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MAY 2001

Broadcast ENGINEERING®

THE JOURNAL OF DIGITAL TELEVISION®

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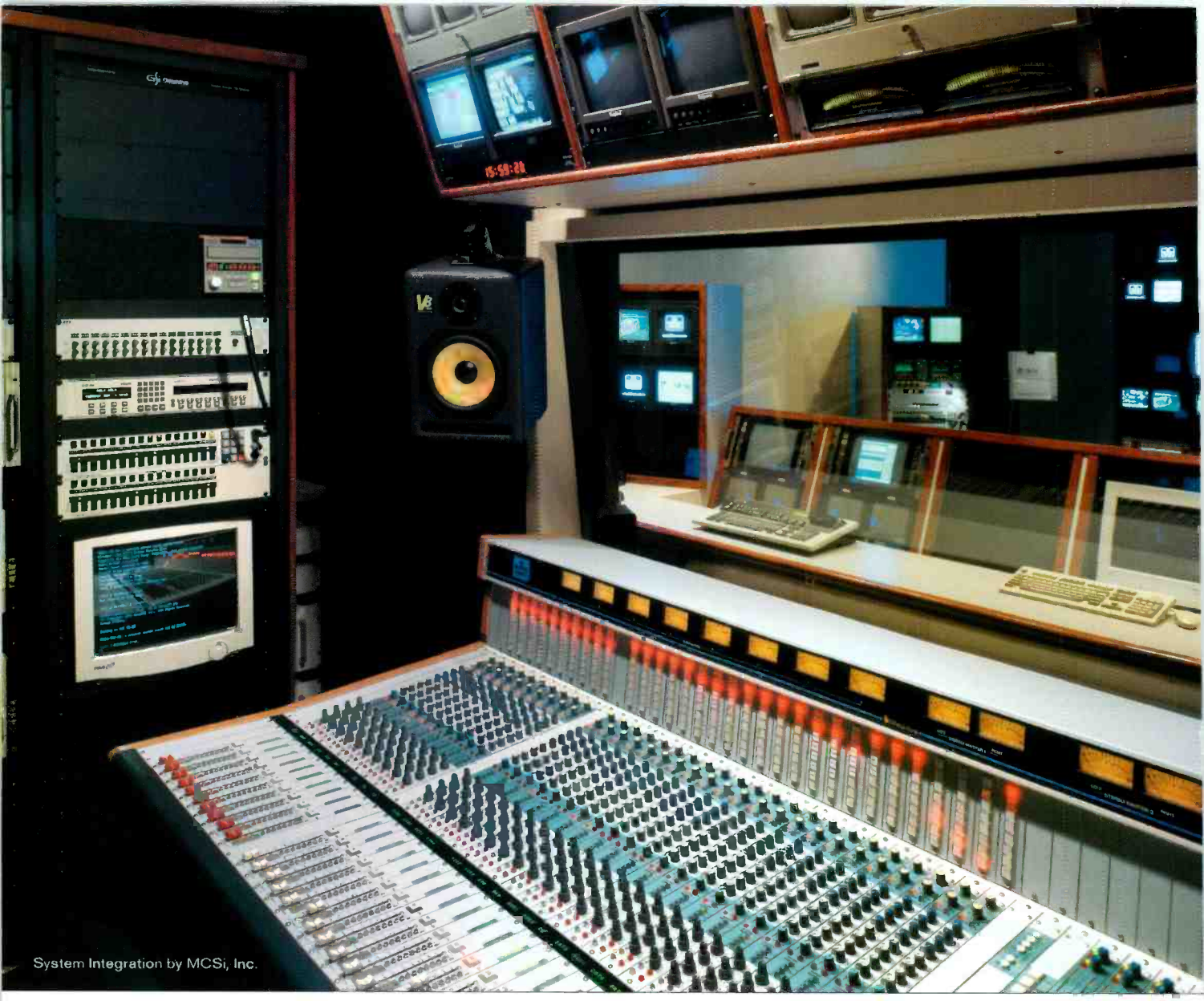
just admit you need help

Multiformat routing

the impossible made easy

Streaming media

station websites: profits or pits



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— John Orr, Mgr., Broadcast Engineering Projects

"YOU JUST CAN'T GO WRONG with WHEATSTONE. Their boards are intuitive and clean sounding, and you can track signal flow at a glance. In my eyes the greatest feature of the TV-80 is their mix-minus bus system. *Anyone out there who's 'faking' mix-minus by using submasters or an external box will wonder how they did without it.* The TV-80 is a definite time saver, both in installation and operation. It makes audio operators more confident and reduces show prep time—we're now able to do more and better pre-production. Definitely WORTH EVERY PENNY!"

— Craig Reeves, Audio Engineer

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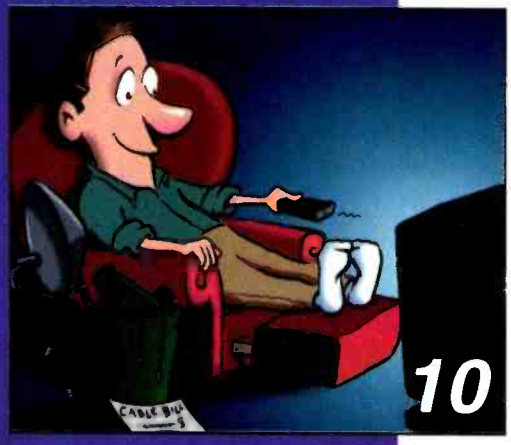

Features

Beyond the Headlines

Digital Handbook

ON THE COVER: Crawford Communications Audio A suite, designed by acoustician Tom Hidley. The 33x22-foot room features an SSL Avant console supported by Pro Tools, Kinoshita speakers, Dolby E and Dolby Digital encoders and a JVC DILA projector for HD and SD projection on an 11x7 Stewart Microperf screen. The full 5.1 Surround Sound room is used for mixing high-end programs, DVDs and special venue projects. Photo courtesy Crawford Communications, Inc. Photo by Thomas Birdwell.

(continued on page 8)

"There's nothing better..."

"DVCPRO50 clearly builds on DVCPRO25, which has been an excellent workhorse format for us. We knew how reliable DVCPRO50 would be. It's cost-effective and the quality is excellent– there's nothing better for our needs."

- Dale Kelly, senior vice president, Pappas Telecasting

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Systems Design & Integration

New Products & Reviews

Departments

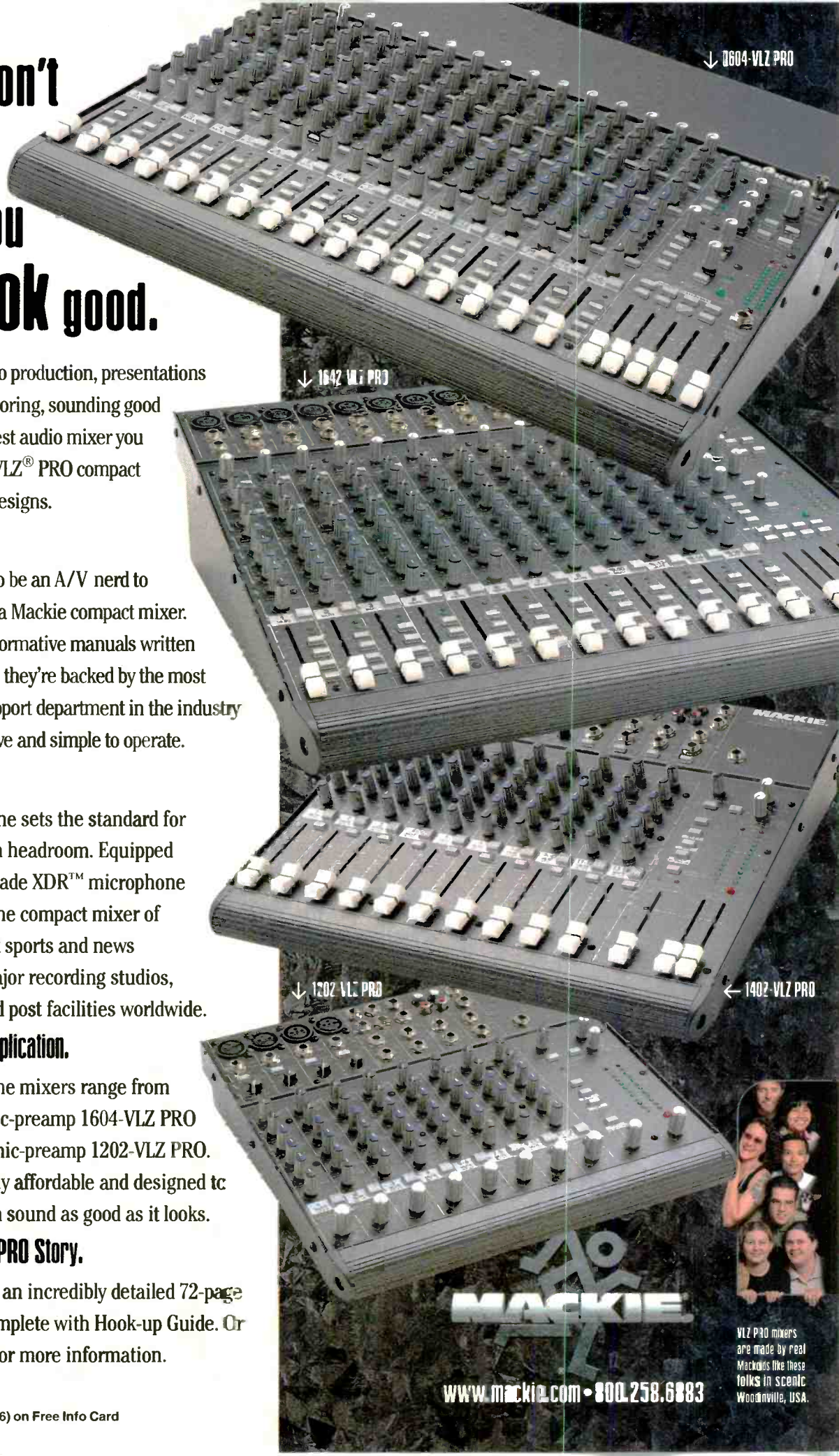
FREEZE FRAME

A look at the technology that shaped this industry

Early audio

Remember audio? What audio tape recorder is regarded as the first successful tape recorder produced in the U.S.? You must specify manufacturer, model number and year introduced. Enter by e-mail. Title your entry "Freeze-frame-May" in the subject field and send it to: editor@intertec.com. Correct answers received by June 1st, 2001, will be eligible for a drawing of *Broadcast Engineering* T-shirts.

If you don't sound good, you don't look good.



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Circle (106) on Free Info Card

Editorial

Free TV

There's trouble brewing for the cable and satellite industries. There's an increasing resistance to higher fees just for the privilege of watching TV. Here are some average charges for television services: Basic cable/satellite is $36, plus $10 for premium channels. Digital cable is $46; personal video recorder access adds $10. The typical household now spends almost $600 a year just on television service. What most of them don't realize is that TV can be free.

I began pondering the benefits of free after I fired AT&T last week. Yep, fired 'em. For 25 years I'd refused to change long-distance carriers. I'd been an AT&T customer for most of my life. Still, when the bill reached almost $40 a month in long-distance service, I figured I had nothing to lose. So, last month I decided to give one of those 10-10 services a try. For one month I made all my calls with VarTec instead of AT&T. A funny thing happened. I saved money.

When the bills came, two things were immediately obvious. First, 142 minutes of long distance with AT&T cost me $31 (with my discount), while that exact same 142 minutes cost me $8 with VarTec.

Simple math would tell you that I could save almost $23 a month. Right? Wrong.

It was then that I discovered that because I hadn't spent *enough* money with AT&T that month, I was being charged an additional "monthly usage minimum fee" of $4.35. I was being charged more because I'd used their service less? Go figure.

When I complained, I was told I could change to a lower per minute plan, but that I'd now have to pay a $4.95 monthly charge in addition to the toll charges. I asked the customer service person why I'd trade their $4.95 charge for their other gouging fee of $4.35 when I was getting all the long distance I wanted for 7 cents a minute anyway with VarTec. His response was, "Would you like me to terminate your service?"

Boy, was that an easy answer!

As I enjoyed the empowerment of having fired AT&T, I wondered if there were other ways to get technology at lower costs — or even free. After a little thinking, I came upon an old idea that's sure to be the next "killer application." I'm going into business. Check out my commercial:

"Free TV? Sounds impossible doesn't it? Are you tired of paying $40 a month for cable or satellite service? Want to eliminate those high fees for 50 channels of television you never watch? Want to get rid of all those set-top boxes and multiple remote controls? Would you like to be able to see your favorite TV programs on all your TV sets, all without paying extra fees to Time Warner, Cox or DirecTV?

"I can show you how to receive all the TV signals where you live — absolutely free. Never pay a cable or satellite bill again. No fees. No hassle. No more cable interruptions. No more rain or snow outs.

"This secret lies in a special device that will allow you to pick up invisible TV signals in the air around you. Just like your satellite dish receives its signals from space, this device scoops out the TV programs that are everywhere in the air around you. 'Sure' you say, 'but what about digital?'

No problem. My technology is fully digital compatible. You'll be able to get both today's analog TV stations and the hot new digital TV stations that are on the air now. Watch HDTV, digital TV or analog TV in your home, all without paying a monthly fee.

Don't continue to pay for something that's free. Just send $29.95 and I'll forward complete, detailed plans for the technology you need to bypass cable and satellite companies. Never pay a monthly fee again. Free TV. Be really free!"

Brad Dick

Brad Dick, editor

Send comments to:
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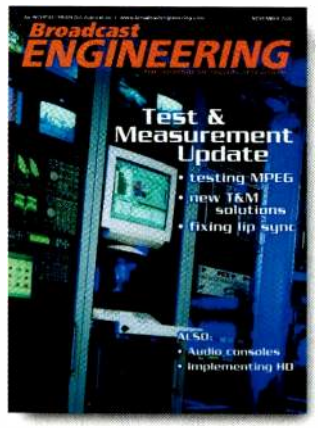
Reader Feedback

Great article

I usually read lightly through the various trade magazines I receive until I find an item or article I need to read carefully because I know if I do I will learn something new and interesting. Such was the case for me recently with the November issue of *Broadcast Engineering*, regarding the article *Testing MPEG*, by Pearse Ffrench.

What a great article. It was a learning epiphany regarding my understanding of MPEG-2 as it applies to DTV transmission and television reception. Mr. Ffrench did an excellent job of explaining the compression, encoding, transmission and decoding process without going too deeply into "engineer speak," The article held my interest and gave me the opportunity to take some great notes for my personal DTV reference notebook. I now have a MUCH greater understanding of the whole process. So much so that I now feel comfortable explaining it to others, thus increasing their understanding of DTV.



Great article. Great job! Please pass on my compliments and thanks to all involved — especially Mr. Ffrench.

TIM WERNER

Just how do I get DTV?

I'm a recently retired CE and, no, I didn't invest $6000 in a DTV receiver. I've been out of the loop for several months, so I'm confused with the way DTV is being marketed by the retailers. They sell DTV-Ready, DTV-Compatible and DTV-Capable monitors, but I've not seen an ad for a DTV tuner.

I asked at a couple of stores, and they all provide evasive answers. I know there is an RCA tuner and Panasonic has one, but I've only seen it in one store and have been told by my colleagues that some don't work well.

"They sell DTV-Ready, DTV-Compatible and DTV-Capable monitors, but I've not seen an ad for a DTV tuner."

What goes? Have you addressed this in one of your great editorials?

DON SINEX
CE KOCE-TV, RETIRED

Don:

First, there are several manufacturers providing DTV tuners. Some current models include Panasonic TU-HDS20 and TU-DST51, Sharp TU-DTV1000, Samsung SIR-T100, Sony SAT-HD100 and RCA DTC-100. Some of the satellite and cable STBs, for example the EchoStar 6000, provide for an optional ATSC tuner module. Second, it's unfortunate, but you'll not see much in the way of promotion or product in this area because Hollywood wants to "protect" copyright holders and be sure you can't digitally record anything you view — at least not free. The current STBs don't provide that kind of "protection." Personally, I prefer unprotected viewing.

BRAD DICK
EDITOR

Freezeframe winners

The February Freezeframe question, "What did the HL in Ikegami camera nomenclature originally mean?" was apparently too easy. While I thought it might be a tough question, readers proved otherwise.

Of course, the answer is Handy Looky, roughly-translated Japanese for small portable camera. With 50 correct answers, the only difference was in the spelling. Great work to those who had the right answer. Because of the large number of entries, all correct entries were placed in a box, and the following readers' names were drawn to receive a Broadcast Engineering T-shirt. Thanks for all who entered. This month's question is on page 8.

Ernie Flotto, KAET-TV
Steve Alhart, NEP
Paul Bonnette, Encore Video
John Anthony, TV Stars
Roger Kicks, Wyoming Public TV
Susan Ponds, KPHO-TV
Frank David, LeBLANC Broadcast
Jeff Kreines, DeMott/Kreines Films
Chris Whittington, NBC
John Hillis, News Channel 8
Mike Weber, Optimus
Phil Hejtmanek, WPWR-TV ■

The US post office commemorated the first broadcast of ABC Monday Night Football by showing an Ikegami HL 35 camera. This camera helped initiate the concept of ENG.

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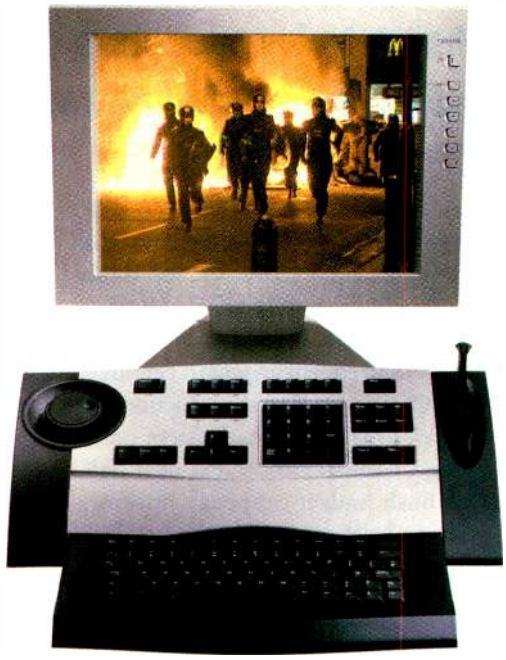

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Circle (108) on Free Info Card

News

President uses budget threat to hasten transition

BY LARRY BLOOMFIELD

President Bush is adopting a get-tough attitude toward broadcasters in an attempt to get the transition to digital implemented at a quicker pace. A hint of what was to come surfaced in early March when the administration sent Congress an outline of the budget, but the full impact of this new approach became a reality in early April when the President submitted his full budget request to Congress.

The Bush budgetary proposal suggests that the Federal Communications Commission (FCC) draw up rules that would impose an annual charge to television broadcasters of $198 million for the use of legacy analog transmitters until they return the spectrum. The move is designed to free up spectrum used by analog television transmitters so that the FCC can auction it to wireless companies for consumer-oriented advanced telecommunications services. "The legislation will promote clearing the spectrum in channels 60-69 for new wireless services in a manner that ensures incumbent broadcasters are fairly compensated," Bush's 2002 budget said.

The FCC is slated to auction the channel 60-69 spectrum in September. Although the sale was to have been completed last year, the proposed budget gives the agency until September 2004 to get the job done.

The Bush budget would impose an annual charge to broadcasters of $198 million for the use of legacy analog transmitters.

If excising the channel 60-69 spectrum from the family of television broadcast frequencies weren't enough, the FCC is also slated to auction the airwaves used by broadcasters occupying channels 52-59 by next fall. The Bush budget proposal, however, grants a brief reprieve in the timeline, extending it to September 2006.

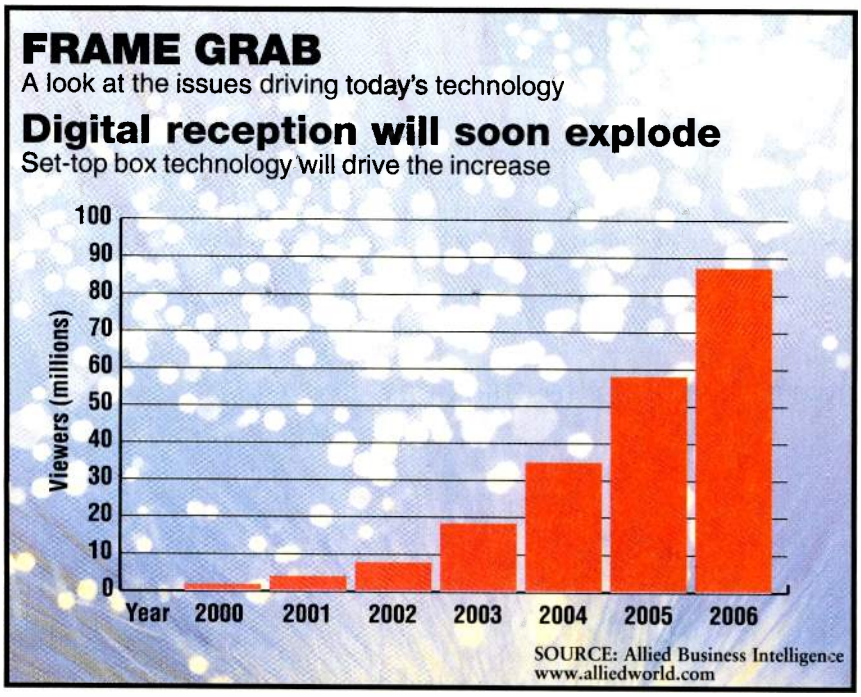
"As a result of the increased certainty about how and when the spectrum in channels 60-69 will become available and shifting the deadlines for both auctions closer to when the spectrum is expected to be available, revenues for these auctions are expected to increase by $7.5 billion," the budget said.

The proposed budget is vague when it comes to what the legislations should or would say and when it would be sent to Congress for action. This is not surprising in light of the fact that the plan to charge broadcasters is opposed by the industry and key members of Congress, and past attempts to impose fees have failed in Congress.

"Penalizing America's broadcasters — who are struggling to make the transition to digital — with punitive spectrum fees is a terrible idea, and I will fight it every inch of the way," said Rep. Billy Tauzin, R-La., who chairs the House Commerce Committee, which oversees the FCC and the broadcast industry.

While Tauzin opposes any analog spectrum fee, he said he would support delaying the 52-69 auction.

"The president has offered a restrained budget that is both fair and responsible, but — as in all administration budgets — changes to it are inevitable," he said. "In the area of telecommunications, for example, the president's decision to postpone certain spectrum auctions makes a lot of sense to me, and I will support his efforts."



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Multi-hop DTV translators at work in Utah

In many parts of the country, the transmitter is not the last link before home reception; a translator (or multiple translators) extends its reach. Without television translators, part of the American viewing audience, in particular that portion in the Rocky Mountains and west, would be without free, over-the-air television.

Jim DeChant, general manager of KTVZ in Bend, OR, relates the situation that faces many broadcasters, "I cannot cover my service area with our main (transmitter) only. We'd be hard pressed if we didn't have the eight translators." Oregon has over 500 NTSC translators extending the range of the stations in Portland, Eugene, Medford and other larger cities.

As we make the migration to digital television, this type of service becomes increasingly more important, especially the legacy issues. Full-power stations have been granted a second frequency to aid them in their transition to digital; but not so for translators. Dr. Byron St. Clair, president of the National Translator Association said, "We are extremely concerned about the present movement in Congress and the FCC to recover channels 52–59 before the transition to digital is complete. If these channels become unavailable for translator use, it will be virtually impossible to extend a significant number of DTV primary stations into rural areas traditionally served by translators."

There have been tests and experiments to see how the currently accepted technology (8VSB) will perform in the rigorous geography of the West. Paul Burkholder, communications director of Humboldt County in Winnemucca, NV, started tests as far back as November 1999.

"We tested ATSC signals with low-power transmitters and translators for a period of six months," Burkholder said. "I even wrote a 100-page book on it. Twelve unique receive sites were used where we compared 100W NTSC signals with 10- to 60W digital 8VSB signals. During the initial test, we didn't do any hops [translator-to-translator], we simply wanted to see if the digital signals could replicate NTSC coverage in the typical 'west-of-the-Great-Plains' terrain. You know, mountains and valleys."

The tests uncovered issues that Burkholder says the translator companies are currently addressing. "Phase noise in standard heterodyne converters proved to be a big problem," he said, adding, "The type of converters most translator operators are familiar with probably wouldn't pass a digital signal."

The tests didn't stop with just translators and LPTV. "We did some work on microwave delivery to translators," Burkholder continued. "We found that it wasn't necessary to convert from 8VSB to one of the other modulation schemes such as QAM and that we could get several 8VSB signals into the 25MHz-wide microwave channel. We found that the standard IF frequency of 70MHz worked just fine using off-the-shelf downconverters and downconverting to standard TV broadcast channels 3, 4 and 5. We'd inject those into the IF and let the microwave equipment do the upconverting, recovering those channels at the other end of the microwave system. Instead of being able to carry only one NTSC channel on the microwave system, we found that we could carry up to three ATSC signals on the same carrier."

"Although we did do some translator-to-translator testing, we turned that part of our testing over to Kent Parsons," Burkholder concluded. Kent Parsons is well known to Utah broadcasters. He has been involved in the Utah state translator system for over 45 years. In addition to this, he is the vice-president of the National Translator Association. Because Utah has about 10 percent of the total translators licensed in the United States, and with Parson's experience, it was a natural match, not to mention that about 500,000 homes, or about one-quarter of viewers in Utah depend upon translators for TV service.

"After four months of experimenting, monitoring and testing with two long-range repeaters, the conclusion reached is that DTV translators we worked with will and do deliver quality television signals to rural viewers with high reliability and at reasonable costs," Parsons proudly stated. "The signals I'm receiving in my home after the double hop are the same quality as those being transmitted from the originating television station in Salt Lake City."

The tests were done with the cooperation of KSL-DT (Channel 38), an NBC affiliate owned by Bonneville International Corp.

The first leg in the translator double hop is located atop Levan Peak, some 83 miles from Salt Lake City. Parsons injected an interesting factor: "One of the anomalies is that this is not line of sight. In the path, not five miles from Farnsworth Peak where KSL-

Little thought has been given to how stations west of the Rocky Mountains will integrate translators into their digital transition plans. Photo courtesy DTV Utah.

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DT's transmitter is located, there is a protrusion that sticks up about 180 feet above the line of sight. Other than that, the path is clear.

"At the first receive site (Levan Peak), we are getting a signal strong enough that we have 29db to spare without using a preamplifier. The received signal goes into a Zenith ATSC (8VSB "remodulator") cable translator that converts the signal to a standard 45MHz IF frequency. We then upconvert using a General Instruments frequency-agile upconverter. This feeds, on frequency, a Larcan MX100 which produces 30W of digital-television carrier power on channel 17 that feeds a PR450 directional Paraflector antenna made by the Scala Division of Kathrein. Our experimental call sign for this location is K17FJ," Parsons reported.

Parsons' goal was to to get a digital signal into his home in Monroe, UT, where he could track error rates etc. But for that to happen it was necessary to translate the signal one more time, which was done at the Cove Mountain translator site, about four miles east of Monroe. "Cove has a direct, unobstructed shot from Levan Peak," Parsons said.

"In one test, we found that, with very limited power, we can transmit very long distances. For example, we reduced the power and transmitted the signal 67 miles with only 10mW of power on channel 17 and got good pictures. Because of the cliff effect, you either have a signal with digital or you don't." Parsons also pointed out that they are receiving channel 17 from a site that is also transmitting a powerful channel 16 analog signal without any appreciable adjacent channel interference.

Those who have seen the results of this experiment are no longer skeptical that DTV can be implemented with translators. The bottom line in all this is that DTV translators work, can use modest power, will eventually cost about the same as analog translators, and produce quality service for those hundreds of thousands of rural TV viewers and the many cable systems that rely on translators. ■

CBS, Infinity split with NAB

CBS Television and Infinity Broadcasting resigned from the National Association of Broadcasters (NAB) to protest NAB's support of ownership caps on television stations. A release by the network stated: "We have been proud NAB members for many years, but it has recently become clear that we have a fundamental issue on which we and certain of the NAB's television members disagree. Until recently, we felt it was possible to remain members of the Association with this disagreement unresolved. Due to actions taken by the NAB, that is no longer the case."

Fox and NBC left NAB two years ago over the same issue. This leaves only ABC and PAX as network members, though it should be noted that NBC owns about a third of PAX.

CBS sees the NAB's position as being one that is actively working against its goal of eliminating ownership caps. But the network will continue to work with others in the industry to make sure free, over-the-air television and radio stand on an even footing with their competitors both for the good of the business and for the public they serve.

CBS, NBC and Fox want to be able to buy and own anything they can get their hands on. There are those who see this as limiting competition, but Viacom, the News Corp. and other broadcasters say the proliferation of media outlets on cable and the Internet has eliminated the need to limit ownership.

Local broadcasters have pressured the NAB to protect their interests against those of the networks and a few large station groups who are intent on consolidating control of terrestrial television broadcasting. There are those who see the lifting of the caps on ownership as undermining the financial viability of local broadcasters, as well as limiting their ability to evolve the business model of local broadcasting. Small companies argue that the FCC should keep the limits to prevent large groups of stations and national networks from ignoring the needs of local viewers. Affiliates have long maintained the position of gatekeeper for the networks and program syndicates, injecting a healthy dose of local information and entertainment services. Managers of network-owned and operated stations (O&Os) give the same argument with respect to local information, news, public affairs, etc.

CBS sees the NAB's position as being one that is actively working against its desire to eliminate national ownership caps.

In any event, local or small-group-owned stations will need to become local content producers and help local advertisers reach local customers with new forms of content and targeted advertising, generating a competitive local platform. This would allow a more creative and technically oriented job market at each station.

Viacom Inc., parent of CBS, along with the News Corp.-owned Fox network and General Electric Co., parent of the NBC Networks, have filed a suit in the U.S. Court of Appeals in the District of Columbia to force the Federal Communications Commission to review the broadcast ownership cap issue. The NAB plans to file a brief in the case opposing the networks, sources said. When Viacom bought CBS Corp. and its television stations last May, the company's total reach to a national audience rose to 41 percent. The FCC ordered Viacom to comply with the cap within 12 months. That original time frame has now expired. ■

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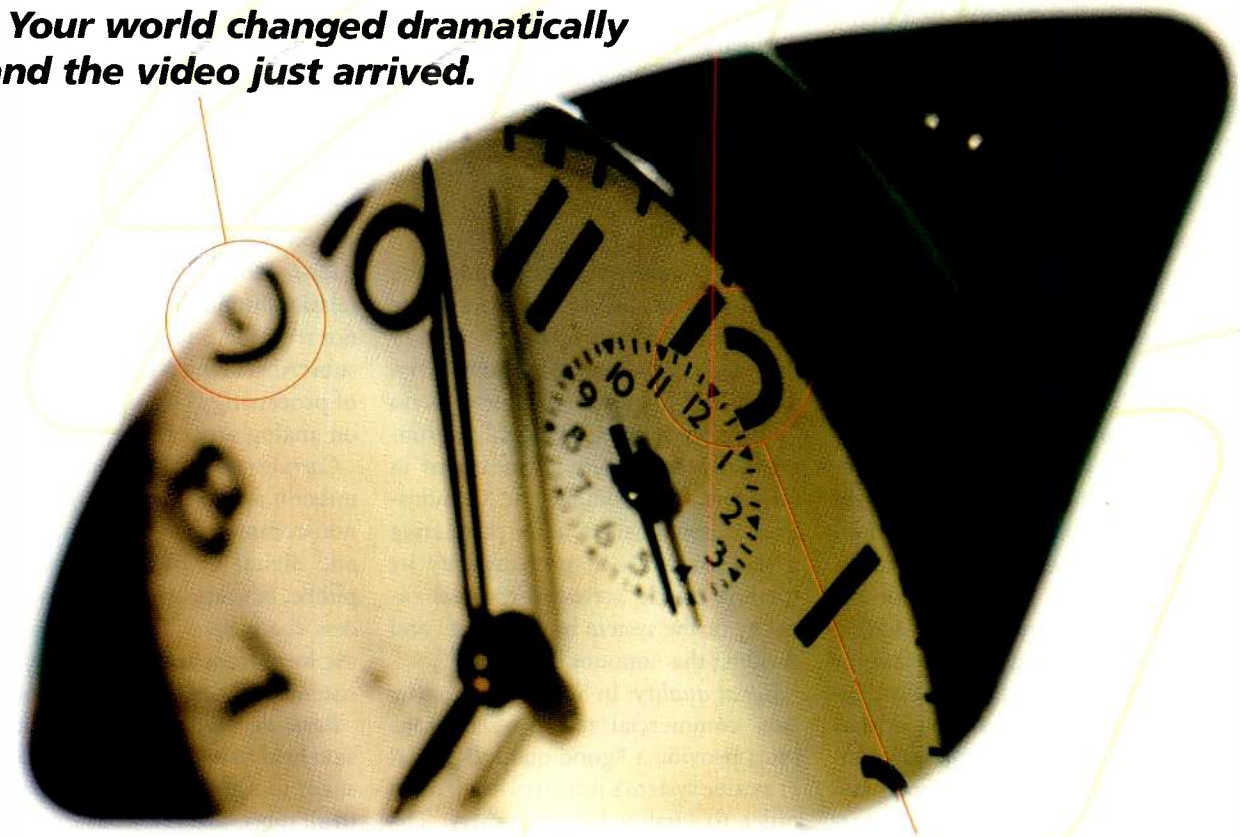

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FCC Update

DTV must-carry adopted

BY HARRY C. MARTIN

The FCC has issued an order that for the first time establishes rules for the mandatory carriage of digital television stations on cable TV systems. Must-carry will apply only to a single programming channel, analog or DTV, plus program-related material. In a Further Notice of Proposed Rule Making, the FCC is seeking further comment on this issue, including information on the need for dual carriage for a successful transition to DTV and the return of analog spectrum, present and future cable system channel capacity, and the use of retransmission consent for DTV signals.

The specifics of the FCC's DTV must-carry rules are as follows:

Retransmission consent: The Commission concluded that commercial television stations broadcasting in both analog and digital during the transition may choose must-carry or retransmission consent for their analog signals while electing to negotiate for retransmission consent for their digital signals. The Commission ruled that a station electing retransmission consent for its digital signal may negotiate with a cable operator for partial carriage, i.e. one channel, of that digital signal. Finally, for the time being, a television station may tie the carriage (one channel) of its digital signal with the carriage of its analog signal as a retransmission consent condition.

Content of signal subject to mandatory carriage. The Commission ruled that the "primary video" entitled to mandatory carriage includes only a single programming stream and other "program-related" material. The station may choose which of its unrelated multiplexed signals is considered the "primary" video. Among the program-related materials that would also be subject to must-carry are closed captioning, V-chip data, Nielsen ratings data, and channel mapping and tuning protocols, but not e-commerce or Internet services.

Channel capacity: Section 614 of the Communications Act requires cable operators to devote up to one-third of their activated channels to must-carry. The use of the term "channels" is no longer appropriate in a digital environment, where capacity is measured in megabits. Accordingly, the Commission revised the method for calculating a cable system's channel capacity by totaling usable activated channel capacity of the system in megahertz and dividing that amount by three.

Signal quality: In Section 614 of the Act, commercial television stations must provide a "good quality" signal at a cable system's principal headend in order to qualify for must-carry. The Commission determined that for DTV stations, the signal strength level necessary to meet this requirement is -61dBm.

Material degradation: The Commission found that cable operators may remodulate digital broadcast signals from 8VSB to 64 or 256 QAM. Cable operators are not required to pass through 8VSB signals, although the Commission noted that doing so might be a good option for cable operators early in the DTV transition. The Commission also found that cable operators may not carry a DTV signal in a lower resolution than that afforded to a non-broadcast digital programmer carried on the cable system. As to the statutory requirement that must-carry stations be carried without material degradation, the Commission found that a cable operator would not necessarily be materially degrading a DTV signal if it carries less than the full 19.4Mb/s transmitted by a broadcaster.

Channel location: The Commission found that there is no need to implement channel positioning requirements for DTV signals like those that exist for analog signals, and that channel mapping protocols contained in the PSIP data stream adequately address a television station's channel positioning concerns.

Set-top box availability: The Commission found that a cable operator is not required under the Act to provide subscribers with a set-top box capable of processing DTV signals for display on analog sets.

Carriage on PEG channels: The Commission found that carriage of digital non-commercial educational stations and digital LPTV signals on unused public, educational or government access channels, with the permission of the local franchising authority, is consistent with the Communications Act.

Basic tier: Importantly, the Commission held that DTV signals carried pursuant to must-carry must be available to all subscribers on a basic service tier.

DTV station granted must-carry rights

In a related decision, the FCC ruled that a Florida digital-only television station is entitled to mandatory carriage rights on cable systems in its local cable market. The FCC granted the station's carriage request and ordered that as a transitional matter the station could elect whether its signal would be carried in digital or analog format. If the station elects analog carriage, it must provide at its own expense equipment to the cable operators to convert the DTV signal to analog. ■

Dateline

Television stations in the following locations must file their biennial ownership reports on or before June 1, 2001: Arizona, Washington D.C., Idaho, Maryland, Michigan, Nevada, New Mexico, Ohio, Utah, Virginia, West Virginia and Wyoming.

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

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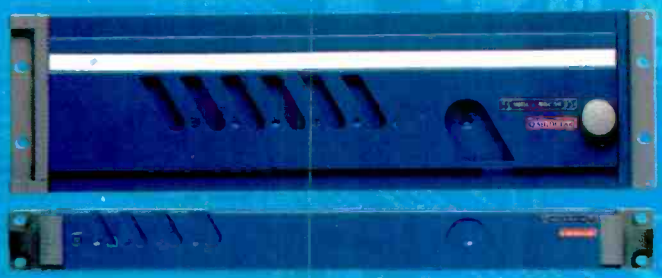

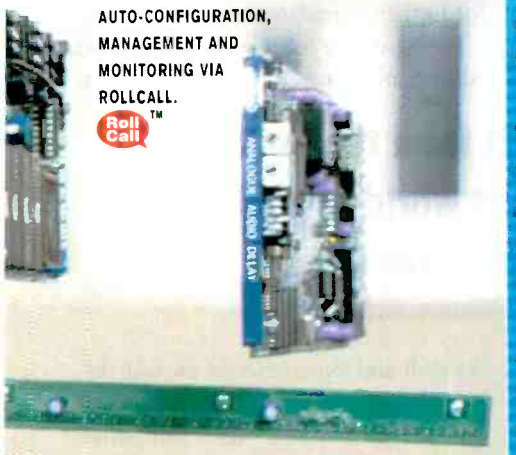

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Preparing video for the Web

BY DAVE ABBOTT

Broadcasters face a number of variables as they select a technical solution to deliver video assets over the Internet. Broadcasters must consider streaming formats, data storage strategies, live streaming vs. video-on-demand strategies, reporting techniques, encoding bit rates, ad serving, costs and bandwidth. By closely examining the options available for anyone looking to make local-content Web channels available, many of the difficult decisions can be demystified.

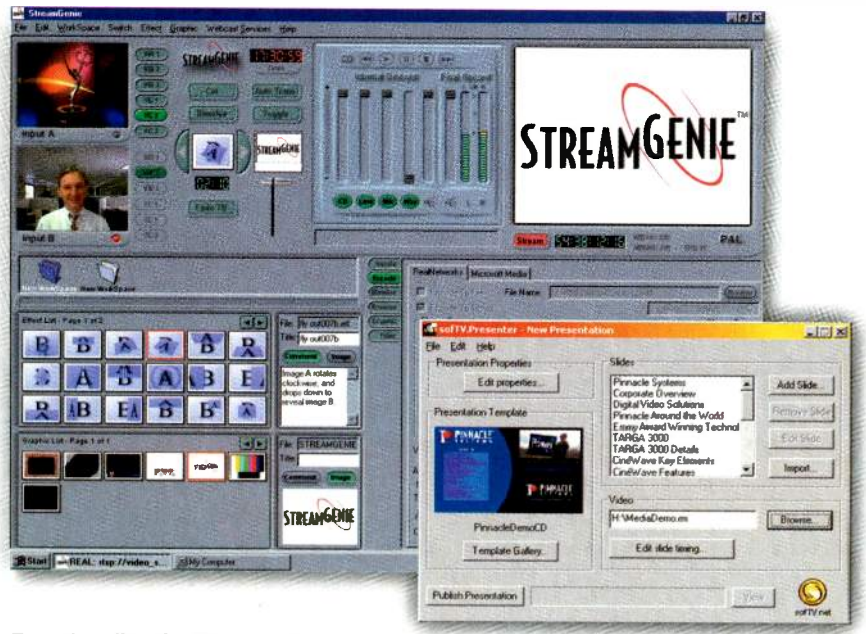
The process of making video available on the Internet is in two stages for the purpose of this discussion: acquisition and delivery. Acquisition encompasses how the video is routed to the capturing system, edited and encoded into Internet-friendly formats. Delivery is just that – how the video stream is distributed to viewers. From acquisition to delivery, it is critical that expectations are shifted from the quality expected in the broadcast world to what is acceptable to an Internet viewer. A great deal of money can be spent trying to improve quality at each step of this process – quality that after encoding for delivery is hardly distinguishable. Consider that fact in any discussion of the economical methods of bringing video to the Internet.

The first questions to ask during the acquisition phase concern the daily workflow for the video handlers and what sources of video will likely be used. In one model, a journalist receives video from several sources, including line-level feeds, RF and tapes in various formats. As newsrooms migrate to digital platforms, there is access directly to the video servers as well. In this model, it is key to ensure the quality of the input signals – a good, clean RF feed works well. If encoding bit rates are going to be below 200K, there is no difference between line-level input and RF. Even at 300K, the differences are minimal. If the input signal is not clean, the quality will only worsen as acquisition proceeds, and nothing can be done to compensate for further degradation in quality.

Expectations should shift from the quality expected in the broadcast world to what is acceptable to an Internet viewer.

The selection of the encoding and editing platform is dependent upon the skill and experience of the individual who will be doing the encoding. If that person is not a video journalist, but instead is from the Web-publishing world, a consumer-grade video editing package should be used, as the individual will only be selecting entry and exit points in the clips to be encoded. The captured segments are encoded into an MPEG file as an intermediate step for reasons discussed below. However, if a skilled video editor is available, many broadcast-quality video editing packages are capable of publishing into multiple, Web-ready formats. In terms of quality and workflow, this is often the optimal solution and should be pursued if available.

Now that the video has been edited and captured, the final step of the acquisition stage is to encode it in a format for viewing on the Web. The two most popular streaming formats are from Real and Microsoft; QuickTime is a distant third. Encoding into multiple formats will allow more users to see the posted video, as not everyone is capable of viewing every format. Choosing an appropriate bit rate is key. Minimally, choose one that is modem-friendly — 28K or 56K — or that gives a higher-quality experience like 128K. If resources are available, 300K is a popular next step and



Encoders like the Pinnacle StreamGenie, shown above, allow broadcasters to reach larger audiences on the Web by encoding streaming content into multiple formats. Photo courtesy Pinnacle Systems.

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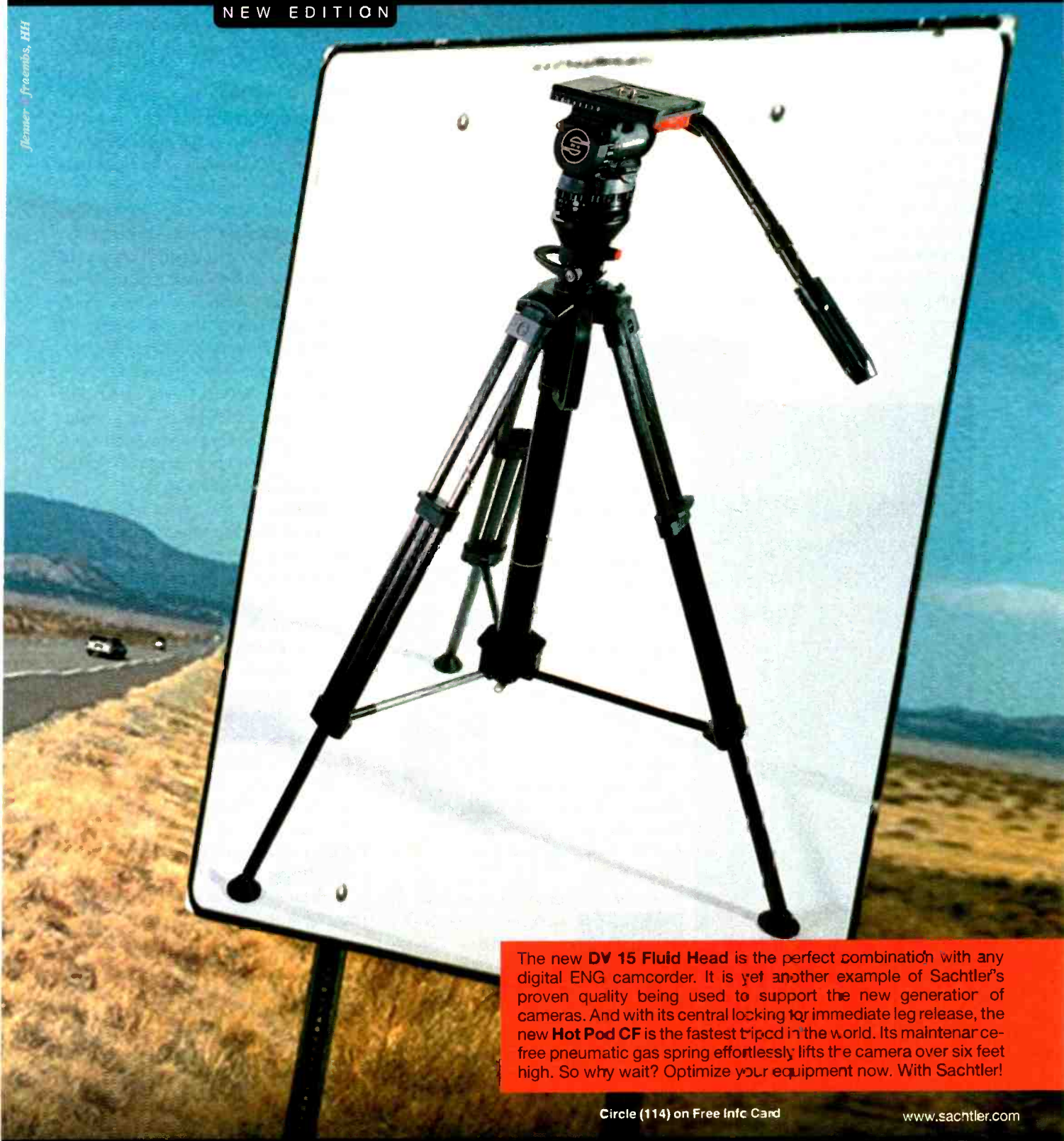

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yields strong results. There are clear cost trade-offs here: The higher the bit rates and greater the number of streaming formats, the more expensive it will be to create and serve video.

Delivery

The second step in publishing video to the Web, delivery, is the process of distributing encoded video to the public.

The most important technical aspects of choosing between serving video internally and outsourcing are access to reasonable bandwidth (routers and switches of adequate capacity as well), and the ability to load balance the video servers for scalability and reliability.

Serving video is expensive, as is the disk space to store it. It uses significantly more bandwidth than traditional Web serving, especially at higher bit rates. Whereas a single T1 can serve a number of Web pages, just 10 simultaneous video streams can saturate it, rendering an entire website useless if it is sharing the same bandwidth. IBS regularly sees five- to tenfold traffic increases on breaking news days, the same days that it is most important to be up and serving. It would most likely be cost prohibitive for a smaller bandwidth consumer to maintain the necessary overhead to cover large spikes in traffic. Shop around before taking on the ambitious project of internally serving; it is a consumers' market for outsourced serving of video. Many of these vendors have effective methods of delivery that will provide the user with a superior overall viewing experience.

Other considerations

There are other important issues related to video serving that complete the environment, including ad serving, traffic reporting and live streaming.

The ability to serve ads with the video streams is an important consideration to serving video, especially if it is part of the revenue model. In addition to several outsourced solutions, there are stand-alone packages on the market that are capable of inserting ads as well. Consider where in the video stream the ad is to be inserted, how buffering is handled and product scalability — not all products are created equal. Outsourced solutions will often prove most economical for low-volume applications.

Consider traffic statistics when creating a video-serving environment. Traffic reports (including streams served, average length of stream served, media player and abandonment rates) are helpful in characterizing video usage and identifying problems. The ability to measure server and network traffic is vital for capacity planning as well as for identification of trends. Several stand-alone monitoring packages and outsourced solutions are available.

Until this point, discussion has centered on video-on-demand vs. live streaming. The principles are the same: ensure a quality input signal, encode into as many formats as is practical and point the resultant streams at servers that will be available and can handle the load.

For broadcasters, making video content available for the Web does not have to be excessively expensive or complex. Key issues are to identify realistic requirements for video acquisition and delivery quality, reporting and ad serving that meet the individual broadcaster's budget and business requirements. While getting started, do not hesitate to outsource all or some of this process to not only to get serving video more quickly but to learn from the experiences of others, ensuring a successful implementation.■

Dave Abbott is chief technology officer for Internet Broadcasting Systems.

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Transition to Digital

Format conversion, Part 1

BY MICHAEL ROBIN

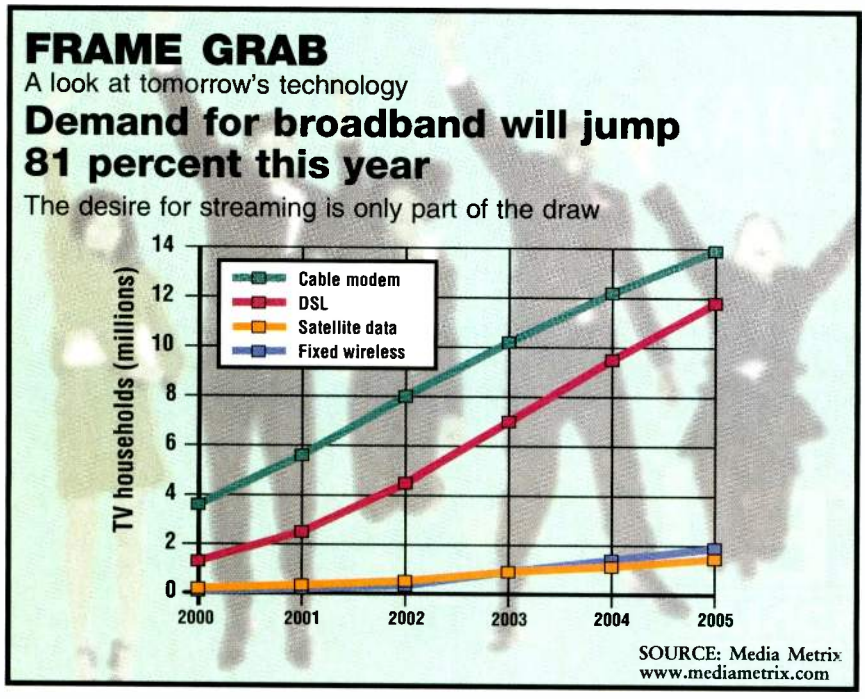
Motion pictures made between the late twenties, the advent of sound on pictures, and the early fifties, the advent of widescreen pictures, share two main characteristics:

- Horizontal vs. vertical picture dimension ratio (aspect ratio): After experimenting with various aspect ratios the motion picture industry settled on a 1.37/1 aspect ratio called the Academy format. This aspect ratio was reduced to 1.33/1 with the advent of sound on film.
- Number of acquired pictures per second (picture frequency): The chosen picture frequency is 24 images per second. This satisfies the eye requirements with respect to recreating the illusion of movement. To satisfy a related eye requirement, critical flicker, each stationary picture of the sequence is projected twice, resulting in a "refresh rate" of 48 cycles per second. This is a compromise between the human vision system requirements and financial constraints related to film length.

When the basics of practical television were developed in the 1930s, the chosen aspect ratio was 1.33:1 (4:3) to match the contemporary film aspect ratio. While this choice resolved the picture format compatibility with the dominant film technology of the time, the chosen picture repetition rate aimed at satisfying different requirements. On both sides of the Atlantic the need was felt to relate the picture repetition frequency (refresh rate) to the power line frequency. For all sorts of historical reasons this was 50Hz in Europe and 60Hz in North America.

With the advent of color television, North America felt the need to alter the frame-repetition frequency. We still live with the consequences of this decision.

Transmission bandwidth constraints dictated the use of interlace scanning, and the result was 25 frames per second (50 interlaced fields per second) in Europe and 30 frames per second (60 interlaced fields per second) in North America. With the advent of color television, North America felt the need to alter the frame repetition frequency t0 29.97 frames per second (59.94 interlaced fields per second). The reason was relatively simple: Given the nonlinear distortions of the television transmitters and receivers of the time (1953) it was feared that the sound carrier (4.5MHz offset from the vision carrier) might generate interference products with the chrominance subcarrier (3.579...MHz) resulting in a spurious 920kHz interference that would be quite visible. The NTSC color subcarrier has a value related to half the horizontal scanning frequency (Fsc = 455/2 Fh) and to the vertical scanning frequency and thus achieves low visibility due to a process of line-to-line phase reversal. By making the 4.5MHz intercarrier spacing a multiple of Fh/2, the 920kHz interference visibility would also benefit from the line-by-line phase reversal. Since the FCC opposed the change of the carrier spacing the only way out was to change the horizontal and vertical scanning frequencies. So we ended up with Fv = 59.94Hz instead of the original 60 Hz and with Fh = 15,734.25Hz instead of the original 15,750Hz.This had no influence whatsoever on the television



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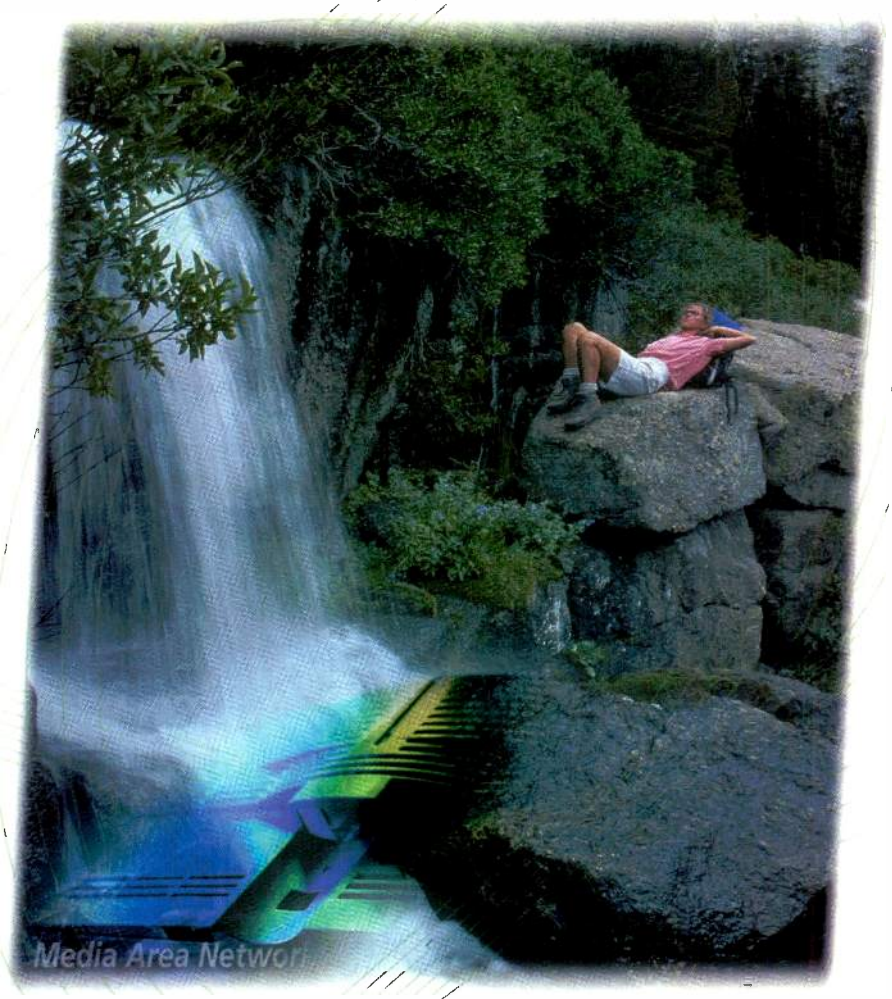

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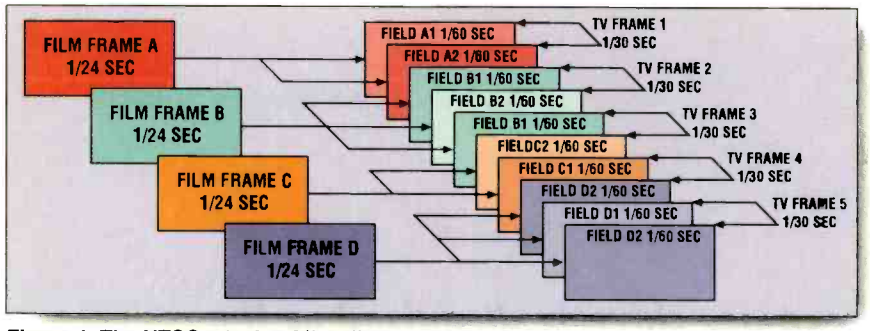

Figure 1. The NTSC telecine 2/3 pull-down process

receiver's synchronizing ability but played havoc with future studio operations. We still live with the consequences of this decision.

Transferring film to video

With PAL or SECAM, featuring 25 frames per second (50 interlaced fields per second), transferring film to video is usually achieved by running the film at a slightly increased speed (25/24 = 1.04166...). This shortens the duration of the projected movie slightly, which is relatively acceptable, and raises the reproduced sound pitch, which is mildly annoying.

NTSC video required a different approach. It is evident that it would be totally unacceptable to run film at 30 (or 29.97) frames per second. The solution adopted is based on the fact that 30 (television frames per second) and 24 (film frames per second) have a common denominator, namely 6. Essentially four frames projected at a speed of 24 frames per second take the same amount of time (4/24 = 1/6 sec) as five television scanning frames at 30 frames per second (5/30 = 1/6 sec). Thus if the image is scanned completely five times while four film frames are passing through the projector the two systems maintain synchronism. The relationship is maintained if one film frame is scanned with two television fields (2/60 sec), the next film frame with three fields (3/60 sec) and so on. This method is called the 2/3 pull-down. While this solution was adopted before the advent of NTSC color, with its modified scanning rates (29.97 television frames per second) it works equally well with the slightly reduced frame rates. Figure 1 illustrates the NTSC 2/3 pull-down process as follows:

- TV frame 1 contains two fields of the first (A) film frame;
- TV frame 2 contains two fields of the second (B) film frame;
- TV frame 3 contains one field each of the second (B) and the third (C) film frames;
- TV frame 4 contains one field each of the third (C) and the fourth (D) film frame; and,
- TV frame 5 contains two fields of the fourth (D) film frame.

"This film has been formatted to fit your screen"

The methods described above worked well until the early 1950s. By then there were about 15 million television receivers in use in North America. This created apathy among potential moviegoers, who preferred to stay home and watch television. The movie industry reacted by enhancing the movie watching experience visually, by using various widescreen formats as well as color, and aurally by multichannel sound. This resulted in a variety of aspect ratios requiring the widening of the screen. Table 1 lists some of the formats in existence and their characteristics.

While the variety of available formats is impressive, equally impressive is the fact that there are currently some 250 million NTSC television receivers in North America, all with a 4/3 (1.33/1) aspect ratio picture tube. It is therefore debatable whether the widescreen movie formats have made moviegoing more popular than television watching. While movie houses could adapt fairly easily, at a cost, to various film aspect ratios, television broadcasting had relatively few, and generally unsatisfactory, choices. These were:

- **Avoid transmitting widescreen films.**
- **Use the horizontal cropping method.**

Figure 2 shows the manner in which a 16/9 (1.77/1) aspect ratio picture is cropped on both sides to extract a central window that fits into a 4/3 raster. In the *pan-and-scan* mode, the

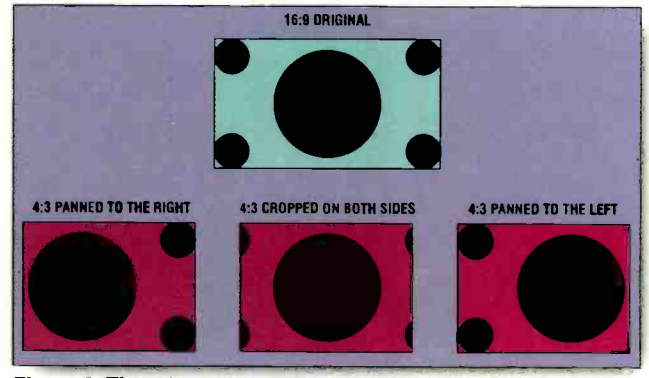

Figure 2. The edge crop mode.

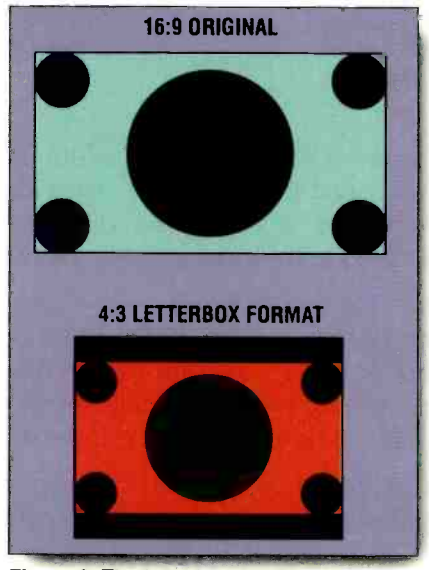

Figure 3. The letterbox mode.

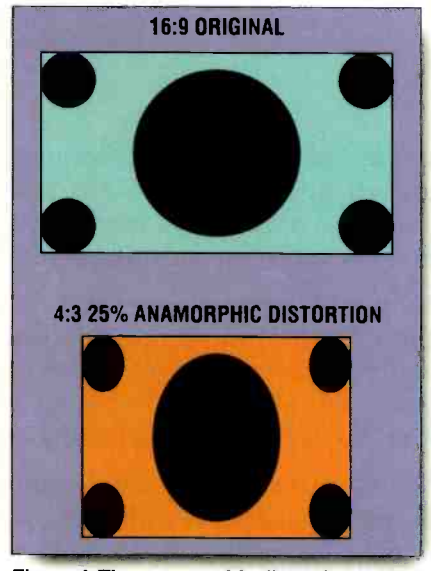

Figure 4. The anamorphic distortion mode.

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FORMAT	ASPECT RATIO
ACADEMY	1.33/1
CINERAMA	2.65/1 to 3/1
CINEMASCOPE	Initially 2.55/1 and later 2.4/1
SUPERPANAVISION 70	2.76/1
ULTRAPANAVISION	2.76/1 (65 OR 70 mm prints) or 2.35/1 (35 mm prints)
PANAVISION	Initially 2.35/1 and currently 2.4/1
VISTAVISION	Approximately 1.85/1
TODD-AO	2.2/1 during filming and 2.35/1 on 70 mm print
TECHNIRAMA	2.2/1 (on 70 mm prints) OR 2.35/1 (on 35 mm prints)
SUPER 35	2.45/1 filmed anamorphically

Table 1. Contemporary film formats.

operator moves the central window in the horizontal direction to follow the main action. This is the most common approach in North America. Evidently, given the variety of formats, films cannot be projected directly on-air. Specialized production houses transfer film on videotape using skilled operators occasionally directed by a producer familiar with the original film producer's intent. By necessity, some details of the picture will be dropped so there will be a definite loss of picture information. On the other hand, the screen will be completely filled. This method is popular in North America. The film's releasing agency is usually motivated to inform the TV viewer that "This movie has been formatted to fit your screen." Viewer beware.

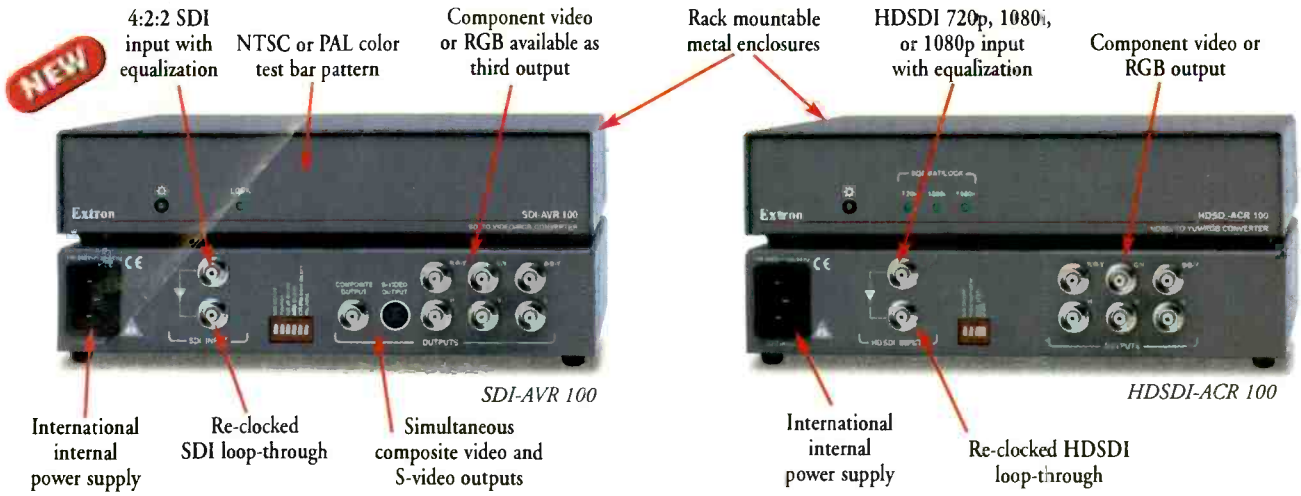
• **Use the letterbox method.** Figure 3 shows the manner in which a 16/9 aspect ratio picture is reduced vertically and horizontally to fit inside a 4/3 aspect ratio window. The process generates black bars at the top and the bottom of the picture. The thickness of the black bar depends on the aspect ratio of the film. *Letterboxing*, as it is commonly called, reduces the vertical resolution because the black bars reduce the number of active scanning lines. This method is generally used in France and Germany and is shunned in the U.K.

• **Use the anamorphic distortion method.** Figure 4 shows the manner in which a 16/9 aspect ratio picture is squeezed horizontally to fit inside a 4/3 aspect ratio raster. This method results in anamorphically distorted shapes. In North America this method is used in the beginning and end of the movie to allow showing all the credits, many of which would be masked by the pan-and-scan process.

In the next month's article we will discuss the implications of the ATSC/DTV digital standards and the scanning format conversions usually encountered. ■

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

Send questions and comments to: michael_robin@intertec.com



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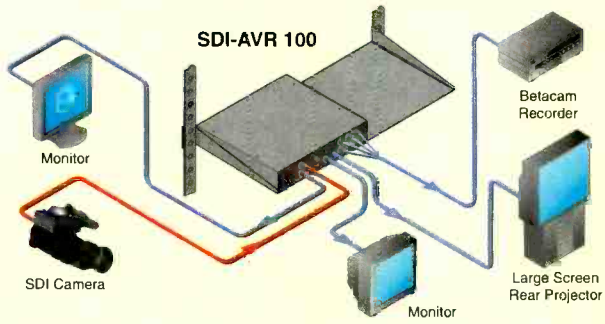

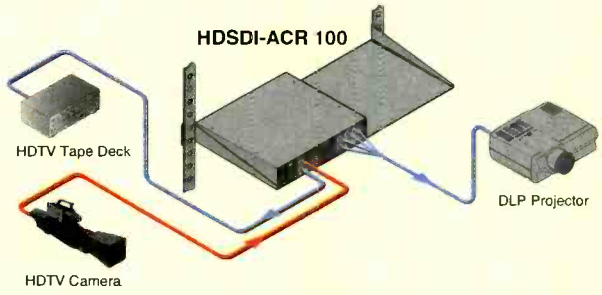

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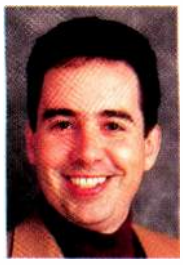

Storage area networking

BY BRAD GILMER

Storage area networking is one of the hottest topics there is. Storage area networks (SAN) promise to increase creativity and productivity by allowing users to share content across multiple systems. At its heart, a SAN is a pool of common virtual storage that multiple processors can share as if all the storage were local. A SAN can consist of local storage on a number of machines, centralized storage or a combination of both. Unlike a traditional network, a SAN does not involve file transfer. When users gain access to shared content, they are not making a copy of the content on their local storage, nor are they attaching a file system to their local box. To the user, it appears as if the content resides on their local system, regardless of where the content is physically stored. Furthermore, the SAN operates separately from a local area network (LAN), so storage-related functions do not slow normal "network" LAN traffic.

Unfortunately, the SAN had a somewhat troubled start, largely because it is based upon technology and standards that needed some "wrinkles" ironed out. While there are still some compatibility issues, these problems are much better understood.

The SAN consists of three basic components: an interface (like SCSI, Fibre Channel or ESCON), interconnects (switches, gateways, routers or hubs), and a protocol (like IP or SCSI) that controls traffic over the access paths that connect the nodes. These three components plus the attached storage devices and servers form an independent storage area network.

SANs had a troubled start, largely because they were based upon technology and standards that needed some wrinkles ironed out.

While the SAN supports a number of interfaces, Fibre Channel (both Fibre Channel Arbitrated Loop [FC-AL] and Fibre Channel fabrics) has gained the limelight due to its flexibility, high throughput, inherent fault-tolerant access paths and potential for revitalizing network-to-storage communications. In most, but not all, SAN implementations, Fibre Channel serves as a sort of shared "SCSI extender" allowing local systems to treat remotely located storage as a local SCSI device.

An important issue to consider in designing SAN systems is fault tolerance vs. high availability. Because you are using the same storage system for a number of clients, a failure in the storage system can have serious effects in your organization. Fault-tolerant systems are designed to be resistant to faults, so a single fault will not typically cause a total system failure. Dual power supplies, redundant disks or RAID, dual disk controllers and automatic changeover software are some of the design components typically included in fault-tolerant systems. These systems are designed as a single unit or a set of interconnected units. They are sold as a system and may be expensive. Many fault-tolerant systems are designed so that the only way you know there has been a failure is by checking status monitoring and alarms. The hardware and software quality-control procedures on fault-tolerant systems can be extensive.

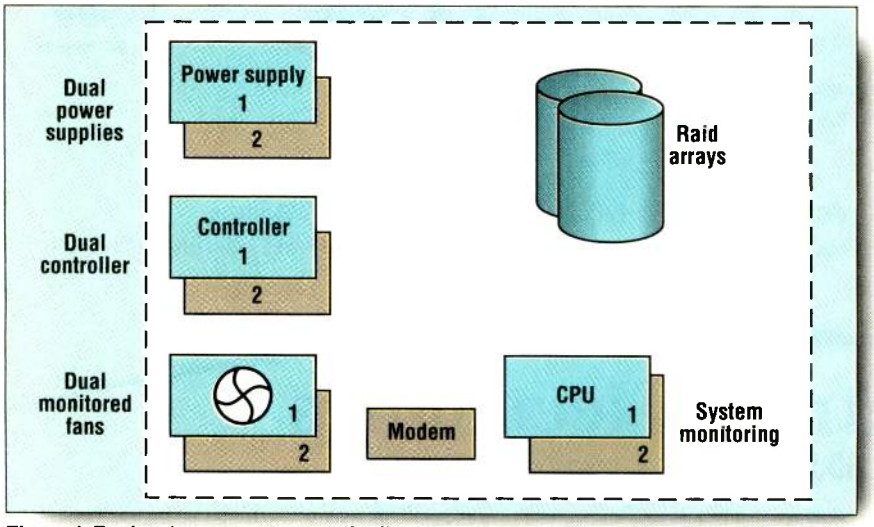

Figure 1. Fault-tolerant systems typically rely on dual subsystems to reduce or eliminate downtime.

One thing to be aware of is that fault-tolerant systems typically come with 24-hour support that is geared for the IT and business world. This support can be costly, but it can be very thorough, with capabilities such as "phone-home" monitoring. With phone-home monitoring, the system can call into the support center when errors are detected, and the support center can call into the system for diagnostics and upgrades.

Another approach that can be much more economical, but which may or may not provide the same protection from failure, is that of *high availability*. With high availability, the strategy is different. The point is not to prevent failures, although high-quality components can be used. Instead, a designer

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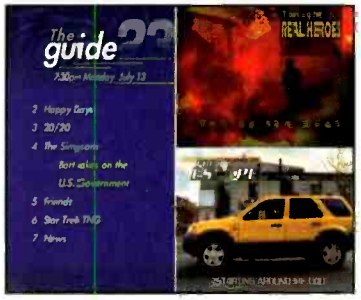

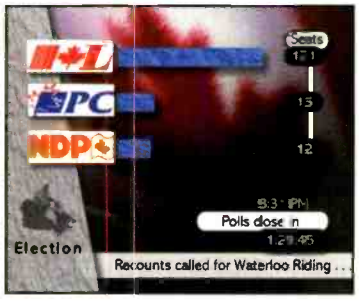

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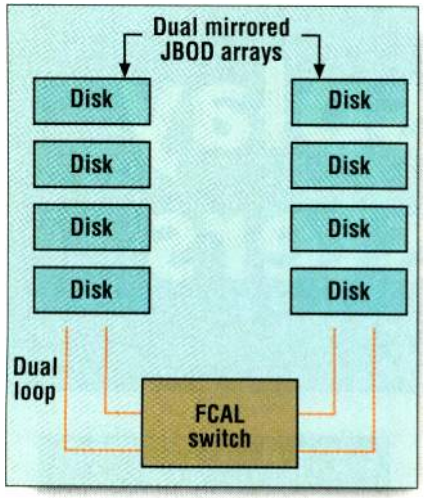

Figure 2. High-availability systems typically feature two completely separate JBOD (Just a Bunch of Disks) arrays connected by a Fibre Channel arbitrated loop switch.

uses off-the-shelf components to design a system such that a single failure has little impact. An example might be to design a network with two completely separate Ethernet systems. The servers and clients might have two Ethernet cards in them instead of one. It might seem cumbersome to put together two completely separate Ethernet networks, but high availability takes advantage of the low price of consumer computer hardware. Ethernet is practically free these days unless you are talking about the really high-speed technology.

Do not get me wrong – high-availability systems are typically also very well engineered. They can provide excellent recovery from faults and may provide a lower overall system cost than fault-tolerant systems. High-availability systems may have a higher fault rate than fault-tolerant systems, although this depends entirely on decisions made by the system designers. The bottom line? Fault-tolerant systems may indeed be more "fault tolerant" than high-availability systems, but there is a cost associated with this. It is up to the user to decide if it is worth the expense.

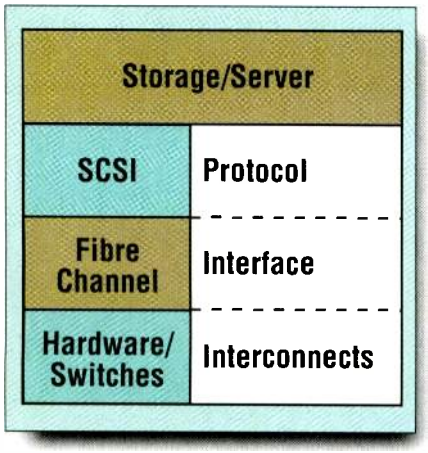

Figure 3. An example SAN might use SCSI protocol, a Fibre Channel interface and hardware/switch interconnects.

The decision between fault tolerant and high availability may be as much philosophical as it is economic or technical. Some users feel much more comfortable with systems that are designed as a whole and have IT-type support. Others feel more comfortable with systems built out of readily available components that they can easily see and understand. When considering SAN systems and the issue of reliability, be sure to think about your philosophy and buy the appropriate solution.

As I said before, SANs allow multiple users to share the same data. With a SAN, you can have one remote storage location, or several locations, including local disk. SANs raise some interesting design issues. For example, if SAN data is not stored in a particular location, how can it be adequately backed up? Some SAN solutions automatically create two copies of any newly ingested material. The system makes sure that the same data is not stored in the same location. Other SAN systems stripe the data across multiple systems. If one server's local storage becomes unavailable, the SAN recreates the data using well-understood parity algorithms. In any case, it is important that users understand how their SAN data is protected and what the cost of this protection is in terms of disk storage.

If the SAN is grown in an unplanned way, its overall bandwidth can be exceeded under peak conditions.

Another issue in SAN design is bandwidth. How do designers of SAN systems ensure that the SAN does not fall over if all users on the SAN request data simultaneously? Simple – first, they design the bandwidth of the SAN so that it has extra capacity. The extra capacity assures that the SAN keeps functioning even in times of extremely high demand. Some might argue that this is wasteful and drives up cost. The fact is that high-speed network hardware is falling in price and is now such a small part of the total system price that this is no longer a consideration. Second, they insist that connections to the SAN be carefully controlled. If the SAN is grown in an unplanned way, its overall bandwidth can be exceeded under peak conditions.

If a SAN is so great, why doesn't everyone use one? Storage area networking has a few challenges. First, it does not work well in a multivendor environment. Why? Because the standards for SANs do not address the issue of file interchange. Just because you can transfer a file from one vendor to another does not mean you can play it. SANs exist pretty much as single-vendor solutions.

Second, SANs may turn out to be more expensive when you are looking for a server system that has a low number of I/O channels but lots of storage. Finally, a SAN may not be the way to go if you are looking for a small system. Generally, simple stand-alone systems are less expensive.

So where do SANs make the most sense? SANs are best used in larger systems where users want many I/O channels and they all want to access the same content. As storage prices fall, building one server with a huge amount of storage is not a problem. However, I/O still requires bandwidth inside the server. There are two common strategies for dealing with large I/O requirements. One is to build a large server with what amounts to a router inside it; the other is to connect a number of smaller I/O devices to a network. That is what the SAN does. It allows one to grow a network efficiently, without having to upgrade boxes. ■

Brad Gilmer is executive director of the AAF Association, technical moderator for the Video Services Forum and president of Gilmer & Associates, a technology consulting company.

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Commercial insertion

BY STEVEN M. BLUMENFELD

At this year's NAB, it was hard to see people who only last year were talking about retiring to a beautiful home on the beach in some exotic location. Stock options were the talk of NAB2000, but here we were, only a year later and the bubble had burst for most, especially those in the world of Internet streaming media. In today's streaming media environment, revenue is king and near-term profitability is the Holy Grail.

Almost every Internet business model, especially those that did not make sense, based their entire revenue stream on money from the hundreds of advertisers that were going to flock to their site. While reading through many business plans, I often wondered about the sheer quantity of businesses that staked their livelihoods on the few advertising dollars spent on the Internet. Especially because a vast majority of those dollars went to relatively few companies.

Some basic assumptions about advertising in the Internet age have changed over the past few months. It is no longer enough just to bring advertisers eyes and/or ears. They are demanding qualified and clearly segmented audiences. Given the current market economics, commercial insertion and profiling technologies are on the rise in the streaming media world.

Targeted delivery

Unlike in broadcast, the cost of providing Internet content increases based on the number of people who tune in to your stream and how long they stay with it. To increase revenue, a few companies have begun to see the value of offering systems that support real-time dynamic ad insertion. Targeted ad-insertion systems allow ads to be inserted over local spots based on user profiles. These systems increase advertising effectiveness via one-to-one marketing and give advertisers a built-in value add. Because these systems enable advertisers to better target audiences, for the first time what they pay for is actually what they get. The stations themselves are able to generate non-traditional revenue using their existing streaming infrastructure.

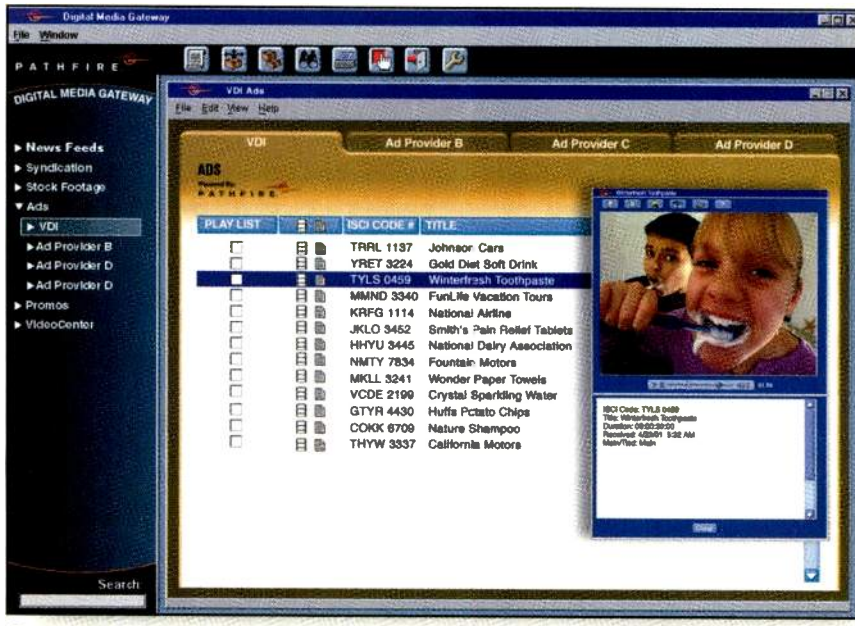
The iM IT system with IM tuning from IM Networks (formerly Sonicbox) is an example of a targeted ad-insertion system. The technology makes it easy to track revenue, gauge marketing effectiveness and adjust campaigns as needed.

It is no longer enough to bring eyes and/or ears to advertisers — they are demanding qualified and clearly segmented audiences.

When you install the iM IT software system at your encoder, it inserts flags within the stream that are controlled by the broadcaster and have a number of variables associated with them. They request specific content from the IM Networks streaming advertising insertion server. These targeted streaming ads are inserted in real time within your stream and delivered as a normal part of your online content.

The system also makes additional information such as part numbers available to allow easy integration within an e-commerce system. Currently most streams have an advertisement at the beginning, and sometimes at the end, but I have seen very few with real-time messages inserted within the stream. Just like TV ads, there is value in offering your message in the middle of desirable content.

Recently, Coollink Broadcast Network (CLBN) signed an advertising insertion and streaming agreement with Beethoven.com. CLBN will be providing targeted ad-insertion technology and Internet broadcast solutions. Through their DemoTrak system, they provide broadcasters and advertisers with a



Commercial insertion systems like Pathfire's, shown above, allow broadcasters to effectively target advertising to individual users. Image courtesy Pathfire.

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real-time audience profiling system. More importantly, the integrated system allows for on the fly update / insertion of content. That way, a marketing department can try various types of incentives and concepts and see immediately if they are working.

Dynamic content

In numerous past articles I have written about the value of content indexing and real-time retrieval. Now let's take this idea of real-time content insertion a step further. We have always been able to set up a playlist and then have those assets play out in a pre-specified order — similar to how it is done in the non-streaming world. However, the current playlist-type systems are at a fundamental disadvantage in that they are not dynamic. Streaming, unlike broadcasting, lends itself to real-time, dynamic content. The strength of streaming is its ability to offer multiple instantiations of the same content. Advanced technologies – both hardware and software based on the new MPEG-7 standards and products and services from companies like Convera and Virage — are likely to make standardized contextual indexing and retrieval a reality in the near future.

When we, the broadcasters, have the ability to profile our customers in real time, find specific content and insert it based on those profiles into real-time streams, we will undoubtedly be changing the face of streaming advertising.

As we are able to give users more of what they want, they will enjoy the experience more and return more often for longer periods of time. Thus driving up those stock prices and making NAB2002 even more enjoyable. ■

Steven M. Blumenfeld is currently the GM/ CTO of AOL - Nullsoft, the creators of Winamp and SHOUTcast.

A path for delivering digital content

BY NANCY INWOOD, ASSISTANT EDITOR

Internet and satellite technology is being used to change the way the television industry works. The efforts of Pathfire, formerly known as Video Networks, are changing the way the television industry works on a day-to-day basis.

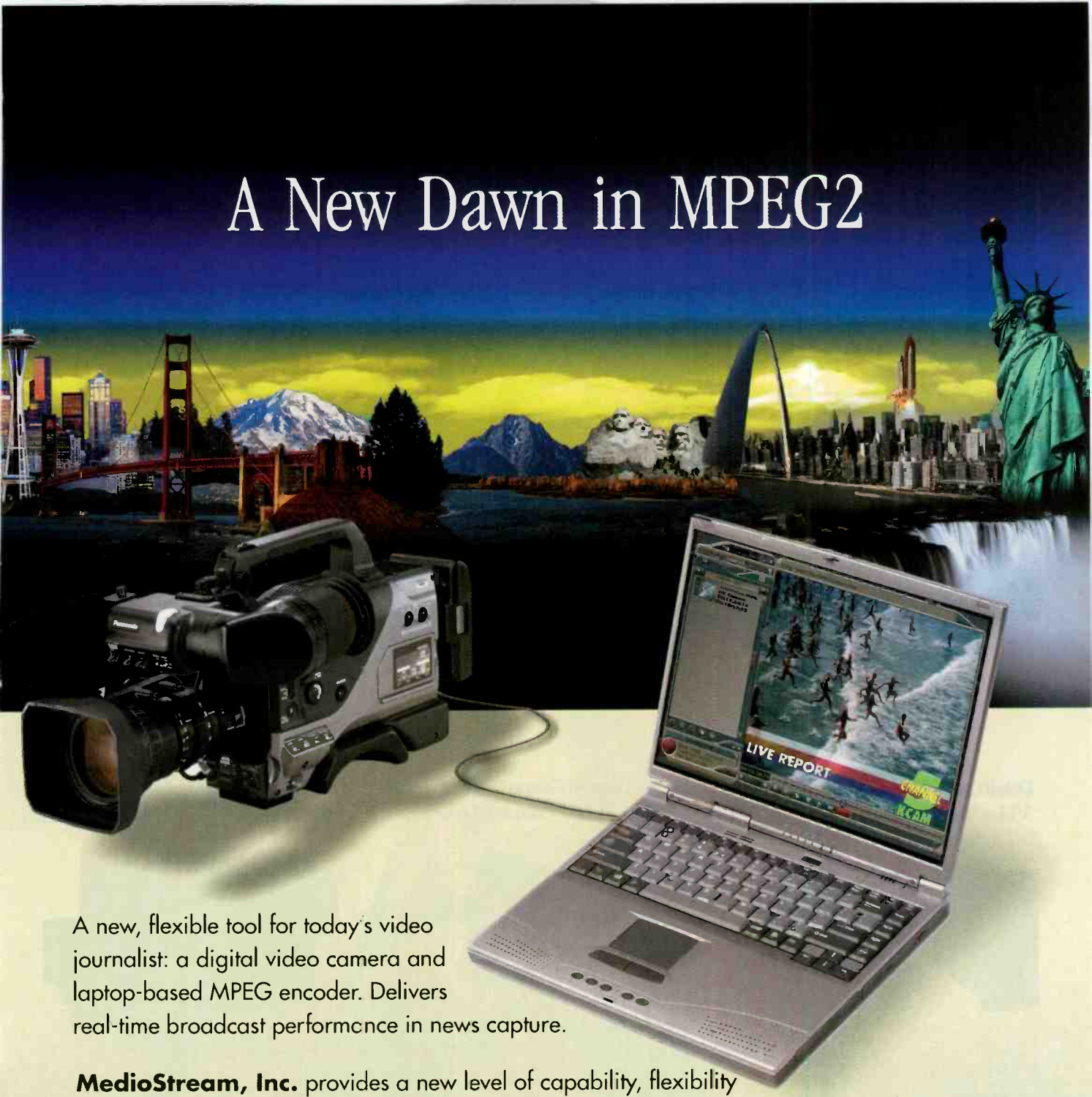
Pathfire's spot distribution system allows for digital distribution of ads and uses a Java interface to allow users to schedule spots, confirm or change distribution priority, confirm distribution progress, and archive spots for future use. The system also allows buyers and sellers to send and receive documents via the Internet, by letting their traffic and billing systems talk to each other — no matter which system each company uses.

Used by NBC and more than 200 of its affiliates, Pathfire's video-on-demand service is a digital content management solution that eliminates the need for manual duplication of tapes and costly physical delivery. Breaking news feeds are delivered digitally to each producer's desktop. The system is also a good choice for multiple systems operators who need an easy way to get content to cable headends.

Pathfire also offers an online syndication portal called VideoCenter. VideoCenter links video producers and content owners with users and viewers. Syndicators can use VideoCenter as a self-serve portal that allows them to purchase media tools, host streaming media, Webcast special events, transact business, share and trade content with partners, inventory and catalog assets, and get customer feedback.

Pathfire's services have already had a great effect on the television industry and offer the potential for use in other industries, including film and the Internet.

A New Dawn in MPEG2



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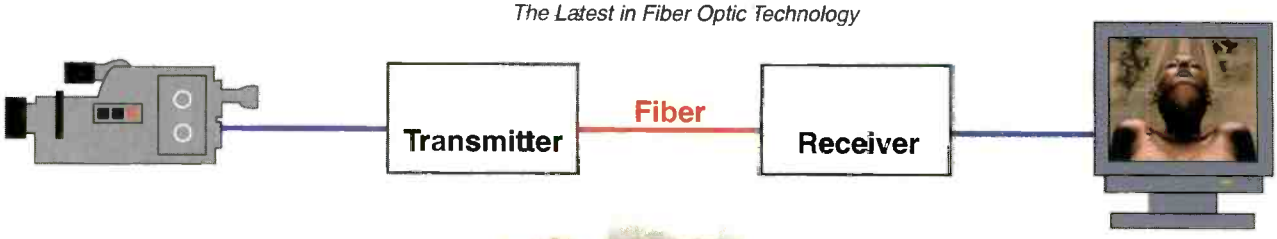

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SYSTEMS DESIGN SHOWCASE

JC Studios

rebuilding TV history

By Paul Stiegelbauer

When TeleVest was looking for a new home for its daytime drama "As the World Turns," we ran into a problem well known to anybody trying to find property in New York City: Space is extremely hard to come by. Through a combination of good timing and good connections, we were able to convert a Brooklyn, N.Y., NBC facility into JC Studios, the new site for "As the World Turns." The show had been shooting at the CBS-TV complex in Manhattan, but had to vacate the facilities there for several reasons, space being one of them.

JC Studios uses two 32-channel Aysis Air digital consoles to keep the entire production chain digital. Staff members showr above (from left to right) are Paul Stiegelbauer, director of technical operations; Ron Bernknopf, chief engineer; Frank DiMaulo, audio engineer; and Ed Dolan, senior audio engineer. Photo by Dave King.

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There are several challenges associated with converting a 13,000-square-foot film stage built in the 1930s and a 10,000-square-foot stage built in the 1950s into a modern broadcast operation, and we encountered nearly every one of them. We inherited essentially empty and outdated studios and had to start rebuilding from scratch. The only things that NBC left were two older SSL audio consoles in need of upgrading and an assortment of cabling and wiring. There was no documentation about any of the equipment they had used. So we had the infrastructure, but no idea where anything went. We were also faced with a tight time frame to complete our construction. We took ownership of the space in November 1999 and had to be on the air in January 2000.

We now have both studios up and running with new digital equipment in place that can easily support the migration to high definition. The studios are networked through two Solid State Logic Aysis Air consoles, which form the hub of JC Studios' audio operations.

The refurbishment begins

The first challenge was trying to use the infrastructure that was here, without any documentation, while staring at a deadline of two months to get two major studios operational and ready to tape.

The studio needed major upgrading. We were able to get the equipment we needed initially, with the idea that we would do the needed upgrades as time allows. We started by putting in all new cameras and tape machines, as well as microphones and mic booms.

The first challenge was trying to use the infrastructure that was here to get two major studios operational in two months.

There was no way we could purchase and install new audio consoles right off, so we got by with the SSL 6000 boards initially. They worked fine but were in need of updating. Also, we were building everything digitally, and these analog consoles didn't fit. The decision to go with the 32-channel Aysis Air systems was our first step in taking the entire production chain digital.

The new audio boards were a good decision for what we needed to do. The show is recorded AES/EBU and stays in that format until air. We have SSL Aysis Air Mixers in the studios and a Zaxcom DMX1000 in the edit suite. While the video in the studio is still recorded in NTSC on Digital Betacam VTRs, we don't lose anything in post because of the serial-digital video editing done there on the GVG-2200 switcher.

One of the best things about the audio installation is the small number of patchbays needed to upgrade to the new system. The old SSL 6000 mixers needed an input and output for everything. This took up about 16 patchbays under the old system. The new digital system requires only two digital and two analog patchbays in each studio. We were able to keep the old infrastructure lines to the studio to use if the need arises.

We had several preliminary meetings with the show, we observed several tapings and put together a list of what we thought was needed as far as broadcast production technology. We needed three microphone booms per studio, support microphones for backstage work, at least five RF combo mikes, effects mics and a variety of processing. We also had Dolby noise reduction units installed to eliminate any sort of air conditioning noise.

The existing facility also had cabling left over from the 1950s — coax with cloth coverings that was obviously outdated. We ended up replacing it with HD-ready cable, because the plan is to take the show high definition. Everything we've done has been with an eye on the future shift to high definition. Everything we're putting in now can be easily replaced. With the cameras, it's a matter of changing the

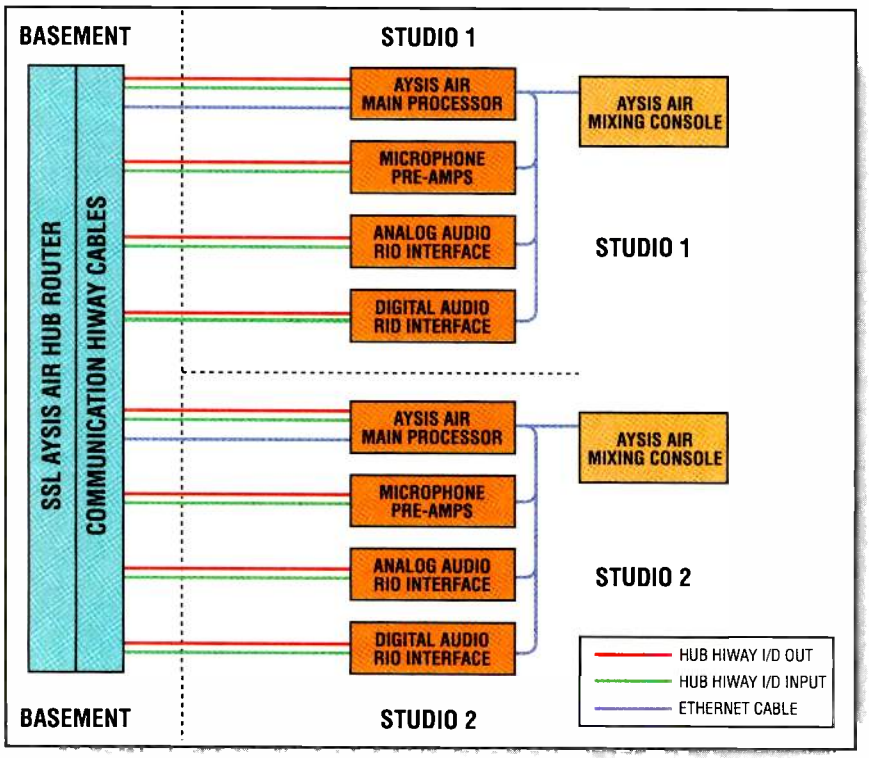

Figure 1. In the SSL Hub Hiway distribution, shown above, digital routing information sent to and from the components in the system allows inputs to go to any fader on either console.

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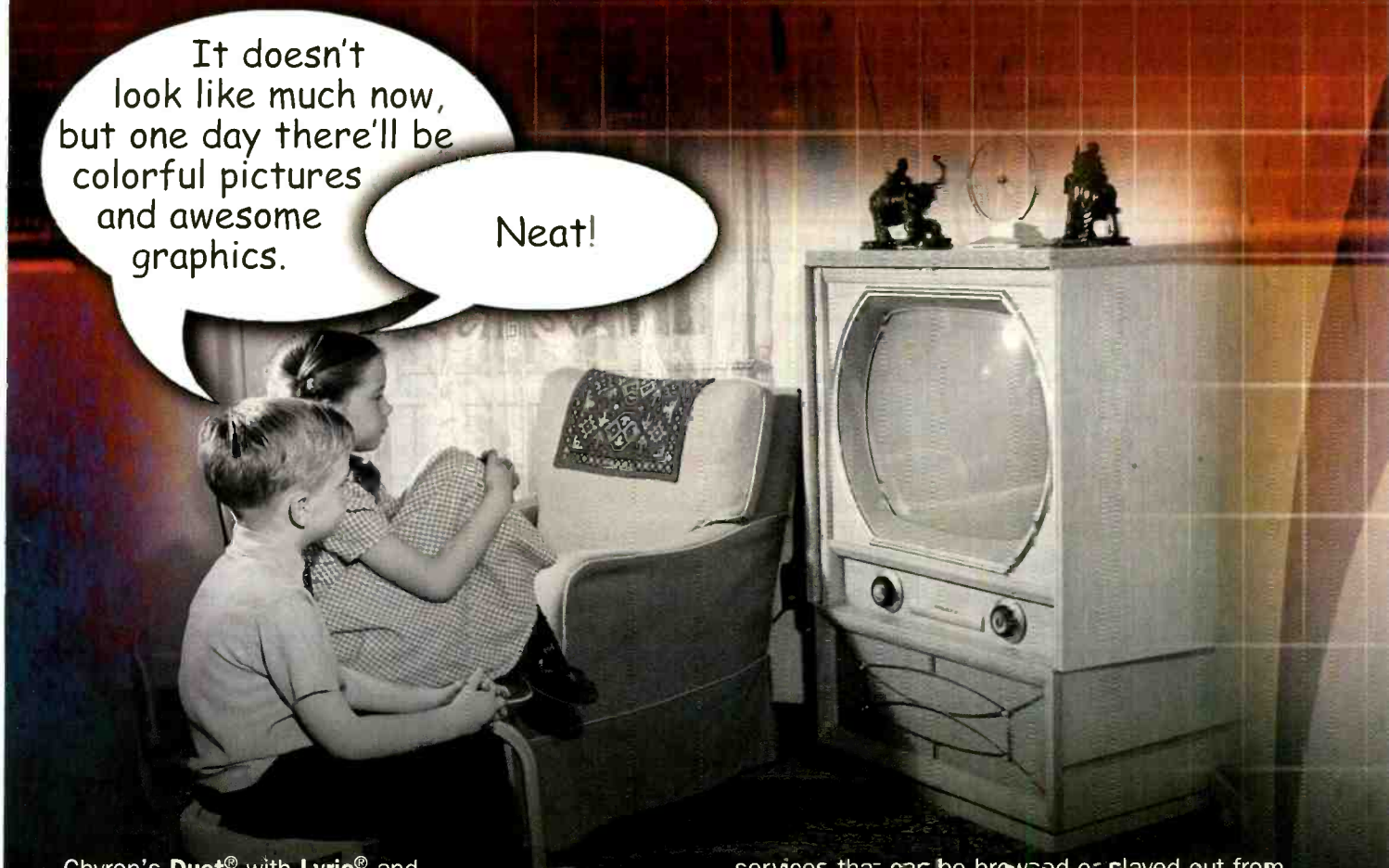

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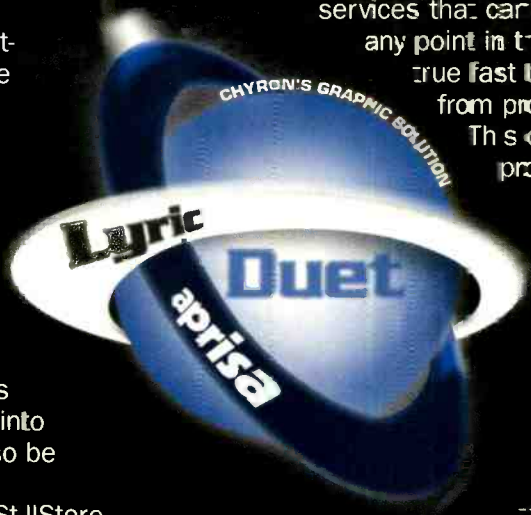

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camera heads and making a few minor modifications and then they're ready. With other equipment, it's more of an obstacle, however. Converting gear like switchers, distribution amplifiers and sync generators requires us to take one studio down for at least three months.

Another obstacle is trying to decide which HD format — 1080i or 720p — will emerge as the standard. The show doesn't want to transition to high definition until there is a clear-cut winner, but it's safe to say that we plan to upgrade when that is the case.

The transition will mean 12-hour or longer days for everyone. That's where the SSL Aysis Air consoles, with their hub networking capability through the SSL Hub Router system shown in Figure 1, become a significant factor. Network-ability was at the top of our list when it came to choosing consoles. Each has 32 channels, eight of which are stereo channels. The consoles essentially work as massive audio routers. This feature comes in handy since both studios are tied to "As the World Turns." There are many times when we use sets from both studios. Also, we shoot from Studio 2 in the morning while Studio 1 is being prepped for an afternoon session. Then while we're in Studio 1, Studio 2 is being made ready for the next morning. There are also times when we want to use the two studios at the same time to complete a segment, so we needed two consoles that would work together seamlessly and effortlessly.

Everything we're putting in now can be easily replaced, with an eye to a future shift to high definition.

The Aysis Air can pick up any source in either studio on either board because they are on the same network. It makes the audio end of things easy, eliminating the need for a lot of cross-patching. Or they can be broken apart and run independently, for example if one control room must be taken down. Both studios can be run off just one console. The design is also similar to the older SSL boards, which means that we don't have to re-train engineers. Our audio engineers were already familiar with the SSL 6000s, so their learning curve on the Aysis was minimal. Each channel has dynamics and EQ that is fully recallable, eliminating the need for external processing. One push of a button and we're back to the settings for the room and characters. The console's other features include equalization and filtering and the ability to have compressors and limiters on each input.

The new broadcast and video gear that was installed in JC Studios as part of the refurbishment includes 14 Thomson Digital Betacam DVWA500s, eight Ikegami 388W studio cameras, three Ikegami 388PW hand-held cameras, six Ikegami TM14-20R color monitors, 14 Ikegami TM20-20R color monitors,

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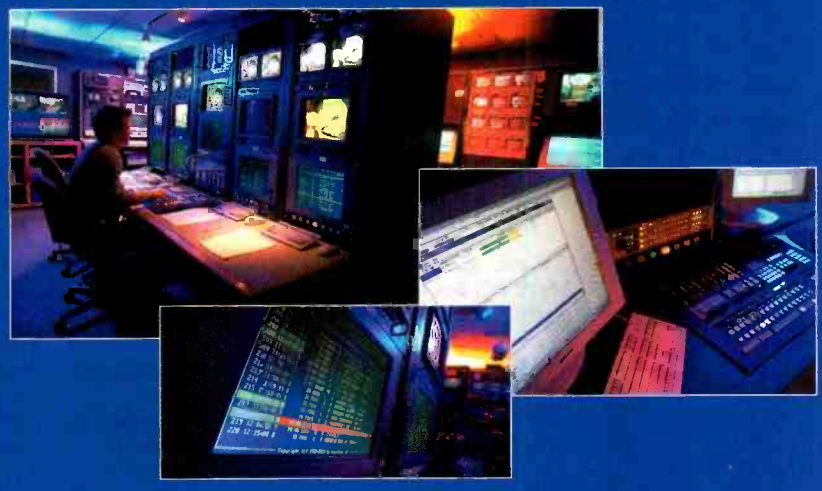

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Each studio also has the same complement of five cameras, and we have one swing camera. So we have 11 cameras that the show can access at any given moment. In addition to the two digital consoles, we have10 Digital Beta tape machines housed in a fully digital editing room that we built specifically for those machines. The video goes in analog to the tape machines, and at that point becomes digital. We edit and air fully in digital.

Another benefit of having both studios networked through the consoles comes when one facility is down for maintenance. We can still use that facility's studio; we just can't use the control rooms. We've put in video coax tielines between the studios so we can operate all 11 cameras out of one control room, if we need to. There are also times when we need to operate several sets from one studio into the other studio. It makes it a lot easier if we can just call up the boom mics from the active studio and tie them into the control room. Having the entire plant networked has made life much easier. It's also very time-efficient, allowing us to work essentially around the clock, since we can have three or four sets going up and down each night, depending on the storyline.

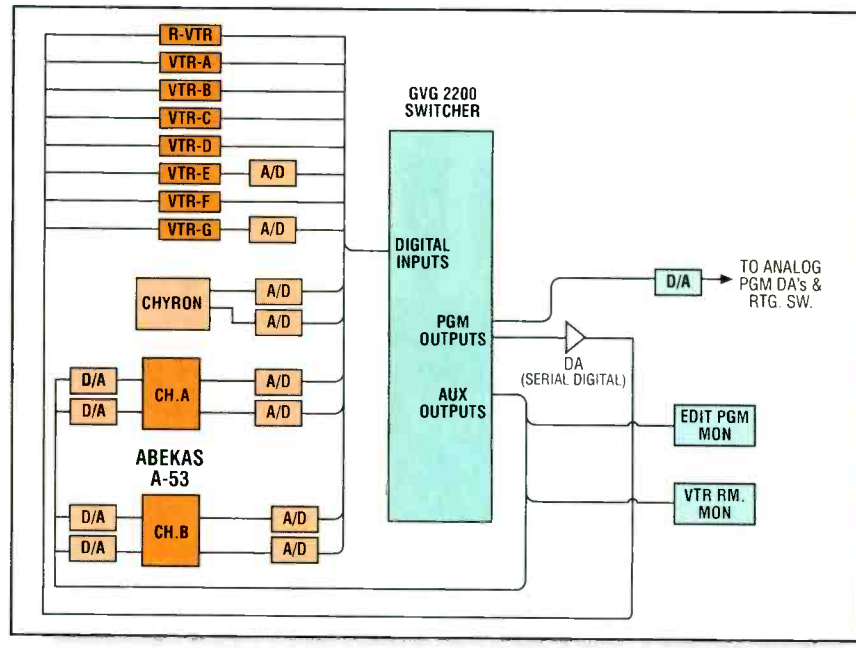

Figure 2. JC Studios utilizes DVW-A500 Digibeta VTRs, a GVG 251 editor and a Zaxcom DMX-1000 digital editing mixer in its online edit room, illustrated above. A converter feeds a GVG Horizon Router for analog duplication because the room still uses analog wiring.

JC Studios currently occupies an entire city block, as the entire show is taped on-site, including exterior shots, which are captured in the studio's backlot area. As it stands now, the entire show is taped — nothing is live — but we are thinking about expandability. ■

Paul Stiegelbauer is director of technical operations at JC Studios.

Equipment list

- Thomson Digital Betacam VTRs DVWA500
- Ikegami 388W studio cameras
- Ikegami 388PW hand-held cameras
- Ikegami TM14-20R color monitors
- Ikegami TM20-20R color monitors
- Canon Super 21 lens for studio cameras with full servo control
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Transmission & Distribution

Transmission lines revisited

BY DON MARKLEY

As we get deeper and deeper into the DTV world and transmission line systems are added or replaced, more errors are appearing. UHF isn't as forgiving as VHF, and tolerances that were acceptable in VHF result in bad systems at the higher frequencies.

The author and his staff have been experiencing a common problem in new installations. The standard way of getting around obstacles like tower legs or cross-members has been to simply add more elbows. That method still works, but has to be applied with caution. It is not enough to simply call your vendor of choice and order the required number of elbows. If your vendor tells you that is all that is needed, seek a new vendor immediately.

Elbows are like people. They don't mind working together, just not too close. When elbows are simply connected back to back, they have a tendency to introduce unwanted reflections in the transmission line.

Elbow complexes

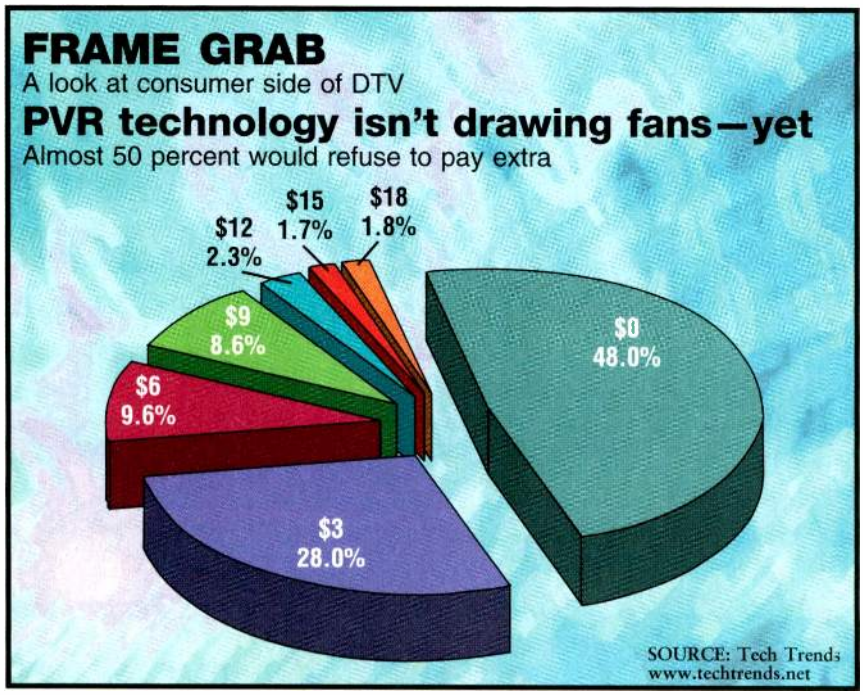
Placing elbows back to back seems to create mismatch problems that don't exist when they are separated by a length of transmission line. However, such systems can still be used. When it is necessary to use a complex of elbows, have the elbows optimized on the desired channel by the manufacturer. If possible, this should include all short sections of line that have been cut to fit your specific project. If the elbows have been properly optimized, adding a cut length of line in the final project probably won't be a significant problem unless the length is short and simply connects to another elbow.

Elbows are like people. They don't mind working together, just not too close.

An ideal approach is to first make sure that the elbows purchased are optimized on channel. Where two elbows are to be connected back to back, have them tuned and match marked in that configuration. If it is necessary to add a short length of line between them or from them to an additional elbow, any problems that result will be immediately apparent when the system is checked out after installation. By the way, don't even think of applying power to a new system without having it carefully checked out with a network analyzer. The author recently checked out a system that had been carefully assembled by a good tower crew. It was found that a piece of hardware had been dropped into the line and was resting on a Teflon insulator. If the line had been energized before that material was removed, a significant cleaning project would have been required and at least one piece of inner conductor probably would have had to be replaced.

If adding a piece of line into the system in the elbow complex appears to cause a problem, it is best to remove the complex, including the elbows and cut sections, and return the whole assembly to the factory. The parts should be match marked to show the factory the order in which they will be used. The assembly can be put back together at the factory and optimized as a unit. This will result in the best possible performance on site.

The biggest elbow complex is normally at the top of the tower where the line is connected to the antenna. It is common to see three or more elbows and some small cut sections at that location. Often, some of the small sections of line will have tuning slugs on the inner conductors to obtain the best match between the antenna, elbow



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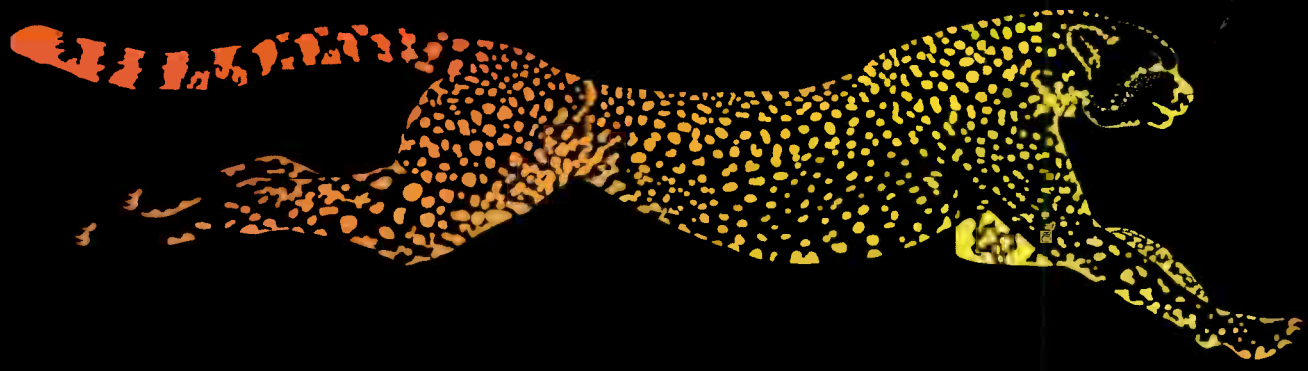

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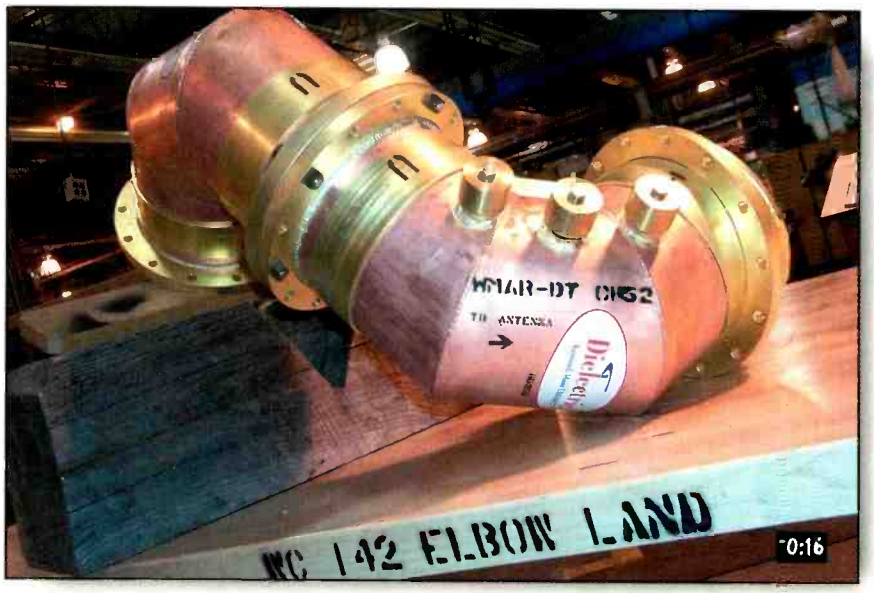

Especially at the top of the tower, elbows are often connected back to back, as shown above, which can cause mismatches in the signal. Photo courtesy Dielectric.

complex and main transmission line. Their location is critical. The components should arrive match marked, with the locations of the tuning slugs clearly identified. If this isn't the case, don't bother to install the system. Just send it back.

It is possible to do some tuning in the field if necessary. One way in which this is done is by adding slugs to the inner conductor of the coaxial line. This adds a reflection that can be used to cancel out an existing reflection. The size of the slug will largely determine the magnitude of the reflection and its location will determine the phase. The problem with using only rings is that they can cancel out a mismatch at one point in the channel and leave a problem at another frequency.

A solution is to place a sleeve on the center conductor that may have a lesser outer diameter than the ring but will exist along a greater portion of the line. The greatest problem here is that a box full of these little patches is necessary to solve the problem by experimentation. That is why the preferred method is to send the offending complex back to the factory. First, they have the necessary range of tuning pieces. Second, they can lay this all out on the bench to work on it rather than trying to add the tuning sections while hanging on the tower. Third, they do this all the time and can get the whole thing done while you are working up the courage to try it in the field.

Another problem is created when an elbow of unusual angle is desired. Normal shelves only contain 90-degree components. If a special angle is required, it will usually require special order and manufacture. Those parts, if needed, should always be optimized at the factory on the desired channel. Another solution to this problem is the use of semi-flexible transmission line. This has been found to be desirable in wideband systems where numerous elbows are necessary. Rather than use all those elbows, the overall performance of the system may be improved by using a hybrid system where the more complex paths are accomplished with semi-flexible lines and rigid line is used for the straighter runs up the tower.

All in all, obtaining excellent performance from a new transmission line system is a strong possibility. It requires some planning and careful coordination with the manufacturer and the installer. Or you can take your chances that totally off-the-shelf products won't cause the IOTs to come flying out of the cabinet when you turn on the transmitter. Let's see now – just how much does an IOT cost these days and just how does one explain that to the front office? ■

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

Send questions and comments to: don_markley@intertec.com

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Understanding OpenML and OpenGL interfaces

BY SHAWN UNDERWOOD AND THOMAS J. TRUE

The OpenML Media Library is a specification being developed by the Khronos Special Interest Group (SIG) (www.khronos.org) as a standard application programming interface (API) for digital media input and output. OpenML has its basis in dmSDK, the third-generation digital media API from SGI. The Khronos SIG is composed of a number of the leading media-centric companies in the computer hardware and software industry. The Khronos SIG is dedicated to creating an open, cross-platform environment to make the creation and delivery of video-rich, dynamic media faster, cheaper and easier.

Creation of the Khronos SIG

In January 2000, representatives from several companies gathered in a hotel outside of Boston to discuss the need for a standard specification to effectively integrate and synchronize video, graphics and audio in a single schema across platforms, operating systems, hardware devices and software applications. Following that meeting, the Khronos SIG was formed and announced at NAB 2000. At that time, the group stated its objective to have the first release of the standard available in 12 months. At this year's NAB, the Khronos SIG will unveil version 1.0 of the spec and hold a special developer briefing to review the technical details and answer questions about implementing the OpenML standard.

OpenML addresses the need to support platforms at a low level while retaining the ability to interface to higher-level APIs.

There are nine promoters in the Khronos SIG: 3Dlabs, ATI, Discreet, Evans & Sutherland, Intel, Nvidia, SGI, SONICblue and Sun Microsystems. Companies may also join Khronos SIG as contributors or adopters.

Overview of specification

Background. In the current digital media programming environment, developers are required to deal with different APIs for video, audio and graphics across each platform they support. Although several APIs are available that deal with more than one component, they are limited to support for a small subset of platforms. Or they may support a large set of platforms but exist at a higher level such that it is impossible to tune the application to take advantage of feature-rich hardware. Enter the need to support platforms at a low level while retaining the ability to interface to higher-level APIs for use in less performance-critical situations. OpenML and its brother OpenGL address precisely that need. The two libraries communicate with each other at the device-driver level in order to efficiently utilize system resources, achieve maximum performance and throughput, and properly synchronize digital media streams with graphics output.

Framework. OpenML is designed to work in partnership with OpenGL, the window system and other device control libraries to form a complete digital media environment for applications. In this conceptual framework, applications use standard interfaces to access the available hardware devices in a system. Here, OpenGL and the window system control the 2D and 3D graphics hardware within a system, while ML controls the video and audio input and output hardware within a system. As illustrated in Figure 1, applications can make ML calls directly or make calls to higher-level libraries that in turn call ML functions. ML then interfaces to the device-specific dm modules for each hardware device. The end result of this architecture is that applications are sheltered from non-portable, device-specific code.

Architecture. The ML interface is built around an application memory-centric model. In this model, all memory buffers received from and sent to video and audio devices are allocated and managed by the application. This feature provides maximum flexibility for memory management within an application. One result of this flexibility is that buffers containing video data can be sent directly to the graphics subsystem without requiring a time-intensive

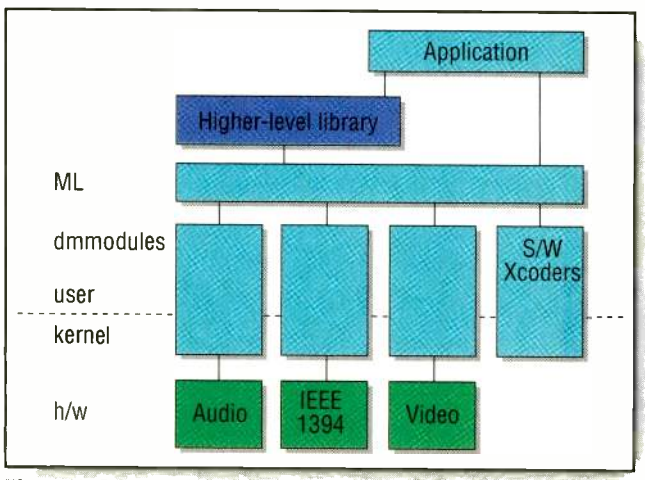

Figure 1. OpenML Framework. ML controls the video and audio input and output hardware and interfaces to device-specific dmmodules for each hardware device within a system.

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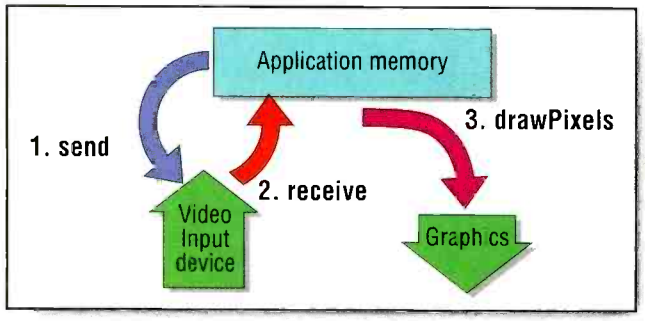

Figure 2. Application memory-centric model for ML interface. In this model, all memory buffers are allocated and managed by the application.

buffer copy. This is illustrated in Figure 2.

Another key feature of the ML is asynchronous communications between application and video and audio devices. In this model, applications communicate with devices asynchronously by sending and receiving messages. These messages can contain both controls and data. The nature of this asynchronous communication provides further flexibility for real-time digital media applications.

Devices. ML is based upon four components: jacks, paths, pipes and transcoders. Paths between system memory and jacks perform video and audio transfer, while pipes in and out of transcode engines perform compression/decompression and other transcoding functions.

Synchronization. In addition to basic video and audio transfer and transcoding capabilities, ML also provides functionality for audio and video synchronization. It uses an Unadjusted System Time (UST) counter to timestamp each audio frame or video frame or field with a signed 64-bit integer value. This value represents the nanosecond value of the UST counter. The other half of the synchronization equation is the Media Stream Counter (MSC).

The ubiquity of real-time graphics rendering has also underscored the importance of features that address the quality needs of broadcasters.

The ML MSC contains a 64-bit integer value that is incremented for each audio frame or video frame or field.Synchronization is then accomplished using UST/MSC pairs.

Display. OpenML also provides for window system independent control over the display of video streams in a system. The display may be a desktop screen or another device such as a special studio monitor. The native windowing system isn't necessarily aware of the display device. The control of such devices includes selecting the area of the graphics frame buffer that is displayed on a particular video device,

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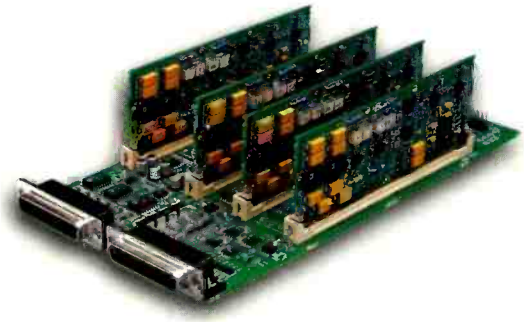

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In OpenML's conceptual framework, applications use standard interfaces, like the one employed by the Weather Channel, to access available hardware devices. Photo by Tim Olive.

setting of the refresh rate and pixel resolution, control of external synchronization (genlock), and loading of gamma correction look-up tables.

OpenGL extensions

The creation of a better digital media API doesn't stop with video and audio. In today's world, real-time rendering of graphics has opened up a wide variety of new workflows that require the tight integration of graphics and video/audio playback. These range from content creation in a broadcast facility to the high-quality playback of dynamic media in embedded devices.

In those environments, there is a requirement for new extensions to OpenGL to define operations such as synchronization of buffers for streaming media applications and standardized methods for transferring video to texture memory. The ubiquity of real-time graphics rendering has also underscored the importance of features that address the quality needs of broadcasters and film/video post-production facilities. To address those needs, extensions are needed for support of features such as full-scene anti-aliasing and recognition by the rendering engine of interlaced images.

The Khronos SIG long-term vision is to continue to develop open APIs, not only to simplify the authoring of dynamic media but also to enable a large variety of appliances and low-cost devices to play back this rich media through small-footprint embedded APIs. Implementations of the new OpenML standard are being developed on IRIX, Linux, Solaris and Windows 2000. The group is also starting work on OpenML 2.0 and will be working to develop conformance tests so users can come to expect a high level of consistency between OpenML-compliant devices. The Khronos SIG is actively seeking additional members to be contributors as it begins work on OpenML 2.0 and an emerging family of embedded graphics APIs. With the commitment to the Khronos SIG shown by the industry's leading technology companies, that work will soon begin paying off as creative users find themselves better able to create rich, dynamic media that consumers will enjoy over a wider variety of playback devices. ■

Shawn Underwood is senior product line manager of telecommunications and media, and Thomas J. True is applied engineer for digital content creation at SGI.

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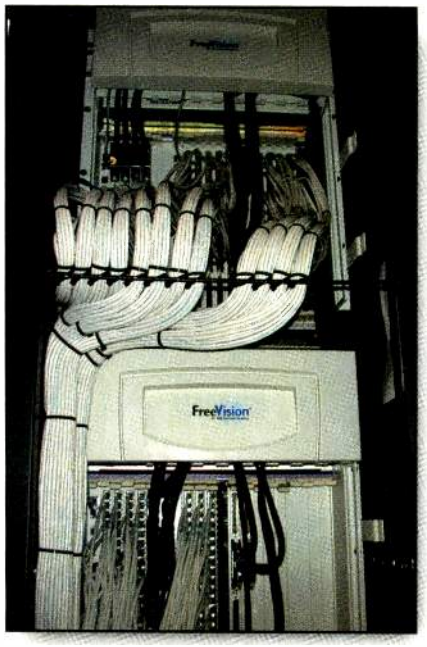
Multiformat routing

BY GREG DOYLE

Modern facility design requires a multitude of signal formats—all of which must be flexibly managed throughout the facility. The primary players are good old composite analog NTSC, analog audio, standard-definition serial digital video, high-definition serial digital video, AES digital audio, multichannel digital audio such as MADI and machine control such as RS422. As the broadcast model continues to change with new signal formats such as SDTI, MPEG-compressed bitstreams and multichannel audio, new methods of signal management are being developed to route these signals throughout the system. As system designers, our goal is to develop a plant that is generic enough to pass any signal across any wire and any switch point. While there are, of course, some practical limitations to this goal, both SD and HD images can share the same pipe and crosspoint infrastructure. This article will look at some of the challenges, design considerations and choices available for the modern facility.



A KVM matrix like the one shown above allows routing of keyboard, VGA and mouse across multiple servers to user stations for facility server management.

The routing matrix

The core of any facility, be it multimedia, broadcast, content aggregator or satellite operations, is typically the routing matrix. Today's video routing matrix may be tasked with data rates ranging from 3Mb/s to 1.485Gb/s, all on the same frame. As signals are received at the routing matrix they are usually equalized for cable loss and re-clocked after switching at the output. The primary goal is to develop an infrastructure that can pass standard-definition or high-definition images across the same crosspoint.

Today's video routing matrix may be tasked with data rates ranging from 3Mb/s to 1.485Gb/s, all on the same frame.

The first challenge for the wideband routing matrix is choosing the clock rate for the frame. Some manufacturers choose the high-end data rate with the theory that this provides a stable enough signal at the lower ends of the spectrum. This will work in most systems as long as the incoming signal is stable. In some cases a re-clocking distribution amplifier can be used if there is a problem. However, this tends to defeat the purpose of designing a super-wideband facility.

There are routers that will automatically detect the routed signal and select the appropriate clock rate. Alternatively, blocks of the router can be pre-selected to a given data rate. Any data received that does not meet these frequencies are passively routed to the output without re-clocking.

In many cases the manufacturer will choose a super-wideband crosspoint card and mix and match the I/O cards as needed for wideband, SD or HD. This allows the optimal re-clock for the chosen signal. The advantage to this method is that it provides a stable data path while still allowing the plant to migrate to multiple formats down the road. By choosing a super-wide-bandwidth frame and stuffing it with standard-definition cards you can save 30 to 40 percent on the initial installation. Remember, however, when the time comes to upgrade to a wide-bandwidth card, you will need to purchase a new set of I/O cards.

Cabling infrastructure

Choose a cable infrastructure that will allow both SD and HD signals to pass across the same pipe. Depending on lengths, we typically choose a 75Ω RG-6 coax for both formats. The last thing I want to do is rewire my facility when the business model changes. By installing a generic coaxial infrastructure you can accommodate SD, HD, MPEG and even AES audio on the same backbone.

Digital islands

Many stations choose to perform a partial upgrade, creating islands of digital in the plant. For these cases, there are many good router frames that allow you to mix digital and analog crosspoint cards on the same frame. This design will often incorporate A/D and D/A interfaces between the two formats. Tieline management allows the digital and analog sources or destinations to be seamlessly routed across the interface devices. The theory is much like telephone trunking, with the idea that not all interface paths will be used all the time. The router look-up tables determine which interface is available and route the signal across an open path. The only challenge

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is, in times of trouble you may not know which path the router chose. A good practice is to hang a monitor across each interface path for troubleshooting purposes.

Digital audio presents a whole new set of challenges. Two innovative approaches to routing AES audio include time division multiplexing (TDM) and asynchronous transfer mode (ATM) routing.

Time division multiplexing works by creating a time slot across a high-bandwidth switch and placing portions of each AES packet in the time slot. In application, the AES packet is broken down to two mono channels and each is placed in a high-speed memory buffer. Breaking the AES packet down to two monaural channels allows cross-level routing. For instance, the left channel can be routed to the right or forced to both left and right for full mono. As long as we have had stereo audio routing, there has never been the possibility of routing across audio levels within the router. The only way to achieve this in the past was to tie up more router inputs, with the left and right feeds swapped at those additional inputs. Manufacturers are promising digital signal processing at the output of their AES routers that will allow additional features such as cross fades, level control and signal processing.

ATM routing provides a large trunking platform for multichannel audio in formats such as MADI. Typically the trunk provides up to 64 separate audio paths, and breakout interfaces are provided at strategic points to provide individual analog or digital outputs. The I/O scheme can be based on mono or AES. This is a good system for larger facilities with many source devices and large mixing consoles. An ATM network is based on the transfer of fixed-length packets of data cells. The word length and structure of an ATM datagram is defined by a worldwide standard in which the header of the ATM cell contains the target address with the path and channel number, the cell type, and a checksum for the header. ATM switches can set a new target in the header to facilitate the sequential transfer process. The "payload" in the cell structure is reserved for the actual data communication. We usually see ATM AES routers in systems at 256x 256 or larger. At this size they can be more economical than a traditional AES matrix.

A good practice is to hang a monitor across each interface path so, in times of trouble, you know which path the router chose.

There is also the question of synchronous vs. asynchronous. As a general rule, we design around synchronous routers with a solid AES reference to all devices throughout the facility. Asynchronous routing will typically work in the facility with good results; however, devices such as videotape machines present an ongoing challenge, even in a plant incorporating solid AES reference. The issue is that the tape machine is referenced to house black. There is no way to determine which field of video,

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A 512x512 super-wide-bandwidth matrix capable of 4Mb/s through 1.5Gb/s. Photo courtesy Activate. Photo by Richard Bennion.

in reference to AES sync, the AES frames will be locked to. Remember, our friends in Europe developed AES around 50 cycles. With good old NTSC as a reference (almost 60 cycles), you have a one-in-five chance of being on the same frame as the rest of the facility. Synchronous routers will bring the output back in time with the rest of the house, thus eliminating pops, hash and errors.

Machine control

One of the most misunderstood routing devices is the machine control or RS422 routing matrix. Consider the RS422 matrix as a port switch, rather than a router with X number of inputs by X number of outputs. Each port of the routing matrix is both an input and an output providing send and receive data to the tape machine or the controlling device. The most important thing to consider when choosing a port switch is the ability to cross the data pairs. This becomes important when routing between two tape machines. If machine A selects machine B, machine A should be the controlling device. If machine B selects machine A, machine B should be the controlling device.

The KVM matrix

The KVM matrix is a unique routing system that allows routing of keyboard, VGA and mouse across multiple servers to user stations. It is used widely in the data networking industry for server management and provides out-of-band access to data and application servers. Out of band indicates that access to the server is accomplished outside of the network, as opposed to by application layer tools such as SNMP, Telnet or Java. This can be important if the network is down and you need to do a hard reboot on a remote server. Connectivity is usually accomplished across a single Category-5 UTP cable with a special interface at each end for the keyboard, VGA and mouse connectors. The matrix allows non-blocking access to several hundred computers from one to hundreds of user stations.

As the transition continues, we are seeing a need to route signals from the relatively low data rate of MPEG-compressed images all the way up to HD. In other applications, such as wide area network management, fiber routing is being introduced. Hey, now we can route from DC to light. ■

Greg Doyle is president of Doyle Technology Consultants in Redmond, WA.

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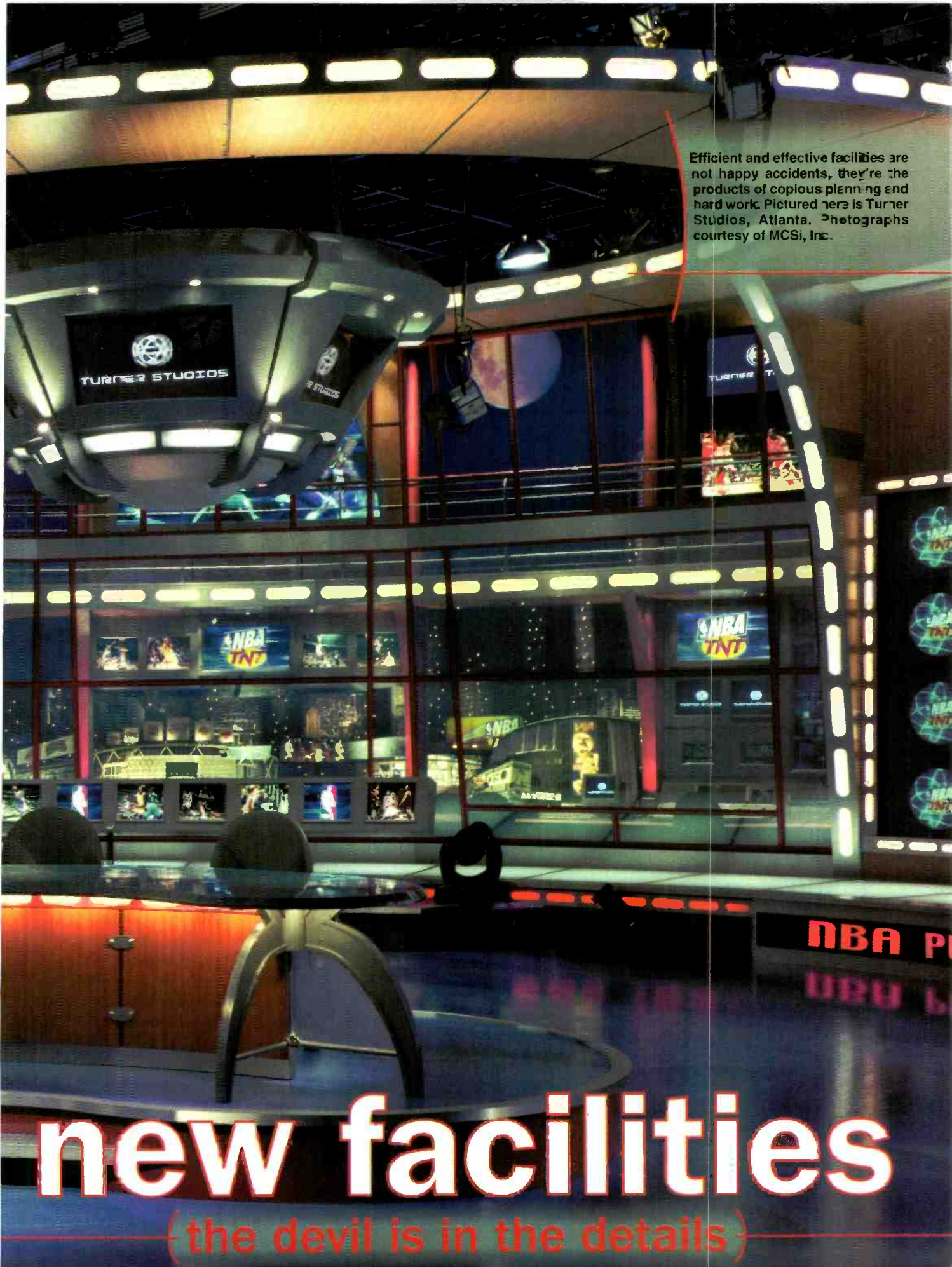
planning

By Christian Mitchell

Time and money – two limiting factors that lurk in virtually every installation or construction project. From a TV station facility to a simple router expansion, the costs involved and the time required for completion are essential factors in the decision, but are usually overlooked or understated.

In an ideal world, the total dollars



Efficient and effective facilities are not happy accidents, they're the products of copious planning and hard work. Pictured here is Turner Studios, Atlanta. Photographs courtesy of MCSi, Inc.

new facilities

(the devil is in the details)

of a capital expenditure would go entirely toward equipment purchases or other revenue-generating items. But we don't live in the ideal world, and construction, HVAC, building code compliance, electrical and other costs often take precedence over equipment.

Due to the overwhelming cost of expenditures related to a broadcasting project, most live in a "pending" state until the necessity for the system reaches a critical mass larger than the capital needed. In many cases, meeting needs recognized months ago becomes a race with the clock.

Can anything be done to improve the time and money crunch?

Off-site prefabrication of rack infrastructure ensures both equipment compatibility and a good fit, thereby helping to eliminate last-minute snags.

Effective project planning

Project planning seems obvious and essential, but due to the surprisingly time-consuming reality of it, many choose to pass it by. Shortcuts are often taken, and important planning details are overlooked.

Most often, projects are begun without valuable input from all personnel involved with the finished system or facility; newer and effective technologies are unexplored; migration and transitioning phases are not resolved until the project is completed; and hidden costs that could have been foreseen are not budgeted for. All result in higher total cost and project delays.

Can anything be done to improve the time and money crunch?

The solution lies with the chief engineer or project manager, who can help to guide you in the right direction and help streamline the planning process.

To create an effective project plan, focus on specific goals while establishing a realistic completion date that matches your business goals. Research all of the costs that the project will incur. With this advice, you are on your way to developing a successful plan.

While final construction is still progressing, off-site equipment rack integration keeps the build process on schedule.

Getting started

The uncertainties of tomorrow's revenue streams and the ever-changing technologies make cost-effective facility design and integration choices extremely difficult. To help in these choices and decisions, it is usually advisable to call on a systems integrator (SI) to handle project planning and implementation.

SIs know the technology, have expert consultants and design engineers, and provide top-quality installation and integration services. They are experienced with projects like yours and, more importantly, SIs are used to tight timelines and tight budgets. They know how to develop a project plan that achieves the most for your dollars.

But can the expense of hiring an SI be offset by the SI's efficiency?

The advantages of contracting with a seasoned SI include project experience and work history, as well as developed project- and time-management skills. These are important assets for controlling costs and working a tight schedule. A good SI also knows the value of quality control and testing throughout

the entire integration process, which not only provides you with a quality installation, but greatly reduces the time spent on troubleshooting.

A good SI should provide thorough system testing and proofing and support their work with test instrument-printout documentation. Many also provide a joint final-testing process with the station engineering team, thus allowing client observation of the testing methods and providing a learning experience for those engineers who will have to maintain the new facility.

While it is necessary to keep in mind the cost of an SI's services, remember low price and quality do not always go hand in hand. The long-term dependability and quality of design of your facility should be your primary concern, and selecting an SI strictly on cost may not be in your best long-term interest.

While most systems should be staged off-site, on-site integration and system testing is still a neccessity due to home site peculiarities and, often, delays in delivery.

Ask the prospective SI about their project history — what facilities they've built or upgraded.

Ask the prospective SI about their project history — what facilities they've built or upgraded. If possible, review their project portfolio or take a tour of one of their completed projects. Inquire how they would approach your project, what design and timeline materials they would produce for you, and the experience of the team that they would assign to your project.

Careful planning results in convenient and attractive solutions to difficult facility challenges. This overhead cable tray is an accessible alternative to under-floor runs.

If you have any doubts, ask the SI to assign an ombudsman that has authority to correct wrongs and that will stay current with your project. Make sure you discuss the design review process and how they will respond to your input. Find out how easily they will comply with your need to change designs if dictated by changes in your business plan.

Beginning the process

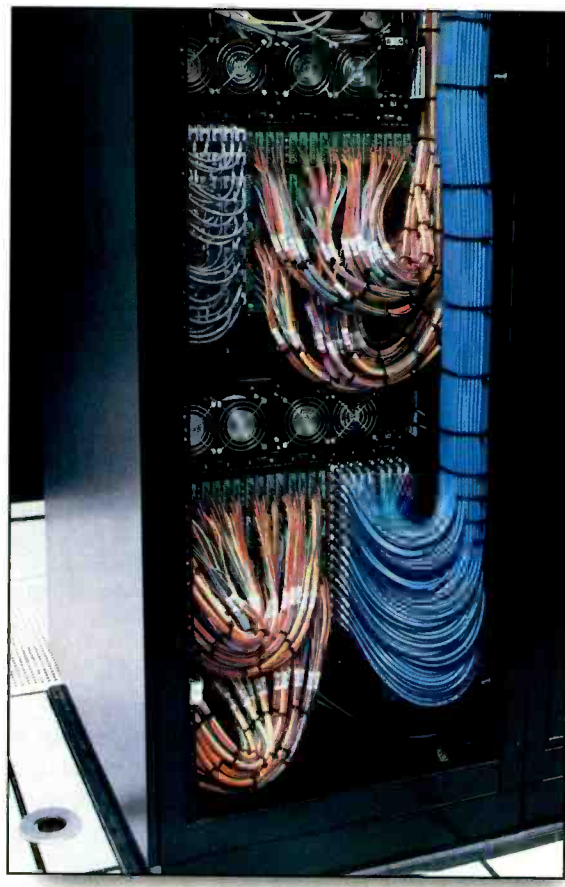
Once on board, the SI will typically conduct a series of discovery meetings with the station's personnel to learn of current operational, maintenance and management procedures, and if and how these should change in the new facility.

A good SI will also ask questions of the client in an attempt to extract major operational and business goals. Questions such as:

- Do you expect to be multicasting on several different channels or networks? If so, how many?
- Do you intend to provide streaming video on the Web or Web access to your media archive?
- Do you intend to archive your programming content? If so, how much and for how long and to what level of quality?
- Do you expect to produce HDTV programming content or simply provide a pass-through for pre-packaged material?

A major consideration easily overlooked by the inexperienced planner is the valuable input of the operations department. The people who will use the equipment day after day should be consulted on the ergonomics of the system components — how the monitoring is arranged and sourced. Are the sight lines from each operator's position clear? Does the operator have to stand up every time he wants to check the playlist? How big should the console be and where do task lights need to be located?

These items may seem trivial on the front end, but to the integrator it can mean the difference between a change order and a complete system. If not addressed up front, these changes mean additional cost to you. Station operators, engineers, producers and managers may



Systems intergrators will provide documentation for details of distribution and patching design so that complicated configurations will be manageable to regular staff.

have varying perceptions of needs and operational procedures. The SI must weight each for validity and relevance to the station's business plan, and then prepare facility designs that will assure the functionality required.

Project schedule and conceptual design

Establish a project schedule that targets a completion date that matches up with your business goals as a first means of attack. This schedule should be a realistic transition plan that defines all of the necessary work activities, resources, milestones, equipment de-installations, equipment reuse, on-air dates, backup facilities, etc. and is the blueprint for the project.

Such a plan can take several months to complete. The SI must shepherd this plan, but the legitimacy of a facility transition plan is directly linked to the number of station personnel who contribute to its creation and the accuracy of their input.

This involvement can create a great deal of controversy within the facility design team, but that struggle is necessary to make sure everyone who has responsibility for the project contributes quality input to the final plan.

Other points to consider when setting a schedule:

- **Does the plan dovetail with all construction milestones for facility completion?** An SI who starts electronic installation before the technical environment is wasting their time and your money. He may also be exposing your valuable equipment to contamination and undue wear and tear.
- **Is the high-voltage service going to be ready when the integrator is ready to energize his technical areas?** If the power is still in the process of construction and/or testing, the integrator needs to stay away from it until the general contractor certifies it complete and safe.
- **Is the heating and cooling system ready to sustain the full technical load when the integrator powers up the system?** If this is not the case, the integrator could be exposing the equipment to unnecessary wear at high temperatures simply because the HVAC hasn't been balanced yet. This is why it is imperative the SI begin to work early with the architect to assure a smoothly integrated process.

The information gained from this process, along with research on equipment and systems, aids in the transition into the conceptual design phase of the project. A formal review of these designs, operational issues, equipment choices and schedule with the client and designated representatives will typically result in minor changes by the client to better address specific needs. The final goal of the conceptual design phase is to produce an equipment and system list. With design approvals and an established equipment list, the SI will proceed to the next phase – *final design* (also called *preliminary design* by some SIs).

Systems integrators know how to develop a project plan that achieves the most for your dollars.

Final design and construction design

During the final design phase, the

The SI should be responsible for all equipment management, identification and inventory control, removal of reuse equipment and other project construction details.

Despite their involvement throughout planning and construction, maintenance personnel should receive comprehensive training at the completion of the build to ensure optimum performance from the facility. Finished production control, Turner Studios, Atlanta, GA

SI's engineers will continue researching equipment and systems to validate their designs in meeting station needs. Details of distribution, system timing, patching design, rack and console elevations, control, and facility mnemonics will also be determined. Confirm system-testing plans at this time.

After a detailed review of this phase's designs and data with the client, and with the client's approval, the construction/design phase begins. (All the while, equipment and hardware orders are being placed in accordance with the project schedule to dovetail with facility construction that is, hopefully, proceeding in accordance with the schedule.)

An SI's construction designs will provide installers with complete information on every aspect of equipment installation. It is a good idea to have the SI responsible for all equipment and hardware management, identification and inventory control, (and bar coding, if specified), removal of re-use equipment, and other such project construction details. This eliminates finger pointing if equipment or hardware is not on site as dictated by the project schedule.

SIs usually prefer this responsibility as they are, by and large, more experienced in this type of coordination, and it provides them with more control in complying with the schedule.

Put in writing at the start of the project specifically what you expect and when you expect it.

Completion

From this point on, routine and candid project meetings will be held by the SI's project manager until the project is complete. Assign staff to attend these and be fully interactive with preparation and any task assignments.

Once complete, the approved testing plan must be followed by the project manager. Typically, testing should begin with the initial wire pull, verifying correction locations, wire types, etc. Static testing should continue throughout the installation, with all testing and documentation complying with the approved test plan.

Remember, quality control during installation is critical. The SIs know this and usually do a great job, but the station's staff should periodically inspect the work and should not be afraid to ask questions.

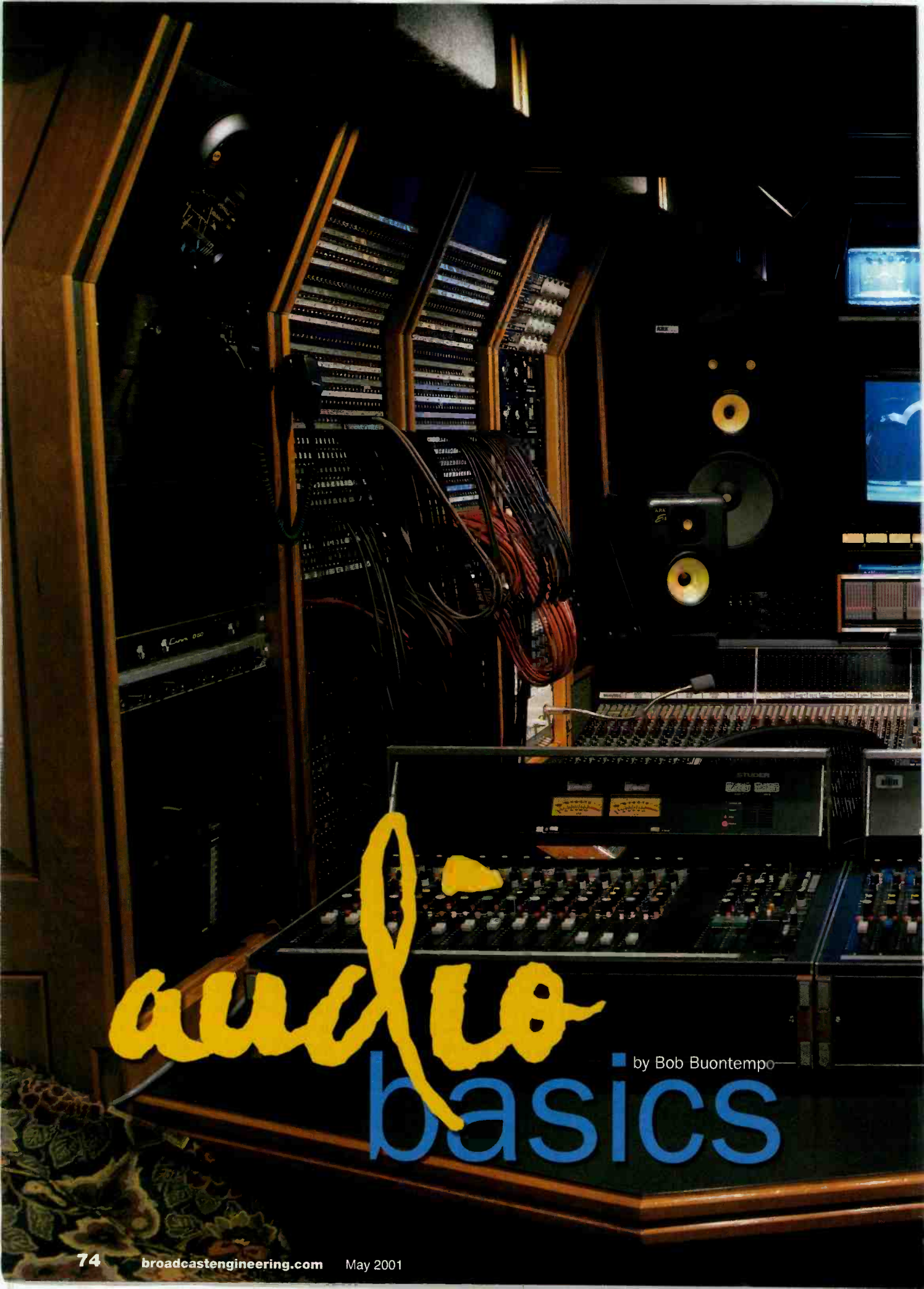
Once final testing and all punch items are complete, training can begin. The extent of training will vary with the particular needs of the client, but infrastructure training is essential.

The SI should go through the complete system with your operator and maintenance personnel, covering routine maintenance, troubleshooting techniques, emergency operations, backup systems, patching and normal defaults. SIs are experienced in performing this type of staff training and will review the system drawings, the use of wire and other database materials.

Closure

In the end, there is usually a formal delivery by the SI of all contractual documentation items. SIs do a good job of compiling and packaging such materials, but still examine them for oversights, omission or errors. As in any business agreement, put in writing at the start specifically what you expect and when you expect it. Fortunately, most SIs have no problem delivering the goods. ■

Christian Mitchell is a freelance writer based in Atlanta. He can be reached at mitchell_christian@hotmail.com. *The author would like to thank LaVaughn Thompson, Paul Goure and Tom Norris of MCSi, Broadcast Solutions Group for their help on this article.*



audio basics

by Bob Buontempo

With digital audio and surround sound systems becoming more commonplace, the public's awareness and expectations of audio quality is increasing. As more viewers install home theaters, high-end DVD players and even 96kHz-sampled monitoring systems, the need for TV stations to transmit the best in audio quality will even increase. Meeting these challenges is tough, even for an experienced engineer. However, lest we forget, not everyone has many years of audio technology experience. And, as many know, some video engineers still treat audio as "that noise that accompanies the picture." To bring some sanity to the issue, this article is strictly targeted at those who may have something less than a Ph.D. in audio technology. Those of you with audio golden ears can go on to something else.

David Hewitt's Remote Recording Service is a state-of-the-art broadcast and recording studio, which just happens to be mobile. The seven-time TEC award-winning studio recently provided the audio feed for the Academy Awards.

Check your wiring standards

Probably the single most common mistake for beginners is the wiring of an XLR plug. You'd be amazed at how often beginning technicians confuse the numbering and wiring of a simple XLR connector. For who knows why, it does not go from one to three or three to one. Rather, pin 2 is designated to be the *hot* or *in-phase* pin, pin 3 to be the *cold* or *out-of-phase* pin and pin 1 is ground. Years ago, there was no agreed-upon standard, and you may still find equipment with pin 3 wired hot. This is especially true with older, non-U.S. equipment and even some old Ampex VTRs. Check the operating manual for the pin configurations.

For 1/4-inch TRS (stereo plugs), military-style, bantam or tiny telephone connectors and jacks, the tip becomes pin 2 (hot), the ring pin 3 (cold), and the sleeve connects to the shield.

If you're dealing strictly with monaural signals, you can get away with a few phase reversals in your connectors and you probably won't notice it. However, connect two mics out of phase and try mixing them together and it's a completely different matter. The signals will cancel and create moving acoustic phase errors, resulting in havoc for the audience (and engineer). The fix is to swap the hot pin wire with the cold pin wire inside the XLR plug on *one* side of the offending XLR connecting cable. If you use this alternately wired cable to connect the two units, they will now be hooked up in-phase with each other. Be sure to label that cable as phase-reversed so that if it is unplugged and used again, it will be designated for use only when you need to reverse a phase. It's better to use commercially built phase-reverse adapters. They provide a quick and easy solution to phase problems. You can even paint them a special color so you'll know where they are and when they are in use.

Have a few phase-reversed cables and patch-bay jacks available in your studio, especially for use with rental or guest equipment that may have alternate pin configurations being brought in. This can save time and trouble if someone wants you to interface a special device.

If you need to make a cable with a 1/4-inch, unbalanced, mono connector on one end, and an XLR on the other, you must combine two methods of wiring. The hot connection goes to the 1/4-inch plug's tip on one end, and to the XLR connector's pin 2 on the other. The shield goes to the 1/4-inch plug's sleeve, and pin 1 on the XLR connector. If you are using single-conductor, shielded cable, you are done on the 1/4-inch side. For the XLR side, make the wire bridge between pin 1, which currently has the shield connected to it, and pin 3.

When wiring a 1/4-inch, unbalanced plug using balanced cable you have to combine methods. Connect the hot wire to the plug's tip and both the shield and old wire to the plug's sleeve.

Now that you know all you need to know about wiring XLR connectors, stop. All this becomes even more critical if you're dealing with powered microphones. When using phantom power for condenser microphones or direct boxes requiring power, you cannot connect the low side of the cable to ground. You cannot use unbalanced cables in these applications. If you do, you're going to ground or short the power supply. Not good.

When you get outside and into the real world, stray current, ground loops and other gremlins creep into the audio system.

Equipment levels and impedances

So what should the VU meter read? Low-impedance, balanced devices are often calibrated to output +4dBm with a VU meter reading of zero. Broadcast applications sometimes use +8dBm. That's a historical thing and it has to do with an antique technology called equalized phone lines. If you're old enough to remember this, you're probably not a beginner. Unbalanced equipment often is calibrated to an output level of –10dBm with 0VU.

Historically, equipment designed to drive phone lines or long cables required a balanced transformer as the output device. Today, op amps can

Even complex digital studios like this one at Capitol Sudio A begin with simple audio connections. Producer and recording engineer Tommy Vicari using a Neve console.

Bruce Davies, product executive at Solid State Logic, is pictured at the new MT Production (MTP) digital console at SSL headquarters in Oxford, U.K.

easily drive phone lines and long loops without difficulty. Even so, road gear usually uses transformers because of their reliability and ease of interface.

Transformers are ubiquitous and an old-fashioned technology that allow engineers to convert between impedances and levels, balanced and unbalanced as well as prevent ground loops. We still use them because, well, because they work. They don't require power or create heat. However, they do add weight, which is a consideration in portable equipment.

The second method of creating balanced circuits is with op amps. A pair of op amps can be used, configured 180 degrees out of phase with each other, to provide a high-quality, balanced output signal. These are cheaper and easier to use than transformers when building balanced circuits. The disadvantage is that they do not help cure ground loops and they don't like being connected to lines with voltage on them. A transformer can handle a certain amount of current, especially DC without affecting the audio quality. Try that with some op amps and you'll fry the output stages.

In the studio, you can get away with murder; almost anything works. It's when you get outside and into the real world that stray current, ground loops and other gremlins creep into the audio system. That's when a transformer can save the day.

Many pieces of newer equipment have been designed to easily interface with each other, so they will be more attractive to both the professional and prosumer markets. These usually have wider latitude in the levels they can receive on input and are able to output. They usually have adjustable I/O circuits to accommodate a wider range of equipment interfacing. They have also been designed to tolerate impedance differences, and many provide inputs for both balanced and unbalanced signals, on both XLR and 1/4-inch TRS connectors. Many of today's small mixing and touring consoles provide both XLR and ¼-inch I/O connectors. This makes interfacing with a variety of external devices much simpler.

Metering

Let's return to the issue of levels. A VU meter usually measures audio levels. A mechanical, analog VU meter relies on a needle to show the average level. The VU meters used on professional equipment display the average or *root mean square* (RMS) level of the signal. This level is defined as .775 percent of a signal's peak voltage. The ballistics of RMS VU meters are specifically designed to react not the peak level, but to the average power of the signal.

Don't assume that just because a device has a mechanical VU meter that it is calibrated to anything, let alone a standard. This is especially the case with consumer gear. You have to measure the device's output level with the needle set at 0VU to be sure what level you're dealing with.

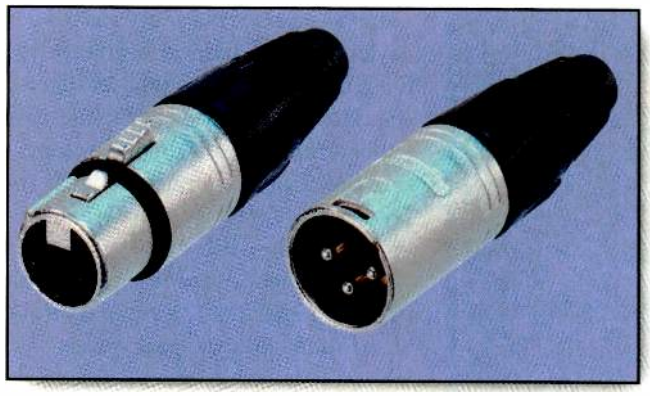
Many devices today rely on LED or plasma metering. These electronic meters can indicate peak levels, VU levels or anything the manufacturer wants. Many times the meters are adjustable to several types of metering indication. Just keep in mind for now that there's a tremendous difference between peak and VU. (But, that's a subject for a different article.) Read the manual or measure the output level or you'll be guessing what 0VU means on your device.

If you're dealing with digital recording, typically DAT machines, watch your levels. DAT machines usually display peak levels, with a reference for 0VU somewhere between -14 and -18 on their meters. This allows for adequate headroom for the encoders. Analog circuits handle excessive peak signals smoothly and with less distortion than do digital circuits. Digital circuits go from low distortion at normal signal levels to massive distortion once you've exceeded the peak signal capability of the circuitry. That's another reason the meters read on the low side, to help prevent clipping the signals.

Plasma displays and LED VU meters come in many different types and appearances, and their features vary greatly. Some may display the average level, some the peak level, and some can display a combination of both. Others are not only capable of switching between metering various levels, but also include features like peak-hold display, which leaves an indicator lighted at the highest level the meter has thus far measured until a higher one comes along.

Types of signals

Not all audio signals are identical. Some signals have what's called slow attack times, others fast attack times. Technically, that just means that the rise time or duration of the signal is quick or slow. Each type of meter responds to signals in different ways. A VU meter may be bouncing around the



Most professional audio equipment uses XLR connectors. This style of connector handles both analog and AES digital audio. Female (left) and male (right). Photo courtesy Neutrik.

–15dBm level where a peak meter shows red -- the overload range.

For example, a kick drum will produce a signal with an extremely fast rise time. The VU meter will barely begin to move by the time the sound is finished. This means the VU meter will tend to underindicate the actual peak signal level. A peak meter will be able to immediately indicate the exact peak level of short duration signals like this. All this means is that you may want to employ both types of metering and the choice is highly user dependent.

Eliminating ground loops

The most common gremlin in any audio installation is the ground loop. Even when you have done all your homework, there's still a good chance that when you turn on the system, you're going to hear a hum. That's the ground loop. It's likely to be your biggest nightmare. However, there are a few tricks you can try.

The first choice is to "lift" the ground on the input connector. The best way to do that is, again, with a special adapter device. This will disconnect the ground (shield wire) from pin 3 of the output plug from pin 3 of the input plug. This usually works.

Unfortunately, this won't work for microphone connections. You need the shield to keep hum from being introduced to the mic's signals. Lifting the ground may not work when using TRS connectors. Unbalanced inputs require that both pins have a signal to work. If you have hum there, we need to move to a whole new, and higher, plane of solutions.

Grounding

In the U.K. they call it "earthing." If you're faced with solving grounding problems, you'll probably find a few of your own names for the problems. Often, grounding equipment according to electrical codes guarantees that the system will hum. While you're not being encouraged to violate any EIA rules, you may have to wink a bit at theory and go with practicality on the audio connections to get this to work properly.

Usually, just disconnecting the shield at the input to the device will eliminate the hum. The hum is a result of two devices being grounded at slightly different electrical potentials. Current then flows between the devices on the ground (shield) wire and hum is induced into the signal. Disconnect one end of the shield (usually at the input device) and you'll probably eliminate the ground loop and, consequently, the hum.

The best way to ground equipment and avoid ground loops is by employing a star ground system. This technique requires the connections of the AC (chassis ground) of every piece of equipment in the studio to the systems' main ground point. A facility-wide ground system should be a part of every audio and video installation. Typically this involves a ground bus of heavy copper wire or plating located in the bottom or side of each equipment rack. Each device in the rack is then carefully bonded to that bus. Then all those buses can be connected with heavy copper wire to the central grounding star point.

Occasionally it is necessary to reverse or lift the ground on a piece of gear in a system to eliminate a ground loop. Many portable devices provide an AC power switch that has three positions. Two are on, one (center) is off. The difference is that the two on positions reverse the chassis ground polarity. If the console you're using has such a

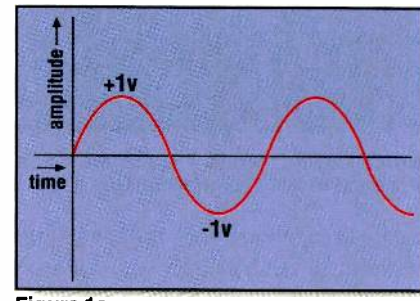


Figure 1a.

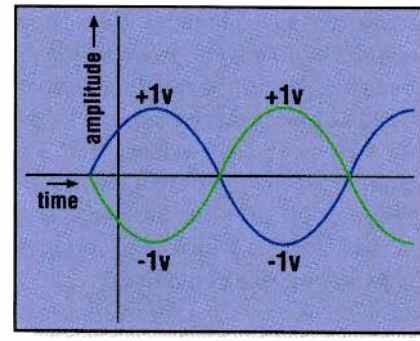


Figure 1b.

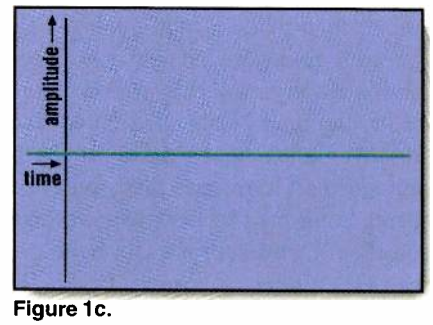


Figure 1c.

To understand what will happen if you use two acoustically out-of-phase microphones or a connector that is wired out of phase, recall that two opposite waveforms will cancel. If you begin with a simple sine wave (shown in Figure 1a) and add a cosine waveform (shown in Figure 1b), the result is zero (shown in Figure 1c).

The best way to ground equipment and avoid ground loops is by employing a star ground system.

Turner Studios in Atlanta. Note the use of video monitors for audio applications. In such applications, be sure the monitors are properly shielded or you'll have more hum than with a bad cable. Also watch how close to the monitors microphones are mounted. The monitor's horizontal sweep circuits can create an audible high-frequency buzz if the mic is located anywhere close, especially if you are using low-quality displays. Photo courtesy Daniel O'Connell.

power switch, simply moving it to the other position may cure the ground loop. Do not operate any equipment above ground (without an adequate ground). This is unsafe. Do this and we could lose a reader.

Digital audio connections

The AES standard provides for proper wiring of digital audio connections, using an XLR connector. The interface provides for two tracks of digital audio to and from a digital device. These tracks are accompanied by several other digital signals, such as various sampling and bit rates, timecode, digital clock, and word sync, all on one, two-conductor, shielded cable.

Sony/Phillips Digital Interface (SPDIF), was originally a consumer audio format that later crossed over into professional territory. This method uses an RCA/phono-type plug along with a 75Ω cable to carry its signal. It's the same interface technology as that used for typical video connections on home consumer devices.

Many consumer devices now use optical interfaces, which are simple and reliable, but expensive. They're good for eliminating ground loops.

Alesis' ADAT Modular Digital Multitrack systems can perform two-way transfers of eight channels of digital audio via a proprietary, laser-carrying, optical cable. The cable used with this system also simultaneously carries SMPTE timecode and other digital control signals.

Tascam's Digital Interface (T/DIF) is used by its DA series MDMs and is familiar to many broadcast and post-production houses. It is capable of performing audio tasks similar to those of the Alesis ADAT system, while using TASCAM'S own version of optical interface.

Several companies have made interface boxes (such as Otari's Conversion System) that will convert from any one of several various digital audio systems to any of the other types. Some digital audio equipment manufacturers also include either Tascam or ADAT connectors on their products (sometimes both) and may include AES and/or S/PDIF capabilities as well.

Using sync

Finally, if you do use a digital method of signal transmission to connect your system, don't forget to use a common timing source to sync them all together. In broadcasting, SMPTE timecode is the most common method of synchronization. Remember, however, that audio typically uses a frame rate of 30fps non-drop, while NTSC video uses a 29.97fps, or 30-drop frame rate as its standard.

If you do use SMPTE timecode for your sync, make sure all the audio gear locking to the timecode has its software set to the correct frame rate.

House sync or black burst generated by the video synchronizer in a broadcast or video setup is the best source of a master clock for the timecode used to sync the audio equipment to the video. Word clock, if available, is the best synchronization system for pure audio quality, because all the clocks in all the digital devices will be synced right down to the sample rate. If you happen to have an all-digital broadcast system and can generate word clock at the correct rates for the entire audio *and* video system, you'll really be looking and sounding good.

Take a few minutes to look over your studio setup, and see if you might better interconnect the equipment, while optimizing its operation. When that happens, you should be able to get your product to start sounding as good as it already looks. ■

Bob Buontempo is an independent audio consultant based in Elizabeth, NJ.

Applied Technology

Telex's BTR-800 and BTR-700

BY TOM TURKINGTON

Telex's new BTR-800 and BTR-700 wireless intercom systems can be called problem-solvers. Both systems are fully UHF and fully user-synthesized, and both offer features designed to allow maximum functionality in their target markets.

Why UHF? First, because it's a less-crowded frequency band, allowing for higher propagation performance. While many wireless intercom systems feature split-band capability (part UHF-part VHF), by operating completely in the UHF domain the BTR-800 and BTR-700 can offer greatly increased range under certain circumstances. In addition, antennas and other intercom-related products are much smaller in the UHF range, increasing ease of use for system engineers.

Being fully user-synthesized – offering full frequency agility with user control – is equally important. Due to the increased number of users in the UHF band, the proliferation of DTV and the "auctioning off" of a large portion of the frequency spectrum that was once widely available for UHF intercom use and other broadcast applications, being user-synthesized is important for any broadcast professional or systems contractor. This is especially true if you're traveling between different facilities and venues, and from city to city. But even if you're stationary, it is virtually assured that you will need to get your intercom out of the way of other wireless equipment, such as some form of wireless microphone system or two-way radios. Being user-synthesized is useful in this case.

The BTR-800 is designed specifically for broadcast television, as well as high-end rental houses that serve this market. With its two-channel capability, it is designed for situations where two distinct channels of intercom need to be accessed by a wireless extension to that intercom system. Two-channel is important because most common hard-wired intercom systems, especially those used in most TV broadcast trucks and facilities worldwide, are two-channel. Also, two-channel capability lets users switch easily between intercom channels. The intercom also offers a 1RU base station and smaller beltpack. Applications may also include theater, higher-end industrial use and sports applications. Its features illustrate why the system is suited to these applications.

Antennas and other intercom-related products are much smaller in the UHF range, increasing ease of use for system engineers.

With the push of a button, the "Stage Announce" feature lets the wireless user send a dry, line-level audio signal at +8dB to a given destination. For example, a stage manager can easily communicate with other people involved with a production (talent, engineers, etc) – making announcements on stage or in the green room.

Also, the system provides a relay closure, which allows users to trigger a two-way radio and have an audio signal be routed over it or any closure-activated device. Audio can be routed through a preset path inside the digital matrix, or it can trigger an IFB so the stage manager can actually talk into the ear of the talent or anyone else on the wireless system.

On a production set, the director's intercom circuit is usually the busiest. He or she is calling a lot of shots and doesn't want or need to be bothered with the peripheral conversations that often take place between people on set or on stage. With the Wireless Talk Around feature, known in TV as ISO, audio is lifted off the back of the base station so the audio from the wireless user doesn't go anywhere else except to all the other wireless users. This way, if there was some emergency or problem on stage or on set, you could easily take care of that problem without the rest of the world knowing about it.

The system's two-channel capability comes in handy in several of these applications. A theater stage manager might be talking to the lighting circuit of an intercom system, then have to suddenly change over and talk to staging. In TV, stage managers very often would be talking to the producer and stage managers, who most of the time are on the producer's circuit, but need to be able to easily flip over and talk to either the director or another audio

Telex's BTR-800 wireless intercom system offers two-channel UHF capability and full frequency agility with user control.

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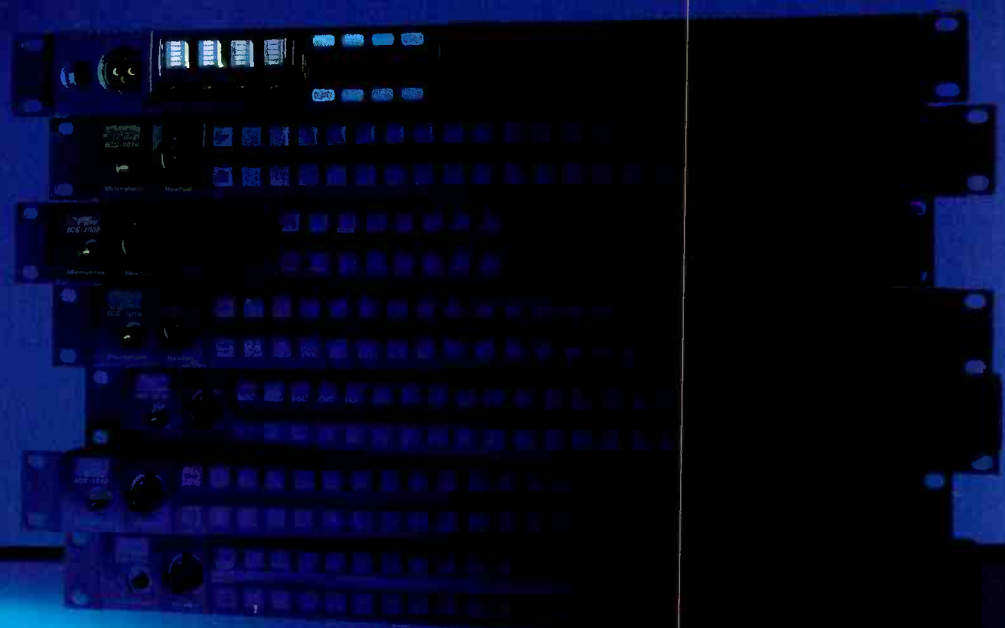

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circuit. In a sports application, often there is an offensive and defensive circuit that a head coach might have to talk to separately, and two-channel makes that distinction much cleaner.

The BTR-700 is essentially a stripped-down version of the BTR-800. It offers full UHF capability and frequency agility, but it is single-channel and excludes the wireless talk-around and stage-announce features. It is a lower-cost alternative designed for users who don't require the additional channel or other features. Its applications include some broadcast use, as well as primary contractor markets (fixed install, arena/stadium, touring sound). Many theater intercom needs (excluding the higher-end productions) only call for one channel. Also, many rock-and-roll production managers use single-channel intercoms, and probably wouldn't need to go to two-channel, but they would upgrade for the UHF and user-synthesized capabilities.

One significant characteristic of both systems is ClearScan, which allows users to select frequencies without really knowing what factors exist that could potentially be sources of interference. They can then scan through and find clean frequencies even in hostile RF environments. So, when your crew pulls into a new city, they can easily find the clearest frequencies and be up and running in about a minute. ■

They can then scan through and find clean frequencies even in hostile RF environments.

Tom Turkington is product manager of RadioCom Wireless Products for Telex.

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NBA's Portland Trail Blazers go with dpsReality

BY JOHN BURNS

Post-Up Productions is owned by billionaire and high-tech pioneer Paul Allen, who also owns the Portland Trail Blazers NBA basketball team. Post-Up Productions is located at the Rose Garden Arena, the home of the Portland Trail Blazers. Its primary function is to serve the team's broadcast needs, while maintaining a steady roster of outside clientele, including high-profile sports clients such as the NFL's Seattle Seahawks and visiting NBA teams. Our facility is capable of both live production and post editing, featuring a nonlinear edit room, paint system with an in-house designer and two linear rooms, called High Post and Low Post. Low Post is used for linear editing and live productions and feeds the big screens in the Rose Garden Arena. High Post is an all-component-digital room capable of both live and post edit, and all live telecasts flow from this room.

We use the dpsReality digital disk recorder from DPS/Leitch both in the studio and on the road, for animated clips for replay, billboards, score reveal and statistics. I also edit the pre-show tease using its nonlinear timeline. I take one system with me, installed in a luggable computer, and interface it with the production switcher at my destination.

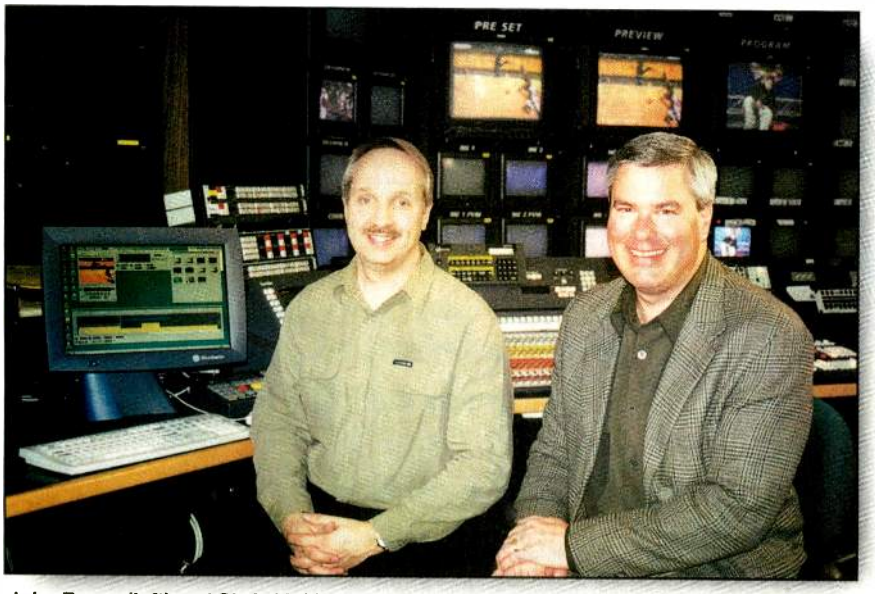
Because we were using the system so much on the road, we purchased another unit with the SDI I/O card for our facility at home. The system is installed in High Post — wired directly to our production switcher. It is used for live and post production and becomes another source for our linear editor. Because it runs in a Windows NT system, we tied that unit to our intranet to allow files to be passed easily from room to room. On some occasions, especially on game days, we maximize the use of the room with one editor using the D5 and Digital Betacam machines for linear editing, while another editor uses Digital Betacam and the dpsReality for nonlinear editing.

Our Grass Valley 4000 switcher does not have direct VTR control, so we use a DNF controller as a gateway to interface the digital disk recorder to the production switcher for live control. The production switcher can issue P-bus commands, which the DNF translates to VTR cue points. I use the digital disk recorder to build a timeline with all the clips needed for the broadcast and input all the time cues into the DNF controller. Then I turn to the production switcher and build effect using switcher timelines. I issue P-bus commands during the effect run that recall the clip of choice and run (or play) the dpsReality DDR.

The software supplied with the system allows for functions such as RS-422 control of video clips and time-lapse photography.

Alpha-channel support and simultaneous key- and fill-output features allow the digital disk recorder to produce high-quality keys through our GVG4000 switcher. For example, an animation element created with Adobe After Effects in an offline room can be placed on the network and retrieved by the editor. The image sequence with alpha channel is imported into the system via the network connection, and the editor has a complete, keyable animated clip ready for use live or in post edit.

The system was selected based partly on past experience with DPS products. When Post-Up was designing the new Rose Garden Arena facilities, one of our goals was to replace traditional



John Burns (left) and Chris McMurtry of Post-Up Productions use the dpsReality digital disk recorder both on the road and in the studio. Post-Up uses the system interfaced with the production switcher for live and post production.

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Manager, RF Systems
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Ernie Mayberry
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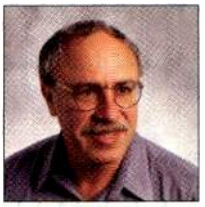
BSEE, MSEE

Dick Bibber
40 years RF experience



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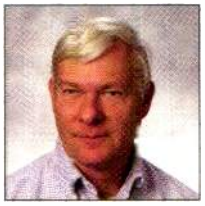
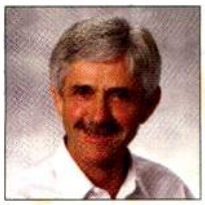
MSEE



Dan Livingston
Principal Mechanical Engineer
36 years experience
MME, BME



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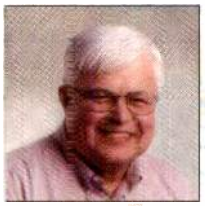

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menu signs in the vending areas with video signage allowing menus to be changed on an event-by-event basis. Post-Up used the DPS Perception Video Recorder cards on a total of 14 video streams in an in-house cable system. We still use the cards for a variety of capture and playback purposes today.

In addition to this experience, we chose the current system for its feature set, which offers foreground video as well as the ability to generate a simultaneous alpha signal for external keying. The rich feature set also eliminated the need to purchase third-party software for RS-422 deck emulation.

DPS' customer service was another factor in our decision. When we have a question for the techs, the answers come quickly. The updates with improvements and fixes come in a timely manner as well.

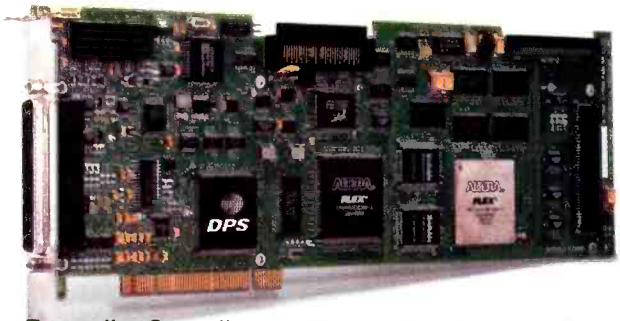
The production switcher can issue P-bus commands, which the DNF translates to VTR cue points.

We have found more uses for the system than we originally expected. We have grown to use the nonlinear editing functions a great deal. For instance, I used it to edit a tease for the Golden State Warriors game at the hotel while on the road.

The software supplied with the system allows for functions such as RS-422 control of video clips and time-lapse photography without requiring us to purchase additional software.

We have been trying out dpsReality's web streaming and MPEG output options and will continue to look towards DPS products as we expand in the future. As Post-Up expands into high-definition, we want the same capabilities that we have now with SD broadcast, making dpsRealityHD a logical addition to our workflow. ■

For more information on the dpsReality fromDPS/Leitch, circle (451) on Free Info Card.



To recall and run clips, operators at Post-Up build effects in a GVG 4000 switcher and run the dpsReality via a DNF controller.

John Burns is technical director and editor at Post-Up Productions.

Today's broadcasting *requires the* ***seamless*** *integration of* ***stills, clips,*** *and* ***animation***

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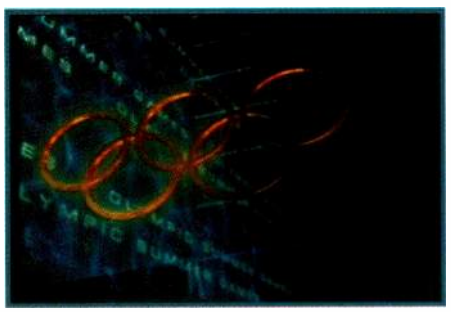
Live playback



Images courtesy of TSN

"Kaydara mediastore provided us with instant cues to images and animations, all the stuff we use to dress up our [Olympic coverage]. Trying to create these effects without Kaydara mediastore would have been a nightmare for us."
- Paul McLean, producer, TSN

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Virtual sets: Imagining we were there...

BY JOHN LUFF

For over 150 years photographers have understood empirically the physics of imaging. Without the benefit of mathematics, an artist can compose a scene, place the subject in it in a pleasing way, and control the lighting, focal length of the lens, subject distance, depth of focus, and position of the camera. When photography became a moving image art form, the cinematographer also had to take the relative motion of the camera, the background and the subject into consideration.

Anyone who has budgeted for a production knows that staging for motion pictures or video cameras is an expensive proposition. Controlling reality always is, and creating illusions is sometimes nearly as expensive. In order to control the total effect, scenes are often staged in elaborate studio setups where lighting and other variables can be strictly controlled, allowing for matching scenes from multiple days of shooting without the variables of the natural environment.

There is now a way to similarly control the illusion of reality and create imaginative and realistic images. The increasing spohistication of computer graphics has fueled a new industry that crosses many genres. Visualization for science, entertainment, advertising and training has advanced rapidly in the last 20 years. Entire motion pictures are being created in computers, and in the future even actors may well be created digitally.

Controlling reality is always expensive, and creating illusions is sometimes nearly as expensive.

By combining natural images with computer images, it is possible to place actors into scenes with historical context, ones in which the actor's health might be jeopardized or that cost too much for even Hollywood to accept. However, there are complications involved in combining shots from real optical systems with those simulated in computers.

For such an approach to work it must be possible to model the geometry, lighting, surfaces and properties of the environment in the computer. Some common elements in staging are exceedingly complex to model in a computer. For instance, fog, wind, and other time-varying conditions can only be simulated in computer imagery. For the purposes of this review we need to restrict our imagination somewhat and look at a simpler and more achievable artificial reality.

For virtual sets to work, the set designer must have access to computer-modeling tools that can interface with the compositing applications. Most architectural and drafting packages can output the geometry in the right form. The computer graphics artists must then apply the surfaces specified and render the image for approval. The general process with movement involved is complex to understand all at once. A simpler case will point out the difficulty of analyzing the entire range of variables.

Imagine a scene in which the camera in the composited image is fully static first. In order for a natural image to be used as part of a composite, several factors must be matched to a fairly high degree of accuracy, including:

- Angle of the camera, focal length and the position of focus;
- Pan and tilt and roll angles of both cameras;
- X,Y,Z position of the camera relative to the scene;
- Lighting source(s) location, intensity, spectral characteristics, type of light (diffuse varying to point source); and
- Colorimetry of the recording media (film or video colorimetry and computer image transfer functions).

It is easy to calculate the geometry and effects of focal length of the lens, as long as the lens does not produce distortion, as in a very wide-angle lens. Indeed, digital video effects use the

The increased sophistication of computer graphics, coupled with more cost-effective computing power, is giving broadcasters the option of using virtual sets like this one at CNBC Asia. Image courtesy of Radamec.

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same methods to create the illusion of a flat image plane moving in three dimensions with six degrees of freedom. To generate the parameters used to calculate a model from the perspective of a hypothetical camera that will match exactly the image of a camera shooting a natural image, we need to either constrain the real camera or measure the six degrees of freedom necessary to represent it.

This is done by attaching sensors to the pan head and lens and positional sensors to the tripod or studio dolly (or crane). Simple enough; we grab the data, feed it to algorithms that calculate the synthetic image and then composite the real camera with the computer image of the hypothetical camera using blue screen (chromakey) techniques. Voila! A completed image, and the first step in a virtual set. The scene geometry does not change, so we create a backdrop and into it we place the actor.

If the actor must move in a set where he/she moves behind the set pieces, the blue screen includes foreground objects that the real camera can use to block the actor's image just like the real set would, but at a much lower cost. As long as the background is static, you can compute the image once and use it for every subsequent frame.

If the camera and background move, the relative processing power must geometrically increase. Remember that first the sensors send information to the computer to tell it where the natural camera is, where it is pointing and the characteristics of the lens. Then the computer must calculate the synthetic image that matches those parameters and output the background plate. If the computer takes one video frame to calculate the image, we delay the real camera's output one frame and they will be in perfect synchronization. If the processing power changes as the scene becomes more complex, then the delay for the natural image must track with the latency of the computer-derived image.

Think of the complexity of a shot of a news set. The shot begins with a tight shot of the anchor and pulls out to reveal a complex set with monitors in the background. At the beginning of the scene the background detail is thrown out of focus by the depth of focus of the lens. Very little processing power is needed to calculate the image. At the end of the shot the image is considerably more complex. If the camera begins to move in three dimensions as it zooms out, you can see the daunting number of variables the computer must crunch.

Fortunately, the power of real-time graphics engines has increased rapidly and now can support modest real-time moves without the appearance of hysteresis between the foreground and background images. We may well approach the point in the future when a set designer never builds a model, but simply gives his design to a trained 3D draftsman who builds a model in the computer. A computer artist "decorates" the set, and a lighting person working with virtual reality tools places the lights to get the desired effect. At the end a printout gives the parameters for the real lights and camera positions to the studio crew.

Entire motion pictures are being created in computers, and in the future even actors may well be created digitally.

This all works well as long as the process is real time, but what if we want to record the actor without tying him or her up while the technologists sort out the inevitable issues? All we need to do is store the data (metadata actually) and time stamp the data so it can be kept in sync with the camera image. SMPTE 315M-1999 sets standards for capturing and storing data conveyed by ancillary data packets at considerable resolution. That data is stored in a standardized way and transmitted in the ANC data sections of the transmission medium. The time and other metadata can be used to render the background image at any time without issues of processing time and latency. Later synchronization and compositing is thus possible.

Clearly it is also possible to drop a synthesized image into the foreground of a natural image, as was done in "Jurassic Park," when the tyrannosaur showed up in studio shots. When such "non-geometric" objects are placed in natural scenes, the computing necessary will almost certainly be non-real time today. We can expect the future to make such processes more transparent.

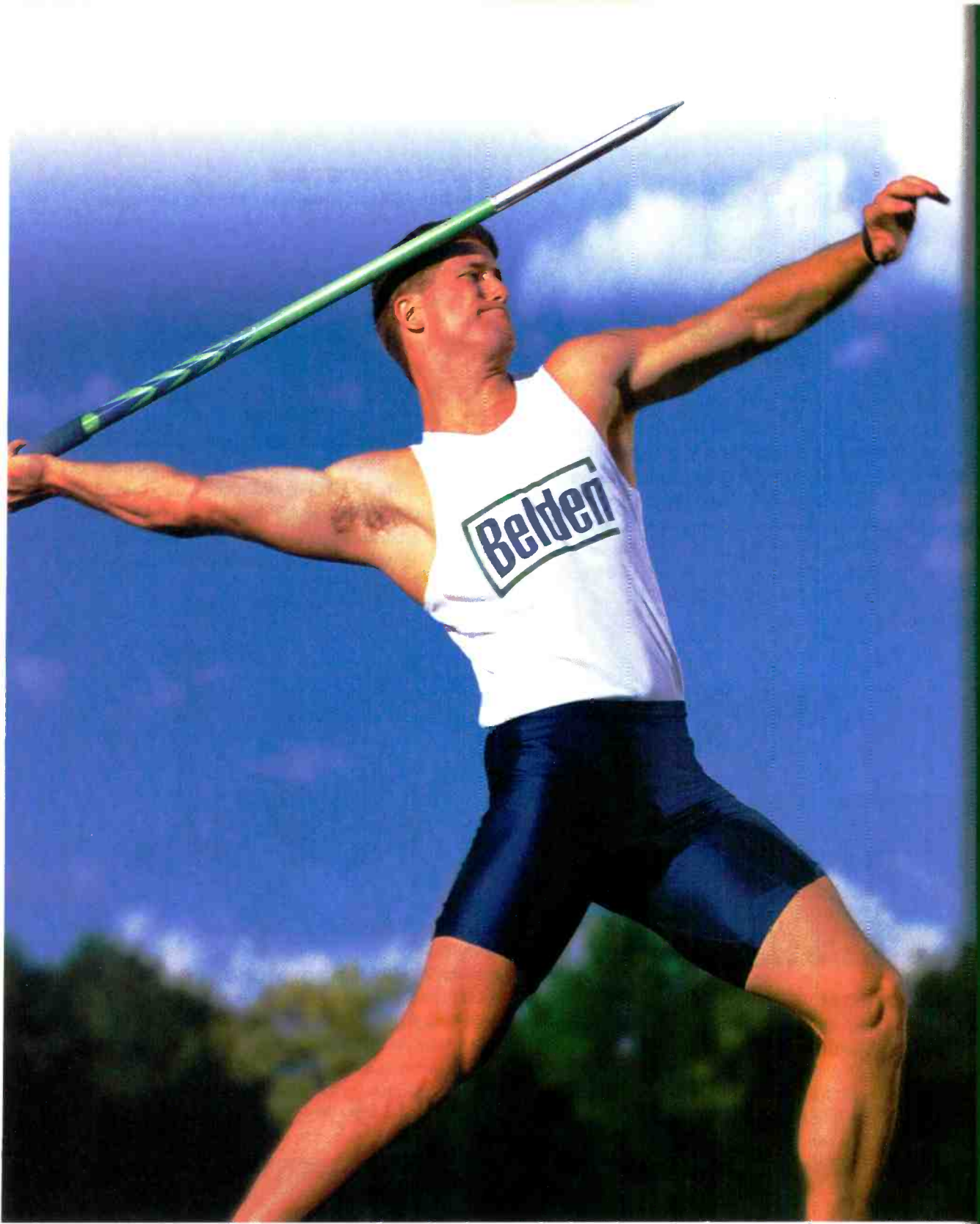
At the end of the day, the process can provide significant benefits. If sets are nothing more than chromakey environments, it is possible to change from one program's set to another quite rapidly, though still not instantaneously. Studio costs and recurring costs for set storage are reduced. New artwork can be added to a set without significant preparation time. It is possible to experiment with new looks and lighting quickly and without using large crews to test new ideas . Some set elements can be rendered to a set automatically by creating an embedded object that links to the art. One could even argue that the depth of detail that HDTV can display is facilitated by using detailed computer models instead of complex and expensive studio sets. On the downside, that requires an intricate computer model and extremely accurate tracking between the foreground and background plates.

The reasons why must be balanced with reasons why not: Virtual set technology is not inexpensive set technology. When compared with regular changes to a major set, the reduction in capital cost may well be demonstrable, but a careful analysis must be done.

It must also be noted that the technology is complex and requires careful alignment to remain fully useful. Technical personnel skilled in lighting a real set are not of much help in lighting a virtual set in a computer. Set decorators who have considerable artistry may have to learn new skills and ways of communicating their art to remain useful members of the team. Plan on hiring a crack computer artist and programmer to get the most out of the technology.

Computing power is dropping in cost, and the future cost of such technology is likely to make the use of virtual sets commonplace in many types of usage and at varying price points. ■

John Luff is vice president of business development for AZCAR USA.



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ALL-IN-ONE PRODUCTION STUDIO

Quantel Clipbox Studio: includes a server; offers live DVE, mix/effects and keying; all clips can have an associated moving key; the unit will combine one moving clip over another, while resizing, positioning and masking and play the combined scene out of a single port; clips and stills can be cropped to focus on detail; has eight video ports that can be configured as inputs or outputs; each video output includes four channels of embedded audio. +44 (0)1635 48222; fax: +44 (0)1635 815815; www.quantel.com

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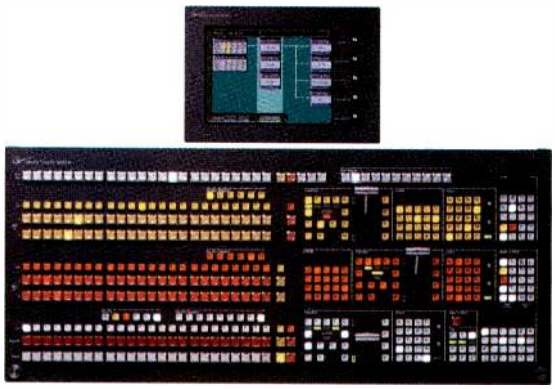

PRODUCTION SWITCHER

Grass Valley Group Zodiak: includes 2.5- and 3M/E configurations; low-power consumption; fits into a 7RU frame; includes 35 SDI inputs on 2.5M/E version and 64 SDI inputs on 3M/E version; four keyers per full M/E; five wipe-pattern generators per full M/E. 800-824-5127; fax: 530-487-3755; www.grassvalleygroup.com

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AUTOMATION AND CONTROL SYSTEM

Omnibus Colossus: provides multichannel, multiformat delivery; designed to bridge the gap between video, audio, Internet and data-streaming applications. 530-470-1700; fax: 530-470-1718; www.omnibus.tv

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PAN/TILT SYSTEM

Hitachi Denshi Eagle: developed for remote observation applications; the PTE-300 head and PT-EE-L housing protect from wind and rain; provides full control of pan, tilt, zoom, focus and camera menu functions for the DK-H3, HV-D3, HV-D15, HV-D16 and HV-D5W and provides plug-and-play capabilities for any system. 516-921-7200; fax: 516-496-3718; www.hdal.com

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ROUTING SWITCHERS AND MODULAR ROUTERS

Leitch Routing and Distribution Group: includes the VIA32 line of routing switchers, the Xplus 16x16 line of modular routers, the Xpress 12x1 line of monitoring routers; uses Blue3 Dynamic Routing Fabric to provide scalability and flexibility; the X-Plus series of SDI modules supports ASI and routes all composite, component and widescreen serial standards. 800-231-9673; fax: 757-548-4088; www.leitch.com

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DIGITAL SIGNAL PROCESSING CAMERA

Panasonic AW-E300S: features a separate optical system; allows the CCD assembly to be separated from the camera for a wide range of imaging applications; features three 1/3-inch IT CCDs that deliver 800 lines of horizontal resolution, 60dB S/N ratio and a minimum illumination of 1.5 lux. 800-528-8601; fax: 323-436-3660; www.panasonic.com/broadcast

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TEST AND MEASUREMENT STREAMER

Videotek STM-350: designed with VTM-300 and VTM-400HD; a real-time streaming video unit that works through SpyderWeb software; 2RU unit offers front-panel controls. 800-800-5719; fax: 610-327-9295; www.videotek.com

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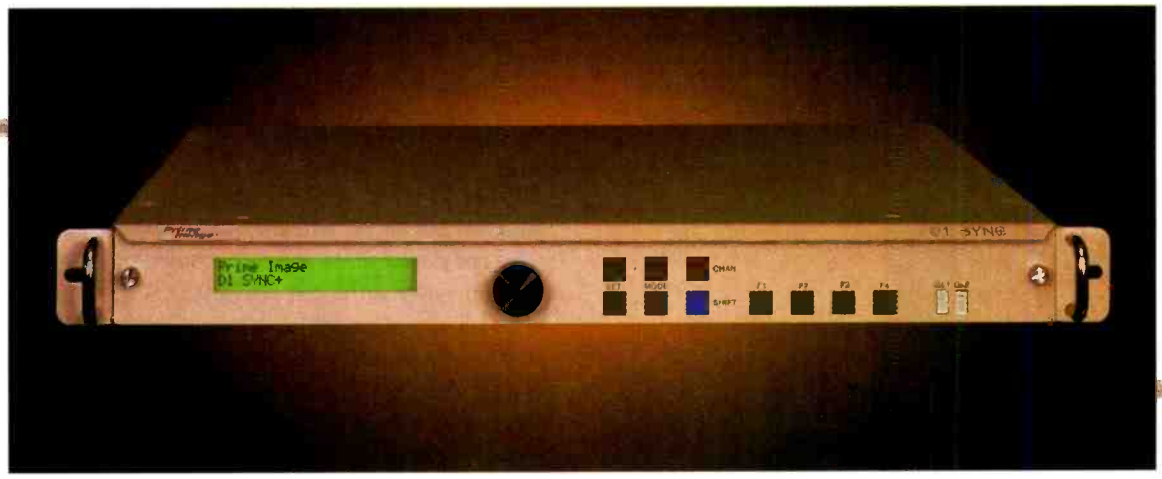

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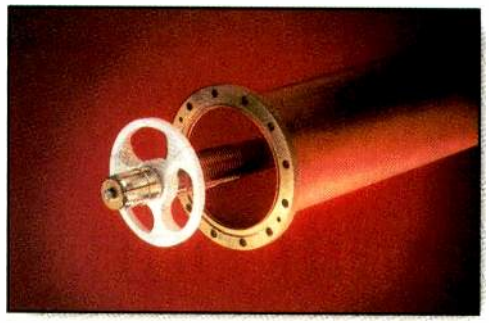

COAXIAL TRANSMISSION LINE

Andrew MacXLine: two added versions — 4 1/16-inch and 6 1/18-inch, 50Ù; features thermally compensated transmission line; made from high-conductivity copper tubing; bellows section incorporated in the inner conductors; inner connectors are captivated and use tensioned springfingers for maximum contact force. 708-349-3300; fax: 708-349-5444; www.andrew.com

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DATACASTING CARD

Lucent Digital Video WaveStar TSI-100: enables broadcasters to allocate bandwidth for data services while retaining picture quality; provides a flexible, multiservice aggregation hub for a number of data services. 908-580-7000; fax: 908-580-7151; www.lucent.com/ldr

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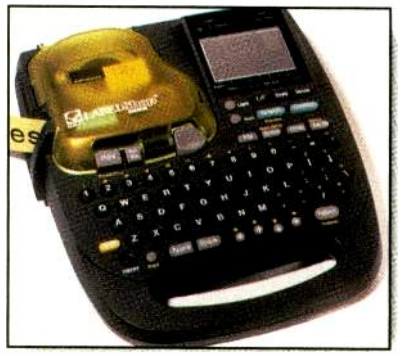

RESIN THERMAL TRANSFER PRINTER

K-Sun Corporation 2001XLST: images on industrial shrink tube material for wire marking; conforms to FCC Class B standards and meets UL-224 specifications; shrinkage temperature range is 194- to 518°F. 800-622-6312 ext. 214; fax: 715-247-4003; www.ksun.com

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VERTICAL INTERVAL SWITCHERS

Knox Video ProSwitch series: contain either single or dual outputs in thin-profile, 3RU rackmount chassis; consist of five lines of switchers each with an additional channel of video: Alpha (composite), Beta (S-video), Gamma (component), Delta (RGBS) and Epsilon (RGBHV); bandwidth either 200MHz or 350MHz; accept and route balanced or unbalanced stereo audio. 301-840-5805; fax: 301-840-2946; www.knoxvideo.com

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CONTROL PANEL

Quantel Studio FX: provides full control of acquisition, management and playout of still and clips; includes an SVGA display platform; server will support two FX stations for distributed operation; offers full Sony protocol VTR control; video or video and key can be recorded from a live feed or from a CQ; features facilities for top and tail editing of clips within the system; the crop facility for both clips and stills has a method of optimizing recorded material. +44 (0)1635 48222; fax: +44 (0)1635 815815; www.quantel.com

Circle (361) on Free Info Card

OPEN-INTERFACE SOFTWARE TOOL

BarcoNet SNMP Profile Manager: designed for BarcoNet's ROSA network management system; offers operators a solution to manage all network elements by a single, vendor-independent management platform; ROSA with SNMP Profile Manager is capable of integrating network devices from several vendors into a single management platform without extra programming. 800-992-5016; fax: 770-590-3610; www.barconet.com

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FIXED-MODE ASPECT RATIO CONVERTER

Crystal Vision ShARC: will convert a 16:9 video signal to 4:3 by horizontally stretching the central 75 percent of the input picture, with no vertical processing involved and no need for black bands at the top and bottom of the final picture; has a wide and flat frequency response, with low levels of measurable conversion artifacts such as aliasing, banding and ripples. +44 1223 506 515; fax: +44 1223 506 514; www.crystalvis.com

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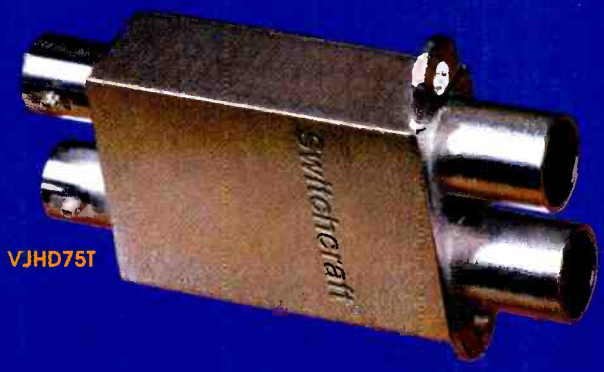

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Media 100 Cleaner Live: delivers real-time, capture and Internet streaming in both the Windows Media and RealSystem 8 streaming formats simultaneously; allows anyone to broadcast a live event using the Internet; includes the ability to save full-resolution DV input streams to disk for later editing using Media 100 CineStream and view status of key functions instantly with traffic monitors. 800-773-1770; fax: 508-624-9384; www.media100.com

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FLUORESCENT LIGHTING

Lowel-Light LowelScandles: features a multitasking, fluorescent fixture designed for quick and easy choice of light size and quality by a change of accessories; provides 200W daylight or tungsten-balanced illumination from eight 24-watt lamps, switched in pairs for variable output; features an output of 220Fc at 5 inches, when used with its supplied Collapsable Front Reflector. 800-334-3426; fax: 718-921-0303; www.lowel.com

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Staco Energy Encore Series: contains blackout protection; offers power-conditioning features that protect against brownouts, surges, sags, spikes and other power anomalies; fully SNMP capable; offers scalable unlimited runtime via external battery packs with independent chargers, front-access, hot-swappable batteries, fast recharge times, voltage regulation incorporating double boost and double buck. 937-253-1191; fax: 937-252-1723; www.stacoenergy.com

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MPEG VIDEO CODEC

Cell Stack System Aurora: fully-integrated MPEG-2; equipped with encoder, decoder and ATM interface in one stand-alone, remotely managed appliance with four audio channels; PAL/NTSC format; automatic 3:2 pull-down inversion and decoder pan-and-scan support; sample rates of 32-, 44.1- and 48kHz, plus optional half sample rates. 972-713-8999; fax: 972-713-9597; www.cellstack.com

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BANDPASS FILTER

Microwave Filter Model 14042: used to prevent PCS interference at the ENG receive site; passes the entire ENG band, channels 1 through 10 and 1990- to 2500MHz; provides stopband rejection of 25dB at 1910MHz and 2580MHz, with a passband insertion loss of 1.0dB. 800-448-1666; fax: 315-463-1467; www.microwavefilter.com

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Aspen Electronics

ProBrick: comes in the PB-70 and NHP-100; designed as a modular, full-service battery with removable mounts and electronics service and cell pack replacement; capable of meeting the digital cameras and lighting application requirements. 714-379-2515; fax: 714-379-2517; www.aspenelectronics.com

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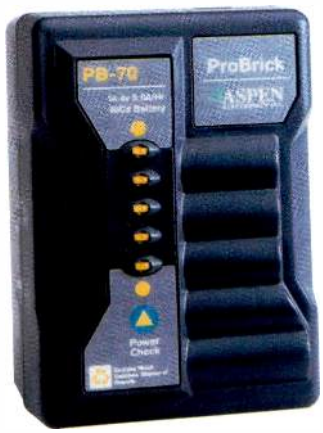

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CHANNEL COMBINER

Communications & Energy 7503HV: connects three 1KW VHF transmitters to one broadcast antenna line; features a frequency range of 174- to 450MHz; filter requires a minimum guardband of at least one channel; connectors are 50W 7/8th; filters are mounted on a common panel for studio installation. 315-452-0709; fax: 315-452-0732

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VIDEO DISK RECORDER

Doremi Labs V1 MP2-HD: features MPEG-2 4:2:2 recording and playback of high-definition video; simultaneous record and play capability for time delay and instant replay of live video feeds; housed in a 3RU chassis with up to two internal hard drives. 818-562-1101; fax: 818-562-1109; www.doremilabs.com

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VIDEO WORKSTATION

Quantel iQ: supports resolution co-existence — the ability to work simultaneously on material of different resolutions within the same job; combines the flexibility of a standard PC with the power of high-performance hardware to allow work in real-time on high-definition material. +44 (0)1635 48222; fax: +44 (0)1635 815815; www.quantel.com

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Tektronix PQA300: single-channel analysis system provides frame-by-frame results that are shown through multiple charts, displays and difference maps for identification, tabulation, analysis and archive of results; comes in a compact platform for desktop and rack applications; available with an optional integrated touchscreen display. 800-835-9433; 503-222-1542; www.tektronix.com

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Pinnacle Systems CineWave: delivers real-time special effects with uncompressed, standard-definition media; features uncompressed SD video and the speed of real-time effects; provides layering, effects, advanced nonlinear editing, motion tracker, and paint and compositing tools. 650-526-1600; fax: 650-526-1601; www.pinnaclesys.com

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PAN/TILT CAMERA

Hitachi Denshi PT-1: features a digital 16:9/4:3 switchable integrated pan/tilt camera unit with a color touchscreen controller; works with third-party controllers. 516-921-7200; fax: 516-496-3718; www.hdal.com

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ASSET MANAGEMENT AND ARCHIVE

Omnibus Workflow: provides graphical mechanism for the design of complex television station process automation; offers close integration between business and planning systems and the management and movement of physical media within the broadcast operation; enables users to manipulate, add and annotate metadata within the broadcast environment. 530-470-1700; fax: 530-470-1718; www.omnibus.tv

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AUTHORING SOFTWARE

Triveni and Chyron Lyric-Skyscraper: drives on-air graphics systems for conventional analog TV broadcast; creates and inserts interactive enhancements for DTV; combination of Chyron's Lyric and Triveni's Skyscraper. 631-845-2000 or 609-716-3505; fax: 631-845-3867 or 609-716-503; www.chyron.com; www.TriveniDigital.com

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AUDIO POST SYSTEM

AMS Neve Logic 3SC 5.1: features a networkable post workstation; features faster editing and project turnaround, 64/128 input menu-free mixing console; simultaneous multiversion mixes; surround monitoring; new DSP ToolBox plug-ins. 888-888-6383; fax: 212-965-3739; www.ams-neve.com.

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"BUILT TO ORDER" PRODUCTION STUDIO

Quantel's Editbox Choice: adds the 'built to order' option to the Clipbox Studio, extending the capabilities of Quantel's nonlinear editing system to the promo and shortform markets; +44 (0)1635 48222; fax: +44 (0)1635 815815; www.quantel.com.

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VIDEO SERVER

Panasonic Broadcast & Television Systems AJ-HDR150: now shipping; offering multiresolution recording and playback in the DVCPRO compression format; records 20 hours of DVCPRO footage, 10 hours of DVCPRO50 footage, or five hours of DVCPRO HD footage with internal RAID-3 storage. 800-528-8601; fax: 323-436-3660; www.panasonic.com/broadcast

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NEWSROOM NONLINEAR EDITING SYSTEM

Panasonic Broadcast & Television Systems newsbyte50: now shipping; operates on either 50Mb/s DVCPRO 50 and 25Mb/s DVCPRO; completes high-speed disk transfers at 2X faster than normal speed in DVCPRO 50 and 4X faster than normal speed in DVCPRO. 800-528-8601; fax: 323-436-3660; www.panasonic.com/broadcast

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VIDEO INSERTION GRAPHICS SYSTEM

Inscriber Technology NBC Namedropper XL system: now shipping, enables stations to insert call letters, logos or other identification information into a network promotion or program. 519-570-9111; fax: 519-570-9140; www.inscriber.com

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Dolby Laboratories DP570: now shipping; facilitates the creation of content with multichannel audio for digital television and DVD; 2RU unit requires minimal operational effort from the audio professional. 415-558-0200; fax: 415-863-1373; www.dolby.com/metadata

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MPEG CAPTURE CARD FOR STREAMING MEDIA

ViewCast Osprey-2000: now shipping; combines standard MPEG with streaming video and audio and video inputs; captures and encodes from digital or analog sources and integrates seamlessly with leading editing and streaming applications; one encode step instead of several steps to create multiple streaming bit rates and file formats. 972-488-7200; 972-488-7199; www.viewcast.com

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Business highlights from broadcast and production

BY NANCY INWOOD

Harris Corp. was selected by Dotcast as the manufacturer and systems integrator for the Dotcast Digital Network. Harris' Broadcast Communications Division will manufacture, install and maintain Dotcaster Edge Servers and supporting technology.

Shure Inc. purchased Popper Stopped studio pop filters from Middle Atlantic Products.

Time Warner's Channel 7 in St. Pete, FL, has outfitted its mobile production unit with six Telemetrics TM-9255 coax camera control systems.

Tektronix acquired Adherent Systems, which it will combine with its video business to provide solutions that will enable the deployment of MPEG technology for storage and transmission of video over broadband communication networks, including the Internet.

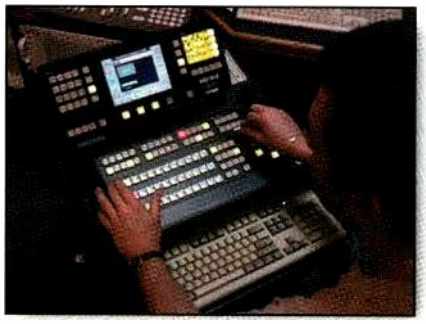
Paxson Communications made Tektronix test and measurement equipment the standard for use in its PAX TV Network.

Manhattan HDTV facility Colossalvision purchased a Fujinon HA10x5ERM HD lens.

Solid State Logic has had five recent sales of Aysis Air, Aysis Air Mobile and Axiom-MT to major broadcast facilities and mobile trucks. The orders include JC Studios in Brooklyn, NY; SWTV in Tempe, AZ; Turner Studios in Atlanta, GA; WWOR TV in Secaucus, NJ; and NMT in Somerville, NJ. JC Studios purchased two 32-channel Aysis Air digital broadcast consoles.

Crawford Communications finished its four-month move into a new all-digital facility. The company's operations were relocated to 3845 Pleasantdale Road, Atlanta, GA, 30340.

Philips Electronics and Sun Microsystems are collaborating in the development of streaming multimedia solutions for emerging broadband media and VOD.



Vancouver-based post house Rainmaker Entertainment Group completed installation of a new Snell & Wilcox HD1010 eight-input, HD production switcher within its premiere HD edit suite.

KUHT/Houston Public Television purchased three Sony DMX-R100 digital consoles for its new facility on the University of Houston campus. The first new console is currently online in the complex's Studio One production room, with the other units scheduled to go online later in the year.

ParkerVision PVTV equipment is in use at Ackerley Group-owned KION/KCBA-TV in Salinas, CA, including Digital PVTV Studio NEWS systems and Digital CameraMan three-CCD robotic pan/tilt cameras.

People

Panasonic Broadcast & Television Systems has appointed Frank DeFina as president. DeFina will serve concurrently as president of the Panasonic Security & Digital Imagine (PSDI) Company.

DeFina

Hassinger

The Society of Broadcast Engineers has hired Galen Hassinger as its frequency coordination director.

Sierra Video Systems named Rick Grant as its new chief technology officer. Grant, along with his brother Bob Grant and Larry Arzt, began Sierra Video Systems in 1985.

Videotek promoted Polo Recuay to vice president of engineering.

Wolfgang Schmittseifer will become Rohde & Schwarz's managing director for marketing and sales in North America as of July 1, 2001.

Schmittseifer

Jay Fine

National TeleConsultants announced that Jay Fine, has been named managing director.

Emerson Ray joined Sundance Digital as director of sales, East region.

Starz Encore Group LLC, a wholly-owned subsidiary of Liberty Media Group, has named John Beyler as its new vice president of technology.

Doug Bulter has been named director of engineering at A.F. Associates. Butler will be responsible for the ongoing development and daily management of AFA's project engineering team.

Odetics Broadcast announced several promotions including William Keegan from director of North American sales to vice president of worldwide sales, Carol Marsh from engineering services manager to director of operations, and Tim Sullivan from manager of customer satisfaction to director of customer service. ■

Screen Shot

Aggie presentations captured by HD Vision

Texas A&M commissioned HD Vision of Irving, TX, to produce two HD presentations for its Les Appelt Aggieland Visitor Center. The productions featured various aspects of the 44,000-student campus and surrounding communities.

All images for the productions were captured using Sony HDC-700A cameras with Canon 9x1 and 18x1 lenses. The programs will be stored on an Avid/Pluto Hyperspace HDCAM server and projected by a JVC DLA-M4000 using a Panja System for server and lighting control with Dolby 5.1 sound.

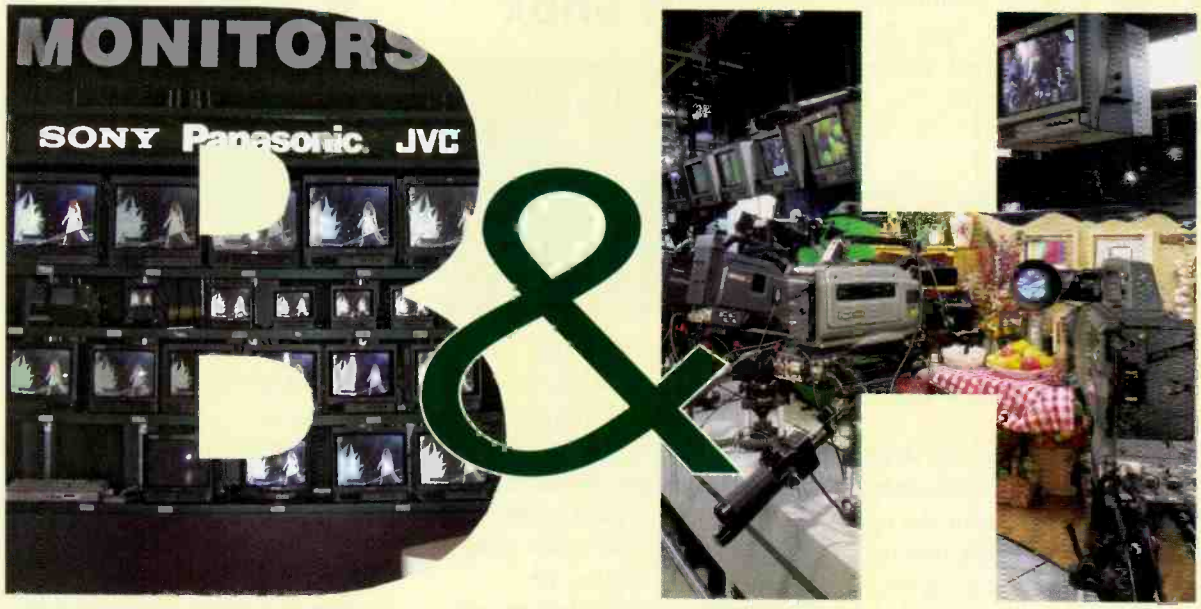
HD Vision retained the services of 16x9 Productions to produce both of the presentations for the university.

Fujinon lenses go "Searching for Noah's Flood"

Director of photography Foster Wiley of DC-based Wiley Dowd Productions was given the task of "Searching for Noah's Flood."

He took along Fujinon HD lenses on a Panasonic AJ-HDC20A HD camcorder. Fujinon HA20x7.3BERM and HA10x5.2BERM HD lenses were used for shooting the special.

"Searching for Noah's Flood" is the tentative title of a National Geographic special to air this summer on PBS that chronicles the search for parallels between the well-known biblical flood and evidence of a catastrophic flood in the Black Sea in Turkey in 5600 B.C. Noted explorer/oceanographer Bob Ballard, discoverer of the Titanic, led the exploration looking for signs of ancient civilization and sea vessels.



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SONY

DSR-PD150

3-CCD Mini DVCAM Camcorder

High quality acquisition in the DVCAM component digital format, as well as in DV, allowing up to forty minutes recording on one tape Mini DVCAM tape or over a full hour inthe DV mode. Suited for Event Videography and Video Journalist applications. This compact camcorder features three newly developed 1/3 inch 380K pixel CCDs with increased resolution and sensitivity at reduced noise and vertical smear.

- Allows two scanning modes: 480 progressive (for still) or interlaced (for video).
- Complete Professional Audio functions with two built-in XLR inputs.
- Built-in electronic zoom lens features Autofocus and SuperSteadyShot with an MTF 12X high quality optical lens with manual Zoom, Focus and Iris control.
- Built-in slot for a flash memory card or Memory Stick for still image storage. Up to 988 JPEG pictures can be stored in one 64 MB MemoryStick. The stored images can be mixed or keyed to the live image allowing logo insertion and/or mix effects.
- High resolution (500 lines) B&W viewfinder and a color swing out bright color LCD panel are included

Sony DSR-PD150 List Price **$4,000**
For B&H price ..... **Call**

DSR-250 3-CCD DV & DVCAM

Introducing everything you need in an event camera and more. The new completely digital DSR-250 from Sony is a high image quality reduced size camcorder which has been optimized for shooting events and parties. Every feature you could want is included in this revolutionary acquisition tool.

- **1/3 inch x three 380K pixel** (effective 340,000 pixels) **CCD's** that allow two scanning modes: 480 progressive (for still) or interlaced (for video). They also provide high quality acquisition with increased resolution and sensitivity at reduced noise and vertical smear. • One touch auto focusing in manual focus mode.
- **530 lines of horizontal resolution**, allowing you to capture your subject with tremendous detail.
- **Switchable aspect ratio** 4:3 (TV mode) or 16:9 (Movie mode)
- **DXF-801 high resolution 1.5" black & white viewfinder** (same as on DSR500/1 & DXC-D35) enables easier focusing. Automatically switches from 4:3 aspect to 16:9.
- **Records in DVCAM or DV**, standard tapes or mini. Up to 270 minute recordeding in DV mode onto a 184 min. DVCAM tape.
- Manual or automatic functioning: Focus, Iris, Shutter-speed, Zoom, Gain (3 positions and memory).
- **Flip out 2.5" 200,000 dot LCD monitor,** finally available on a professional camera • Time date stamp • Soft shoulder pad.
- **58mm lens** with **12x optical zoom.**
- **Advanced optical stabilization** allowing for a high quality digital zoom out to 24x, with a maximum digital zoom out to 48x
- **Assignable time code** (Rec Run, Free-run, User-bit)
- 16 bit 2 channel audio recording, or 12 bit 4 channel.
- **Digital in/out** (IEEE1394) and **analog in/out.**
- **Still image capture onto memory stick** • Upload graphics from memory stick or USB adapter, software included
- Phantom 48V power • Built in speaker • Directional microphone in pro mic holder. 2 XLR audio inputs • **Wireless remote .**
- **Built in edit controller.** Equipped with an i.LINK interface, allowing camcorder to serve as edit player or recorder.
- External 12V supply/Connection for light. The DSR-250 is equipped with light output (DC 12 V, maximum 30 watts).

Sony DSR-250 List Price **$5,900**
For B&H price ..... **Call**

DSR-300A

3-CCD Digital (DVCAM) Camcorder

Inheriting many of the same features and functions as the DSR-130, the affordable DSR-300A actually extends operational convenience with a range of new features and peripheral products. Remarkably compact and lightweight, the improved DSR-300A provides high mobility without compromising picture quality and can be held comfortably on your shoulder through the longest shoots and gives videographers the ability to acquire their footage quickly and easily.

- The DSR-300A has three 1/2" IT Power HAD CCDs to deliver 800 lines of horizontal resolution, 62dB S/N ratio and high sensitivity of F/11 at 2000 lux.
- Power HAD CCDs also gives you a low smear level of -110 dB (DSR-300) allowing more freedom to shoot highlighted subjects.
- With built-in 26-pin VCR interface, they can feed composite or S-Video output signals to an external recorder for parallel or back-up recordings. VCR recording modes including Parallel, Internal (only) and External (only) are selected via the trigger switch positioned on the operational panel
- With the DSR-300A, a picture previously recorded on tape can be superimposed on the viewfinder screen (Freeze Mix Function), allowing you to easily frame or reposition the subject just as in the previous shot. Combined with the SetupLog function, the retake shot becomes a breeze
- LSI Digital Signal Processor (the very same one used by the DXC-D30 cameras) for a high signal-to-noise ratio of 62 dB.
- Both mini cassettes (PDVM series) and standard cassettes (PDV series) can be used with the DSR-300A. With PDV 184ME (standard), a maximum recording time of 184 minutes can be acheived. They can also play back tapes recorded in the consumer DV format
- For operational convenience while shooting, the Time Code is superimposed on the viewfinder screen or MONITOR OUT screen, even during playback
- DXF-801 viewfinder featuring variable peaking, 3 level tally light and a white LED light with 2 levels of intensity to illuminate the lens setting • IEEE1394 i.Link (out only)

Sony DSR-300A List Price **$9,900**
For B&H price ..... **Call**

Panasonic

AG-DVC200

Full Size DV Camcorder

The industry's first DV camcorder to utilize large DV cassettes

The AG-DVC200 1/2" 410,000-pixel IT 3-CCD DSP camcorder records for an astounding 4-1/2 hours (270 minutes), and offers an interchangeable bayonet mount lens that permits users to use their favorite 1/2" lens. With the incredible ability to shoot at F11 in lighting as low as 0.5 lux, the AG-DVC200 delivers an outstanding 800 lines of horizontal resolution, an IEEE 1394 interface, a signal-to-noise ratio of 62dB, and very low smear.

The 11-pound shoulder-style camcorder delivers many functions offered in Panasonic's most-popular DVCPROcamcorders, including a 4-position ND/CC filter, the ability to increase gain up to +36dB forshooting in dim light, User Scene Memory storage, and a 6-speed shutter with synchro scanfor the flicker-free shooting of CRT displays.

JVC

GY-DV500U

QUICK DIAL 74

1/2-inch 3-CCD Professional DV Camcorder

The GY-DV500 combines the convenience and cost-effectiveness of Mini DV with the performance and features you need. Incorporate three 1/2-inch 380,000 pixel IT CCDs for superior picture performance (equivalent to 750 lines of resolution) superb sensitivity of F11 at 2000 lux and minimum illumination of 0.75 lux (LoLux mode). Rugged construction with a rigid diecast magnesium housing. Extremely portable, compact and light weight (lesss than 11 lbs. fully loaded). Additional features like the menu dial and Super Scene Finder assure ease-of-use and shooting flexibility, while the IEEE1394 and RS-232 interface allow integration into various non-linear and post-production systems. A professional camcorder in every sense, the compact, lightweight GY-DV500 redefines acquisition for corporate, educational, cable and broadcast production, as well as wedding videography and multimedia applications.

Professional Performance

- 3 1/2" 380,000 pixel IT CCDs with 750 lines of resolution.
- F11 at 2000 lux. • Black Stretch/Black Compress function
- An advanced color matrix circuit ensures natural color.
- Lolux mode increases sensitivity with almost no increase in noise. • Multi-zone iris weighting system offers accurate auto exposure under any condition.
- Viewfinder status displays audio indicator, tape and battery remaining time, VCR operation and warning indicators. • Menu dial lets you quickly navigate through the viewfinder menu.

Professional Audio

- Two 16-bit 48-kHz channels or two 12-bit 32-kHz channels with a dynamic range of 85 dB
- Two XLR-balanced audio inputs with 48v phantom power and manual audio control
- Side-mounted speaker for playback.

Automatic Functions

- Continuous Auto Black (CAB) circuit assures perfect Black Balance in a changing environment.
- Full Auto Shooting (FAS) mode for point-and-shoot ease of operation. Automatic video level control (ALC) is also activated, along with Extended Electronic Iris (EEI) and Full Auto White, which provide both variable gain and variable shutter.
- ALC (Automatic Level Control) with EEI for continuous shooting in all light levels

Special Purchase

BUY any JVC GY-DV500U Package:
GY-DV500U with Viewfinder and Lens Outfit
GY-DV500U with Bescor ST144 Kit
GY-DV500U with Viewfinder, Lens and AB1 Kit
GY-DV500U with Viewfinder, Lens and AB2 Kit
GY-DV500U with Viewfinder, Lens and IDX
GY-DV500U with Studio Kit
and RECEIVE FREE:
Anton Bauer Battery Kit ..... A Value of **999.95**
OR: IDX Battery Kit ..... A Value of **849.95**

GY-DV550U

1/2" 3-CCD DV Camcorder

Introducing the Versatile GY-DV550 from JVC. Designed by professionals, for professionals, the GY-DV550 is the world's first DV camcorder to offer studio camera capability. Thanks to the built-in 26-pin interface, you can connect the GY-DV550 to a CCU for remote-controlled studio operation or backup recorder in the field. But that's not all. It also comes with pool feed input/output, so you can transfer image data back and forth to another camera or cameras, making it ideal for special shooting situations such as press conferences, exclusive interviews, and sporting events. Record isolated camera views (ISO-Cam) during a live multi-camera shoot, making it ideal for parallel shooting at live concerts and other events. Naturally, we've made sure the GY-DV550 is equipped with all the other capabilities you need, including a standard 1/2-inch bayonet mount for use with a great diversity of professional lenses, bidirectional IEEE 1394 (NTSC), two 48 kHz 16-bit digital PCM audio channels, and a built-in SMPTE or EBU timecode reader/generator, as well as XLR microphone inputs, audio outputs, headphones output, and both composite and Y/C outputs. Maximum versatility, top-level performance, and superior cost-efficiency make the GY-DV550 the smart solution for producers who need a camcorder capable of doing double-duty in both the studio and the field.

Ready for EFP remote control (RM-LP57/LP55) The EFP remote connects directly to the GY-DV550 for precise control over the video parameters.
Return video output for Tele-Prompter Tele-Prompter capability assures full support for studio program production.
Genlocking function To meet the demand for systemization, the GY-DV550 is equipped with a genlocking function that includes SC lock to assure high-resolution pictures.

State-of-the-art 1/2" 3-CCD image pickup Incorporates three 1/2" 380,000 (NTSC)/440,000 (PAL) pixel interline-transfer CCD's. Each CCD is equipped with highly advanced circuitry that eliminates vertical smear when shooting bright lights in a dark room. Lag and image burn are also reduced to indiscernible levels, while high sensitivity of F11 at 2000 lux assures creative flexibility and simplifies lighting requirements.

SR-VS10U

MiniDV and S-VHS VCR Combo

The HR-DVS1U is a unique all-in-one video solution combining miniDV and Super Hi-Fi Stereo in one VCR. The MiniDV deck allows direct playback of cassettes you've recorded on a MiniDV camcorder without any cables to connect. One easy solution!

- Mini DV Format &High Resolution Super VHS and VHS
- DigiPure Technology w/ TBC and 4MB Frame Memory
- PCM Digital Audio (DV) andHi-Fi VHS Stereo with MTS Decoder • Jog/Shuttle on Remote
- VCR Plus+ with Cable Eye® Cable Box Controller
- Insert Editing with Flying Erase Head • Plug & Play
- Audio Dubbing • Auto Index and Index Search
- DA4(Double Azimuth) Head Helical Scan System
- Digital AV Tracking • Express Programming • Auto SP-EP Timer Recording • Active Video Calibration • Multi-Brand TV/DBS Compatible Remote with Jog / Shuttle
- S-video Input on Front / Back Panel • Two S-Video Output on Back Panel • Rear AV INPUTs, Gold Plated Front Inputs
- DV Playback Component Video Output, Two A/V Outputs

Panasonic

AG-DVC10

Mini DV 3-CCD Camcorder

This lightweight unit uses the mini-DV format, large diameter lense, and a 3-CCD image sensor to deliver the high recording quality needed for professional use.

High-Quality DV Recording

- Records on Mini DV cassettes in either SP (standard Play) or LP (Long Play) mode
- Records audio either as 16-bit 2 channel, or 12-bit 4-channel

Superior 3-CCD Picture Quality

- 1/4 inch, 270k-pixel IT 3CCD image sesnsor • 43 mm filter
- 12x Optical zoom
- Gain Up to + 12dB
- Neutral Density Filter
- Manual Focus, Manual Iris

New Shoulder-Type Design

- Excellent Shooting Stability
- Light weight weighing aprox. 6 lbs. • Extremely mobile

i-Link (DV IEEE1394) Terminal

anton bauer

HyTRON 50 Battery

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

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

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

QUAD 2702/2401

Four-Position Power/Chargers

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

I·D·X

E-50

Endura V-Mount Battery Pack

E-50 Endura V-Mount Battery Pack

- The V-Mount or wedge-mount battery mounting connection is being found on more and more of today's camcorders. Due to this prevalent battery mounting system, IDX has developed the Endura Lithium Ion V-Mount battery system to work directly with these newer camcorders.
- The IDX Endura batteries incorporate Syncron technology, which automatically engages an on camera light whenever the record button on the camera is activated.
- The E-50 Lithium Ion Endura is a sleek and durable 50W, 14.4V battery.
- A PowerLink is included, as standard equipment with every Endura battery. This allows two batteries to be piggybacked together in order to double the power of this lightweight battery.

Special Purchase **$299.95**

SONY 800 SERIES

UHF WIRELESS MICROPHONE SYSTEMS

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

SONY

DSR-20/40 DVCAM Player/Recorders

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

- **i.LINK** They both offer i.LINK ((IEEE1394) input/output. In addition, in the "Digital dubbing including TC Copy" mode, full information of video, audio and time code of the original tape can be copied to another tape. Especially useful when making working copies of the original.
- **Inputs and Outputs** They provide a full range of analog video inputs and outputs for integration into current analog-based systems. They both offer composite and S-Video input/output, while the DSR-40 (only) offers a component output as well. The DSR-20 is equipped with analog audio inputs and outputs (RCA), the DSR-40 with RCA inputs and XLR-balanced output. These connections in combination with their i.LINK interface allow a smooth transition to an all digital system in the future.
- **Record/Playback Functions** Automatic repeat function for repeated playback. After reaching the end of the tapet, the DSR-20/40 automatically rewinds the tape, then starts playing back the segment again.
- They are capable of searching for Index Points, which are recorded on the tape as "in-point" marks every time a recording starts. They can also search for photo data recorded on a DVCAM cassette by the DSR-200A/300/PD-100, or where the recording date has been changed.
- **Reference Input** External sync input enables synchronized playback with other VCRs. Especially important in A/B Roll configurations. In addition, the DSR-40 only allows adjustment of H-sync and SC phase via the menu.
- **Control S Interface** The DSR-20/DSR-40 have a Control S input allowing control via the optional DSRM-20 Remote Control.

DSR-20.....List Price **$3,950** ....**For B&H price**....**Call**
DSR-40.....List Price **$5,100** ....**For B&H price**....**Call**

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

DSR-40 Only • Equipped with an RS-422A interface, it can perform as the editing player in A/B roll or cut editing system.
- The DSR-40 is not equipped with a synchronization capability, the editing accuracy is performed by pre-roll and play.

DSR-30 DVCAM Digital VCR

The DSR-30 is an industrial grade DVCAM VCR that can be used for recording, playback and editing. DV standard 4:1:1 sampling digital component recording with a 5:1 compression ratio provides spectacular picture quality and multi-generation performance. It has a Control L interface for editing with other Control L based recorders such as the DSR-200A DVCAM Camcorder or another DSR-30. It also has a continuous auto repeat playback function making it ideal for kiosks and other point of information displays.

- Records PCM digital audio at either 48kHz (16-bit 2 channel) or at 32kHz (12-bit 4 channel).
- Equipped with Control L, capable of SMPTE Time Code based accurate editing even without an edit controller. Built in editing functions include assemble and separate video and audio insert.
- By searching for either an Index point or Photo Data recorded by the DSR-200A camcorder, the DSR-30 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 lock ensures audio is fully synchronized with the video for absolute precision when doing an insert edit.
- Built-in control tray has a jog/shuttle dial, VCR and edit function buttons. The jog/shuttle dial allows picture search at ±1/5 to 15X normal speed and controls not only the DSR-30 but also a player hooked up through its LANC interface.
- DV In/Out (IEEE 1394) for digital dubbing of video, audio and data ID with no loss in quality.
- Analog audio and video input/outputs make it fully compatible with non-digital equipment.

Sony DSR-30 List Price $4,475
For B&H price .....**Call**

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.
- Auto repeat of entire or a specific portion of the tape.
- Built-in character generator can display VTR status, time code, self-diagnostic messages, set-up menu, etc.
- Both read LTC Time Code) and UB (User Bits). The UVW-1400A also generates LTC and UB (Free-Run/Rec-Run).
- 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.

UVW-1200.....List Price **6,200** ...**For B&H price**...**Call**
UVW-1400A.....List Price **8,400** ...**For B&H price**...**Call**

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.

UVW-1600.....List Price **9,600** ...**For B&H price**...**Call**
UVW-1800.....List Price **11,300** ...**For B&H price**...**Call**

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 & 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 10D00K).
- Blue gun, underscan and H/V delay capability

PVM-14M2U.....List Price **1,265** ...**For B&H price**...**Call**
PVM-14M4U.....List Price **1,573** ...**For B&H price**...**Call**
PVM-20M2U.....List Price **2,525** ...**For B&H price**...**Call**
PVM-20M4U.....List Price **2,920** ...**For B&H price**...**Call**

PROFESSIONAL VIDEO TAPES

fuji

Professional Grade VHS

PG-30	2.29	PG-60	2.39	PG-120	2.59

Broadcast Grade VHS Box

BGR-30	3.49	BGR-60	3.99	BGR-120	4.69

H471S S-VHS Double Coated

ST-30	6.99	ST-60	7.49	ST-120	7.99

M221 Hi 8 Double Coated

Metal Particles			Metal Evaporated		
P630HMP	4.49		E630HME	7.69	
P660HMP	6.29		E660HME	10.49	
P6120HMP	8.49		E6120HME	13.99	

M321SP Metal Betacam (Box)

05S	10.99	10S	11.99	20S	12.99
30S	13.99	60L	20.99	90L	32.99

DP121 DVC PRO

12M (Med.)	7.49	23M	8.79	33M	10.99
63M	19.99	66L	22.50		
94L	30.99	126L	39.99		

maxell

Broadcast Quality Hi8 Metal Particle

P6-30 HM BQ	5.39	P6-60 HM BQ	6.09
P6-120 HM BQ			7.99

P/I PLUS VHS

T-30 Plus	1.89	T-60 Plus	1.99	T-90 Plus	2.09
T-120 Plus	2.19	T-160 Plus			2.69

HGX-PLUS VHS (Box)

HGXT-60 Plus	2.69	HGXT-120 Plus			2.99
HGXT-160 Plus					3.99

BQ Broadcast Quality VHS (Box)

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

BQ Professional S-VHS (In Box)

ST-31 BQ	6.79	ST-62 BQ			6.99
ST-126 BQ	7.45	ST-182 BQ			13.99

Betacam SP

B30MSP	13.49	B60MLSP	19.99	B90MLSP	27.95

Panasonic

Mini DV Tape

AY DVM-30	6.49	AY DVM-30 (10 Pack)	ea. 5.99
AY DVM-60	6.99	AY DVM-60 (10 Pack)	ea. 6.49
AY-DVM80	12.99	AY-DV123EB	20.95

DVCPRO

AJ-P12M (Medium)	7.99	AJ-P24M	9.99
AJ-P33M	11.49	AJ-P66M	19.49
AJ-P66L (Large)	20.99	AJ-P94L	29.99
AJ-P126L			38.95

SONY

Hi-8 Professional Metal Video Cassettes

P6-30 HMPX	4.79	E6-30 HMEAD	6.99
P6-60 HMPX	6.79	E6-60 HMEAD	9.99
P6-120HMPX	8.99	E6-120HMEAD	13.99

PR Series Professional Grade VHS

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

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

T-30BA	3.69	T-60BA	4.19	T-120BA	4.99

MQ Master Quality S-VHS (In Box)

MQST-30	7.49	MQST-60	7.69	MQST-120	7.99

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

KCS-10 BRS (mini)	8.99	KCS-20 BRS (mini)	9.99
KCA-10 BRS	8.99	KCA-20 BRS	9.49
KCA-30 BRS	10.69	KCA-60 BRS	14.99

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

KCS-10 XBR (mini)	9.79	KCS-20 XBR (mini)	11.29
KCA-10 XBR	10.29	KCA-20 XBR	11.79
KCA-30 XBR	13.29	KCA-60 XBR	17.39

BCT Metal Betacam SP Broadcast Master (In Box)

	Single	10 Pak/Ea.	50 Pak/Ea.
BCT-5M (small)	10.99	9.99	9.19
BCT-10M (small)	11.49	10.29	9.79
BCT-20M (small)	12.99	11.49	10.99
BCT-30M (small)	13.49	12.49	11.99
BCT-30ML	13.49	11.89	–
BCT-60ML	20.99	19.99	18.99
BCT-90ML	30.99	28.99	27.99

PDV Mini Series Professional DVCAM Tape (w/memory chip)

	(1)	(10) Ea.		(1)	(10) Ea.
PDVM-12ME	14.49	13.49	PDVM-22ME	15.19	14.49
PDVM-32ME	15.49	14.99	PDVM-40ME	16.99	16.49

PDV Series (Standard) **Professional DVCAM Tape**

PDV-34ME	24.99	23.99	PDV-34N	20.99	19.49
PDV-64ME	27.99	26.99	PDV-64N	24.99	26.99
PDV-94ME	32.99	31.49	PDV-94N	29.99	28.49
PDV-124ME	38.49	37.49	PDV-124N	32.99	31.99
PDV-184ME	46.49	44.49	PDV-184N	39.99	38.99

Mini DV Tape

DVM-30EXM w/Chip	12.79	DVM-60EXM w/Chip	16.99
DVM-30EX "No Chip"	11.99	DVM-60EX "No Chip"	12.99
DVM-30PR "No Chip"	7.99	DVM-60PR "No Chip"	9.75

Full Size DV Tape with Memory Chip

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DigiSuite LX offers all the great features of the best-selling Matrox DigiSuite platforms, plus DV, MPEG-2, and 1394 support. DigiSuite LX provides native DV and MPEG-2 editing under Windows 2000 • Award-winning realtime feature set • Native-DV and 50-Mbps MPEG-2 editing
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• Field-proven, reliable technology

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- PNY 256MB SDRAM memory • Windows 2000
- 48X CD ROM Drive • Matrox G450 Dual Display Card
- Adaptec 29160 LVD-160 SCSI Card
- Seagate 73GB LVD-160 SCSI Drive • 3.5" floppy drive
- 102 Button Keyboard • Microsoft Trackball mouse
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- Fully assembled and tested

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Incite Software for DigiSuite

Incite is a non-linear editing software designed to run on Matrox DigiSuite hardware. Incite provides an easy to use editing interface, multiple editing modes, a powerful toolkit with extensive utilities, more than 15 simultaneous real-time effects with unlimited keyframing for up 2 layers of video + 1 layer of live input video + 1 graphic layer, tools for multilayer compiling and advanced compositing, real-time titling and graphics, as well as an extensive range of options that will quickly expand your editing software into a fully equipped editing suite.

For the local studio, the editing toolkit must be extensive. Incite provides features like media logging and batch capturing, 4 editing modes (TV, Film, Ripple and Get Trimmed), three point editing, quick transition creation, virtually unlimited real-time possibilities (including easy to build DVE, video key and motion effects), real-time animated titling & graphics features that will satisfy the most demanding client, templating and cut/copy/paste features for rapid application, filters and effects rendering for multilayer compositing, 3rd party FX integration, consolidate storyclips and batch re-digitizing ... just to cite a few key features.

For large post-production houses and broadcasters they key concepts are speed and integration, live input and hybrid editing features, VLAN control for up to 31 VTRs, Integration of 3rd party effects hardware directly on the Incite timeline, and the ability to work with multiple formats (from Lossless MJPEG to DV and MPEG-2). As for speed, The number of real-time effects is unsurpassable while all effects that need to be rendered are rendered in the background.

on-line Express

Professional Editing for DigiSuite

Powerful, Intuitive and Freeform Editing
On-Line Express offers advanced editing tools and a freeform timeline which allows you to focus on your creativity and maximize your productivity. Edit multiple layers freely by moving single clips, blocks of clips or entire timelines without constraining modes.

Multi-Cam Editing - Whether or not you shot multi-camera, you will love the unique Multi-Cam feature. On-Line Expree allows you to easily scrub and view 4 simultaneous camera angles for selecting desired cut points.

Powerful Media Management - On-Line Express provides the tools necessary to organize, sort and retrieve your digital content. With unlimited bins, projects and timelines you can easily open multiple timelines and bins and freely cut and paste between them.

Auto Storyboard - This unique feature allows you to instantly create programs with dissolves and audio crossfades without working on the timeline!

Supported Hardware - On-Line Express was designed specifically for the Matrox DigiSuite hardware. Support of Dual monitor display with the use of Matrox G400 or G450 VGA boards. Whether you are editing in MPEG-2 or streaming to the web, On-Line Express has a solution for you.

on-line Turnkey System

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- 48X CD ROM Drive • Matrox G450 Dual Display Card
- Adaptec 29160 LVD-160 SCSI Card
- JEMS 292GB LVD-160 (10K) SCSI Array • 3.5" floppy
- Sony DRV-100 Internal DV Tape Drive
- 102 Button Keyboard • Microsoft Trackball mouse
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- 90 day Free Tech Support
- Fully assembled and tested

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Avid Xpress DV

Powerful Video Editing Tools

Avid Xpress DV software combines powerful video and audio editing tools, digital mastering, and extreme ease of use. Captures and edits DV video, adds effects, mixes audio, and outputs over IEEE1394 FireWire. Or transcodes the content to all major new media formats. MPEG-1 (for CD-R) MPEG-2 (for DVD-RDM) QuickTime or AVI for computer based presentations or for streaming on the web. As a member of the Avid Xpress Family, The Xpress DV offers the same Avid graphical user interface (GUI) used in the very high-end avid products. powerful audio and video tools.

DELL Precision 220 Workstation Bundle

- Pentium III 866 MHz / 1 GHz CPU
- 128mb/256mb RIMM (RDRAM) memory
- Matrox G450 32mb Graphics Card
- 20GB ATA100 IDE (7200 RPM) System Drive
- 40GB ATA100 IDE (7200 RPM) System Drive
- 48X IDE CD ROM Drive • 3.5" Floppy Drive • Windows NT

XPress DV software loaded and tested

Express DV on Dell Precision 220 Workstation

866 MHz Processor, 128mb RDRam	*1 GHz Processor, 256mb RDRam*
$4,499	$4,999

Shown with optional Monitor

canopus DV-Rex M3

Mobile Real-Time DV Editing Workstation

Add portability to your video editing. This light weight unit sets up in minutes and comes with a flip down keyboard and a 15" high resolution LCD panel. Works with both analog and DV I/O allowing you to combine footage from analog and DV sources. Incorporates the latest computer components including dual Pentium III CPUs, 256MB RAM, Xplode effects acceleration and expandable storage options.

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Some real-time effects include transitions, up to 10 tracks of titling, luma keying, color correction, slow-motion and picture-in-picture. Audio effects include echo, reverb, and parametric and graphic equalization.

PINNACLE SYSTEMS CineWave

Non-Linear Editing Package

Revolutionary non-linear editing package that delivers the power of true uncompressed video with Apple's Final Cut Pro. Using Pinnacle's new HUB3 video processor, the CineWave combines infinite layering, incredible effects, advanced compositing tools and accurate motion tracking with all the major video formats in compressed or uncompressed video. Based on the new dual processor Apple G4's, CineWave delivers the worlds first scaleable desktop video system capable of outputting both Standard Definition and High Definition simultaneously.

Includes • Commotion Pro • Hollywood FX

Apple G4/Final Cut Pro Complete Video Editing Systems

Good System

Includes: • Apple G4/466 Computer
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- 45GB of ATA/100 storage
- CD-RW rewritable CD writer
- Final Cut Tutorial CD
- Mitsubishi Diamond Pro 2040 22" Monitor
- Apple Care-three year warranty
- Complete System integration and testing

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Great System

Includes: • Apple G4/533 Computer
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- 60GB of ATA/100 storage
- Total of 256MB of memory
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- Artel Boris Graffiti CG Program
- Final Cut Tutorial CD
- Mitsubishi Diamond Pro 2040 22" Monitor
- Apple Care-three year warranty
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Best system

Includes: • G4/533 DUAL Processors
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- ATI Rage Orion dual display card
- Total of 256MB of memory
- Artel Boris Graffiti CG Program
- Final Cut Tutorial CD
- 2 Mitsubishi Diamond Pro 2040 22" Monitors • CD-RW writer
- Apple Care-three year warranty
- Complete System integration and testing

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The GALLERY

The GALLERY

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Classifieds

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Candidate should have an Associate degree (or equiv.) in electronics and 4 years minimum experience as a Maintenance Engineer working in television. Computer and Networking skills, and a strong knowledge of TV systems are highly desirable. Must be able to perform electronic repair and maintenance to the component level. SBE Certification a plus!

Send Resumes to: *David Costar, Technical Recruiter, cnn.engr.jobs@turner.com; 250 Williams St., Ste.1250, Atlanta, GA 30303*

EMAIL PREFERRED, no phone calls please!

INDIAN RIVER COMMUNITY COLLEGE

Ft. Pierce, Port St. Lucie, Stuart, Vero Beach and Okeechobee, Florida

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To handle video and engineering needs including maintaining, installing, calibrating and repairing broad range of teleproduction equipment used to deliver and receive Distance Learning Programming throughout the College's service area.

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TRANSMITTER ENGINEER, C4-008984: The University of Utah has an immediate opening for a Transmitter Engineer. Bachelor's Degree in Electrical Engineering or a related field or equivalency, plus two years' high-power transmitter maintenance experience or equivalency required. Eight years' experience preferred. Provide maintenance for KUED/KULC/KUER high-power transmission systems. Maintain television/radio transmitters, subsystems, microwave systems, towers, microwave antennas, and transmission systems. Stock emergency parts and supplies. Maintain and calibrate remote control and telemetry system. Perform facilities upkeep of transmitter sites. Maintain FCC and performance logs. Perform and log calibration of transmitter and instrumentation. Responsible for the quality and final transmission of signals leaving the station's outputs. On-call 24/7. Functions as the controlling point for the stations between 12:00am and 5:00am. Send applications to: Staff Employment, 1901 E. So. Campus Drive, Salt Lake City, Utah 84112, fax 801-581-5571. Access applications at www.med.utah.edu/hr. TDD Accessible 581-6787. Equal Opportunity Employer

RF ENGINEER with mapping and propagation modeling experience needed. Small consulting firm experiencing rapid growth needs engineer with at least 2 years of RF experience. Familiarity with Mapinfo definitely a plus. Knowledge of FCC Rules and Regulations concerning commercial radio needed. Fax resume to 334.323.3623.

ORBAN, the industry leader for digital broadcast audio processing products has immediate openings for the following positions: Customer Service Engineer This position will provide technical support for our broadcasting equipment. This support includes providing information on specification, application, installation and setup, troubleshooting and repair, as well as theory of operation. AA degree in electronics or equivalent experience is required, including a minimum four years of broadcast engineering experience. Experience with PC hardware, knowledge of electronic troubleshooting and repair, excellent verbal and written communication skills are a must. Embedded/C/C++ DSP Engineers Seeking development engineers with 3 or more years experience coding C/C++ for real-time embedded systems, with emphasis on Z80-series and x86-based processors. Hardware design, GUI, DSP (Motorola 56xxx) and Win32/MFC a plus. Digital audio experience preferred. Orban is a division of CRL Systems, Inc. We offer excellent benefits, close to BART. Send resumes to Orban Human Resources, 1525 Alvarado St., San Leandro, CA 94577, or e-mail to resumes@orban.com or fax to (510) 351-3323. EOE.

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Should have a minimum of 10 years as a Television Chief Engineer or equivalent with a strong background in RF and Management. Will oversee approx. 10 television stations. Location of home office is flexible, but preferably Chicago with regular travel required to all stations in your group.

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Project Engineer

Must have strong organizational and computer skills. Must be self-motivated and detail oriented. Position requires strong management skills and able to sufficiently and productively handle multi-tasks at hand.

Technician for Broadcast Integration Facility

Several applicants are needed at Paxson's integration facility to interconnect broadcast equipment into a "turn-key" master control. Capability to read schematics, solder, work with your hands and attention to detail is a must.

For more details and job qualifications, please send your resume, indicating position desired, to: Paxson Corporate Engineering, 11300 4th St. North, Suite #180, St. Petersburg, FL 33716. Fax to: 727-576-2876 or email: engjobs@paxemail.com. EOE

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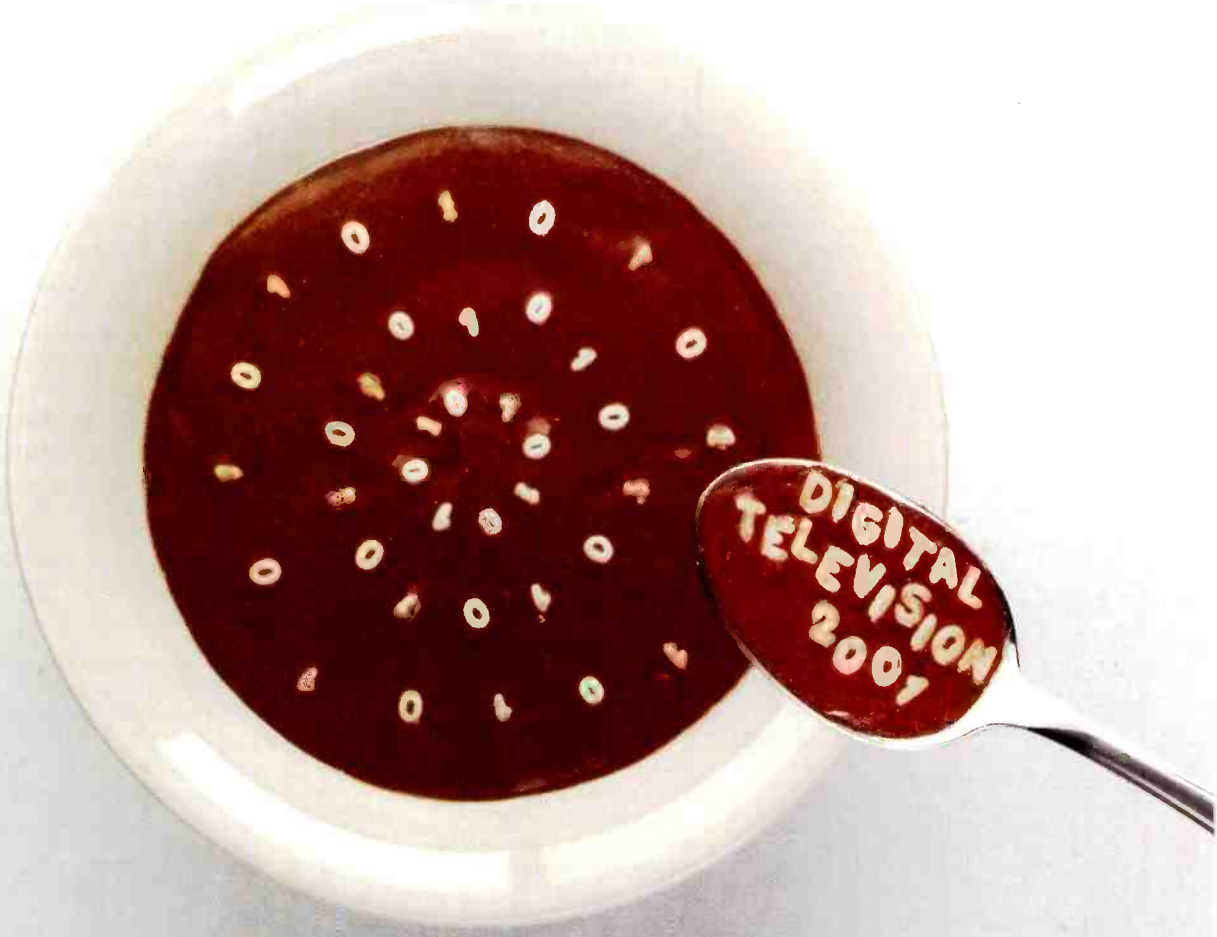

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EOM

Where are the women?

BY PAUL MCGOLDRICK

I asked my seven-year-old daughter today what she thought a scientist is: She gave a very cogent answer. Then I asked her what an engineer is: She thought that was someone who "fixes cars and things." At least she didn't come up with the "running-trains" definition that plagues so many of us when we tell people what our profession is. But while she has career choices on her mind — even today — they involve professions such as explorer and police officer, but obviously not engineer. Now that she knows her dad is an engineer, we can have a reasonable conversation at a later date about what it means to be one.

Have you given any thought to why there are so few female engineers in electronics? There are plenty of female scientists, and a large percentage of computer science graduates are women. But in electronics, the numbers are mind-bogglingly small. When you tighten the defined area to broadcasting there are even fewer female engineers, and off the top of my head only two come to mind.

When I was teaching electronics/broadcast engineering a few decades ago, we saw an occasional female undergraduate, often as not employed by a government department. Data on European college entries indicates that the number of women applying for engineering courses is 25 percent to 35 percent, depending on the country, but that number falls in electronics. In the United States, the percentage of female engineering graduates is down in the single digits. Peer pressure, career guidance counselors and parents must take at least some of the blame for not explaining the engineering profession, perhaps because they do not understand it themselves. As a body, engineers should take blame for not getting out there to be proactive in promulgating ourselves. Even for me, although I had no doubts that I wanted to be an engineer, I came under academic and peer pressure to study the "pure" sciences. I wish there would have been someone I could have gone to for some support and information.

Engineers should take blame for not getting out there to be proactive in promulgating ourselves.

I know a few female engineers in the semiconductor industry and — to a woman — they have said that the first three months in the work environment were hell while they had to prove to their male colleagues that they knew what they were doing. That is probably true in any work environment where a newcomer is different from the incumbents, but in this particular arena the situation is pronounced. Looking at the career paths of several of these people, they must have been doing rather better than their male peers.

There are numerous reports that women generally take less interest in mathematics during and after puberty. Do these young ladies also assume (if they know what engineering is) that this has got to be a boy "geek" thing? And why the falloff in mathematical interest? I have heard some women say that math is a useless skill when you get on to algebra, calculus and so on. They only believe you need enough to get you through the daily grind of buying and selling, measuring and timing. That certainly suggests to me that they have been the victims of a dose of extremely bad math teaching — one that may be at least partly to blame for the scarcity of women engineers.

When I was about 15 and going through the third math teacher of the year (after losing the first to death and the second to "running off with a barmaid"), I realized that what I was being fed was totally formula-based. Learn this equation, this solution, this relationship. It wasn't teaching at all. We were being trained that if you parroted enough you would pass your exams. Instead I understood that mathematics was a philosophy, an approach, a challenge. I didn't look back, and I had no problems with anything mathematical for the rest of school, through college and into the workplace.

My daughter appears to have absolutely no problem with her grade-level math and she loves numbers and playing with them. I got told off by a high school teacher for explaining and letting her do more complex addition than her grade, but it doesn't seem to have given her a complex of any kind, and I don't think it will be harmful to explain to her what it means that we are going to buy 2E7 pavers for the front yard this week.

Of course she had the final word in our conversation today when, after a few sentences of explanation about engineers, she declared, "Then I'll be the first one!" ■

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

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