in-room, self-contained audiovisual package for meetings. For screening purposes, a Sony multiscan light-valve projector with full-surround 5.1 audio is available.

The multifunction control room includes a fully loaded Sony DVS 7000 3.5 M/E serial digital production switcher. The switcher feeds floor monitors, a Sony two-channel DME 7000 mix effects, a two-channel still-store, a two-channel character generator, and other support and monitoring equipment. The dedicated control room houses the main monitor wall, production consoles and control panels. It is also equipped to operate as an additional linear edit room. The control room has racks for 46 Sony monitors, each with Tally under-monitor displays for source identification.

The edit rooms include two linear rooms and 26 non-linear or digital workstations.

The facility's router provides access to three channels of a Pinnacle Lightning still-store. The three two-channel still-stores and two three-channel stores are all networked together. A Chryon INFiNit! character generator and a two-channel Sony BE 9100 editing system (which can also be used with the Sony DMX 3000 audio mixer) complete the control room's resources. The audio production room is designed to support the main and flash studio and is equipped with an Aysis Air console complete with 96 digital inputs.

The flash studio is an acoustically isolated, floating room that functions as a small insert studio and as an audio recording studio. It is equipped with three Sony cameras on standard pedestals with Radamec robotic pan, tilt and zoom. Assigned to the flash studio control room are two Sony DVS 7000 mix effects systems, a single-channel DVE 7000, 46 Sony monitors with Tally display under-monitor panels. A Sony BE 9100, Sony DMX 3000, a Chryon character generator, and two channels of still-store complete the control room. Access to an Aysis Air console is provided when the flash studio is being used for audio recording.

Too much too soon?

Devine says the hardest part of the project so far has been trying to sort out unresolved technology issues. For instance, communication between different manufacturers' products isn't always straightforward. Control protocols between switchers and routers aren't as easy as they might seem. Also, getting the automation and traffic systems to work smoothly together has been challenging. The engineering staff found that DTV and non-linear editing technology is still maturing, so some challenges can be

SNELL & WILCOX

DO YOUR SIGNALS PASS THE CLEANNESS TEST?

SNELL

YOUR BRIGHTER

Why does my signal need to be spotless in the new digital era?

Digital TV could impress your viewers with enhanced picture quality. But going digital calls for new standards of signal conditioning. Any noise or decoding artifacts such as cross-luminance and cross-chrominance that remain in your video signal will be encoded and transmitted along with the picture. As well as using up expensive bandwidth, these will be magnified if the picture is upconverted to HD. The solution is precision decoding and signal conditioning.

What am I missing with my current decoders?

Your racks may be full of decoders, but for the high-end decoding that is essential in the transition to digital you need a quantum leap forward in quality. The best approach is to use intelligent decoders that analyze the picture on a pixel-by-pixel basis and change the decoding parameters as appropriate. You also need to be sure that your decoder is using the best possible algorithms to guide its processing decisions.

Will my archives be able to match these new digital quality standards?

In the digital era, much of the program content will be archive material. Because this will often be mixed with digitally originated sources, it's vital that you use high quality signal processing when you retrieve it. Without precision decoding and really comprehensive signal conditioning, differences in quality will be clearly visible to the eye of the viewer.

VILCOX

GUIDE TO DIGITAL

What sort of filter do I need to remove different types of noise?

There is no single filter that can handle all types of noise.

Transmission systems such as satellites can cause random broadband noise and impulsive noise like "sparkles", depending on atmospheric conditions. Analog recording onto videotape can produce noise and dropout. And then there are the scratches, dirt or grain found on film transfers. Good signal conditioning will offer combinations of recursive, spatial, median and linear filters, designed and sequenced to deal appropriately with these problems in any particular environment.

Can cleaner signals help me to save money?

Yes. Dirty, noisy signals mean inefficient compressors. That's because compression encoders cannot distinguish between noise and the real image. Worse than that, noise, being random, occupies even more of the compression bandwidth than predictable picture differences. If you clean up your signals thoroughly, you can either broadcast more channels at the same bitrate or provide your viewers with much better quality pictures.

SNELL & WILCOX

THE CLEAREST CHOICE IN SIGNAL PROCESSING FROM SNELL & WILCOX

Precise decoding, noise reduction and signal conditioning will maintain excellent picture quality in your transition to digital television.

MDD2000/MDD550 Digital Decoders
Unique proprietary technology ensures the highest standard of decoding currently available, no matter what the nature of the source.

MDD1000 Digital Decoder
A patented Digital Gate combined with line comb filters for accurate decoding of even imperfect, unstable sources.

MDD500 Digital Decoder
Adaptive field comb decoder provides crisp, sharp pictures with minimum delay mode operation.

Prefix CPP100/CPP200 Pre-processors
The single-box solution to pre-processing, significantly reduces bit rates while enhancing picture quality. CPP200 adds digital audio embedding.

NRS500 Noise Reducer
Seven advanced digital filters tailored precisely to different noise characteristics make this the definitive image enhancer.

NRS50/30 Noise Reducer
Multi-purpose noise reducers combining 3D median, recursive and spatial low-pass filters.

Kudos IQ Modular Range
All the functionality and control needed for going digital, noise reduction and four advanced 10-bit decoders.

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Starting Anew

expected as the technology evolves.

On the other hand, Olson says that the SDI standard has matured to an acceptable level. Beyond that, even to non-linear editing and especially with HDTV, he says, things become less clear.

While it is unusual to build new facilities from scratch, going digital and going HDTV is something every station will face, sooner rather than later. Based on experience and a plan already well underway and on schedule, Devine suggests you start early. Allow 12 to 16 months of design and build time. In his case, which was complicated by moving to a new building, Devine wishes he had started even earlier. He also suggests that you get good help. A good systems integrator is invaluable.

The engineering staff found that DTV and non-linear editing technology is still maturing, so some challenges can be expected as the technology evolves.

And, although such a move and a chance to get in to DTV and HDTV early is exciting, Devine often wishes he had been able to stick to his original three-year transition plan. The early schedule means WNET is further along the cutting edge than he would like to be.

On the plus side, the chance to dispense with legacy systems all at once and to build anew can be worth the occasional mis-steps that occur when you know where you want to go, but aren't quite sure how to get there. ■

Edward Heresniak is an independent consultant in Boston.

Equipment list:
Sony for desktop and broadcast systems
Tektronix for routing, distribution and master control
Tektronix coax SDI switch
Tektronix fiber switch
Cisco 100Mb Ethernet router
Sony HD cameras and studio production equipment
Sony DigiBeta VTRs
Odetics TCS-45 robotic tape system
Tektronix Profile video servers with RAID and a SCSI interfaces
Automation by a Louth
Tektronix HD switcher for master control
Sony HD monitors
Tektronix Lightworks VIP editing systems
Avid media composers
Avid Pro Tools non-linear audio production system
Quantel HAL graphics composition system
Radamec camera robotics
Ikegami cameras
Tally Display under-monitor displays
Sony DVS 7000 3.5 M/E serial digital production switcher
Sony DME 7000 mix effects systems
Pinnacle Lightning still-store
Chryon INFiNit! character generator
Sony BE 9100 editing system
Sony DMX 3000 audio mixers
Solid State Logic Aysis Ayre 48-channel digital console
Sony monitors
Yamaha consoles
Mackie consoles

Design team:
Client: 13 WNET
Technology design consultant: VDO Ltd.
Systems integrator: A.F. Associates

NVISION Provides a Solid Path to DTV

NVISION has developed a new line of modular processing products specifically designed to meet the current and future needs of all DTV facilities

The new 4000 Series is designed around a new generation of equipment frames that have been built to handle any digital signal format, from AES audio at 3.072Mbits to HD-SDI video at 1.5Gbits. In order to accommodate these data rates, this new frame architecture includes a highly specialized 'mid-plane' motherboard that incorporates an impedance matched connector system. To ensure that world emissions and safety standards are met, the frames are also fitted with special compressible conductive gasket material around the doors and I/O plates. The 4000 frames are currently available in two sizes: the 1RU frame (4001) accommodates four processing modules and the 2RU frame (4002) accommodates eight. The 4002 allows the installation of a redundant power supply.

Available modules for this system include the renowned NVISION AES products—A to D and D to A converters, distribution amplifiers, and reference generators—but with improvements over the NV1000 Series equipment. For example, the new A to D and D to A converters are switchable between 20 and 24-bit operation at all AES sample rates, including 96kHz. Each module contains two independent converters. This means that it is now possible to put up to sixteen high quality converters in just two rack units.

"The 4000 Series firmly establishes NVISION as a company that understands the technology issues facing DTV design engineers."

In addition, NVISION has added digital video products such as SDI DAs, embedders and disembedders, HD-SDI DAs, and SDI and HD-SDI fiber optic converters. As you would expect from NVISION, these products have been designed to provide excellent performance as well as to fix problems that had been previously overlooked, while maintaining an affordable price point.

In the case of audio embedders and disembedders, NVISION has taken a unique approach to solving some previously ignored issues.

Avoiding Pops and Clicks

When a switch is made between two video sources that contain embedded audio data, it is difficult to resolve a clean audio transition at the receiver. This is due to two primary factors: 1) The audio data is not commonly phase aligned with the video data and other audio channels. 2) In NTSC systems, any efforts to synchronize audio and video data can be lost if the video paths have differing processing delays.

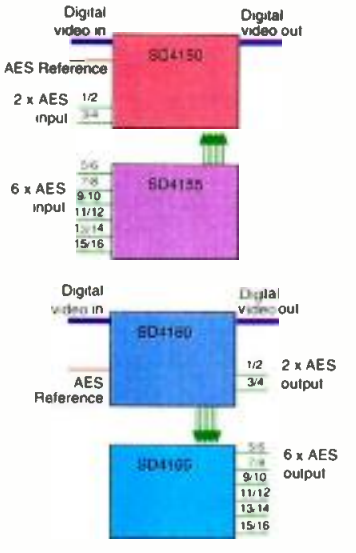
In order to ensure satisfactory audio reception, it is necessary to take care of data alignment at the point of insertion and subsequently provide a method of error concealment at the point of extraction.

NVISION has developed new embedder and disembedder devices that incorporate proprietary audio re-framing ASICs. These ASICs ensure that all audio data carried within each video stream is correctly timed. The output ASICs provide constant AES framing patterns, regardless of input signal. This ensures that AES receivers maintain constant lock, and ir eliminates aberrations due to receiver PLL recovery. Also, error detection circuits within the disembedder ensure effective error concealment, regardless of the embedding method or device used during the insertion process.

A Multi-Channel Solution

When more than four channels are required, the normal technique is to cascade embedders together. This process relies on the ability of the embedder to determine ancillary data content and decide where to allocate its audio channel group data. Receiving disembedders are also cascaded and must have a preset determination of which audio group to extract. The more channels inserted, the more difficult it becomes to determine location.

The new NVISION embedder module provides for one group of four audio channels to be inserted into the SDI data stream. (This is similar to other available products.) To insert more than four channels, another module provides for an additional twelve audio channels (three groups) to be directly fed to the embedder for allocation and insertion. This method provides two benefits. 1) The exact channel group location can be determined by the single embedder module. 2) 'Piggy backing' embedders is unnecessary; therefore, costs are drastically reduced.



NVISION Multichannel Embedding and Disembedding

NVISION's 4000 Series 2 Rack Unit Frame

NVISION's new disembedder module can detect the presence of channel groups and allow the operator to select which group is extracted. If the embedded data contains multiple groups, the addition of an expansion module allows a single disembedder to extract all channels in the order received. A further feature of the disembedder is the built-in monitoring quality D to A converter and mini headphone jack, for convenient channel pair locating and subsequent output group assignment.

Fiber Optics

Fiber Optics is another area where NVISION demonstrates their understanding of signal handling and management. Their new products incorporate unique designs to ensure that pathological signal content is received without bit errors. In SDI signals, pathological content (long strings of all 0s or 1s) can cause a DC shift that results in bit errors at the receiver.

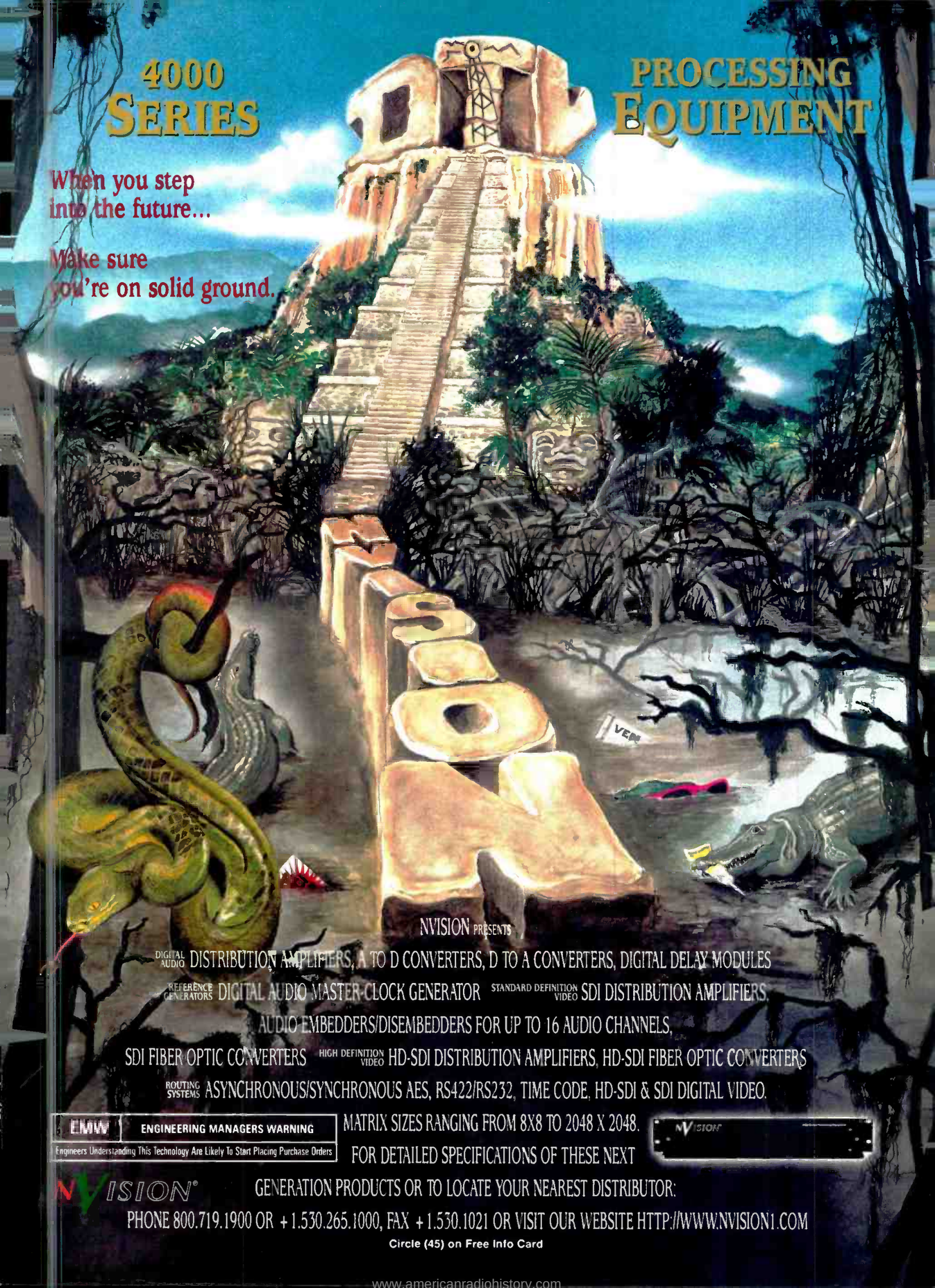
Fiber products for digital video convert the electrical signal into light pulses for transmission across the fiber. But, due to the pathologicals, transmitting the SDI signal is a difficult task. If the pathologicals are not compensated for properly, the results will show up as sparkles in the picture. This problem needed to be resolved, particularly for HD-SDI signals where 1.5Gbit distribution will rely on fiber far more than SDI has in the past.

New E/O, O/E and transceivers from NVISION for SDI and HD-SDI incorporate proprietary technology to ensure that pathological signal content will always be received correctly, without bit errors.

Solid Ground

NVISION has developed an excellent reputation for providing high quality conversion and connectivity products at very reasonable prices. The 4000 Series firmly establishes NVISION as a company that understands the technology issues facing DTV design engineers.

NVISION can be contacted at 1 800 719 1900 or by fax at (530) 265 1021. You can visit their website at www.NVISION1.com



Graphics & Effects TECHNOLOGY

By Marc Boeddeker

Many of today's sophisticated effects can be done on a wide range of platforms, but the age-old question of performance vs. cost remains.

It's only natural (perhaps Darwinian) that, as film special effects have evolved, they have had an impact on the realms of commercial, corporate and broadcast graphics. The term graphics is used here to describe everything from the most mundane title page to the host of singing, dancing and otherwise animated corporate and product IDs found today.

The high-gloss images so prevalent in prime-time broadcast drive graphics and image-creation specialists to higher and higher ground as they compete for the audience's attention. It has been, and continues to be, very expensive to hang out on the bleeding edge of film-quality special effects. But film is not going away any time soon; it will continue to be the acquisition medium of choice for all kinds of high-resolution projects. As advances in computer technology and film/computer-based special effects have produced enhanced technical capabilities, they have also created an expectation, in the minds of viewers, of seeing the unusual.

For years, no one expected "Star-Wars" production values on any but the most expensive projects. Today, producers can be expected to ask for every special effect they've ever seen, and they want these effects for next to nothing. The bar has been raised for facilities of all

Production engineer Jeff Erzin in one of two StrataSphere finishing suites at UPN44 in San Francisco.

GRAPHICS & EFFECTS TECHNOLOGY

Visual effects artist James Bygrave in the Henry suite at the Finish Line in Santa Monica, CA.

kinds in terms of the graphics they provide. Even the slates at the head of a project master reflect on the production values that a facility provides. The task is to provide the most cost-effective solution for the client and the facility.

Platform possibilities

Single-computer workstations are capable of a wide range of graphic composition. With today's faster, more-affordable computers, creating smaller, personal production environments is relatively easy. These systems can, in some respects, rival a traditional post or graphics house, especially if the local houses haven't purchased anything new lately. In a real sense, purchasing state-of-the-art technology a few years ago could easily prevent a facility from keeping pace today, because it is still paying for something that may already be obsolete. Whatever your final equipment decisions might be, purchases should pay for themselves as quickly as possible.

One artist on a fast Mac can cost-effectively crank out all manner of broadcast-quality graphic elements, short animations and Photoshop images. Plenty of die-hard art departments will continue to work on Macs. Inevitably, you'll have to work with Mac elements at one time or another, so make sure you have the necessary software and hardware to do so.

In terms of price, some form of Photoshop/Illustrator-type workstation on either a Mac or PC is probably the least expensive entry into broadcast-quality graphic creation. Many of the graphic plates and menus used as DVD elements are created on Macs or PCs and delivered on Zip discs. In many cases, graphics are composed on both NT and Mac-based systems, and package art may be generated from the same files. Freelance artists preparing elements can survive with little or no investment in output hardware if those elements are going to post houses or other facilities with output equipment, such as DDRs or Digital Betacams. However, file types should be verified before delivery to ensure compatibility.

On another level, if you will be dealing with independent artists, some flexibility in accepting Mac, PC or Unix files as graphic elements is desirable. MacOpener for PCs deals with converting from Mac to PC pretty well. At the least, a computer with a genlocked NTSC output provides the capability to transfer files to a traditional video post environment. As an alternative, a new family of dedicated CGs, with the ability to integrate computer graphic files, has emerged as a hybrid production tool.

Dedicated character generators have been one-trick ponies for years, and as such they continue to provide the standard titling functions (i.e., super names, roll credits and change the score). Until recently, the main quality concern has been the character resolution at the output. Beyond that is the growing necessity to integrate graphics files of all types, including logos and animations from a variety of sources into an expanded production environment. Several NT-based character generators can handle all the usual chores with some PC-inspired improvements thrown in. Word processor functionality combined with the ability to play back frame animation sequences, insert video into characters and backgrounds as well as animate character sequences are just a few of the features found on these products. Photoshop or other plug-ins can easily reside on the same platform, and toggling between multiple applications allows users to create and enhance elements as never before. Final images can be easily exported to other applications.

Moving up to the higher-end workstations, the SGI line starts with the O2 and continues with the Octane on up to the large systems, which include the Onyx and Origin series. These are powerful systems that can be used for a variety of tasks, including 3D modeling, special effects and real-time non-linear editing. Although many of the NT workstations may top out at one or two processors with 128 or 256MBs of RAM, the SGIs *start* there and go up to eight or more CPUs (250MHz R10000 RISC processors) along with 1GB or so of RAM. In these systems, the hardware is only the beginning — software and storage must be considered. Both are expensive and, as the performance increases, so does the price.

Beyond high-end workstations are dedicated graphics systems. Among

Pictured right: Composite of a Doberman and shattering glass used for a Chevy S-10 spot.

these, Quantel is the best-known and, typically, the most expensive system. As costly as they appear, these systems have several benefits that can more than make up for their higher price tags. Typically, dedicated systems are extremely fast and powerful, with all, or nearly all, effects processing happening in real time. In addition, because the majority of these systems can be upgraded to current models (sometimes at significant cost), these dedicated machines typically have much longer useable lifetimes and a higher resale value than their general-purpose counterparts.

Networked systems

Exporting to, or sharing with, applications on other platforms makes some type of network desirable. 10baseT is (almost) free these days, but much faster solutions are becoming more affordable almost daily. Sooner or later, you'll want to move some data around, even if only between a handful of computers. You will be much happier if you get the fastest network you can afford. Network requirements vary for each application, but to keep it from getting tedious, video transfer requires some fairly high data rates, especially in the uncompressed domain (see Table 1).

Networks used to move video need to be designed carefully to ensure there are no bottlenecks. Network topology must also be considered to ensure the available bandwidth is properly distributed to maximize throughput. Storage systems must be carefully sized and matched to the network. Many of the design considerations depend on your particular business model and facility layout. For instance, if much of your work is based on one-on-one editing in front of the client — on deadline — then you probably want a single high-power system with minimal connectivity to other suites. In contrast, if much of the work consists of collaborative projects distributed among a team of artists, then several networked workstations may be a better option.

Multiple applications running on multiple processors and networked to multiple operators can add up to efficient equipment usage, which can help pay for these systems as quickly as possible. Even a small network could allow one individual to move from one workstation to the next while each computer in turn completes a task. Within networked production facilities, elements can be quickly transferred from one workstation or production stage to the next. This transfer allows for maximum use of system resources, such as video servers or rendering capacity. Making computers work all night long is easy, but it helps to have a human around to keep an eye on them. A facility full of locally self-sufficient

workstations can become a rendering powerhouse at night or over a weekend if the correct network is in place.

Other considerations

As with many projects, production can often extend to the final hour before the delivery deadline. Downtime can be a serious issue for any facility, and it is especially painful when airdates and uplinks are involved. To ensure that facilities can continue working in the event of a total power failure, consider protecting the entire facility with enough UPS capacity to keep everything powered for at least two hours. Most regions of the country experience some seasonal disruption of local electricity (i.e., snowstorms, hurricanes, tornadoes, brownouts), and having a UPS on critical systems is a good idea.

In terms of recovering from a hardware failure, time can be a critical factor. Service contracts, which may seem expensive at first glance, are worth it the first time you need a quick turnaround on a replacement board or power supply. Technical support comes at different speeds. Waiting for FedEx to arrive with what you hope is the answer can be very unnerving. Even the most capable engineering staff can't compete with a factory pro who has probably seen the problem before and might even have the necessary parts on hand.

Bear in mind that integration problems may occur when using even the most proven technology. This is especially true with computer hardware and software, as numerous vendors are supplying NT versions of products that may have been developed on another platform or operating system. When purchasing this category of product, it is advisable to deal with a VAR or systems integrator that can be held responsible for getting the package to work, preferably long before the final payment has to be made. Today's graphics technology is more flexible and powerful than ever before but, as with most tools, is nearly useless without creative talent that can turn ideas into reality. ■

Marc Boeddeker is in the digital video division of Producers Post, Burbank, CA.

Network Technology	Max. Rate (Theoretical)	Effective Rate (TCP/IP)	Time to Xfer 1 Frame (Video: Film-8bit Film-12bit)	Time Xfer 1 sec. Clip	Number of Packets per Frame	Numberof Packets per Second ++
10Mb Switched Ethernet	1.25Mb/s	600kb/s-1Mb/s	V: 1-1.6 sec F-8: 9 sec F-12: 13.5 sec	30 sec 3.6 min 5.5 min	720 6480 9720	720 720 720
100 Mb Switched Ethernet	12.5Mb/s	6-10Mb/s	V: 0.1-0.16 sec F-8: 0.9 sec F-12: 1.35 sec	3 sec 21.6 sec 32.4 sec	720 6480 9720	7200 7200 7200
FDDI Ring	12.5Mb/s	Variable up to 10Mb/s	V: >0.16 sec F-8: >0.9 sec F-12: >1.35 sec	>4.8 sec >21.6 sec >32.4 sec	256 2304 3456	2560 2560 2560
ATM OC3	17.5Mb/s	8-12Mb/s	V: 0.08-0.12 sec F-8: 0.75 sec F-12: 1.12 sec	>2.4 sec >18 sec >26.9 sec	22 198 297	265 265 265
Fibre Channel Arbitrated Loop	100Mb/s	Variable up to 26Mb/s	V: >38 msec F-8: >0.35 sec F-12: >0.5 sec	>1.14 sec >8.4 sec >12 sec	22 198 297	579 566 594
Fibre Channel Switched	100Mb/s	26Mb/s	V: 38 msec F-8: 035 sec F-12: 0.5 sec	1.14 sec 8.4 sec 12 sec	22 198 297	579 586 594
HIPPI-800	100Mb/s (each direction)	70Mb/s HIPPI-FP	V: 14 msec F-8: 0.13 sec F-12: 0.19 sec	0.42 sec 3.12 sec 4.56 sec	1 1 1	72 8 6
Sigabit** Ethernet (Switched)	126Mb/s (est.)	88Mb/s (est.)	V: 12 msec F-8: 0.1 sec F-12: 0.15 sec	0.34 sec 2.35 sec 3.68 sec	720 6480 9720	64800 64800 64800
HIPPI-6400••	800Mb/s (each direction)	600Mb/s (est.) HIPPI-ST	V: 2 msec F-8: 15 msec F-12: 21 msec	60 msec 0.36 sec 0.37 sec	1 1 1	500 67 65

Table 1. A comparative performance of different local area network technology solutions in the context of most applications, where the basic unit is a *single image frame*. Therefore, the following data sizes and real-time rates are of importance:

*1MB (NTSC): 30MB/s @ 30fps;
*1.2MB (PAL): 30MB/s @ 25fps;
*9MB (film 2Kx1.5Kx8 bit): 216MB/s @ 24fps; and
*13.5MB (film 2Kx1.5Kx12 bit): 324MB/s @ 24fps.
**: Packets per second indicate how many times per second the CPU has to do protocol processing.
••: These are new network technologies and performance numbers are guesses not based on testing.

At HMA in Burbank, 3-D artist Jim Hanna generates elements in Power Animator and Alias Wavefront's Maya, running on a dual processor Octane.

He recently completed title sequence animations for "The World's Wildest Police Chases," which were then composited in Discreet Logic's Flame. For many projects, final rendering can be completed on the Octane or by tapping into system-wide rendering on other platforms, including NT-based systems running on dual 450MHz processors. With this system, several projects can be in production simultaneously, with system resources shared as needed. Discreet Logic's Smoke, an uncompressed 601, on-line, non-linear editor, is a natural companion to such digital creation stations. The human interface is fairly intuitive for editors versed in traditional on-line, and the ease of use and multiple layers of uncompressed video present many new possibilities, including the ability to easily import pristine 3-D animations and Flame composited or augmented elements into the uncompressed Smoke environment.

High-end work is invariably shot on film, then telecined with a digital Rank unit to uncompressed D-1 for editing, usually on the Quantel Henry. Among other things, Henry features uncompressed 601 digital I/O and a fully featured Paintbox. In this uncompressed domain, film retains the majority of its resolution when translated to video. The absolutely pristine images made possible by today's film technology demand the best that video has to offer, and the producers and directors creating those images don't expect any compromise in the post production process (or many excuses) in the completion of their project.

On LA's west side, the production community is driven by a host of national ad agencies. It's the same community found in many markets. As national ad agencies and their local components coordinate efforts on

Complex composite used in a recent Gloria Estefan music video.

campaigns with local tie-ins, the budget can be split up on a truly national basis. Eye-popping special effects, unusual, attention-grabbing graphics and high-visibility product ID are the essentials in this market, where product identity is paramount. It's a big-budget crowd with a lot on the line, and everything money can buy is at the disposal of the creatives who must craft the national campaign, political spot, or broadcast graphic that seeks to capture the viewer's attention.

It's expensive to play in this league. The stakes and the pressures are high, and a high-end facility must provide more than equipment and state-of-the-art technology to its clients. It must provide an environment that fosters artistic creativity as well as technical excellence. Clients such as the ad agencies for General Motors, Honda and the record industry are tough customers on both counts.

The Finish Line in Santa Monica, CA, is such an environment. The building that houses the facility was once an art gallery. That ambiance still exists in a physical space filled with original paintings and a functional warmth that comes from the quiet confidence that this place can handle anything. Three Henry bays, each upgraded to the V-Infinity package, are supported by one Flame suite. An all D-1 machine room supports the four rooms.

The Henry and Flame artists who inhabit the rooms are an international group, bringing a wealth of experience and perspective to their labors. Lead visual effects artist Stan Kellem handles major agency accounts on a daily basis, and he is also responsible for the compositing and final conform of many top echelon music videos. With him at the helm, The Finish Line recently completed a Henry/Flame finishing package for Gloria Estefan's music video "Heaven's How I Feel." Flame artist Nancy Hyland also created visuals that were composited into the video along with elements provided by other vendors. The video features Estefan in a variety of surreal environments, including a complicated shot of her stepping through a liquid porthole as it changes colors.

"This was an excellent example of 3D CGI, Henry and Flame working together to produce a seamless product," said Kellam.

Hyland worked with artist James Bygrave on a series of Chevy S-10 spots that required, among other things, giving a bear more ferocious teeth in the spot "The Great Outdoors." Another commercial in the series, "The Chase," involved two Dobermans who were supposed to jump through a "sugar-glass" window. Despite 10 days of training, at the last moment, both dogs refused to jump. A shot of one of the dogs jumping through an empty window had to be composited with a shot of the glass being shattered by a heavy bag being thrown through it. Matching the speed and shape of flying glass shards to simulate a dog going though the window took some experimentation. The entire process was complicated by the fact that the scene had originally been shot with strobe lighting, making it even more difficult to match.

"Closet," created by the Rubin Postaer agency for Honda, was also conformed and composited by James Bygrave at the Finish Line with additional Flame work completed by Nancy Hyland. In this spot a woman stands in her over-stuffed closet as it tips over to empty everything out. It was shot in two sequences, with the room actually tilting on its side. After finding a good sync point between the two shots, Bygrave set about matching the lighting while Hyland morphed the two shots of action together in the Flame. In addition, the woman's safety harness was removed in the Flame.

These are just a few examples of the high-end graphics and effects that are standard in today's high tech production environment. Remember, though, with any of this technology, a good idea is the first requirement for producing effective eye candy. Glitz for its own sake is pretty transparent and quite often becomes too irritating to be effective.

Digital Audio Routing

Get ready to triple your audio capacity.

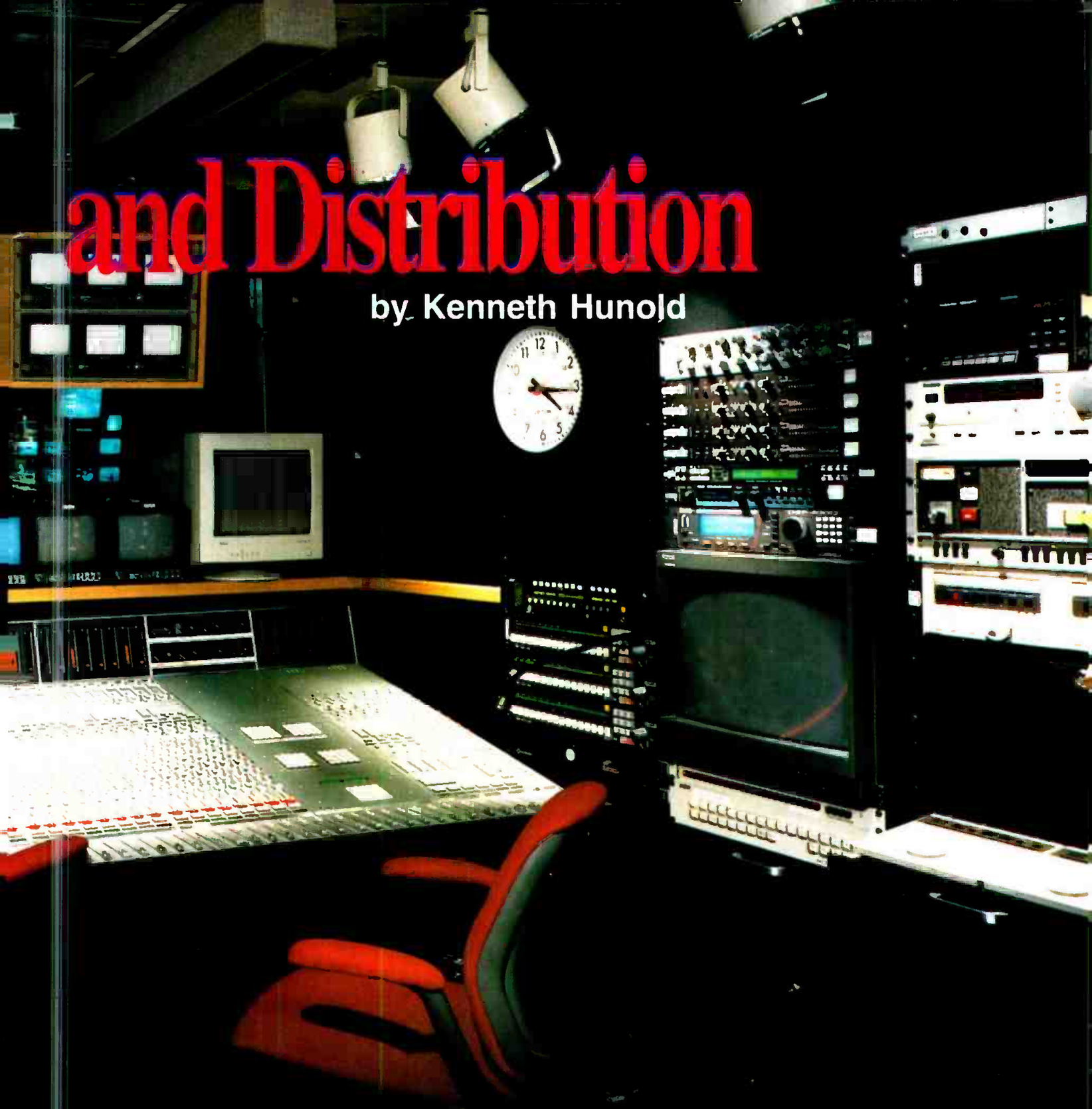
Photo: The ABC TV-7 control room built by A.F. Associates, Northvale, NJ, is one of several facilities built to handle multichannel audio. (Photo by Andy Washnik Studio)

For the most part, broadcast distribution systems and infrastructures have been driven by the final emission format. Most TV audio facilities were monophonic until the mid-'80s when BTSC stereo was adopted.

At that time, audio facilities were quickly cobbled together to route a second channel along with the first, mixing them together when necessary and finally routing them to the transmitter site. This conversion closely mimicked the conversion of FM from

and Distribution

by Kenneth Hunold



mono to stereo in the early '60s. Because the TV and radio stereo systems were similar, some of the solutions used for FM stereo were adapted for TV stereo. However, in some cases, the complexities of routing even two channels of audio were simply too difficult, and stop-gap plans were implemented. One of the most common plans was dedicating one or two sources for stereo playback and patching them directly to the transmitter as needed.

Here we are again, ready to begin broadcasts with a system capable of transmitting not just two, but six channels of audio or more, *per program*, to the public over the air. And again, at the eleventh hour, we are trying to cobble together a system to route and distribute all those audio channels.

Most TV facilities can handle stereo signals with few problems. Some can even handle four channels of audio, the number found on most popular VTRs. But six channels or more? That's another story entirely. This article deals with routing multiple channels of audio through a facility, but not with producing or mixing them.

Multichannel sources

Where is all this multichannel audio coming from? Think of your current program content. It's a safe bet that much of your program material is already in stereo. It is also likely that some programs are encoded in a surround format. Motion pictures are

DIGITAL AUDIO ROUTING AND DISTRIBUTION

prime candidates for multichannel sound because many of them are mixed with four or more channels for theatrical release. For many movies, four, five, six or more channels of audio are already available for distribution.

In the mid-'80s, the AES and EBU standardized the first digital audio multiple channel transmission and distribution formats. The primary purpose of standardization was to combine two audio channels for transmission over a single communications channel. This standard forms the basis for many of the proposals for distributing multichannel audio. The features of the AES standard allow it to be adapted for broadcasting more than two channels. What about enhancing this standard?

Specifications of Various Multichannel Systems Audio Distribution Formats

Interface Type	Number of Channels	Transmitted Bit rate	Compression Ratio	Interface Media
AES3	2	3.07Mb/s	none	coax, twisted-pair
MADI (AES10)	56	approx. 125Mb/s	none	coax, fiber
Dolby E	6 to 8	3.07Mb/s	varies	coax, twisted-pair
apt-x	4	3.07Mb/s	4:01	coax, twisted-pair
AC-3	1 to 5.1	64 - 640kb/s	varies	coax, twisted-pair
NVISION	12	18.4Mb/s	none	coax

Multichannel possibilities

A proposal has been submitted to SMPTE by NVISION describing a method for multiplexing up to 12 channels of audio (essentially six two-channel AES3 signals) into one datastream (see sidebar). This is a new type of interface based on, but not compatible with, the current AES3 standard. The proposal allows multiplexing up to 12 channels of audio sampled at data rates ranging from 32kHz to 96kHz. All signals in a given 12-channel multiplex must have exactly the same sample rate and, ideally, should be phase aligned. This system would be used to route up to 12 channels of audio between two points as one signal. The data rate of the multiplexed signal would be about 18.4Mb/s. This signal could certainly be passed through coaxial cable and may even pass through some existing video routing switchers.

Another multichannel audio interface based on the two-channel AES3 interface is the serial Multichannel Audio Digital Interface (MADI). This interface is standardized as AES10-1991 (revised in 1997) and was originally developed as a single-wire (coaxial) connection between digital audio multitrack recorders and consoles. The standard provides for the transmission of 56 uncompressed channels of digital audio at a common sample rate. This interface carries all 24 bits of audio data at sample rates ranging from 32kHz to 48kHz, and a payload data rate of slightly less than 65Mb/s. This signal should not be routed with conventional analog video routing switchers, but could be routed with a *non-reclocking* level of digital video routing (it does not match any of the standard data rates for serial digital video). This standard has been implemented by some digital audio console makers for routing large numbers of audio channels between processing blocks.

Further, there is a way to route up to 16 channels of audio as part of the serial digital video signal. The existing component digital serial interface allows up to 16 audio channels to be embedded into the digital video bitstream. This is a feature of both the HD and SD versions of the serial interface. Unfortunately, its greatest attribute, allowing audio and video to be routed as one signal, is perhaps its biggest problem. When it comes time to manipulate the audio data embedded in the signal, it is often cumbersome to extract this data and reinsert it later. There are also problems with pops and clicks during switches, and there are channel phasing issues when embedding more than four channels.

One suggestion is to use embedded audio on any link where you would have used diplexed audio on an analog link (e.g., your STL).

Because the ATSC system is capable of six channels of audio (five full-range channels and one low-frequency effects, or LFE, channel) it has been suggested that multichannel programs could be pre-encoded into the ATSC emission standard for routing and distribution. Many motion pictures are released with this AC-3 data (now known as Dolby Digital) as part of the film. Unfortunately, the AC-3 coding algorithm was designed and optimized for low bit rates. Compromises were made, with the assumption that the AC-3 signal would be used on the final link to the consumer. It was also assumed that no further processing would be performed external to the decoder in the consumer's home (except perhaps for time shifting with a VCR). At the audio data rate chosen for terrestrial broadcast (384kb/s), the AC-3 algorithm will *not* survive multiple

Metadata is new to most broadcasters and must be clearly understood.

decode-encode cycles without producing audible artifacts on some program material. Assuming that programs with an encoded AC-3 datastream will have to be decoded for processing (mixing, or even gain changing for voice-overs) and then re-encoded for broadcast, this could seriously compromise the audio quality at the home receiver.

However, there is some good news. The AC-3 system can be operated not only at the 384kb/s broadcast rate, but also over a wide range of data rates. With certain channel configuration restrictions at the low end of the range, the AC-3 algorithm can operate from 64kb/s up to 640kb/s. There has been some discussion about encoding the multichannel signal using the AC-3 algorithm, but at the highest rate (640 kb/s). At this rate the AC-3 signal will tolerate a *few* decode-encode cycles and still provide acceptable audio when coded for broadcast at 384kb/s. This could be an interim solution for "contribution" or "distribution" links.

Photo: The recently installed audio control room at KRIV, Houston, was designed by DTA Carlson, Chicago. (Courtesy Aker/Zvonkovic Photography, Houston)

Most engineers discover, when reading about ATSC audio systems, that a lot of parameters can be set — or, more likely, mis-set — in the datastream. This is *metadata* (the data about the data), and it is something that we must get used to and understand. The content — and concept — of metadata is new to most broadcasters and must be clearly understood to fully realize the capabilities of the ATSC audio system. Until now, the only metadata that broadcasters were familiar with was the label on the box and the slate on the tape. The systems discussed previously do not address the issue of preserving metadata as the audio is routed through a facility. To that end, Dolby has gone back to the drawing board and is developing a system to compress six to eight channels of audio combined with metadata into a datastream that

Photo: Multichannel audio rooms are nothing new; film studios and theatrical venues have used them for years. This control room at the Apollo theater was built nearly a decade ago.

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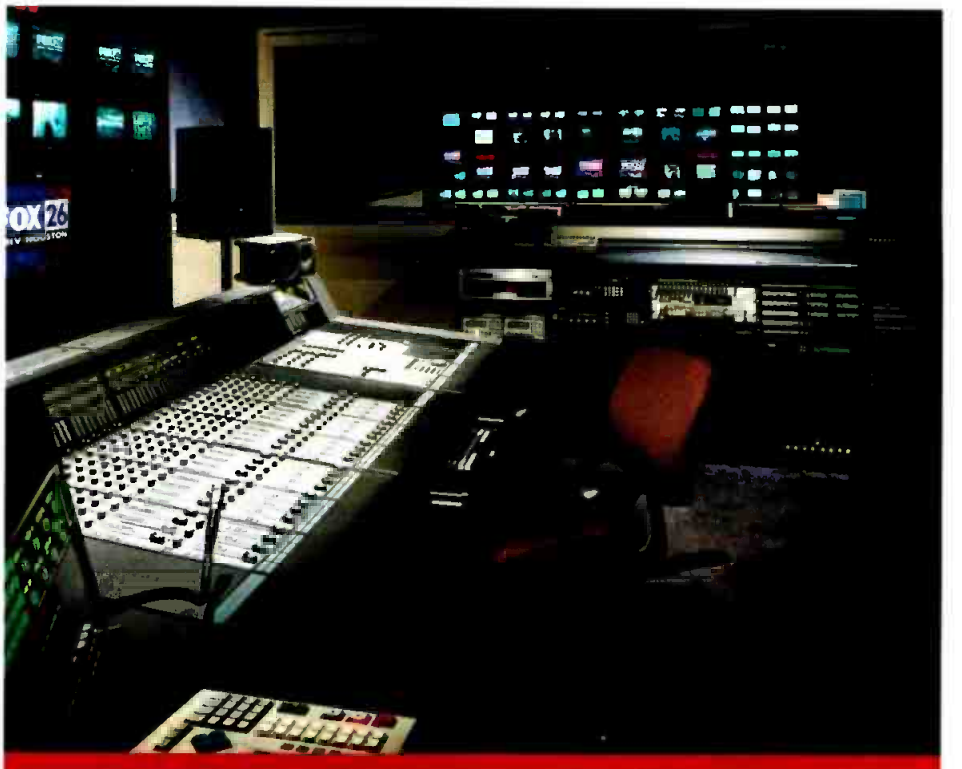

Photo: The recently installed audio control room at KRIV, Houston, was designed by DTA Carlson, Chicago. (Courtesy Aker/Zvonkovic Photography, Houston)

Photo: Multichannel audio rooms are nothing new; film studios and theatrical venues have used them for years. This control room at the Apollo theater was built nearly a decade ago.

tus bits is crucial. Dolby Digital encoders have an AES output that carries the AC-3 signal as an AES datastream. Recording devices, such as VTRs and disk recorders, must not alter the coded data in any way, and they must accurately re-create the entire AES signal (including the status bits) if proper operation of downstream devices is expected. Sample rate converters, which are built into some VTRs, will change the encoded data, rendering it useless. So will any lossy compression scheme. At present it appears that full data rate, uncompressed recorders that record the entire AES signal (not just the audio data) have the best chance of recording and playing back non-audio data on an AES datastream. This is not to say that other devices cannot be made to work as data recorders. Even 16-bit recorders can be used if the signals are properly coded. The caveat is to try it before you decide to use it.

Distributing and routing multichannel audio for digital television is going to be a major concern as broadcasters make the transition to digital television. This article is not meant to scare anyone about the future, but rather to serve as a wake-up call to engineers charged with designing their station's DTV infrastructure. Most broadcasters do not want to add more levels to their audio routing and distribution system. Nevertheless, recording and playback of multichannel audio could be a major headache. Some of the systems described previously are not yet in production and others are just proposals to standards organizations. Solutions will be developed from these products, and others. There is no doubt that these problems will be addressed over time, but that will do little to calm the nerves of the pioneer broadcasters this year and next. We are all watching an industry being born before our eyes. Expect a few sleepless nights in the early days as the whole system grows and matures. ■

Kenneth Hunold is an audio/video project engineer for the ABC Engineering Laboratory, New York.

NVISION's 12-channel proposal

By Steve Epstein

NVISION has submitted a proposal to SMPTE for multiplexing 12 uncompressed digital audio channels (six AES pairs) within a single datastream. This datastream has a bit rate of 384 times the audio sampling frequency, which translates to about 18.5Mb/s for audio sampled at 48kHz. In the AES3 specification, each channel packet contains 24 bits of data along with 4 bits of overhead, C, V, U and P as well as four preamble bits. In the NVISION proposal, bit usage and position as well as preamble codes are identical to AES 1992 specifications, except for the preamble codes that are moved into the multiplex header. Signals at the multiplexer inputs and the demultiplexer outputs are electrically compatible with AES3 1992 (110Ω twisted-pair) and AES-3ID (75Ω coax) and/or SMPTE 276M.

Figure 1: The proposed 384 bit data frames consist of a header followed by 12 28-bit channel packets. Bit numbers are shown above each packet.

The 12 channels of audio data come from six separate but mutually frame-locked (isochronous) and, ideally, phase aligned (synchronous) AES datastreams. Data from these AES streams is multiplexed into consecutive data frames that consist of 12 AES3 data packets and a header packet (see Figure 1). Each of the AES3 packets is a 28-bit truncated version of the 32-bit AES3 sub-frame (see Figure 2).

Block start information is moved to the multiplex header for data efficiency.

Header packets begin with a 4-bit preamble used for multiplexer framing. In addition, the header packet contains the four bytes of channel data, an optional channel-block bit and two reserved bits. A parity bit sets this group to even parity. The last header byte contains the MC bit, the Z bits corresponding to each of the AES3 inputs and a second parity bit that sets the last byte to even parity. The Z preamble from each pair of AES subframes is saved as a Z bit for decoding channel status, which allows accurate recovery of the channel-status information. Equipment is required to pass channel status transparently. Any equipment that processes audio and reinitializes the channel-status bits must restripe the Z framing bit in accordance with maintaining the channel pair correlation.

The multiplexed datastream uses bi-phase mark coding with sync provided by a code phase violation consisting of four periods low followed by four periods high (or the inverse). The electrical interface is with 75Ω coax and BNC connectors. The output signal is 1.0Vpp +/- 10% with a rise time of 5% to 30%. Because the energy band is largely above the RC turnover frequency for typical cable, the need for equalization is reduced or eliminated. Without equalizers, the introduction of jitter is reduced.

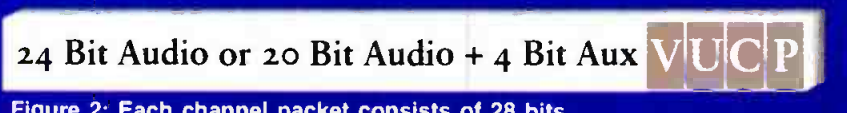

Figure 2: Each channel packet consists of 28 bits.

1998 Salary Survey

Tracking the Trends

By Deanna Rood,
senior associate editor

Each year, *Broadcast Engineering* conducts a survey to determine salary trends in the broadcast industry. The main objective of the survey is to investigate compensation in broadcast, cable and production industries and to establish a baseline for future comparison of salaries. This year's survey also investigated subscriber reaction to recent industry developments regarding HDTV and digital transmission. The good news is that almost all the salaries saw an increase compared to last year — one category (the VP/director of engineering in the below top 50 market) showed a remarkable $14,167 increase. Check out the results of this year's salary survey to see if you are due for that raise.

EXECUTIVE/GENERAL MANAGEMENT

SALARY LEVEL	BROADCAST TOP 50	BROADCAST BELOW TOP 50	CABLE	PRODUCTION
Less than $25,000	0%	9.7%	3.7%	5.6%
$25,000 to $34,999	3.0%	3.2%	11.1%	13.0%
$35,000 to $49,999	9.1%	22.6%	25.9%	7.4%
$50,000 to $74,999	15.2%	16.1%	22.2%	27.8%
$75,000 to $99,999	15.2%	19.4%	11.1%	18.5%
$100,000 or more	54.5%	22.6%	25.9%	27.8%
Est. median salary	$100,000	$62,500	$62,500	$62,500

VP/DIRECTOR OF ENGINEERING
(Includes Chief Engineer for Cable & Production)

SALARY LEVEL	BROADCAST TOP 50	BROADCAST BELOW TOP 50	CABLE	PRODUCTION
Less than $20,000	0%	0%	0%	0%
$20,000 to $24,999	2.1%	0%	5.1%	1.8%
$25,000 to $29,999	0%	0%	2.6%	8.9%
$30,000 to $34,999	2.1%	3.8%	12.8%	3.6%
$35,000 to $39,999	2.1%	3.8%	28.2%	5.4%
$40,000 to $44,999	0%	3.8%	7.7%	14.3%
$45,000 to $49,999	2.1%	7.7%	0%	7.1%
$50,000 to $54,999	6.3%	23.1%	5.1%	10.7%
$55,000 to $59,999	10.4%	7.7%	17.9%	3.6%
$60,000 to $64,999	8.3%	11.5%	2.6%	12.5%
$65,000 to $69,999	10.4%	15.4%	2.6%	7.1%
$70,000 to $74,999	6.3%	0%	2.6%	8.9%
$75,000 to $79,999	4.2%	7.7%	0%	0%
$80,000 to $84,999	6.3%	7.7%	0%	3.6%
$85,000 to $89,999	10.4%	0%	0%	1.8%
$90,000 to $94,999	8.3%	7.7%	2.6%	1.8%
$95,000 to $99,999	2.1%	0%	2.6%	0%
$100,000 or more	18.8%	0%	5.1%	8.9%
Est. median salary	$75,000	$62,500	$42,500	$62,500

BROADCAST CHIEF ENGINEER

SALARY LEVEL	BROADCAST TOP 50	BROADCAST BELOW TOP 50
Less than $20,000	2.9%	0%
$20,000 to $24,999	2.9%	2.0%
$25,000 to $29,999	2.9%	0%
$30,000 to $34,999	11.4%	16.3%
$35,000 to $39,999	2.9%	10.2%
$40,000 to $44,999	2.9%	16.3%
$45,000 to $49,999	11.4%	22.4%
$50,000 to $54,999	5.7%	8.2%
$55,000 to $59,999	2.9%	6.1%
$60,000 to $64,999	8.6%	8.2%
$65,000 to $69,999	2.9%	6.1%
$70,000 to $74,999	8.6%	0%
$75,000 to $79,999	5.7%	0%
$80,000 to $84,999	5.7%	2.0%
$85,000 to $89,999	8.6%	0%
$90,000 to $94,999	2.9%	2.0%
$95,000 to $99,999	2.9%	0%
$100,000 or more	8.6%	0%
Est. median salary	$62,500	$42.500

STAFF ENGINEER

SALARY LEVEL	BROADCAST TOP 50	BROADCAST BELOW TOP 50	CABLE	PRODUCTION
Less than $20,000	4.2%	0%	8.3%	3.7%
$20,000 to $24,999	0%	23.5%	8.3%	3.7%
$25,000 to $29,999	4.2%	17.6%	12.5%	0%
$30,000 to $34,999	6.3%	11.8%	8.3%	14.8%
$35,000 to $39,999	2.1%	11.8%	16.7%	14.8%
$40,000 to $44,999	12.5%	14.7%	12.5%	7.4%
$45,000 to $49,999	20.8%	11.8%	8.3%	11.1%
$50,000 to $54,999	18.8%	0%	20.8%	0%
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$75,000 to $79,999	0%	0%	0%	0%
$80,000 to $84,999	0%	0%	0%	7.4%
$85,000 to $89,999	0%	0%	0%	7.4%
$90,000 to $94,999	0%	0%	0%	0%
$95,000 to $99,999	0%	2.9%	0%	0%
$100,000 or more	2.1%	0%	0%	3.7%
Est. median salary	$52,500	$30,000	$42,500	$42,500

OPERATIONS MANAGEMENT

SALARY LEVEL	BROADCAST TOP 50	BROADCAST BELOW TOP 50	CABLE	PRODUCTION
Less than $25,000	0%	6.7%	11.8%	2.7%
$25,000 to $34,999	7.1%	20.0%	29.4%	10.8%
$35,000 to $49,999	21.4%	42.2%	32.4%	45.9%
$50,000 to $74,999	39.3%	24.4%	23.5%	29.7%
$75,000 to $99,999	25.0%	2.2%	2.9%	5.4%
$100,000 or more	7.1%	2.2%	0%	5.4%
Est. median salary	$62,500	$42,500	$42,500	$42,500

Analyzing the tables

Five separate tables represent the salaries for executive/general management, VP/director of engineering, broadcast chief engineer, staff engineer and operations management.

The executive/general management salaries showed an increase in three of the four segments, when compared with 1997 salaries. The average percent increase was 11.8%, compared with a 9.9% growth in 1997. Starting at the top, the salaries for executive/general management in the broadcast top 50 market held steady at $100,000. The broadcast below top 50 market was up to $62,500 this year, compared with $61,666 last year. Much greater increases were found in the salaries in cable and production. Cable salaries rose by an impressive $10,000, from $52,500 to $62,500. Production salaries rose by an even greater amount of $11,250, drawing an estimated median salary this year of $62,500 compared with $51,250 last year.

VP/director of engineering salaries showed a slight increase in three of the four segments compared with 1997 salaries. VP/director of engineering salaries increased 7.1% this year, compared with a 4% increase in 1997. The broadcast top 50 market increased slightly to $75,000, up $5,000 from last year. The broadcast below top 50 market is where the greatest increase for the entire survey is found. The estimated median salary for VP and director of engineering in the below top 50 market increased from

1998 Salary Survey

$48,333 last year to $62,500 this year, a significant increase of $14,167. Cable salaries in this category decreased from $48,749 to $42,500 and production salaries rose from $53,999 to $62,500.

The salary for the broadcast below top 50 market increased by $14,167.

This year, chief engineer salaries held relatively steady at $62,000 in the broadcast top 50 market. However, broadcast engineer salaries in the top 50 markets rose from $42,500 to $44,999.

The 1998 broadcast staff engineer salaries showed a slight increase in the top 50 markets and a decrease in the cable, production and broadcast below top 50 markets. Broadcast salaries in the top 50 markets increased by $3,410, resulting in a median salary of $52,500 compared with $49,090 last year. On the other hand, salaries in the below top 50 markets fell by $3,333, to $30,000 this year compared with $33,333 last year. Cable staff engineers saw a decrease, from $47,000 to $42,500. Likewise, the production category was down to $42,500 from last year's $44,999.

Things are looking up for operations management. These salaries showed an increase in all four segments compared with 1997 salaries. Some of this year's greatest increases were found in the broadcast top 50 and the cable markets. The broadcast top 50 salaries increased by a substantial $13,751, coming in at $62,500 compared with $48,749 last year. Almost as large an increase was seen in the cable market, which rose from $31,000 to $42,500, an increase of $11,500. Although not quite as large an increase, broadcast operation salaries in the below top 50 markets were up from $39,999 last year to $42,500 this year. On the production side, salaries increased from $39,166 to $42,500.

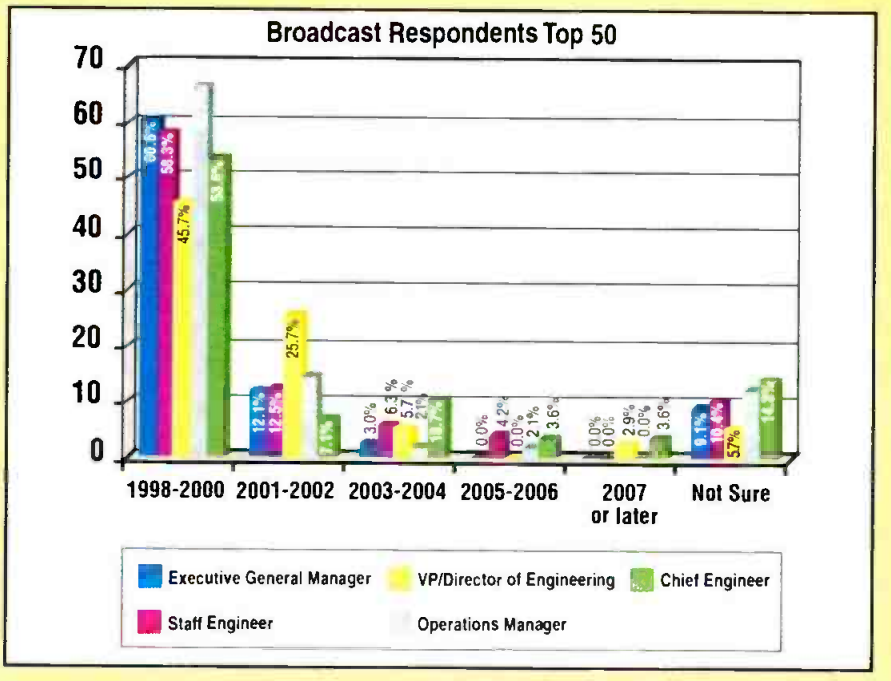
Certification

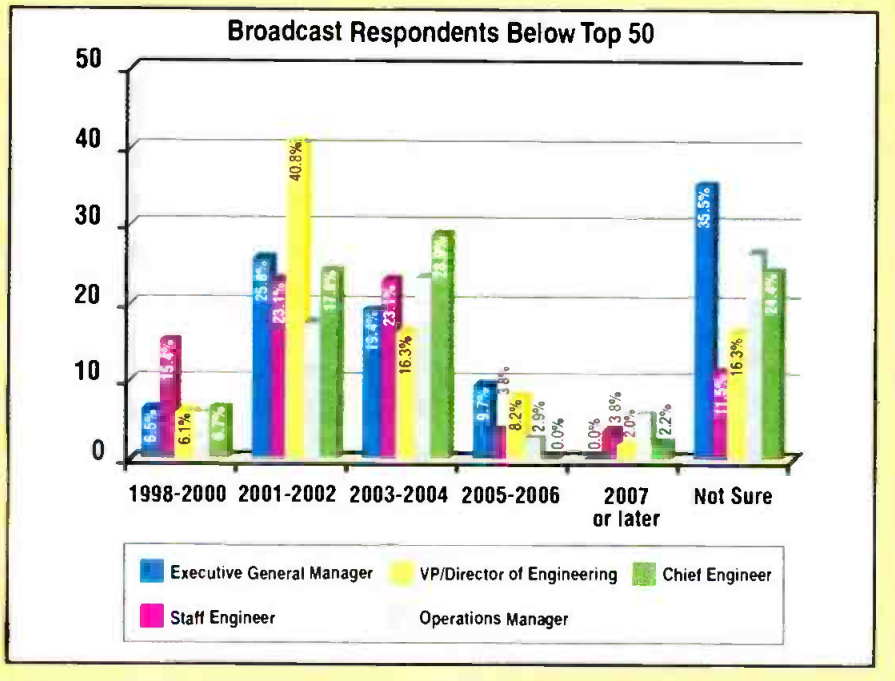
Now for the bad news. For the first time on record, the median salary for an SBE certified engineer was *lower* than for a non-SBE certified engineer. Last year, SBE certified engineers, overall, earned almost $2,400 more than their non-certified counterparts. This year, in the same comparison, SBE certified engineers earned $6,264 *less* than non-SBE certified engineers. In addition, across the board, this year fewer engineers report being certified than last year. SBE members are sure to be asking questions of their leaders to see that these disappointing facts don't become a trend.

Editor's note: The complete results of the 1998 Salary Survey are available for $100 each. Contact Amy Katz at 913-967-1946.

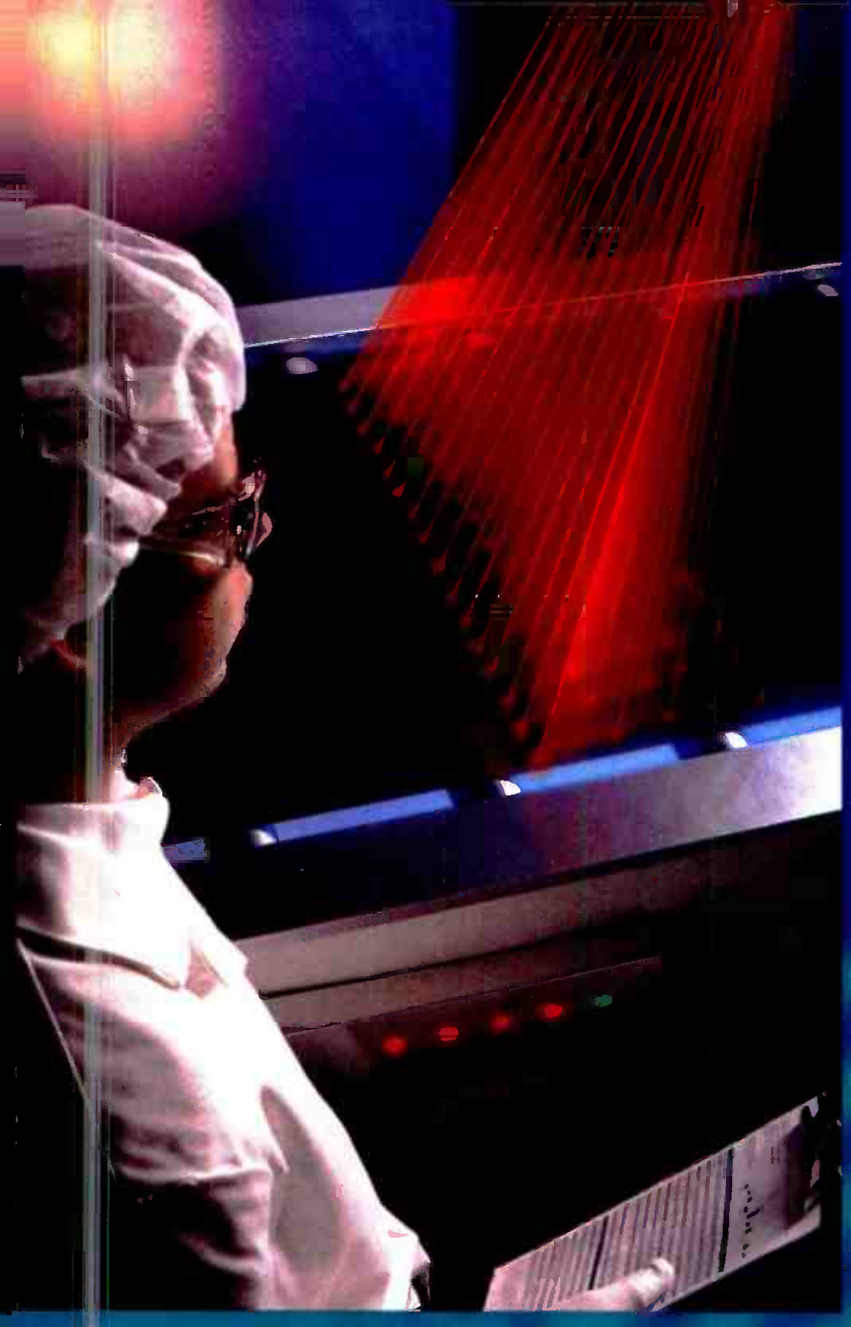
DTV transmission

In this year's survey, respondents were asked when their stations plan on beginning DTV transmission. According to a majority of respondents, their stations are planning to begin DTV transmissions by the year 2002. Not surprisingly, the respondents in the Broadcast Top 50 category overwhelmingly plan on transmitting digital TV between 1998 and 2000.





When does your station plan on beginning DTV transmission?



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The face of feeling

BY KARE ANDERSON

Growing up, most of us were taught that working hard, being nice and learning some skill or knowledge were the keys to a satisfying life. However, we were never told that being likeable, above all else, is the determining factor. In fact, our families, teachers and friends probably didn't know how essential being likeable is.

Getting along with others is the key to greater opportunity, adventure and success. Yet few people know how to teach us this skill, except perhaps by example. Among public figures, consider how the different charms of Presidents Reagan and Clinton have smoothed the way for them, over the bumps of their mistakes or unpopular decisions.

If you dislike someone, you might resist his or her help or advice, even to your own detriment. For instance, you might instinctively shut down by reducing your peripheral vision and your ability to hear. On the other hand, if you like someone, you will go out of your way to help him or her, even when it might also be to your detriment.

To learn more about being likeable, we must begin with the center of most communication — the face. After all, what would life be like without the raised eyebrow, the wrinkled nose, the flared nostrils? Recognizing emotions earlier, in yourself and others, will help you adjust your verbal and nonverbal communication for better mutual understanding.

Reading emotions

As we get older and become more educated, we become removed from awareness of our own feelings and of what we project to others. We are also less observant of what others are signaling with their faces. The sooner we notice what we, or anyone else, is feeling and expressing, the more options we will have to change ourselves and others.

What do we do to connect with others? We smile. Smiling is the most universal expression of friendliness and approval, and we smile in several ways. For example, the *social* smile, unique to humans, is a way of acknowledging others, even if we do not feel warmth toward them. We are being polite. This smile says, "I am not aggressive" or "excuse me." By contrast, a *true* smile, with heightened eyebrows, reflects genuine joy or fondness.

Ironically, though most Americans know how to put on a social smile, less then 3% know their true smile.

The mouth can also signal other emotions. The corners of the mouth are drawn back in fear and pushed forward in anger. When a person is sexually aroused, the lips become swollen and darker. Opening the mouth is a universal sign of curiosity, such as when you are listening. As we grow older, the lips increasingly reflect the emotional state that has dominated our lives.

Our eyes are the second most powerful indicators of emotion. For most primates, the duration of a gaze indicates the hierarchy of the situation; the more submissive primate looks away first. Because we have white in our eyes, unlike other primates, we signal gaze direction more obviously; thus we can use our gaze to shift the attention of others. Most people talk with a mutual gaze and periodically break eye contact, tacitly understanding that the length of the gaze is an indicator of attentiveness. In most social situations, people do not look into each other's eyes, without interruption, for more than six seconds.

Eyebrow movement signals mood change for displaying the emotions of surprise, sadness, fear and anger. Lowered brows that are drawn together, combined with tightened, lowered eyelids and pressed lips, signal anger. Surprise involves widened eyes and raised eyebrows.

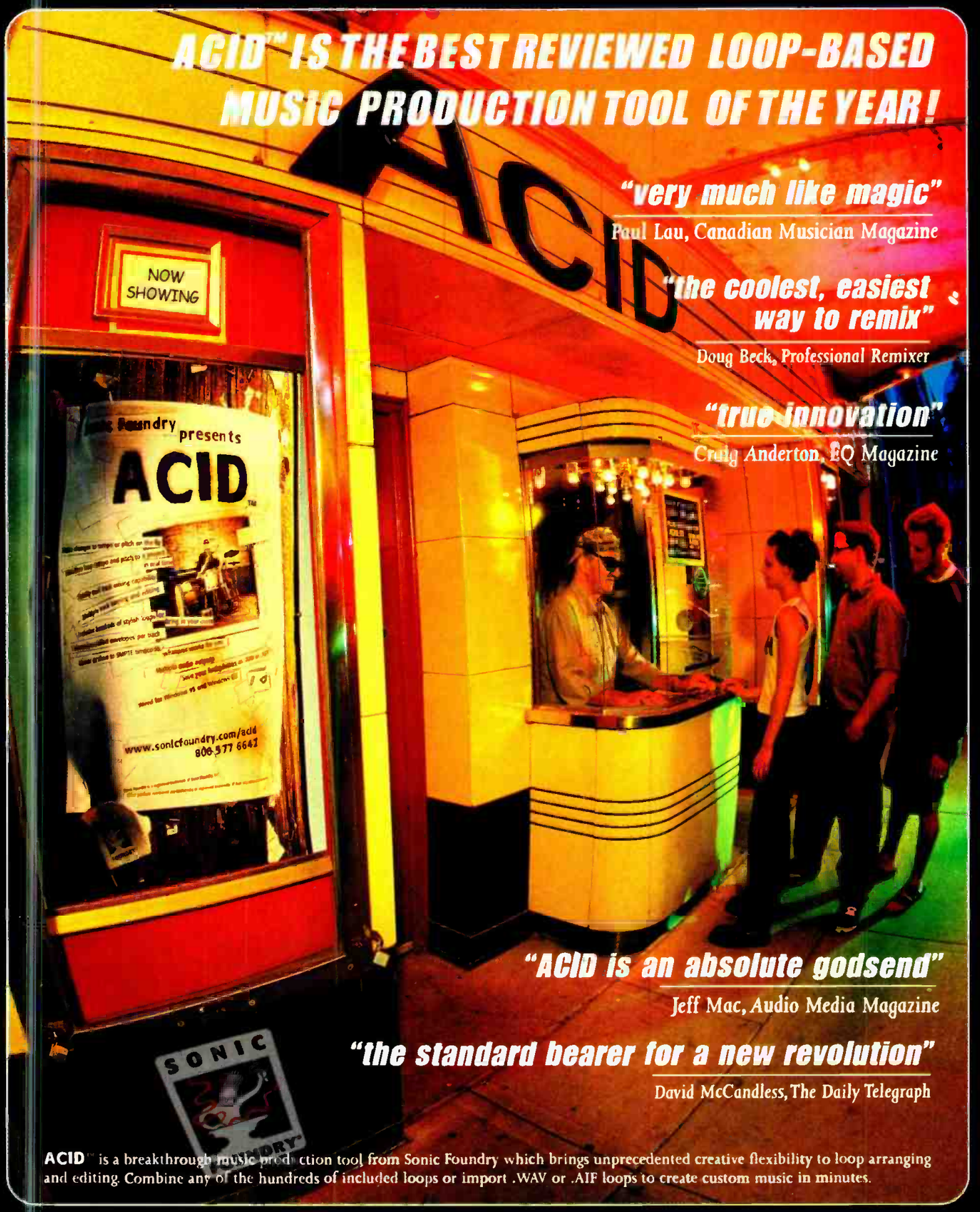
Cheeks communicate emotional changes, such as the blush of shame or embarrassment. For the truly aggressive person, however, the cheeks become pale as the blood drains away from the skin in preparation for immediate physical action. Similarly, when we're scared, our cheeks blanche as the body prepares to meet the challenge.

While the nose is less expressive than other facial features, it signals disgust by wrinkling and flaring in anger and fear.

We are irrevocably bonded to each other by our instinctive facial responses. As you become more familiar with facial signals as early warning signs, you can often anticipate when conflict is looming and face it down with your increased warmth.

How can you display disarming warmth? The universal signals are to widen your eyes (raising your eyebrows), soften your lip muscles, and avoid prolonged, direct stares. It's a start toward showing an open, welcoming face to the world. ■

Kare Anderson is a speaker and author. To get a free subscription to Kare's on-line newsletter, Say It Better, *sign up at her web site* ***www.sayitbetter.com.***



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Applied Technology

General Instrument DTV solution

BY WILLIAM Y. ZOU

1998 marks the beginning of a new era in the broadcast industry. After 10 years of digital TV R&D and standards development, the DTV revolution enters its final stage: implementation. With the aggressive implementation timetable mandated by the FCC, broadcasters are now starting to build their DTV facilities.

The DTV standard to be implemented by the broadcasters is based on the digital HDTV systems developed by the Grand Alliance and standardized by the Advanced Television Systems Committee (ATSC). It consists of three subsystems: source coding and compression, service multiplex and transport, and RF/transmission.

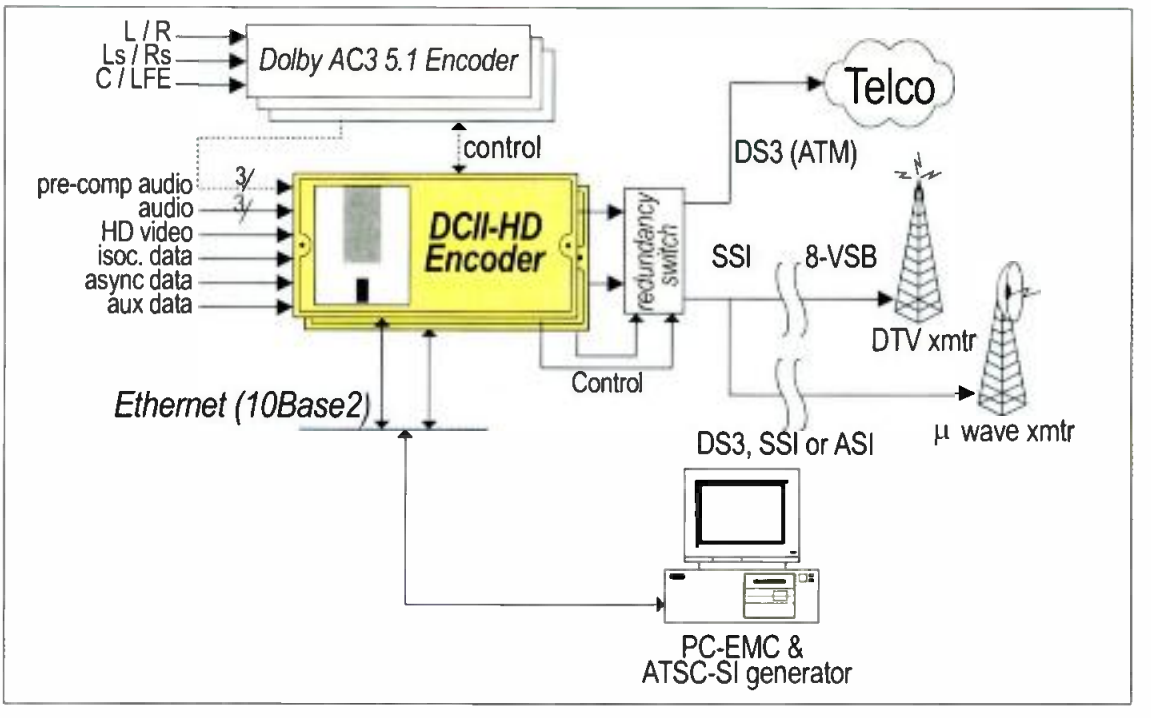

Figure 1. For HD applications, the DCII-HD encoder feeds either an ATM telco network or a microwave STL with DS-3 input.

ATSC subsystems

Source coding and compression deal with bit-rate reduction of video and audio. The compression layer transforms the raw video and audio samples into a coded bitstream that can be decoded by the receiver to recreate the picture and sound. The video compression syntax conforms to the MPEG-2 video standard, at a nominal data rate of approximately 18.9Mb/s. The Dolby AC-3 audio compression is used in the ATSC DTV standard to provide 5.1 channel surround sound at a nominal rate of 384kb/s.

The service multiplex and transport layer based on the MPEG-2 systems standard provide the means for dynamic allocation of video, audio and auxiliary data. It uses a layered architecture with headers/descriptors to provide flexible operating characteristics. Also, the flexibility of multiplex and transport layer provides the means for multiple standard definition television (SDTV) services.

The transmission layer modulates a serial bitstream into a signal that can be transmitted over a 6MHz TV channel. The transmission system is based on a trellis-coded eight-level vestigial sideband (VSB) modulation technique for terrestrial broadcasting.

Obviously, ATSC standard-based encoding systems are key elements in DTV implementation. Encoding

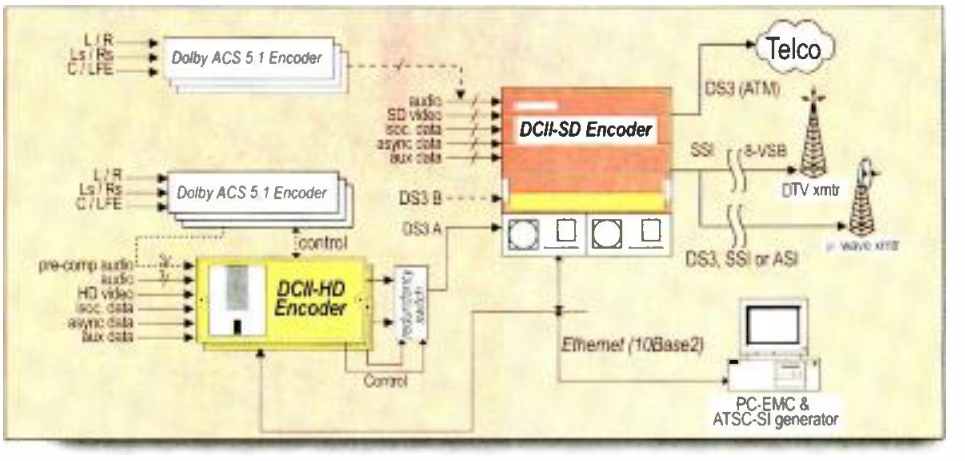

Figure 2. A mixed HD and SD application requires two types of encoders, a DCII-SD for each channel of standard-definition video and a DCII-HD encoder for the high-definition video. The output stream can be HD, SD or a combination of both.

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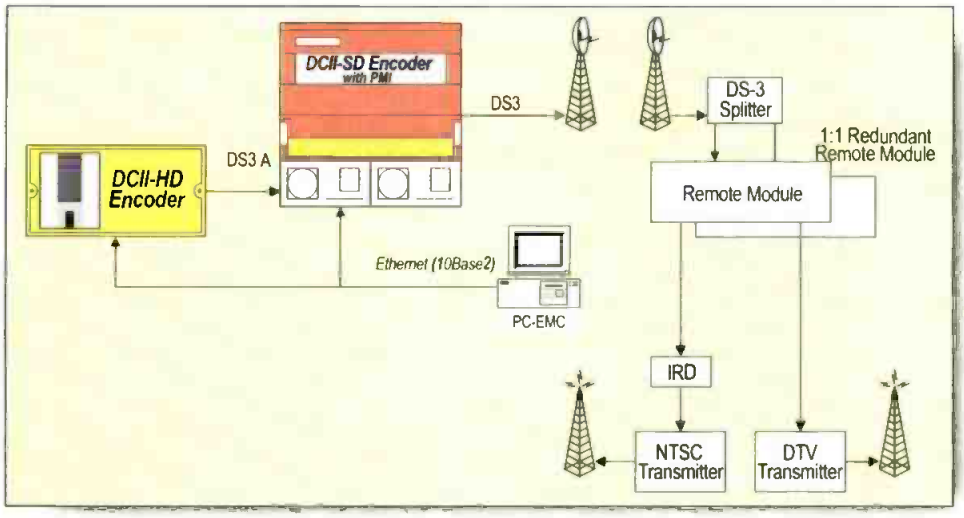

Figure 3. Using a multichannel encoder at the studio allows both DTV and NTSC signals to be carried on a single STL system. At the transmitter site, a DS-3 splitter, combined with a remote module and IRD feeds both NTSC and DTV develop signals to feed both transmitters.

systems will be used in the entire broadcast chain. However, not every encoder in DTV broadcast chain has to be ATSC standard-based. It should be noted that the FCC standardizes only the terrestrial broadcasting signal. In other words, those encoders used for terrestrial broadcast have to be ATSC standard-based. In addition to the source coding, compression and multiplexing, an encoding system provides ATSC standard-based systems information, program guide, data and interactive services along with video and audio.

The ATSC DTV standard as well as MPEG-2 describe the bitstream syntax and semantics. The standards also specify the constraints and decoder models. However, encoding parameters are not specified by the standards. Thus, encoder performance and systems implementation are left to encoder designers. Standard compliant does not guarantee encoder performance. Design experience matters.

To help broadcasters' DTV implementation, General Instrument has developed an ATSC standard-based encoding system. It compresses and multiplexes both SD and HD applications in terrestrial broadcast, satellite, microwave and fiber network transmission.

The General Instrument solution

General Instrument invented the all-digital HDTV system in May 1990. The GI systems offer broadcasters a multistage, cost-effective and flexible approach to moving from NTSC to SDTV and HDTV. They allow broadcasters to start from one service and move to another, or to mixed services, while preserving the value of initial investment and avoiding the expense of completely changing system architecture.

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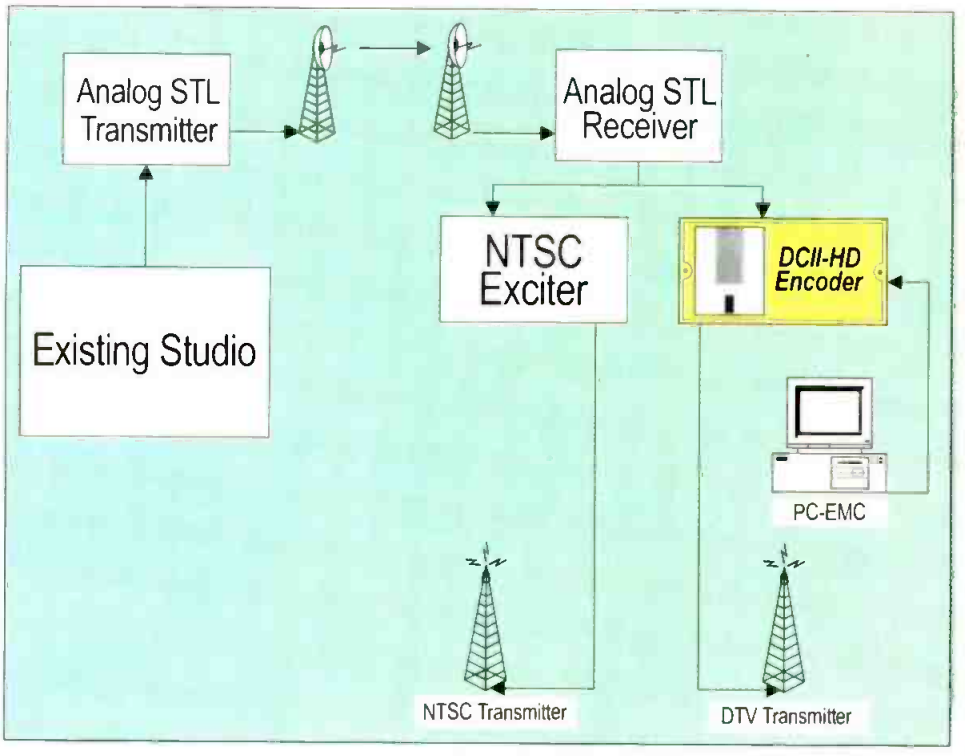

Figure 4. In some markets, the lack of new STL spectrum may require a simulcast approach. The NTSC signal is fed to the transmitter on an analog STL, then to both the NTSC exciter and a DTV encoder.

In addition to ATSC compliance, the new encoding system supports the standard interfaces approved by broadcast industry groups such as SMPTE.

Let's look at how GI encoding systems can be configured for different DTV applications.

HDTV service

In Figure 1, a DigiCipher II single-channel HD encoder is shown for HDTV-only operation. Both 1920x1080 interlaced (60.00 and 59.94Hz) and 1280x720 progressive (60.00 and 59.94Hz) are supported (and, in the future, upgradable to 720x480 progressive). Up to three Dolby AC-3 5.1 precompressed streams can be passed through, or up to three Dolby AC-3 stereo pairs can be compressed by the encoder. Data can be supported in synchronous, isochronous and asynchronous modes. Systems information and configuration are provided by the PC-based Encoder Monitor Controller (EMC).

For STL links, a DS-3 output is provided for microwave radio or fiber connection. At the remote transmitter site, the demodulated DS-3 signal can beconverted to SMPTE 310M

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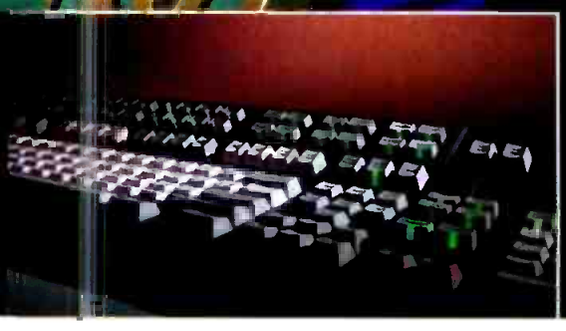

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PINNACLE SYSTEMS

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Synchronous Serial Interface (SSI) format via GI's Packet Multiplexer Interface (PMI) for subsequent 8-VSB modulation. Also, asynchronous serial interface and DS-3 ATM interfaces are supported for other transmission media.

SDTV applications

Developing a multichannel SD application is straightforward. Each encoder chassis can support up to eight SDTV services with the component digital serial interface and up to 24 audio-only services. A format converter can be used to convert analog input sources or digital composite inputs to SMPTE 259M. Up to three Dolby AC-3 stereo pairs can be compressed for each video channel. Data can be supported in synchronous, isochronous and asynchronous modes. The system supports both EIA 608 and 708 closed captioning.

For more than eight program services, up to three SD encoder enclosures can be cascaded through a DS-3 interface as long as the total output stream does not exceed 19.4Mb/s. Statistical multiplexing is supported so that more services or better video quality can be achieved within the fixed channel bandwidth.

For STL links a DS-3 output is provided for microwave radio transmission or fiber connection. At the remote transmitter site, demodulated DS-3 signal can be converted to SMPTE 310M (SSI) format for subsequent 8-VSB modulation. Also, ASI and DS-3 ATM interfaces are available for other media transmission.

The ATSC systems information, program guide, content advisory, naming, numbering and navigation are supported.

Mixed HDTV and SDTV service

Many stations will need to intermix HD and SD services. It's possible to configure the GI system for SD only, HD only, or a mix of the two (see Figure 2).

For SDTV operation, statistical multiplexing can be used to improve service quality by allocating bits among the programs. For HD operation, a statistical multiplexing feature of will be provided in a future release.

The systems architecture of this model provides a unique advantage, which minimizes the impact of switching between SD and HD operation. The off-line services can be set up and in standby mode while the other services are on the air. Another advantage is that low bit-rate SD service (e.g., still pictures plus audio) can be transmitted along with a HD service.

Hybrid STL options

In Figure 3, the encoders show how a simple and flexible solution can be built for a hybrid DTV and NTSC STL path. By using a multichannel SD encoder, DTV services and NTSC (digitized and compressed) can be carried together via DS-3 for STL transmission. At the remote transmitter site, the demodulated DS-3 signal is fed to the remote modules. A second remote module can be used for full redundancy. The remote module with a packet multiplexer interface detects the DTV service multiplex from the DS-3 signal and converts it for 8-VSB modulation. The multiplex carrying NTSC service is fed to a GI

IRD, which outputs the decompressed NTSC signal for analog NTSC emission.

The upper bit-rate limit for each multiplex is 21Mb/s. Thus, excellent quality video plus audio and data for the NTSC service can be transmitted with a DTV service within an existing STL spectrum. For a hybrid HDTV and NTSC STL transmission, a single-channel HDTV encoder can be cascaded to the SDTV encoder. The PC-EMC provides system control and configuration for both NTSC and DTV services.

For broadcasters who want to provide simulcasting DTV service without upgrading the existing analog STL facility, a single-channel SDTV encoder can be installed at the transmitter site. The NTSC signal from studio is encoded and fed to the DTV transmitter (see Figure 4).

Encrypted and distribution services

For encrypted services, such as subscription-based services, the DigiCipher II Uplink Control System (UCS) can be used to provide conditional access as well as encoder systems configuration. DigiCipher II encryption and conditional access is based on special access-control software, the DES encryption algorithm, a multilevel key hierarchy, and secure hardware and firmware implementations in the decoders. Fully encrypted, fixed-key and unscrambled encryption modes are supported on a service-by-service basis. The ATSC conditional access standard, which is now under study, will be implemented when it is finalized.

To provide simulcasting DTV service without upgrading the existing analog STL facility, a single-channel SDTV encoder can be installed at the transmitter site.

The DigiCipher II HD and SD encoders can be used for both terrestrial DTV broadcast and high bit-rate network distribution or contribution/back haul transmission. Up to 47.20Mb/s total information (SD, HD or a mixed SD/HD) rate can be supported. The output transport stream can be modulated in QPSK or OQPSK for satellite transmission, or formatted in DS-3, DVB ASI and SMPTE 310M SSI for microwave, fiber-optic and terrestrial broadcast.

Implementation involves complex system engineering as well as heavy capital investment. And, each station will want to evaluate the options and select an approach that meets its unique needs. General Instrument believes that the DigiCipher II HD and SD encoders provide the tools needed to meet a variety of applications and needs.

William Zou is manager of technical business development at General Instrument Corp., San Diego, CA.

Digital tape equipment

BY THE *BE* STAFF

There is little question that tape is one of today's most cost-effective storage mediums. A variety of recording transports and methods exist, including digital and analog systems. Digital systems offer a nearly transparent recording system. While compression systems found on some devices may change the data, the digital recording systems do not. Issues such as recording bandwidth and compression ratio go hand in hand with quality and speed.

Included here is a sampling of current digital recording systems. Both data and video recorders are shown to compare and contrast the various recording technologies available. Information was supplied by the vendors based on a questionnaire the *BE* staff editors supplied.

Company	Product name/ Model number	Primary application	Maximum capacity	Is compression used? What type?	Compression ratio	Video sampling structure	Input/output interfaces	Sustainable transfer rate	Record video in real time?
Ampex Corporation 650-367-4443 www.ampex.com RS# 450	DST 712 automated cartridge library	Video server archive	5.81B	No			Ultra-SCSI	40MB/s	No
Exabyte 800-392-2983 www.exabyte.com RS# 451	Exabyte Mammoth/EXBEXB EXB 8900	Data backup	40GB compressed	IDRC (Improved Data Record Capability)	2:1		SCSI-2	6MB/s	Mammoth can record CCIR-601 CCIR-601=27Mb/s Mammoth=3Mb/s
JVC Professional Products 973-315-5135 www.jvcpro.com RS# 452	BR-D92U	Video production	124 minutes/ cassette (92GB cassette)	Intraframe DCT-based	3.3:1	4:2:2	SDI, composite, Y, Cb, Cr	270Mb/s (SDI)	Yes
Panasonic 323-436-3681 www.panasonic.com RS# 453	D-5HD VTR, AJ-HD2700	High-definition production video tape recorder	2-hour recording of full bandwidth HD video. On tape date rate, approx. 300Mb/s	Intra-field, similar to motion JPEG	4:1 for 8-bit recording, 5.1 for 10-bit recording	4:2:2 in either 1125I HD or 720P HD	Serial digital HD for 720P or 1125I, optional down-conversion to 480I, 480P or NTSC encoded SDI, analog encoded composite NTSC monitor output	SDI I/O 1.2Gb/s payload HD video, 300Mb/s on tape data rate	Yes
RS# 464	DVCPRO AJ-D750	Acquisition video production	123 minutes AJP-123L cassette	Intraframe	5:1	4:1:1	Analog composite, analog component, serial digital component	N/A	Yes
RS# 465	DVCPR50 AJ-D950	Acquisition video production	120/90 minutes 25Mb/s/ 50Mb/s dual mode	Intraframe	3.3:1	4:2:2	Analog composite, analog component, serial digital component, SDTI (optional)	N/A	Yes, 525/60 or 625/50
RS# 466	AJ-D780 DVCPRO	Hi-speed transfers w/NLE and video servers	123 minutes	Intraframe	5:1	4:1:1	SDTI	N/A	Yes, 4X record and PB
Philips Digital Video Systems Company 800-962-4287 www.broadcast.philips.com RS# 456	DCR 950 50Mb/s Studio Editing VTR	Video Production	93 minutes	DCT, motion JPEG	3.3:1	4:2:2	Component SDI I/O, analog component out, options: CSDI and analog component I/O, analog composite input	25/50 Mb/s record/ playback	Yes
RS# 455 RS# 457	DCR 750 Studio Editing VTR DCR 75 Portable Field Editor	Video production Field acquisition	123 minutes	DCT, motion JPEG	5:1	4:1:1	Analog video component/composite; serial digital optional I/O		Yes
RS# 456 RS# 458	DCR 650 Editing VTR DCR 640 Play/ Rec VTR	Video production	123 minutes	DCT, motion JPEG	5:1	4:1:1	Analog video component/composite; serial digital optional I/O		Yes
RS# 459	DCR 230 Desktop VTR	Video production	123 minutes	Motion JPEG	5:1	4:1:1	Composite Video I/O BNC x1 each; S-Video I/O		Yes
QuVis 800-554-8116 www.quvis.com RS# 460	QuBit	Video production, storage	20GB, 200 minutes at D-1 quality	Proprietary QuVis compression, wavelet based	Variable, based on guaranteed SNR desired	4:4:4:4 12-bit	Video and computer, all	3.3MB/s	Yes
Sony 201-358-4107 www.sony.com/professional RS# 461	HDW-500 HDCAM Studio VTR	Studio video production	Up to 40 minutes with small cassette and 124 minutes with large cassette	JPEG	7:1	17:6:6	HD SDI I/O, dubbing I/O, downconverted SDI (D1 or D2), analog composite	N/A	Yes
RS# 462	DVW-A500 Digital Betacam Studio VTR	Studio video production	Up to 124 minutes with large cassette	JPEG	2:1	4:2:2	SDI I/O, analog component I/O, analog composite output, optional analog composite input	N/A	Yes
RS# 463	DNW-A100 Betacam SX Digital Video Hybrid Recorder	ENG/ studio video production	90 min. on internal hard drive; up to 62 minutes in a small cassette and 194 minutes in a large cassette	MPEG-2	10:1	4:2:2	SDI I/O, SDTI output, SDTI input optional, analog component and composite output, analog component or analog composite optional	N/A	Yes

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VIDEO FILE SERVER

Vibrint Technologies MPression 100: a video file server for the digital TV industry that integrates into existing operations; digitally captures, compresses, manages and outputs video and audio sources that exceed current quality standards in the broadcasting and cable industries; provides cost-effective MPEG-2 compressed or uncompressed digital video and audio content; comprises a video compression engine, an active breakout box, Vibrint Technologies' MPression software and an underlying multimedia database tuned for optimal performance on standard Intel Pentium Pro/Windows NT-based systems; 781-275-4088; www.vibrint.com

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Euphonix R-1 multitrack recorder: provides a user-friendly transition from analog or 16-bit digital tape recording to 24-bit disk recording; maintains a user-interface that has been an industry standard since the early 1970s; improved sound quality from 24-bit conversion, transmission and storage combined with 40-bit floating point digital signal processing; benefits include non-degrading storage, random access, cut-and-paste editing and non-destructive recording; 415-855-0400; fax 415-855-0410; www.euphonix.com

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Pro-Bel 16x2 routers: these routers complement existing routers and are housed in a cost-effective 1RU frame; available in four basic versions: analog video, stereo analog audio, serial digital video and AES/EBU digital audio; mixed formats are provided; though multiple-level Gemini systems can usually be constructed by linking frames together without external controllers, each frame is fitted with external control ports for integration with Pro-Bel's controllers; 516-845-3871; fax 516-845-3888; www.chyron.com

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WINDOWS-BASED CHARACTER GENERATOR PRODUCT UPGRADES

Inscriber Technology VMP 4.0 for NT and Inscriber RTX 2.1 for NT: Inscriber VMP, a tightly integrated modular media creation and management product, includes an on-line character generator, digital store, Xtreme motion effects software and alpha-aware paint capabilities; VMP 4.0 is the first version to fully support PCI-based frame buffer hardware with Windows NT; the CG component's productivity features include NewsEdit text import, template manager and event sequencer with variable transitions. **Inscriber RTX 2.1 for NT:** this upgrade enhances the Windows NT version of Inscriber RTX and includes capabilities, such as the creation of multiple windows using a single frame-buffer, with multiple effects operating independently and simultaneously in each window; allows for tighter integration with Inscriber character generation products so templates created with those products can be accessed directly from within RTX; includes a multithreading feature that lets single applications created with RTX control separate data windows; 519-570-9111; fax 519-570-9140; www.inscriber.com

Circle (265) on Free Info Card

MONITOR RACK KIT

Winsted Sony model 99090: accommodates the Sony PVM8040, PVM8041 and PVM8044 monitors, which use 8 3/4-inch (5U) of rack space; the company offers monitor masks, which mount on EIA standard 19-inch rack widths, and fabricates custom monitor masks for installations that are not rack-mounted; 612-944-9050; fax 612-944-1546; www.winsted.com

Circle (271) on Free Info Card

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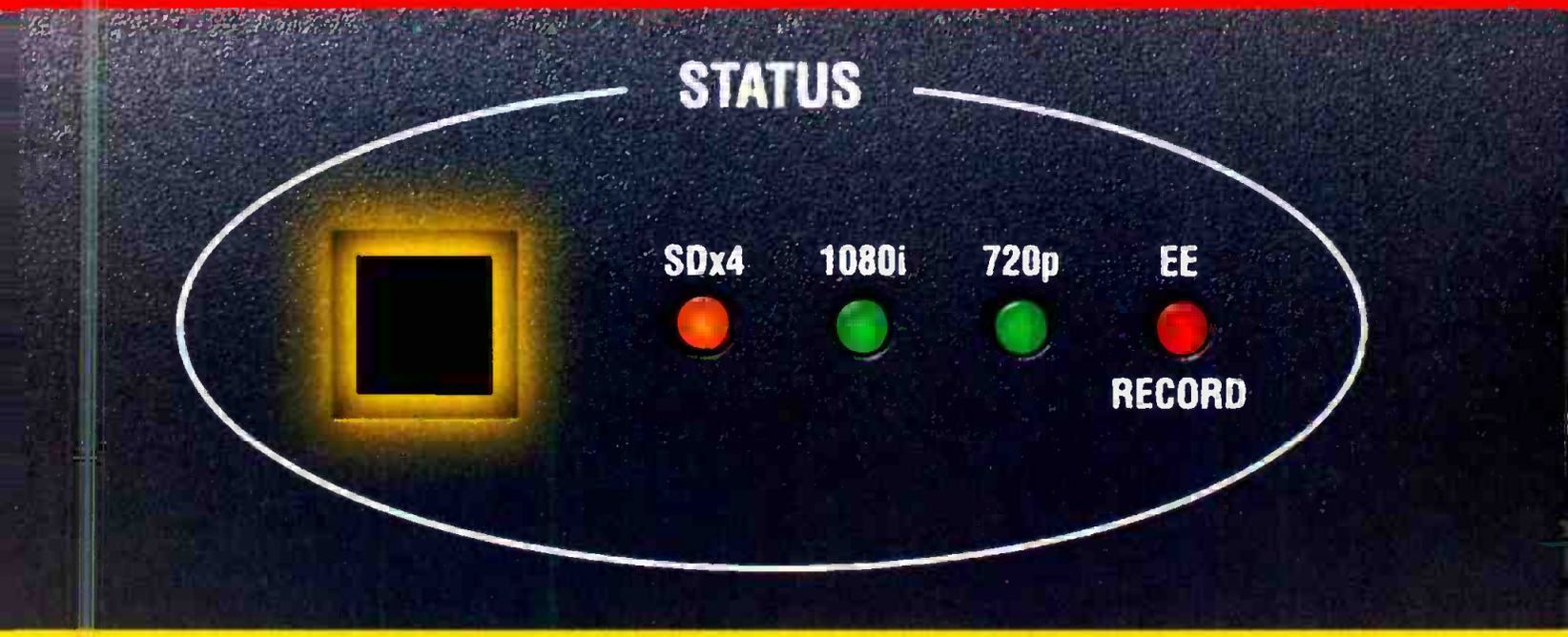

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What's Real ***What's Next***

MEDIA ASSESSMENT MANAGEMENT SOFTWARE INTEGRATED WITH NETWORK COMPUTING DATABASE

ISLIP MediaKey Digital Video Library System integrated with Oracle8: this integration allows users to analyze and index in real time; indexed information is immediately available to users browsing the library, 412-687-0530; fax 412-687-0537; www.islip.com

Circle (265) on Free Info Card

PAN/TILT HEAD

Rademec 431: an addition to its robotic camera control product range,this lightweight Ramadec pan/tilt head supports camera and lens packages up to 33 pounds and incorporates agile performance with precise repeatability; mechanically based on Radamec's 421 pan/tilt head, the unit provides broadcasters with a versatile and cost-effective system capable of performing slow, smooth movements while on–air; the 431 has simple system configuration requirements and can be wall, ceiling or tripod mounted; 908-518-0685; fax 908-518-0687

Circle (266) on Free Info Card

CRT COLOR ANALYZER

ProTeleVision Technologies PM 5639/00 CRT color analyzer: consisting of a color sensor put onto the CRT and a display unit that can be operated by one hand, the unit has a CIE standard display mode and a relative RGB bar-graph display; the sensor's response is designed to parallel the human color response; a rechargeable battery pack is built-in; 201-529-2188; fax 201-529-2109; www.ptv.dk

Circle (264) on Free Info Card

COLOR ALIGNMENT GENERATORS

ProTeleVision PM 5639/82 and PM5639/83: these battery-operated, hand-held generators interface directly to the PM 5639/00 CRT color analyzer; they display special patterns for color-monitor alignment and for projector and videowall alignment; versions for the PM 5639/82 are 525, 625, RGB and YPbPr; versions for the PM 5639/83 are PAL, NTSC and Y/C; 800-421-0888; fax 201-529-2109; www.pvt.dk

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THE BIG PICTURE

Circle (57) on Free Info Card

DSNG ENCODER/MODULATOR

BARCO RE4221 DSNG encoder/modulator: features 4:2:2/4:2:0 encoding, QPSK/8PSK/16QAM modulation, analog video and audio interfaces; housed in a 19-inch, 2RU chassis with front-panel control; designed for DSNG and point-to-point contribution applications; intended for transmission of video programs on various transmission media, including satellite and terrestrial networks; the unit is a single-channel encoder with a built-in modulator and features front-panel control, macro contact and pre-stored configurations; +45 39 17 00 00; fax +45 39 17 00 10

Circle (270) on Free Info Card

MULTISOURCE EDITING ROUTER FOR NON-LINEAR EDITING

KeyWest Technology KW40 multisource editing router: provides full-time cabling for up to four inputs into a non-linear system, including any video format, balanced or unbalanced audio; composite, Y/C, component video and balanced or unbalanced audio inputs are auto-detect; the KW40 has broadcast specifications and uses RS-422 serial control; 913-469-9753; fax 913-469-9091

Circle (267) on Free Info Card

PREWIRED CONSOLE AND MIXER HARNESSES

Broadcast Richmond PCMHs: the company will connectorize inputs and outputs from the customer's console or mixer to all identified audio sources; they cut cable lengths to specification, label both cable ends for on-site reference and troubleshooting and test cable runs for continuity of signal flow; 765-966-6468; fax 765-966-5505; www.broadcast-richmond.com

Circle 268 on Free Info Card

SERIAL DIGITAL FRAME SYNCHRONIZER

Videotek VDP-8601 serial digital frame synchronizer for 601 video: this ½-rack wide unit, powered by 5V, features optional redundant power supplies and enables users to monitor and regenerate error detection handling (EDH) data; can be controlled with the front panel or via a remote control panel; users can select any or all lines of the vertical interval to be blanked or passed; provides infinite output phase adjustment; outputs are fully reclocked; the user can freeze a field and still pass live, synchronized video; 610-327-2292; fax 610-327-9295; www.videotek.com

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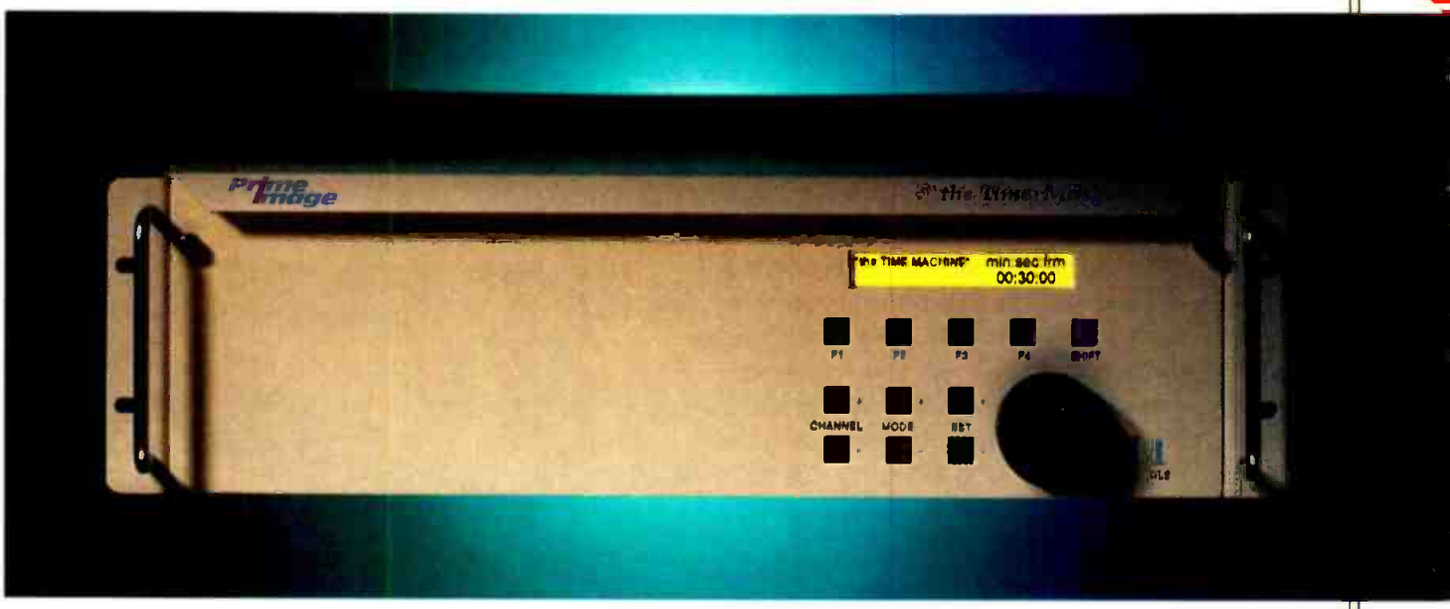

The Time Machine is a new, technological break through product, which reduces program time, to create commercial insertion time. it is a self contained, small 3U rack mountable unit which requires no data compression.

The Time Machine is capable of changing time without changing the pitch (frequency) of the video or audio programming. The Time Machine consists of a main frame which houses the memory and all of the electronics necessary for control of the video and audio-Time Machine storage. A maximum of 30 seconds of video and two channels of time reduction audio is available.

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HEAVY-DUTY DIGITAL MULTIMETER

Fieldpiece model HB74: designed to meet the requirements of field service technicians, this DMM provides added functions, including volts, ohms, continuity and capacitance; capable of testing phase rotation (three-phase) and frequencies of 200Hz and 2kHz at 0.1Hz resolution; 714-992-1239; fax 714-992-6541; www.fieldpiece.com

Circle (272) on Free Info Card

NEW VERSION OF DVD AUTHORING SYSTEM

Spruce Technologies DVDMaestro version 1.1: provides an expanded suite of production controls; new features include a seamless multi-angle video function, playlists and command sequences; the enhanced version also includes fully integrated control of the Pioneer DVD-R system and tools for controlling the physical disc image layout; 408-863-9700; 408-863-9701; www.spruce-tech.com

Circle (269) on Free Info Card

POCKET-SIZED FIBER-OPTIC INSPECTION SCOPE

Jensen TrueView: up to 400X effective, this scope features base 100X magnification and an 8X eye loupe for gross inspection; the scope accepts most commonly used connectors; an optional high-power adapter gives 200 to 400X effective magnification for subtle flaws that could be missed at lower power; 602-968-6241; 602-438-1690; www.jensentools.com

Circle (274) for Free Info Card

SINGLE IMAGE DISPLAY SYSTEM

Barco UNO: a compact display processor for reproduction of SDI video signals on either a standard computer display or on an analog RGB video monitor; does not compromise resolution and has color-matching capabilites; UNO adds broadcast features to a normal computer display (such as pulse cross, blue only, built-in under-monitor display and built-in tallies); combines full broadcast functionality with high flexibility and mobility in a compact unit; +45 39 17 00 00; fax +45 39 17 00 10

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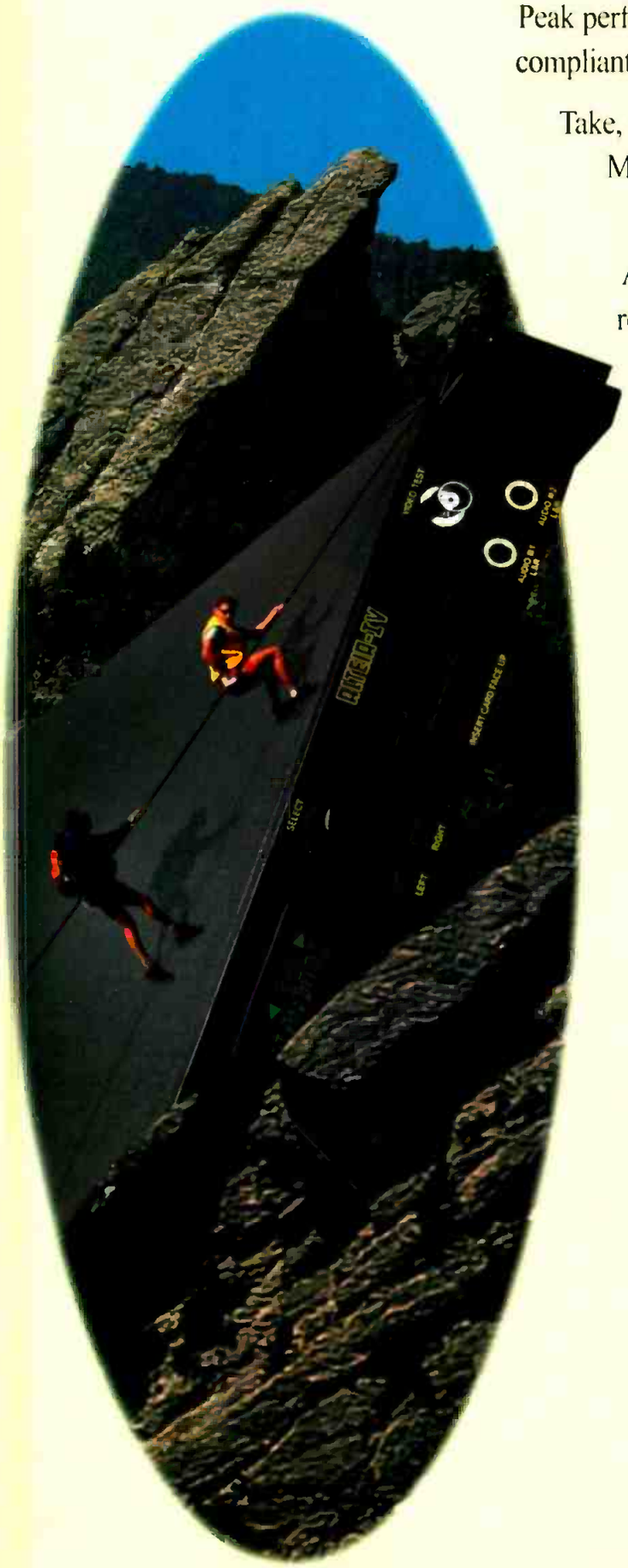

Peak performance is what the new Alteia Series of DVB 4:2:2 compliant digital broadcast receivers and decoders is all about.

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Circle (51) on Free Info Card

MULTICHANNEL UHF DIVERSITY WIRELESS SYSTEMS

Audio-Technica 7000 Series: this series of multichannel UHF diversity wireless systems features A-T's proprietary InvisibleLink circuitry and offers UHF wireless technology with up to 100 switch-selectable PLL-synthesized channels; two primary system options are offered — bodypack and hand-held; the ATW-7375 UniPak transmitter system consists of the ATW-R73 diversity receiver and ATW-T75 bodypack transmitter; a wide selection of wireless essentials mics and cables are available for the TW-7375 UniPak system, including lavalier, head-worn, goose-neck and installed-sound microphones; also available is the ATW-7376 hand-held dynamic microphone/transmitter system; 330-686-2600; fax 330-688-3752; www.audio-technica.com

Circle (281) on Free Info Card

RF PROBES

Holaday Industries HI-4455 & HI-4457: the HI-4455 electric field probe and the HI-4457 magnetic field probe expand the range of the Holaday HI-4000 RF/microwave hazard measurement system for protection against radio frequency and microwave radiation; the HI-4457 provides magnetic field detection and measurement between 10MHz and 1GHz; the HI-4455 provides electric field detection and measurement between 200kHz and 40GHz; 612-934-4920; fax 612-934-3604; www.holadayinc.com

Circle (282) on Free Info Card

NICKEL METAL HYDRIDE BATTERY

PAG Digital NMH60: a 14.4V 4Ah nickel metal hydride battery featuring a high-capacity to size-and-weight ratio (compared to NiCads), ideal for the new generation of smaller, lighter digital camcorders; the NMH60 features onboard, touch-button, digital power and time displays; one touch displays an accurate calculation of the battery's available capacity in amp hours, taking into account the battery's environment; another touch displays the same information as a percentage; when connected to a load, the system is able to calculate and display run-time prediction in hours and minutes; the run-time prediction is updated against any change of load within two seconds; +44 181 543 3131; fax +44 181 540 4797; www.pag.co.uk

Circle (283) on Free Info Card

NEW CG PLATFORM

Pinnacle Systems FXDeko: 100% BroadNeT compliant, the new CG platform FXDeko provides render-free effects, looks and character animations in 3-D space for real-time, live and on-air broadcasts; features 10-bit, 4:4:4:4 operation for a high level of effects performance, key output and video quality; resolution independent and supports a variety of video formats, including digital TV formats, NTSC, PAL, 16x9 and 4x3; for facility integration, any image created on FXDeko can be transferred to Pinnacle Systems' Lightening or DVEXtreme; 888-484-3366; www.pinnaclesys.com/companyinfo.html

Circle (284) on Free Info Card

FIBER-OPTIC PATCH CORDS

Connect-Tech products line of fiber-optic patch cords: meet FDDI and SNA 905 requirements; designed to work with plastic optical fiber cables and fan out cables with the various style connectors; typical lengths are one, two, three, four or five meters — custom lengths are also available; available in ST single mode, FC single mode and SC single mode, as well as dual modes; 800-809-2751; fax 702-883-4874; www.connect-tech.thomasregister.com

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PRODUCTS NOW SHIPPING

HIGH-QUALITY, MODULAR ENCODERS

NDS E5000 range of MPEG-2 digital encoders: these digital encoders incorporate extensive bit-rate ranges, and modular option cards give them flexibility; the E5000 range comprises the E5210 for cost-effective distribution and private networks, the E5410 for contribution applications, and the E5610 for direct-to-home and high-end contribution and distribution applications; +44 181 476 8000; fax +44 181 476 8100

Circle (250) on Free Info Card

SPECIAL-EFFECTS TOOLS

ICEfx and ICE'd Cinelook: these BluelCE tools, ICEfx (for use with Avid Media Composer/Avid Xpress) and ICE'd Cinelook Broadcast (for use with Avid), are designed to save time and increase productivity in the creation of special-effects and motion-graphics treatments from within the Avid system; 781-768-2300; fax 781-768-2301

Circle (256) on Free Info Card

MULTIMEDIA SERVER

CyberStorage Systems multimedia server: this integrated, IP-based video storage, retrieval and delivery system incorporates an open, standards-based platform that integrates a Windows NT server, high-performance RAID storage, and optional broadcast and video software; capacity scales from 27GB to 3.7TB; redundant and hot-swappable components can be used; supports major video compression formats, including MPEG-1 and MPEG-2; 603-598-0005; fax 603-598-4169; www.cyberstorage.com

Circle (254) on Free Info Card

DARWIN SMPTE CARD AND SAMPLING/AUDIO SYSTEM AVAILABLE

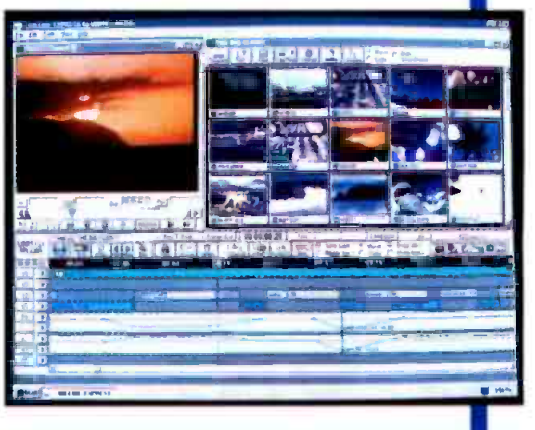
Two new EMU products: SMPTE sync option card and version 2.5 software, for use with the Darwin digital hard-disk recorder; the software provides full support for the new SMPTE card, as well as adding new features, such as autopunch, 4GB SCSI hard-drive support and increased backup facilities; the option card provides reliable and accurate synchronization to SMPTE time-code equipped machines and allows users to sync to and generate all formats of SMPTE time code, as well as lock to word clock to integrate Darwin into an all-digital studio.

Audio Production Studio: a sampling/audio system comprising a Windows 95 PCI card (the E-card), an audio access bay front-panel (the E-drive) and a suite of EMU and third-party application software; the system gives 64-voice/32-channel MIDI synthesizer support, digital mixing, hard-disk recording and real-time effects for audio processing; supports the SoundFont file format; 831-438-1921; fax 831-438-7854; www.emu.com

Circle (251) on Free Info Card

NON-LINEAR EDITING SOFTWARE

United Media on-line express version 1.0: offers real-time slow-motion editing with key-frames control for variable speed changes, audio waveform, support of Matrox Digi-Desktop Board for dual SVGA monitor support, VU meters, high-speed compositing, enhanced A-V scrubbing and keyboard editing commands; 714-777-4510; fax 714-777-2434; www.unitedmediainc.com



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Business

At IBC '98, Philips Digital Video Systems demonstrated prototype asset-distribution technology for the Media Pool digital video server. Using StudioCentral and Origin 200 servers from Silicon Graphics, Philips transferred content from a Media Pool server in the Philips stand to a server in the SGI stand over an ATM OC-3 circuit. The demonstration gave attendees the opportunity to participate in an on-camera interview at the Philips stand and to see the results, after transmission, at the SGI stand. A prototype browser let users view low bit-rate proxy copies and schedule transfers of video stored on either Media Pool server using an Internet browser.

Acrodyne announced the sale of a 60kW NTSC and combination 3kW DTV/UHF ACT transmitter to KCPT-TV, Kansas City, MO. The transmitter will operate on channel 19 for NDC and channel 18 for DTV. Acrodyne is scheduled to deliver the transmitter in time to make an on-air date of November 1. In addition, Pappas Broadcasting had two Acrodyne installations with 120kW sites in Opelika, AL and Merced, CA.

Acrodyne ACT transmitter.

France Telecom, the parent company of GlobeCast, was the 1998 World Cup's official telecommunications operator. The GlobeCast unit built and managed the entire transmissions infrastructure to carry the official feeds between the stadiums to the IBC on behalf of the official host broadcaster, the TVRS98. GlobeCast provided complete production and seamless, end-to-end worldwide transmission services for video and audio from the IBC to destinations worldwide. More than 227 TV and radio companies chose GlobeCast to provide broadcast services for coverage of the games. The company served as the customer point-of-contact for several key North and Latin American broadcasters, including ABC Television and ESPN.

Panasonic Systems Solutions Company (PSSC) has completed the design, integration and installation of a turnkey studio and master control TV system at KUWB-TV, Salt Lake City, for Acme Television. The Panasonic portion of the project is valued at more than $1.8 million.

Panasonic created a complete operating system, from the acquisition of the original programming and spot material to the input of the transmitter, using digital technology. PSSC acted as the total system integrator, working in partnership with Panasonic dealer and system integration company Synergistic Technologies Inc. (STI), Pittsburgh.

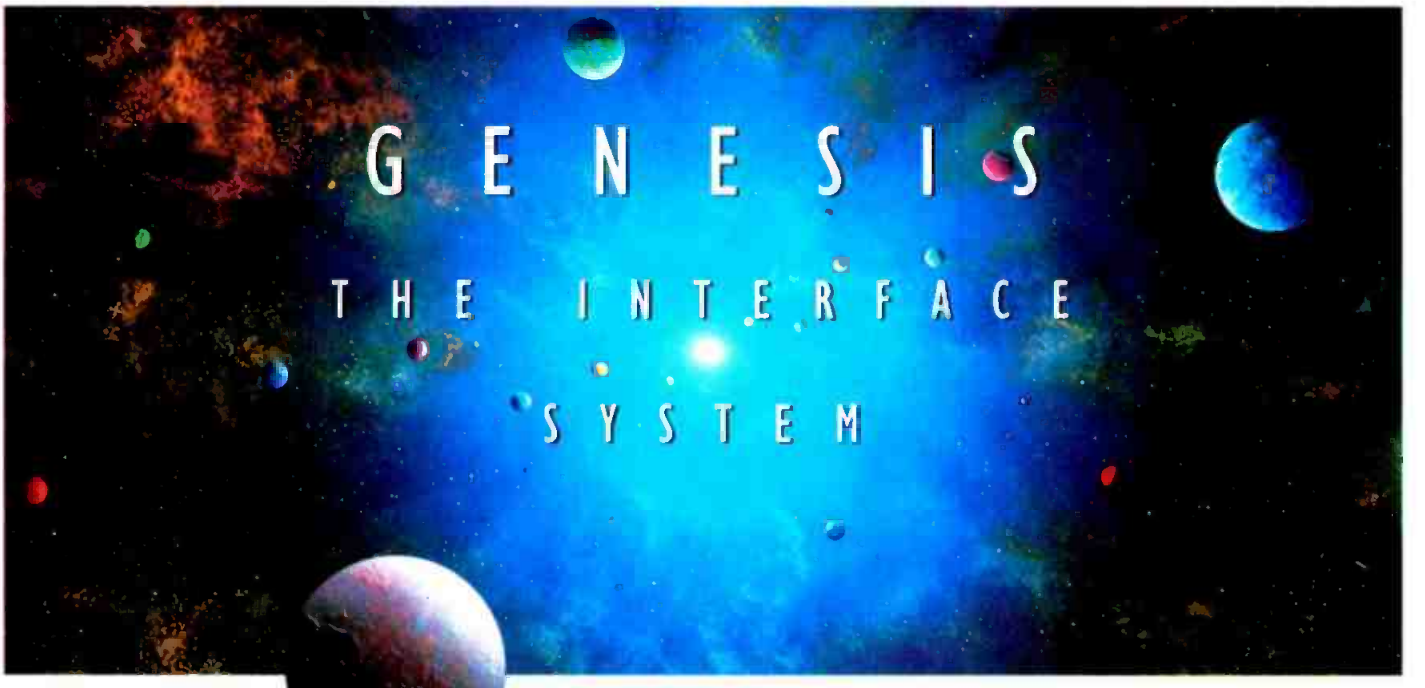
The Phoenix Communications Group has replaced its Beta and ¾-inch equipment with a 4X NLE system from Panasonic for the production and transmission of TV sports programming.

DataDirect Networks' MegaDrive EV-1000 network RAID system has been certified compatible and optimized for use with the StrataSphere real-time, non-linear, broadcast-quality video finishing platform by Scitex DV.

B&H Superstore celebrated its first anniversary at its new site on September 7. The site, located at 420 9th Avenue in New York, is a 35,000 sq.-foot, block-long complex. The store is committed to stocking and displaying complete manufacturer product lines so customers can have hands-on access to a wide range of products. Product comparison displays and interactive touchscreen monitors let customers experiment with options and competitive products. The store's non-linear editing demo suite houses a comprehensive range of video technology, including Scitex DV, Abekas, Avid, Media 100 and Adobe After Effects. The video camera department features a shootout style display, including Sony, Panasonic, JVC, Canon and other digital and analog camcorders.

B&H Superstore professional video department.

The International Teleproduction Society (ITS) has presented Panasonic Broadcast & Digital Systems Company with the 1998 Monitor Award for Special Achievement in Engineering Excellence for the development of the D-5 high-definition recorder. The D-5 format combines advanced intra-field 4:1



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TEKNICHE

CONVERTING THE WORLD

compression with high-density recording technology to produce 8-bit or 10-bit HD digital recordings on compact ½-inch cassette tapes.

BT Broadcasting Services used NDS' Digital Satellite News Gathering (DSNG) system for the compression of its coverage of the World Cup tournament. BT Broadcast Services used 12 transportable earth-station trucks fitted with NDS MPEG-2 encoders.

A frame from the "Farewell to the Big Sombrero" JumboTron presentation posted by WFLA-TV on a Scitex StrataSphere.

NDS Americas has been awarded another ATSC encoder contract for use by an ABC affiliate. WSB-Atlanta, part of Cox Broadcasting, has purchased an NDS E5810 HDTV encoding system along with NDS' StreamServer PCpro control management system. The purchase is part of WSB's final digital integration, allowing it to broadcast a high-definition 720p digital signal by November 1.

ESPN STAR Sports has purchased the NDS Director all-in-one system for digital broadcasting applications. The system is installed in the Singapore broadcasting facility.

Video Tape Associates (VTA) has added a Quantel Henry V8 effects editor to its Atlanta-based full-service post facility. VTA plans to upgrade the V8 to the new unlimited layer Henry V-Infinity this fall.

Quantel's London service team has been honored with the 1998 International Teleproduction Society (ITS) Award for Best Service Support.

BBC Television has purchased a Soundtracs Virtua digital console for a new dubbing suite at Elstree Studios. The new suite will be a dedicated "lock-out" facility for the production of the *Eastenders* series. The digital mixing technology of the 24-fader, 64-input Virtua console, combined with Akai DD1500 digital editing, will allow the BBC to meet demanding transmission deadlines for the series.

Using StrataSphere and DigiSphere systems from Scitex Digital Video, Tampa Bay's NBC affiliate WFLA-TV developed a tribute for the Tampa Sport Authority to mark the closing of Houlihan Stadium. The 20-minute event, dubbed "Farewell to the Big Sombrero," played on the Stadium's JumboTron and encapsulated more than 30 years of stadium events.

AFA Products Group, a division of A.F. Associates (AFA), has established a facility in Northvale, NJ. The office, located adjacent to AFA's main building at 100 Stonehurst Court, will serve as AFA Products Group's headquarters and house sales, service and technical support offices.

Rorke Data has been approved as a third-party peripheral supplier by Panasonic Broadcast & Digital Systems Company. The relationship follows Panasonic's decision to open up the disk storage channel and reduce the costs of storage to the users of its three nonlinear editing systems: POSTBOX, DVedit and newsBYTE.

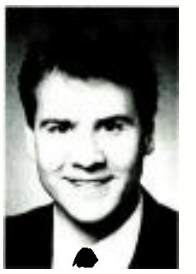
Avid Technology has completed the acquisition of Softimage, a subsidiary of Microsoft. The acquisition allows Avid to offer customers comprehensive solutions for TV program finishing and adds 3-D animation technology to Avid's product line.

ONdigital has purchased Kudos IQ modular interface products from Snell & Wilcox for its first digital terrestrial channels in the UK. The multiplex center incorporates multiple modules from the Kudos IQ range of products. The modules are principally concerned with the distribution of SDI and ASI signals throughout the center. Other Kudos modules are used for digital-to-analog conversion for monitoring purposes.

Galaxy Latin America, which provides DIRECTV to Latin America and the Caribbean, has purchased and installed a number of new digital subtitling systems from SoftNI. The Subtitler Universal Editor software provides GLA translators with editing, timing and formatting parameters designed to make subtitled films more legible and easier to comprehend.

People

Shure has appointed Steve Johnson vice president of marketing, Robert Cappucci director of wireless products and Shawn Stahmer director of new business ventures.



Steve Johnson

Vic Melis

Videotek has appointed Joe Cirincione, product manager, to direct multiple product lines, including the Prodigy production switchers, color correctors and processors, distribution amps, and sync and timing. Vic Melis, product manager, has joined the company to manage the activities of the demodulator and monitoring, routing and distribution, and test and measurement lines.

Michael F. Wells has joined Odetics Broadcast, Anaheim, CA, a division of Odetics, as director of engineering. Wells will manage the development of broadcast products and oversee electrical, mechanical and software engineering activities.

Michael F. Wells

Windows to the Web

www.stortek.com

StorageTek: StorageTek's MediaVault Is a complete storage management system for broadcasters migrating to digital systems. It combines ultra-fast automated tape libraries, ultra-high capacity SD-3 helical-scan cartridge drives and applications-enabling software.

www.pinnaclesys.com

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.

www.e-trim.com

eidria: e-trim is the logging and machine control package for the 3Com PalmPilot and PalmIII series of handheld devices. e-trim provides complete connectivity to most cameras and decks, including RS-422 and LANC (Control-L) devices, as well as LTC timecode feeds - all without any adapters or converters. Simply connect e-trim to your source, mark in and out times to create clips, then HotSync with any Macintosh or Windows computer and your log is ready for import into a variety of editing systems. Questions? www.e-trim.com

www.broadcastengineering.com

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.

www.nova-sys.com

Nova Systems: A leading manufacturer of signal processing equipment for television broadcast, teleproduction,and industrial video applications. Nova's product line corrects, converts, and distributes video as well as audio signals.

Your Web Site Here

eric_proffitt@intertec.com

For more information on advertising in the Windows to the Web or on the *Broadcast Engineering* Web site, contact Eric Proffitt (913) 967-1860 or e-mail at the above address.

QUICK DIAL 71

SONY

DSR-200A
3-CCD Digital (DVCAM) Camcorder

Combining a compact and lightweight body with the superior picture quality of DSP (Digital Signal Processing) and the DVCAM format, the DSR-200A is the ideal acquisition tool for video journalists, event and wedding videographers, stringers and production houses. 500 lines of horizontal resolution, 48kHz or 32kHz digital audio, three hour record time, and minimum illumination of 3 lux is only the beginning. Other features include 16:9/4:3 capability, Steady Shot, high resolution 1-inch viewfinder, time code operation, time/date superimposition and an IEEE-1394 interface for direct digital output. Offers full automatic as well as manual control of focus, iris, gain, white balance and shutter speed.

- Variable servo 10X optical power zoom lens goes from 5.9 to 59mm in 1.7 to 24 seconds. The manual zoom rocker is continuously variable right up to where the digital 20X zoom kicks in.
- Sony's Super Steady Shot reduces high frequency camera shake without compromising image quality. SteadyShot uses 2 horizontal and vertical motion sensors that allow it to work accurately while zooming, moving (even shooting from a car), and shooting in low light conditions.
- Has digital effects including audio and video fade, overlap and Slow Shutter.
- Automatic and manual focus, iris, shutter, gain and white balance. Iris is adjustable in 12 levels from F1.6 to F11, shutter from 1/4 to 1/10,000 of a second in 12 steps, Gain from -3dB to +18dB in 8 steps.
- Zebra pattern indicator, built-in ND filter.
- Custom Preset function lets you preset, store and recall custom settings for color intensity, white balance (bluish or reddish), sharpness and brightness.
- 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.

DSR-200A Field Package:
- DSR-200A Camcorder • NPA-1000/B Battery Case Adapter
- 3 NP-F930/B 7.2v 4000 mAH Batteries
- AC-V900/B AC Adapter, Triple Battery Charger
- VCT-U14 Tripod Adapter • LC-2000CP System Case

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, the DSR-30 is 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 drastically 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.
- Audio clock 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.

PVM-14N1U/14N2U & 20N1U/20N2U
13-inch and 19-inch Presentation Monitors

With high quality performance and flexibility, Sony's presentation monitors are ideal for any environment. They use Sony's legendary Trinitron CRT and Beam Current Feedback Circuit for high resolution of 500 lines as well as stable color reproduction. They also accept worldwide video signals, have a built-in speaker and are rack mountable. The PVM-14N1U/20N1U are designed for simple picture viewing, the PVM-14N2U and 20N2U add RGB input and switchable aspect ratio.

They Feature:
- 500 lines of horizontal resolution
- They handle NTSC, NTSC 4.43, PAL, and SECAM.
- Picture (chrome, phase, contrast, brightness) and setup adjustments (volume, aspect ratio) are displayed as easy-to-read on screen menus.
- Closed captioning is available with the optional BKM-104 Caption Vision Board.

PVM-14N2U/20N2U Only:
- (Last Input Switch) - Contact closure remote control allows you to wire a remote to an existing system so that the monitor's input can be remotely controlled to switch between the last previously selected input and the current input.
- 4:3/ 16:9 switchable aspect ratio

PVM-14M2U/14M4U & 20M2U/20M4U
13-inch and 19-inch Production Monitors

Sony's best production monitors ever, the PVM-M Series provide stunning picture quality, ease of use and a range of optional functions. They are identical except that the "M4" models incorporate Sony's state-of-the-art **HR Trinitron** CRT display technology and have SMPTE C phosphours instead of P22.

- HR Trinitron CRT enables the PVM-14M4U and 20M4U to display an incredible 800 lines of horizontal resolution. The PVM-14M2U and 20M2U offer 600 lines of resolution. M4 models also use SMPTE C phosphours for the most critical evaluation of any color subject.
- Dark tint for a higher contrast ratio (black to white) and crisper, sharper looking edges.
- Each has two composite, S-Video and component input (R-Y/B-Y, analog RGB). For more accurate color reproduction, the component level can be adjusted according to the input system. Optional BKM-101C (video) and BKM-102 (audio) for SMPTE 259M serial digital input.
- Beam Current Feadback Circuit
- 4:3/16:9 switchable aspect ratio.
- True multi-system monitors they handle four color system signals: NTSC, NTSC 4.43, PAL, and SECAM.
- External sync input and outputcan be set so that it will automatically switch according to the input selected.
- Switchable color temp: 6500K (broadcast), 9300K (pleasing picture), User preset.(3200K to 10000K).
- Blue gun, underscan and H/V delay capability
- On-screen menus for monitor adjustment/operation
- Parallel remote control and Tally via 20 pin connector

QUICK DIAL 72

SONY UVW-100B

More affordable than ever, the UVW-100B offers 700 lines of horizontal resolution, 60dB S/N ratio, 26-pin VTR interface, compact design and ease of operation– making it ideal for field shooting applications.

- Three 1/2-inch IT Power HAD CCDs with 380,000 pixels attain sensitivity of F11 at 2000 lux (low light is 4 lux). S/N ratio of 60dB and 700 lines of resolution.
- Gain up can be preset in 1dB steps from 1dB to 18dB.
- Auto Iris detects the lighting conditions and adjusts for the proper exposure.
- Clear Scan records computer monitors without horizontal bands across the screen. Shutter speed can be set from 60.4 to 200.3 Hz in 183 steps. Also has a variable high speed shutter from 1/100 to 1/2000 of a second.
- SMPTE LTC time code and UB generator/reader. Rec Run/Free Run. Preset/Regen are easily set. For multi-camera operation, genlock to an external time code is provided.
- Genlock input and built-in color bar generator.
- 26-pin VTR interface for feeding component, composite and S-Video signals to another VTR for simultaneous recording. Sart/stop are controlled and external VTR status such as Rec and Tally are shown in the viewfinder.
- Diecast aluminum, 1.5-inch DXF-601 viewfinder is rugged yet comfortable while providing 600 lines of resolution.
- Large diameter eye cup reduces eye strain and simplifies focusing. Diopter adjustments (-3 to 0) compensates for differences in eye sight.
- Zebra level indicators, safety zone and center marker generator. Shows tape remaining and audio levels.
- 8-digit LCD display indicates time data, warning indications and video status. Battery status audio level are also shown in a bar graph meter.
- With Anton/Bauer Digital Batteries remaining battery power is displayed on the LCD panel and through the viewfinder.
- Weighs 15lb. with viewfinder, battery, tape and lens. Shoulder pad is adjustable, so you maintain optimum balance when using different lenses and batteries.

UVW-1200/UVW-1400A
Betacam SP Player • Player/Recorder

The UVW-1200 and UVW-1400A are non-editing VCRs which deliver Betacam SP quality and offer features for a wide range of playback and recording applications. RGB and RS-232 interface make them especially ideal for large screen, high quality video presentation, scientific research and digital video environments.

- Ideally suited for work in computer environments, because RGB signals can be converted into component signals and vice versa with minimum picture degradation.
- 25-pin serial interface allows external computer control of all VCR functions based on time code information. Baud rate can be selected from between 1200 to 38,400 bps.
- Built-in Time Base Stabilizer (TBS) locks sync and subcarrier to an external reference signal as well as providing stable pictures. High quality digital dropout compensator further ensures consistent picture performance.
- Equipped with two longitudinal audio channels.
- Both read LTC Time Code) and UB (User Bits). The UVW-1400A also generates LTC and UB (Free-Run/Rec-Run).
- Built-in character generator can display VTR status, time code, self-diagnostic messages, set-up menu, etc.
- Auto repeat of entire or a specific portion of the tape.
- Control of jog, shuttle, playback, record, pause, FF and REW with the optional SVRM-100A Remote Control Unit.
- Composite and S-Video as well as component via BNCs which are switchable to RGB output. The UVW-1400A has two switchable sync connectors and a Sync on Green.
- Built-in diagnostic function and hour meter.
- Initial set-up menu for presetting operational parameters. Settings are retained even after power is turned off.

UVW-1600/UVW-1800
Betacam SP Editing Player • Betacam SP Editing Recorder

The UVW-1600 and UVW-1800 are the other half of the UVW series. They offer the superiority of Betacam SP with sophisticated editing features. They feature an RS-422 9-pin interface, built-in TBCs and Time Code operation. Inputs/outputs include component, composite and S-Video. **All the features of the UVW-1200/1400A *PLUS*—**

- Optional BVR-50 allows remote TBC adjustment.
- RS-422 interface for editing system expansion.
- Two types of component output: via three BNC connectors or a Betacam 12-pin dub connector.
- Frame accurate editing is assured, thanks to sophisticated servo control and built-in time code operation. In the insert mode of the UVW-1800, video, audio Ch-1/2 and time code can be inserted independently or in any combination.

PVW-2600/PVW-2650/PVW-2800
BETACAM SP 2000 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.

PVW-2650 Only
- Dynamic Tracking (DT) playback from -1 to +3 times normal speed.
- 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-2800 Only
- Built-in comprehensive editing facilities.
- Dynamic Motion Control with memory provides slow motion editing capability.

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.

VIDEO and PRO AUDIO

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NewTek

Calibar 3-Oz. Pocket-Sized Test Generator

The size of a ball point pen and running on a single battery, Calibar is an NTSC test signal generator that packs a rack mount's worth of test equipment into a battery operated instrument. Calibar is the fastest, easiest and most portable way ever to calibrate video equipment. No patch bay racks. Just one cable. So besides giving you fast, accurate readings in the studio, it's perfect for off-site events or trouble-shooting in the field.

- Designed for studio and field operation, it produces 24 test pattern functions at the touch of a button. 10-bit precision digital-to-analog conversion assures highly accurate signals.
- Calibar's combination of low cost, portability and full-featured operation makes it ideal for broadcast engineers, television production facilities and video post houses.
- Tuck Calibar in your pocket and you're ready to go. Touch the button to generate SMPTE color bars, touch it again to calibrate convergence and so on.
- With the supplied AC adapter, it also functions as a black burst generator.

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 real-time character generation with the quality you expect from Chyron.

PC-CODI Hardware:

- Fully antialiased 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.
- Adjust a wide range of character attributes. Wide choice of composition tools.
- Characters, 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, INFiNiTI RGBA and TGA with alpha channel. Scribe also imports and exports TIFF, JPEG, PCX, TGA, BMP, GIF, CLP, ASCII, IMG, SGI, PIC1 and EPS formats.

PC-CODI and PC-Scribe Bundle.....2995.00

TRUEVISION / AVID

TARGA 1000/MCXpress NT

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:

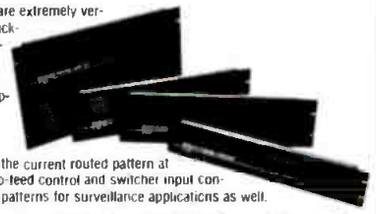
- 300-watt, 6-Bay Full Tower ATX Chassis
- Pentium ATX Motherboard with 512K Cache
- Pentium II- 300 MHz Processor
- Matrox Millenium II AGP 4MB WRAM Display Card
- 64MB 10ns 168-Pin (DIMM) S-DRAM
- Quantum Fireball 6.4GB IDE System Drive
- Seagate Barracuda External 9.1GB SCSI-3 Ultra Wide Capture Drive
- Adaptec AHA-2940UW Ultra Wide SCSI-3 Controller Card
- Teac CD-532e 32X EIDE Internal CD-ROM Drive • 3.5" Floppy Drive
- Altec-Lansing ACS-48 3-Piece Deluxe Speaker System
- Viewsonic G771 17-inch (1280 x 1024) Monitor (0.27mm dot pitch)
- Focus 2001A Keyboard • Microsoft MS Mouse
- Windows NT 4.0 Operating System Software
- Avid MCXpress for Windows NT
- Truevision TARGA 1000 or 1000 Pro Video Capture Card

With TARGA 1000.....$5995.00
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 Diff-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, fine 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.

CORPORATE ACCOUNTS WELCOME

Circle (61) on Free Info Card

Classifieds

Help Wanted

We delivered the first digital technology to America.

Help us deliver the latest.

Out of everyone trying to deliver digital television, Panasonic was the first to put this cutting edge technology into the hands of the American consumer. Now, we're moving onto the next challenge, and we have some exceptional engineering opportunities in Advanced TV/Video Product Development at our Technology Development Center.

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EOM

Lousy DTV PR

BY PAUL MCGOLDRICK

It's hard to believe the Sutro Tower in San Francisco's Twin Peaks neighborhood is 26 years old. It is harder still to recognize how our understanding of seismic events on structures has changed during that time. As engineers, we have some of the toughest test levels around. Lawyers, of course, have the lowest pass grades — in court rooms, half of them lose. Even doctors are allowed to have patients die occasionally. Yet engineers are not allowed to build a bridge that falls down or an appliance that fries you.

However, seismic engineering does include a touch of the *emperor's new clothes*. We are told a particular structure is designed to withstand an X-point-Y quake, and we have to believe it. When an event of that magnitude comes along, and the whole thing folds, the seismic engineers say, "Oops, but we know better now."

A concern regarding broadcast towers is that steel structures don't appear to behave as was thought 20 years ago. Based on recent quakes in Mexico and Japan (Kobe), it appears that the elastic swaying of a tall steel structure can actually build to a whiplash, causing tower parts to break off and go flying. If the tower actually finds resonance for any length of time, it *will* come down.

Residents in the fall zone of Sutro call it Godzilla. Despite this, it has always struck me as a fine-looking structure with its three legs climbing to a neat waist-effect before rising to the steel towers that carry the antenna loads. The antenna loads look even, although the actual mounting is strange — two cross beams way up there with the antennas guyed to them.

So what's the fuss?

I would hazard a guess that if Sutro were proposed today, it would, literally, not get off the ground. Environmentalists would stop it, local residents would stop it and those voted into office in the city would not fight for it. Yet many of those people, who would worry today about this type of structure being newly built, deliberately moved *into* the fall zone of the current structure, putting their fears in the background and the wonderful views from their peaks into the foreground. (Of course, most of the time you are in the clouds up there, with the Bay's natural air-conditioning sweeping in at night and much of the day.) To the extent that people made that choice with open eyes, I have no more time for the complaints about Godzilla than I do about people who move into a house on an airport flight path or in a flood plain. But now it may be time to listen.

After 26 years, the owners of Sutro (a cooperative of Bay broadcasters) want to add a small item to the structure: a DTV antenna. That isn't really surprising, and they are in a bit of a hurry because of the FCC timetables. They want to add a horizontal antenna that is 125 feet long with a three-foot cross-section and, by the way, weighs 12 tons (the *Examiner's* numbers).

Of course, such a responsible party would surely have its paperwork and tests neatly tied up before moving another ounce onto the tower. Right? Wrong. The dynamic analysis that needs to be done with the new antenna on board will take place in February 1999. The new antenna goes up in November 1998 so DTV transmissions can start on schedule. Without a doubt, that analysis can be done more easily, and cheaply, with the antenna in place. But I am blown away by the notion that the owners of this high-visibility tower are going about an installation the way you might expect an operator to proceed when the only thing in danger is his own transmitter shack and a few cows. I am even more surprised that any insurance carrier will give the owners coverage in the interim period.

This installation is being done with the permission of city hall, the mayor and supervisors. Mayor Brown is reported to have attended, briefly, a meeting with residents back in February 1998, where he posed the question, "Who owns the tower?" The residents responded, as prompted, "The media owns the tower." "That's not," said Brown, "an industry I want to take on at this time." Mayor Brown, who gets it every which way from the media because of how they perceive he likes to "own" the whole city, certainly doesn't want any more of the same in a re-election year. It is nice to hope that telling Sutro to do it right would not result in even more of the same for Mayor Brown. ■

Paul McGoldrick is a freelance writer and industry consultant based on the West Coast.

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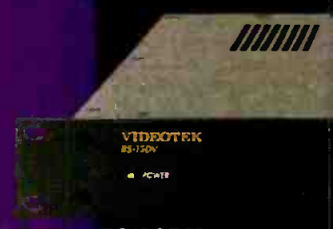

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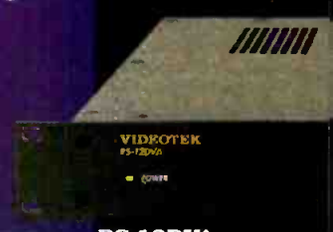

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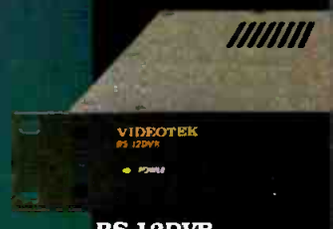

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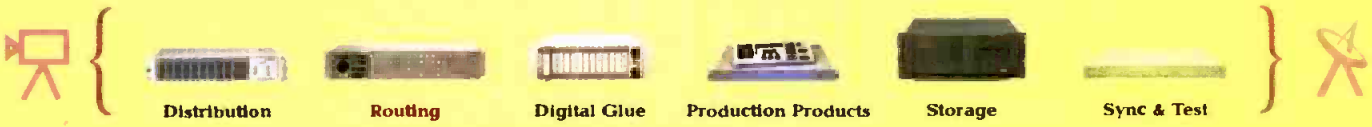

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