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JANUARY 2001

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Truckin' takes on a whole new meaning

Broadcasters & broadband

A data marriage or divorce?

Also: Understanding digital video

The Weather Channel's TV-80 Console

"ONE OF OUR KEY REQUIREMENTS was the ability to support many more microphones, mix-minuses for IFBs, and satellite sources without routing and patching sources and inputs. WHEATSTONE's TV-80 audio console was the logical fit for our needs. It featured eight internal mix-minuses and was 'tried and true' technology. Its preselects with Event Computer give us the expansion and flexibility needed to satisfy a diverse range of needs, from live production out of multiple sets and studios to pre-production for specially produced programming.

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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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SONY

"DTV Broadcasting was just one reason to go with HDCAM."

— Pat Holland, VP Technology, Fisher Broadcasting.
— Mark Simonson, Director Of Engineering, KOMO-TV Seattle.

"We were determined to be a leader in DTV," says Fisher Broadcasting's Pat Holland. "Our flagship, KOMO, became the first U.S. station to broadcast news in an interoperable DTV standard, including 1080i, 720P. We're now broadcasting DTV full time. And Sony helped us every step of the way. They showed us how HDCAM® camcorders and VTRs could meet our DTV requirements. And we've discovered what HDCAM production can also mean to our analog broadcast signal."

According to Mark Simonson of KOMO, "When HDCAM material runs on our analog channel, it dramatically improves the on-air look. HDCAM production has completely transformed our news openings, closings and bumpers. And when we rebuilt our studios, we went to all Sony Hi-Def cameras. Because they use the latest technology throughout, their SD outputs deliver a noticeably better viewing experience."

"We've also found that HDCAM equipment fits right in with our Betacam SX® news production. Using both half-inch formats, we've gone all digital, all component, all 16:9. The advance in picture quality is tremendous. Both formats share a common user interface and both formats meet out needs in size, weight and operating cost," says Simonson.

No matter where you are in your DTV transition, you owe it to yourself to experience Sony HDCAM equipment so you can prepare for tomorrow – and upgrade your on-air look today.

HDCAM

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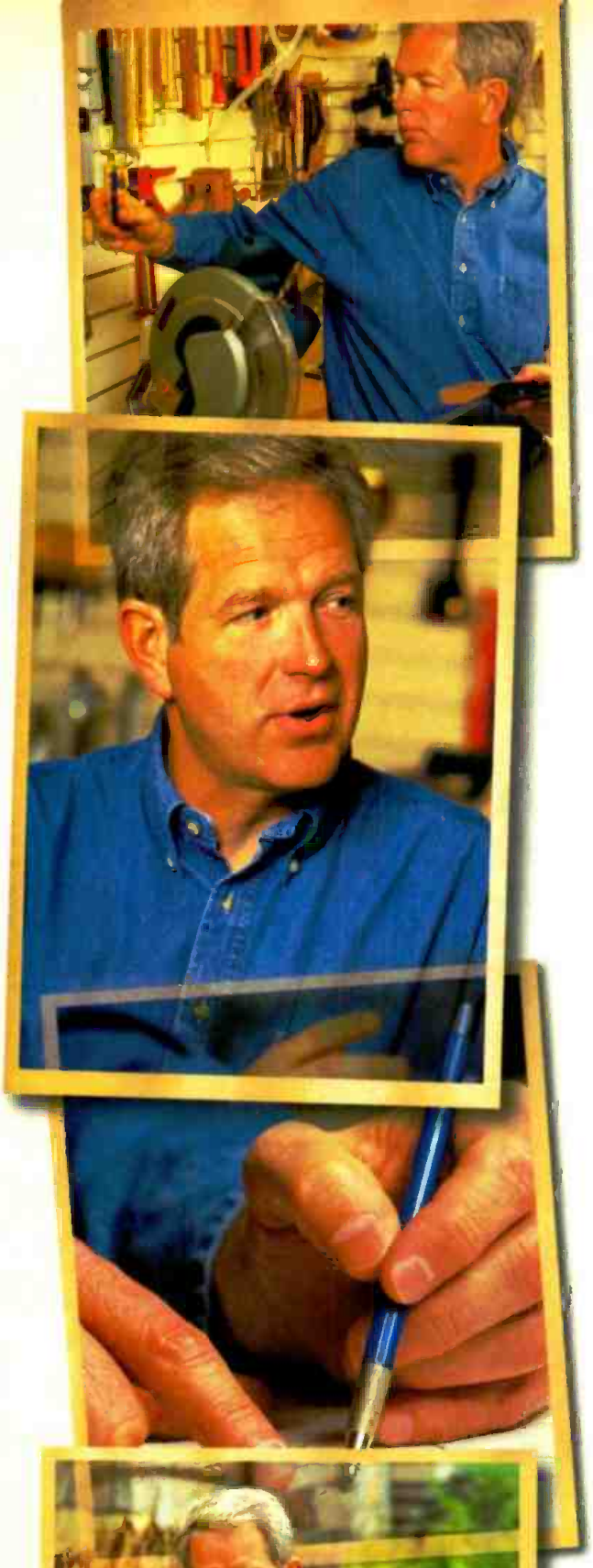

SONY

"HDCAM IS AN EVERGREEN FORMAT."

-Dean Johnson, Creator/Producer of "Hometime"

What keeps TV programming "evergreen"? The nature of the subject, the value of the content — and the decision to acquire in HD. That's why Dean Johnson, creator and producer of "Hometime," began using Sony HDCAM® equipment.

"Our type of show is home improvement TV, and it has a long shelf life. In fact, we're still selling programming that's over ten years old. So we want to make sure that with the effort we put in, we can go forward and mine our programming years from now. That's why we made the decision to go HD. We wanted to provide the highest quality SD video today and also be ready when HD broadcasting goes mainstream."

"Hometime" made the switch to Sony HDCAM camcorders in December 1999. "HDCAM was a breeze to use from the start. Our crew could take it and run with it. Our only learning experience was blocking for the 16:9 format — making sure that the video crew and light stands were out of the widescreen frame. And the camcorder lets us set up a 4:3 safe area in the viewfinder, so we always know what we've got.

"We really believe in HDCAM. We're not broadcasting in HD yet, but HD is where everybody is going. Years down the road, when we want to stream video, we'll have HD to offer. Shooting in HD is just another extension of how we can reach out and better serve our viewers. Whatever is happening in the industry, we want to be right there."

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IN THIS ISSUE

Features

Beyond the Headlines

Digital Handbook

(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

When Pappas Telecasting, the nation's largest private station operator, wanted the best possible format for Azteca America, its new Spanish-language network, the choice was easy: DVCPRO50. Citing both backwards compatibility with 25Mbps DVCPRO and a clear migration path to HD, Pappas chose the award-winning format for acquisition through production. "Everything we're currently building is 4:2:2 601-based, so DVCPRO50 fits perfectly with our new network requirements," said Pappas Sr.V.P. Dale Kelly. DVCPRO50 is the world's first 4:3/16:9 production format to deliver a complete I-frame, 50Mbps, 4:2:2 studio quality production chain from field acquisition through editing to program transmission. Join forward-looking station groups like Pappas in selecting the interoperability and quality of DVCPRO50. To learn more, call **1-800-528-8601** or visit our web site at **www.panasonic.com/broadcast**.

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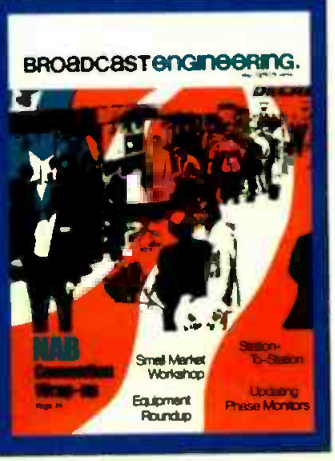
FREEZE FRAME

A look at the technology that shaped this industry.

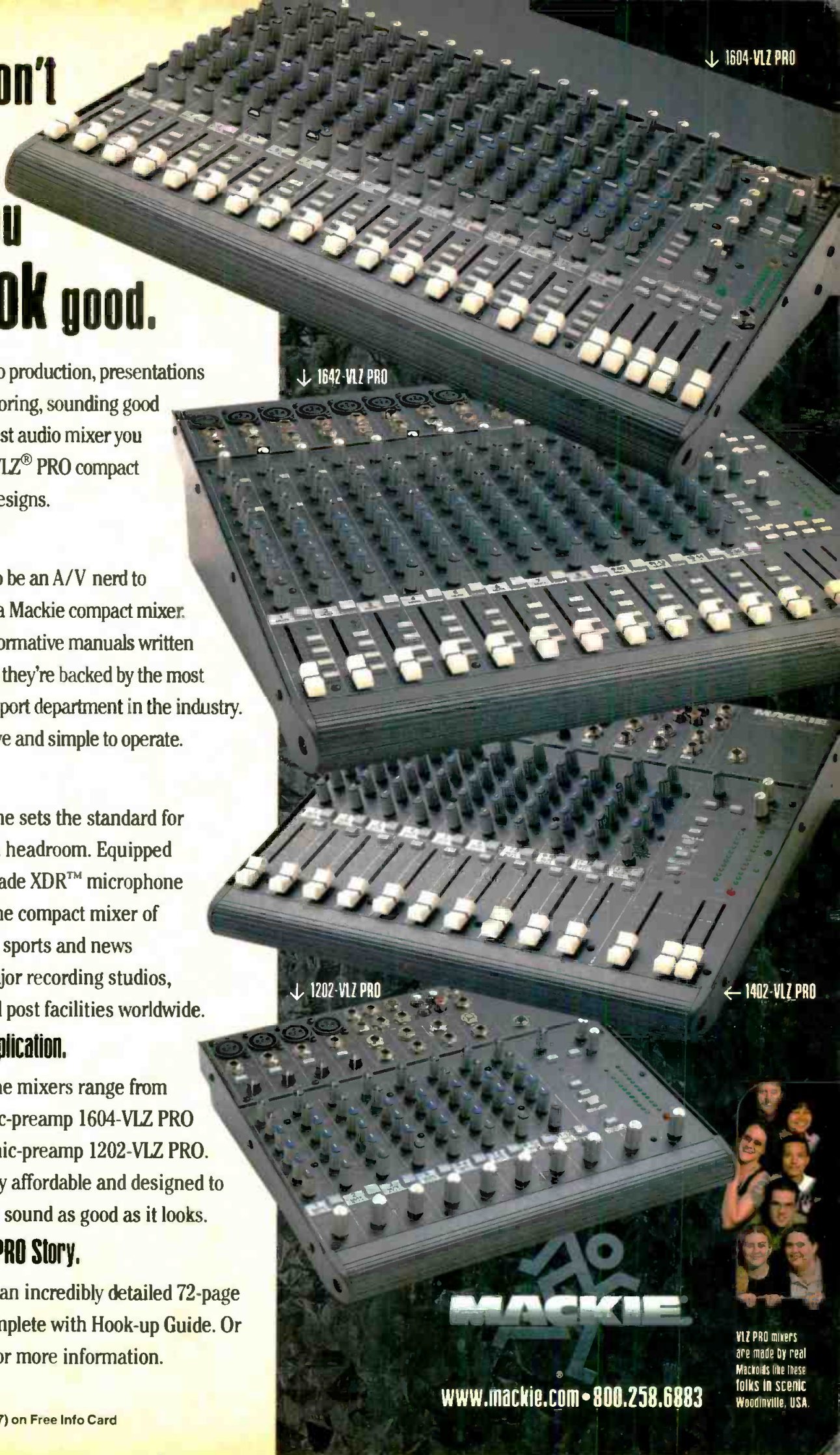
First VTR tape-delayed broadcast

What (now renamed) company introduced a 7lb ENG camera at the 1976 NAB convention, calling it the "women's lib camera." You must provide the company's name as used in 1976. Enter by e-mail. Title your entry "Freezeframe-January" in the subject field and send it to: editor@intertec.com. Correct answers received by March 1, 2001 will be eligible for a drawing of *Broadcast Engineering* T-shirts.



ON THE COVER: This month's cover shows the NMT DX3 remote truck used at Shea Stadium for the 2000 World Series. Built by Gerling & Associates and Barry Bennett Systems, the 53-ft. trailer provides fully digital signal processing and can support up to 18 cameras. Audio is handled by a Solid State Logic GV 8000, and is capable of 5.1 surround sound. Photo by Ben Luzon.

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



For desktop video production, presentations or multimedia authoring, sounding good means using the best audio mixer you can plug into: The VLZ® PRO compact line from Mackie Designs.

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You don't have to be an A/V nerd to get the most out of a Mackie compact mixer. They come with informative manuals written in real English. And they're backed by the most responsive tech support department in the industry. Controls are intuitive and simple to operate.

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Our VLZ PRO line sets the standard for low noise and high headroom. Equipped with audiophile-grade XDR™ microphone preamps, they're the compact mixer of choice for network sports and news location sound, major recording studios, touring groups and post facilities worldwide.

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News

DTV 2000 makes its Atlanta debut

BY BRAD DICK, EDITOR

Broadcast Engineering hosted the 7th annual Digital Television conference in early December in Atlanta, GA. The conference marked an important turn for the event in several ways.

First, the conference was moved from Chicago, where it had been held for five years. Despite the successful Chicago venue, *Broadcast Engineering* staff members wanted to make it easier for new attendees to participate in the show.

Second, we all hoped it would be warmer in Atlanta than previous years in Chicago, and it was warmer. Unfortunately, it certainly wasn't warm. Some attendees, this writer included, found themselves wearing coats in the meeting hall because of the cold.

The conference registered record attendance, and exhibit sales also set a new record for number of booths and for total floor space.

Doyle Technologies, a Renton, WA, systems integrator and consultant, coordinated the sessions this year. The president of the firm, Greg Doyle, keyed the Wednesday afternoon sessions with an in-depth presentation on the design of facility infrastructure and networking. He showed attendees how to effectively plan for the digital technology communications, routing and networking systems they'll need to support DTV, HDTV and new digital services like datacasting.

Attendees enjoyed Michael Silbergleid's lively, "Jerry Springer-like" DTV Shootout session.

Other Wednesday sessions included one of the DTV Conference's favorite speakers, Peter Symes, VDNS Engineering Administration, Grass Valley Group. His presentation reviewed the current development of MPEG-2, but more importantly the coming new flavors of MPEG. Attendees were treated to a glimpse of the new levels of MPEG and their capabilities. More importantly, they learned how these new MPEGs will affect the way they produce and transmit video and audio programming. (Peter Symes' complete presentation on the new MPEGs will be presented in the March issue of *Broadcast Engineering*.)

Tour de force

The Atlanta location afforded attendees the opportunity to tour two unique facilities, CNN and Crawford Communications. Those on the CNN tour saw a behind-the-scenes view of the world's number one cable news network. Many who took the tour didn't realize the facility originated much more than just the familiar CNN and CNN Headline news channels. The Airport News channel, international news channels, CNNfn, and CNNSI feeds and the *internet* streaming news channels are but a small part of the overall CNN operation.

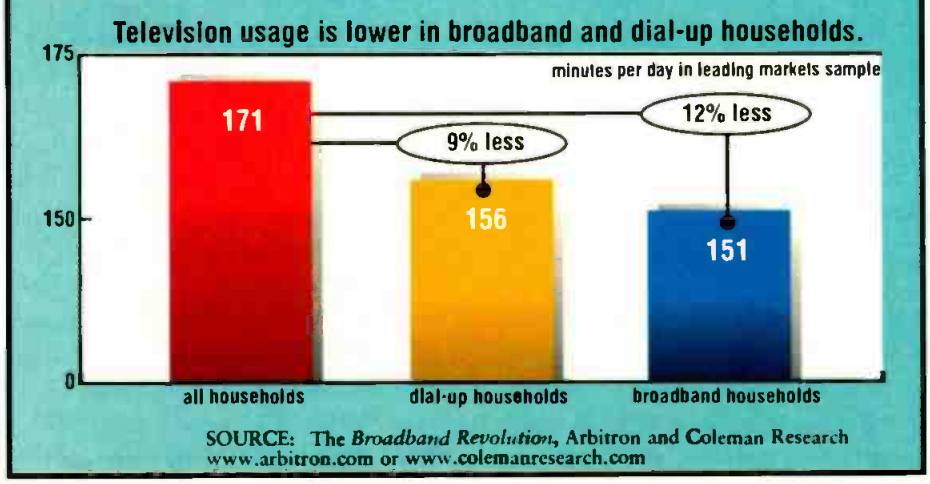
Crawford Communications recently moved to a new facility, which made the tour all the more interesting. As one of the nation's top production houses, Crawford provides sophisticated postproduction services with some of the top editors and producers. Suites are equipped with a Henry Infinity, a Discreet Logic Inferno and Fire, a Philips Spirit DataCine and other leading-edge technology. The tour was a great opportunity for engineers who might not otherwise see such technology at work.

FRAME GRAB

A look at the issues driving today's technology.

TV usage falls in broadband & dial-up households

A full 28% of broadband users say their TV viewing is "much less" or "somewhat less" since getting broadband service.



SOURCE: The *Broadband Revolution*, Arbitron and Coleman Research
www.arbitron.com or www.colemanresearch.com

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Greg Doyle, president of Doyle Technologies Consultants, helped moderate three days of sessions at the Broadcast Engineering DTV 2000 conference in Atlanta, GA. His firm was responsible for coordinating papers for this year's conference.

Streaming media sessions

The third significant difference from previous conferences was the emphasis on streaming media technology. A full-day seminar on designing, installing and using streaming hardware was held on Friday, the last day of the show.

The first streaming question many engineers need answered is "What type of encoding is needed and at what rates should I support?" Mark Warner, Real Broadcast Networks, provided live demonstrations of programs encoded at different rates. This was a useful session for those needing to set up a streaming facility at their TV stations.

To cap the days streaming media tutorial, Greg Doyle and his crew from Doyle Technologies (Randy Trullinger and Barry Ballanger) built a custom encoding/decoding station to demonstrate multiple stream and data rate encoding methods. This allowed attendees to see firsthand how encoding was done, what equipment was needed and the results of the choices that must be made with any encoded stream. After the conference, participants were allowed to spend some hands-on time with the equipment so they would be better qualified to manage encoding technology at their own facilities.

Also supporting the streaming technology theme were presentations from iBEAM and Season Tickets, both streaming media/datacasting-centric corporations. Clips of multicasting versus file and video streaming were demonstrated, along with error detection and correction schemes. Attendees came away knowing how to plan for the inauguration of streaming programs at their facilities.

DTV Shootout

The Thursday evening sessions are always popular, but this year's was even more so. A special panel called "DTV Shootout" was added to this year's program. Moderated by Michael Silbergleid, president of The SilverKnight Group, Inc., the session was designed to bring some clarity to a confusing and controversial issue. Attendees greatly enjoyed Silbergleid's "Jerry Springer-like" orchestration of the session.

Panelists for the Shootout included Ed Williams, Sr. Engineer, DTV Strategic Services group for PBS; Pete Putman, consultant and president of PHP Communications and writer for *Broadcast Engineering*'s allied publication, *Video Systems*; and Mark Hyman, vice president corporate relations for the Sinclair Broadcast Group.

Each panelist was given five minutes to present his perspectives on DTV and its implementation. Then Silbergleid launched the evening's lively discussion with his pointed questions.

He asked the audience how many of their stations were transmitting DTV. Fewer than 15 responded in the affirmative. When asked how many had purchased an HDTV receiver, none in the audience responded positively.

Ed Williams spoke as a DTV proponent and was countered by Mark Hyman. Hyman offered that he wasn't opposing DTV, but thought broadcasters should be given the opportunity to have the advantages COFDM brings.

Pete Putman was both politically and physically in the center of the issue. A ham radio operator, he understands the physics of UHF/VHF antennas well. He showed several of his custom antenna designs at the session. In an effort to show that DTV can be received, he demonstrated DTV reception of the local FOX affiliate from the basement of the Hyatt Regency hotel at the conference site. Given the numerous reports of how difficult DTV reception is, this was amazing to many.

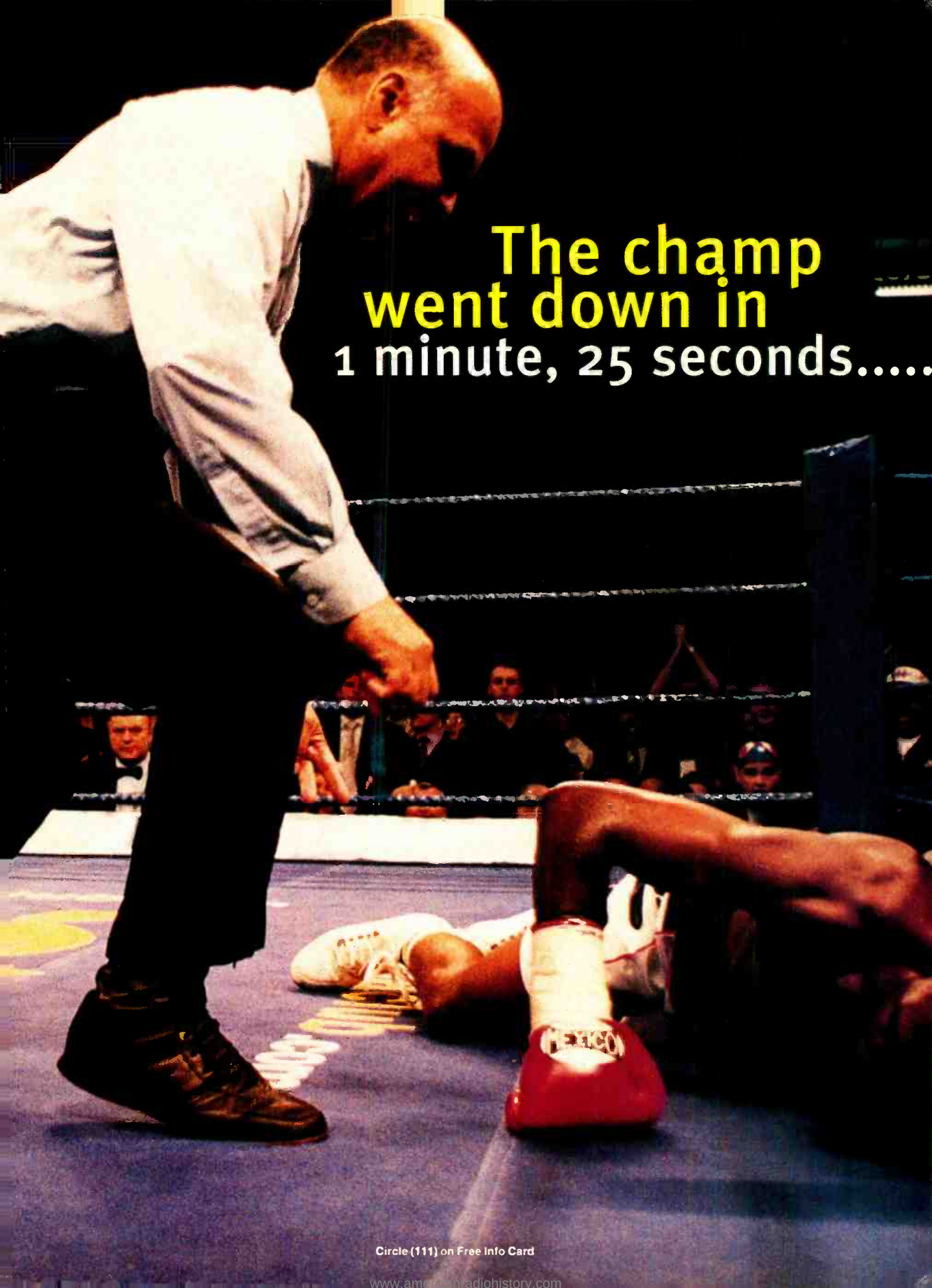
In closing, Ed Williams suggested that engineers voted with their own money by buying HDTV sets. Hyman said that the issue was larger than just HD and that TV stations needed options to develop new services, which are better supported by the COFDM platform.

While few minds may have been changed, Silberglide's moderation made the evening fun and informative for all. In addition, the free pizza was superb.

Datacasting

Sam Matheny, VP/GM of DTV Plus, quickly captured the audience's rapt

The Thursday evening DTV Shootout was moderated by the SilverKnight Group's president, Michael Silbergleid. Panelists included, from left to right: Ed Williams, Sr. Engineer, DTV Strategic Services group for PBS; Pete Putman, consultant and president of PHP Communications; and Mark Hyman, vice president, corporate relations, for the Sinclair Broadcast Group. The chairs didn't fly, but strong opinions were evident.



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The Thursday evening DTV shootout provided the opportunity for attendees to compare opinions with panelists (Ed Williams, PBS, standing) as well as enjoy a beer or two, as evidenced by the unnamed attendee in photo's center.

attention with his presentation on datacasting. For some, the issue of datacasting was new, for others it was something thought to be unnecessary at most TV stations. Matheny suggested otherwise.

Using his company as an example, Matheny reviewed how datacasting worked, what equipment was needed to implement it and how such systems could be managed. By the great number of questions directed to him during the question and answer session, it was obvious that this audience was hungry for more information. (For more information on datacasting, check the *Broadcast Engineering* website; www.broadcastengineering.com. Another good article on the subject is; July 2000, "Datacasting: Is it legal?" By Mitchell Lazarus.)

Next year's conference is scheduled to be held in Atlanta. By then, the issue of COFDM will probably be resolved. However, there will still be plenty of questions and issues to discuss, so plan now to attend. ■

Editor's note: For more information on Greg Doyle's tutorials on networking and streaming media, go to the company's website, www.doyletech.com.

The DTV 2000 exhibit floor was filled with new products and services. Actual live feeds of OTA ATSC signals were available thanks to custom antennas provided by consultant Pete Putman.

.....Unfortunately, the signal went down in 1 minute, 23.

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FCC Update

United States and Canada sign DTV agreement

BY HARRY C. MARTIN

A letter of understanding was signed by the United States and Canada to accommodate cross-border DTV allocations. The letter covers DTV operations within 250 miles of either side of the U.S.-Canadian border. The new letter covers the relationships between analog and digital stations and allotments, as well as digital-to-digital relationships, and has the following specific features:

- All DTV allotments in both countries have been accepted.
- Parameters for acceptance of new DTV allotments have been adopted.
- Analog LPTV proposals within 20 miles of the border, digital LPTVs within 62 miles of the border, and LPTVs whose interfering contours would cross the border, will be referred to the other country for approval.
- Canada will make "reasonable efforts" to place DTV allotments on frequencies that will not interfere with public safety services on U.S. TV Channels 52 - 69.

Public officials from border states, including Ohio, Maine, Michigan, New York and Vermont, have expressed fears that the letter of understanding could lead to Canadian DTV broadcasts interfering with public safety operations on Channels 52 - 69. Canada agreed to take these operations into consideration and to try to move DTV allotments out of Channels 52 - 69.

Dateline

Unless the new EEO rules are invalidated by the D.C. Circuit Court of Appeals, stations in the following states will be required to place their Annual EEO Public File Reports in their public files and on their websites on or before Feb. 1, 2001: Arkansas, Kansas, Louisiana, Mississippi, Nebraska, New Jersey, New York and Oklahoma. Biennial ownership reports will also be due for the same states on Feb. 1.

All commercial DTV facilities must be on the air by May 1, 2002.

All NCE-TV stations must have built out their DTV facilities by May 1, 2003.

Website privacy examined

In this technological era, problems arise much faster than the law can deal with them. With regard to the Internet, one of the most important issues is online privacy.

The Information Age has given consumers a keen awareness of how little privacy they have left. A company with a website has the ability to collect information about a consumer the moment that person logs on. Cookies allow a website to track a certain computer's visits to the website and to know where that computer has looked. (Cookies can not identify the user, just the computer.) Keyword searches can trigger banner advertisements tailored to the information being sought. This information benefits the website operator, because he gets to know his customers. Consumers, however, do not necessarily want to be tracked or seen without their permission.

To avoid government regulation, businesses have begun to self-regulate by developing privacy policies. With the exception of COPPA requirements (referenced below) and the provisions of certain insurance policies, privacy policies are voluntary and should be seen by businesses as a tool to build goodwill. A posted privacy policy provides notice of how a website uses information and gives consumers the option to leave the site if they do not agree. More and more consumers are reading privacy policies and will only deal with websites that have them.

Privacy policies may be voluntary, but they are enforceable in court. In fact, most Internet privacy litigation, whether initiated by the Federal Trade Commission or by private individuals, has involved the violation of a voluntarily posted privacy policy.

If a business posts a privacy policy on its website, the person drafting the policy should be told how information is collected, how long it will be kept, whether it will be used and, if so, how. Once the policy is drafted, key management personnel should understand the company's responsibilities under the policy.

Should features such as customer registration be added, or should technical features be changed on the website, the privacy policy must be updated to cover the changes. Otherwise, the website may inadvertently fall out of compliance with the owner's posted rules, thereby opening the door to liability under any number of consumer protection statutes.

One of the few U.S. privacy laws written and passed with the Internet in mind is the Children's Online Privacy Protection Act of 1998 (COPPA). It applies to the online collection of personal information from children under 13. The regulations specify what a website operator must include in its privacy policy, when and how to seek verifiable parental consent and what responsibilities an operator has to protect children's privacy and safety online.

In sum, once a privacy policy is posted, new obligations are created. Website operators must understand their responsibilities under the policy, meet those responsibilities, update the policy as the website changes and avoid violating the privacy rights of persons logging on. ■

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

Send questions and comments to: harry_martin@intertec.com

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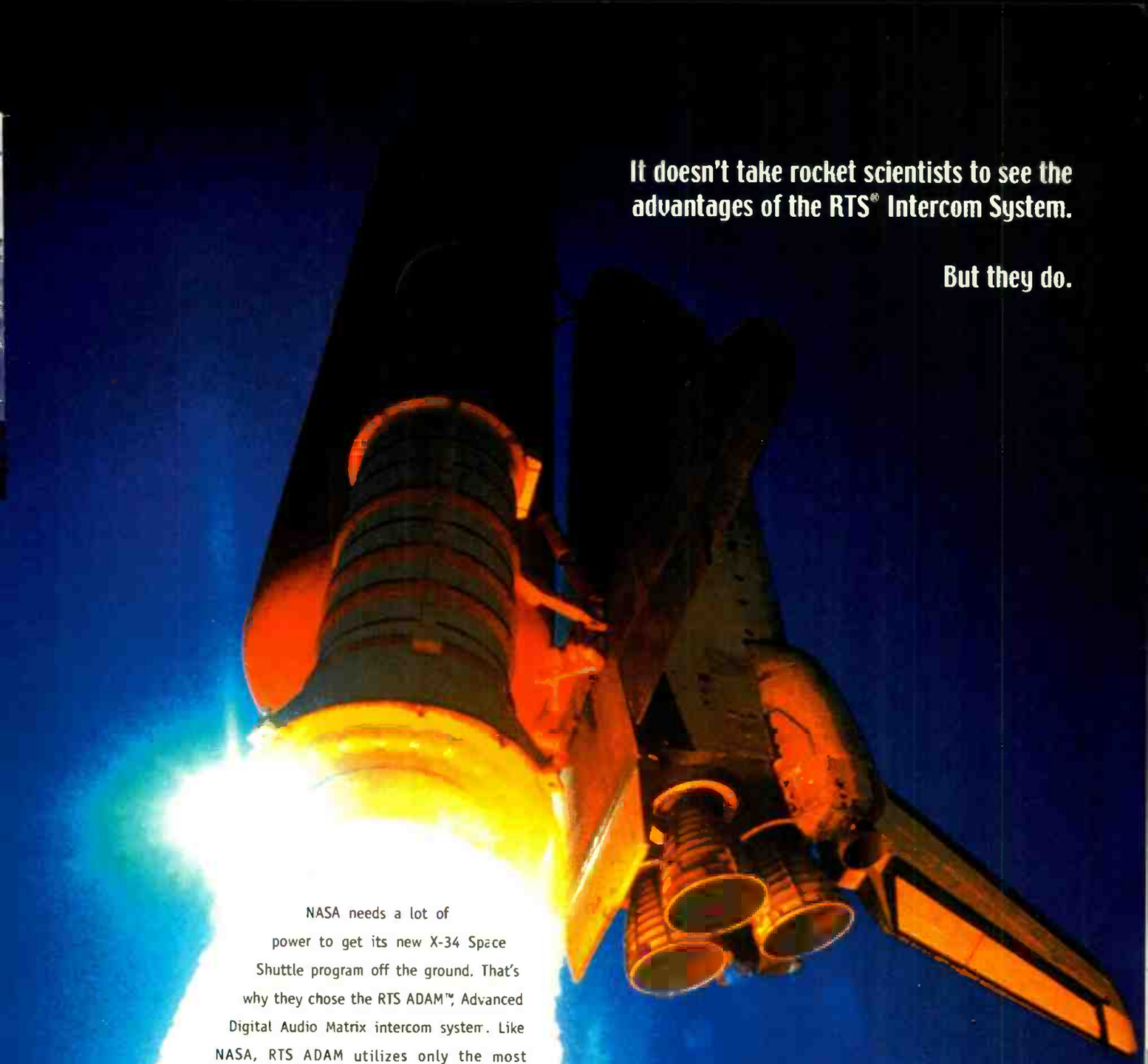

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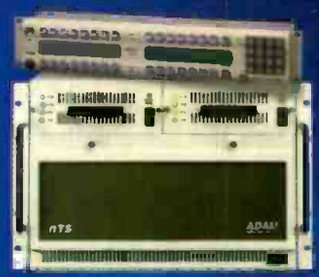

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around the world – Spain, Russia, Thailand and Cambodia. Nokia made the phones, while another area company, Ericsson, made the systems network equipment. Qwest started out as a construction company that figured out a new way to lay fiber along railroad rights of way at a rate much faster than anyone ever imagined. Instead of selling or licensing its patents, it laid its own fiber, giving some strands (approximately 1/4 of the initial 192 strands) to others in return for capital.

Other industries are making forays into areas far from their home turf. Kmart has started its own ISP so that it can act as an Internet portal. Broadcasters have talked about sending webpages via DTV. Maybe some brave broadcaster should take that one step farther. Become a full-fledged ISP, in that way capturing the upstream traffic as well. If nothing else, imagine how must faster the station's website will be delivered to the end user if it sits on a server as part of the station's ISP.

The industry owes it to itself to investigate what is possible.

If the DTV signal was to be used to deliver webpages to the end user, think how much more efficient the streaming of pages could be if the station knew what its data users were requesting. But this is outside your current area of expertise, isn't it? That didn't stop the companies mentioned above from evolving. But how do you direct bill a hundred thousand customers (let's be optimistic)? Not every mom and pop ISP (yes, they're a dying breed) does its own billing; there is an industry that does this. What comprises an ISP? Something most broadcasters are already surrounded by: computers, LANs and application software. The ISP also needs a decent portal into someone's SONET backbone. Maybe this is an application to be tested in a new model station.

No, the Internet is not the whole answer. Broadcasters are in a business where the barriers to entry are high. The barrier to be a dotcom is low. To be a successful dotcom you generally need a brand that is recognized outside of cyberspace. The broadcaster has that. The dotcoms that don't have a brand outside of cyberspace usually go bankrupt because of the capital sucked into the necessary marketing effort. The Internet will be a supplement to the average broadcaster's business to some extent. Shouldn't the industry investigate how sophisticated its involvement in cyberspace should be? Or are we absolutely sure that having a webpage is enough? ■

Jim Boston is director of emerging technology for The Evers Group.

Even in today's world of digital media storage, hard copies of all those video tapes are going to pile up on you.

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Understanding digital video

BY MICHAEL ROBIN

Digital video is a method of representing the infinite variations of video signal levels inside a specified limit (e.g. 0mV to 700mV) as a limited number of binary numbers. Figure 1 shows a simplified block diagram of a typical "black-box" digital device or system. The input is a conventional analog video signal. The signal is band-limited by a low-pass (antialiasing) filter and fed to an A/D converter where the analog signal is converted into digital form.

The digital signal is fed to a medium. The medium may be a signal distribution or transmission link, a videotape or a digital processor such as a frame synchronizer or a digital video effects (DVE) unit. The digital signal has to be formatted by a channel encoder to meet the requirements of the medium. Depending on the medium the channel encoder can be a parallel-to-serial converter or a complex MPEG compressor. Any medium adds noise, linear distortions and amplitude losses to the digital waveform. These distortions should not affect the analog "message" to the point where the zeroes and ones cannot be recognized by the channel decoder. If it does, you experience the well-known cliff effect.

After passing through the medium the digital signal is returned to its original analog format by passing consecutively through a channel decoder, a D/A converter and a reconstruction filter, which removes the higher frequency spectral components.

Sampling is the digital equivalent of amplitude modulation.

Quality limits

The A/D conversion involves two major steps which determine the resultant video signal quality:

The sampling of the video signal. Sampling is the digital equivalent of amplitude modulation. The digital carrier (repetitive sampling pulses) is amplitude modulated by the video signal, resulting in a wide modulation spectrum with carriers at f_s (the sampling frequency) and its multiples ($2f_s$, $3f_s$,..,nf_s). The process is similar to analog amplitude modulation except for the wider modulation spectrum, a result of the rectangular sampling pulse shape. The video sampling frequency has to meet several conditions:

- It must be at least twice the maximum analog video frequency (the Nyquist rule).
- It has to be high enough to allow for the design of practically realizable and cost-effective low-pass (antialiasing) filters with minimum ripple and group delay.
- The sampling frequency must be a multiple of a basic video frequency like f_h (horizontal scanning frequency) or f_{sc} (color subcarrier frequency). The sampling rate of video signals has evolved throughout the years. Today, analog composite video signals are sampled at a multiple of the f_{sc}. Analog component video signals are sampled at a multiple of the horizontal f_h.

The sampling frequency and the characteristics of the antialiasing filters determine the maximum video frequency that the device or system can handle. SDTV and HDTV digital video specifications narrowly define the frequency and group-delay characteristics of the low-pass filters.

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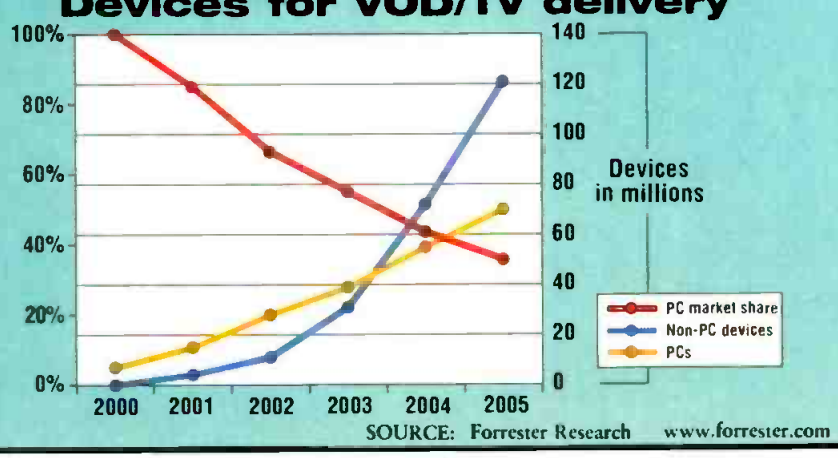

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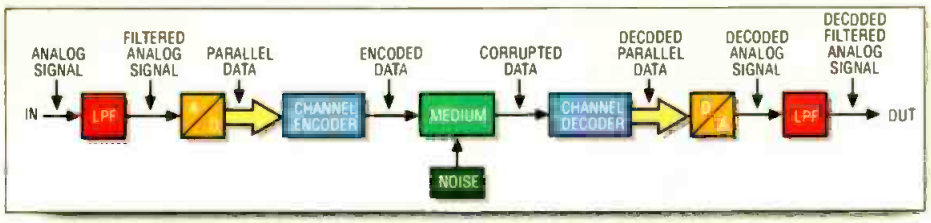

Figure 1. A simplified block diagram of a typical "black-box" digital device or system with a conventional analog video signal as input.

The quantizing of the sample values. The sampling process results in a progression of samples repeated at regular intervals whose amplitude reflect the instantaneous baseband signal amplitudes at the sampling instant. Ideally the sampling pulse should have a very short duration. In reality it has a duration of $T=1/f_s$ resulting in a sample-and-hold process that ensures that each sample amplitude is held in memory until the next sample arrives. This results in a high frequency loss, which is compensated for in the reconstruction filter.

In the quantizing process, binary values are assigned based on the sampled pulse amplitude values. The word length of the sampled value depends on the number of bits per sample that the system provides. As a consequence the amplitude levels of a continuously varying analog signal are converted to a finite number of discrete digital levels Q according to the expression: $Q=2^n$, where n is the number of bits per sample. The resulting digital signal is therefore an approximation of the original signal.

Early video equipment used eight bits per sample, while today's high-end studio equipment uses 10 bits per sample. This limits the accuracy of the digital representation of the original analog signal since only a limited number of values ($2^8=256$ or $2^{10}=1024$) are recognized by the system.

In addition to limiting the number of signal amplitude values that the system recognizes, the various digital standards limit the excursion of the video signal, or the "quantizing range," to less than the total number of possible values. This is due to the need to maintain an acceptable headroom for varying analog signal levels as well as for special timing reference signals (TRS) unambiguously defined as distinct from the samples carrying video information. The limited number of binary digital values representing the video information results in "quantizing errors" (Q_e), i.e. the erroneous representation of video levels. With eight or more bits per sample the quantizing errors are often visible as wideband noise. With less than eight bits per sample a system may exhibit "contouring effects" — the inability to correctly represent gently sloping wide area picture brightness or chrominance values. All sampled amplitudes falling within specific bounds are assigned a single value that is one of the Q levels, i.e. n, n+1, n+2 etc. The quantized error may thus contain an error not exceeding ±½Q. Figure 2 shows the effect of an insufficient number of bits per sample on the reconstructed analog signal. The approximate signal-to-noise ratio (SNR) of a digital system is given by the formula SNR (dB) = 6n + 6, where n is the number of bits per sample. The formula takes into consideration the headroom as well as f_s vs. f_{max} considerations. Consequently a 10-bit system will have an SNR of approximately 66dB.

With eight or more bits per sample the quantizing errors are often visible as wideband noise.

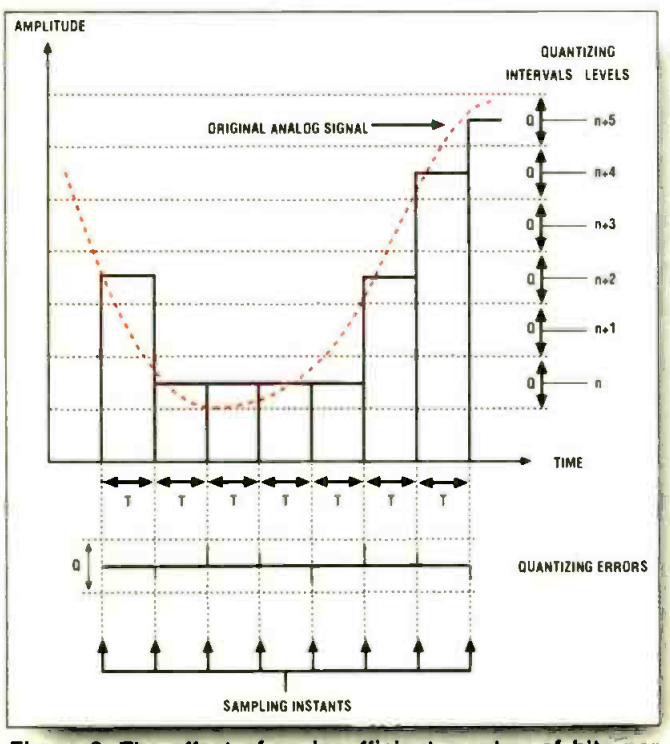

Figure 2. The effect of an insufficient number of bits per sample on the reconstructed analog signal.

The digital video formats

Two different digital video formats have evolved:

• *The composite digital video concept.* This format constitutes a stepping stone from the analog composite (NTSC or PAL) world to the all-digital teleproduction center. Two $4f_{sc}$ sampling frequencies have resulted: 14.3 MHz for NTSC and 17.7 MHz for PAL. In North America there was an initial interest in $4f_{sc}$ composite digital videotape recorders. This had to do with the need to replace aging analog composite two-inch and one-inch VTRs with digital VTRs featuring analog composite input/output ports. A number of manufacturers developed such products identified as D2 and D3 VTRs. A wide range of compatible $4f_{sc}$ digital video studio-quality equipment appeared on the market. In Europe there was limited interest in $4f_{sc}$ VTRs because they cannot handle SECAM.

• *The component digital video concept.* Component digital video is based on the use of one luminance (Y) and two color-difference signals (B-Y and R-Y) signals. The document describing the concept is known as ITU-R BT.601

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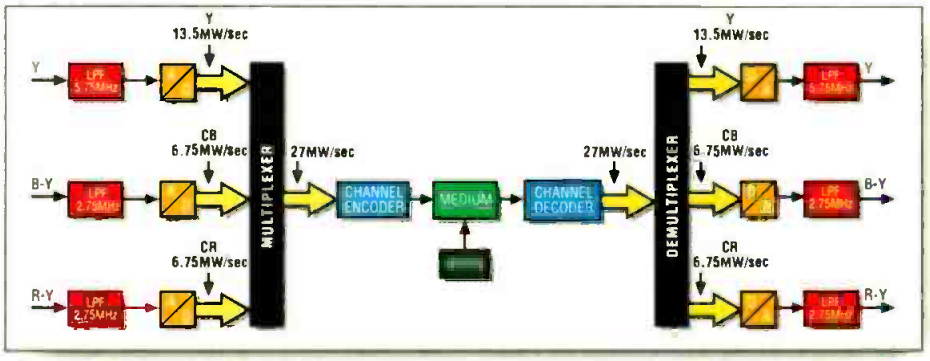

Figure 3. A simplified block diagram of a 4:2:2 component digital black box.

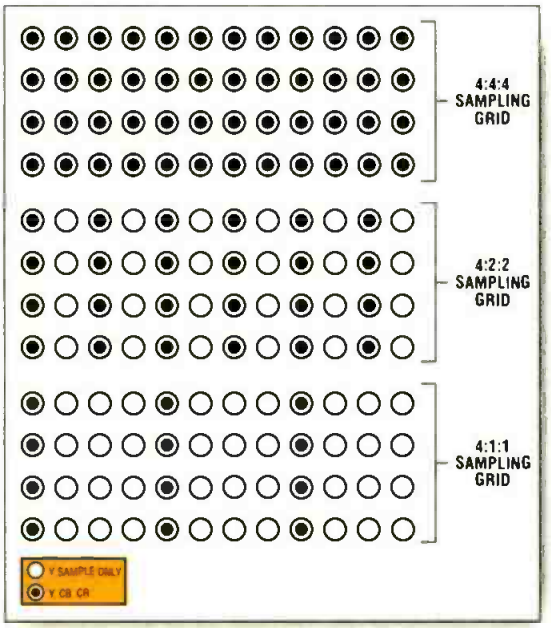

Figure 4. The sampling grids of the three component digital formats.

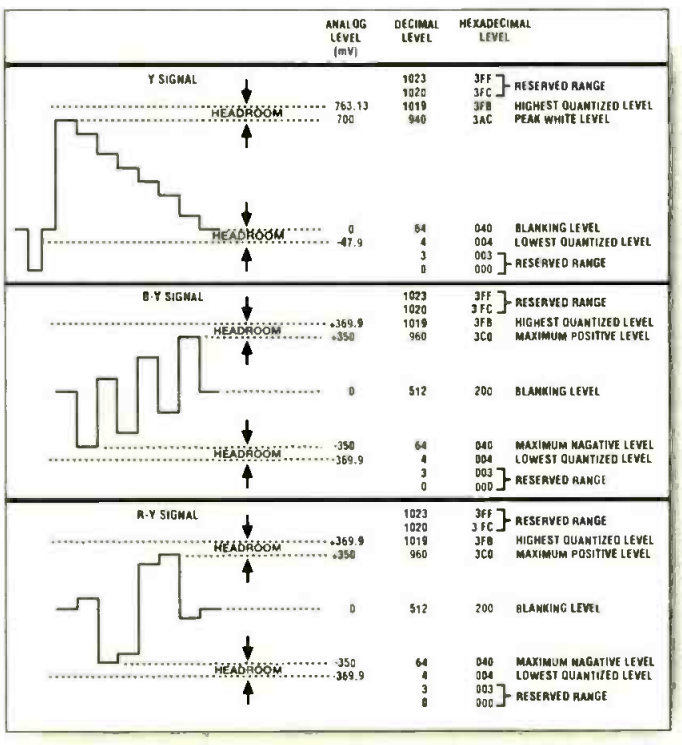

Figure 5. The quantizing range of the component video signals.

(formerly known as CCIR 601). It defines the manner in which three component analog video signals are sampled, quantized and time-division multiplexed into a single bearer for distribution, processing or recording. The development of competitively priced component digital video equipment as well as the trends towards in-plant, land-line, on-air or satellite component digital video signal distribution at full or reduced bit rates was a major factor behind the whole DTV revolution.

The sampling frequencies of the three component signals are common to both SDTV formats (525/60 and 625/50) and each is a multiple of f_h as well as 3.375MHz resulting in the well-known 4:4:4, 4:2:2 and 4:1:1 sampling strategies. Figure 3 shows a simplified block diagram of a 4:2:2 component digital black box. The 4:2:2 sampled and quantized component signals are time-division multiplexed resulting in a bit-parallel data rate of 27M Words/sec. The bit-serial data rate of the 4:2:2 digital signal is 270Mb/s. Figure 4 shows the sampling grids of the three component digital formats. Figure 5 shows the quantizing range of the component video signals.

Among the advantages of using the component digital approach are:

- Wider chrominance bandwidth
- No NTSC/PAL artifacts
- Improved SNR

Pros and cons of digital video

The advantages of digital video can be summed up as follows:

- Single-pass analog-type impairments are non-cumulative if the signal stays digital. However a concatenation of digital black boxes using analog interfaces can lead to cumulative analog signal degradations and should be avoided.
- Reduced sensitivity to noise and interference.
- Digital equipment can perform efficiently and economically tasks that are difficult or impossible to perform using analog technology.
- Digital signals are amenable to the application of techniques for the retention of essential information such as compression.

The disadvantages of digital video can be summed up as follows:

- Analog-type distortions as well unique digital distortions related to sampling and quantizing may result in a variety of visible impairments.
- Digital video may require wide bandwidth for recording, distribution and transmission. Sophisticated bit rate reduction and compression schemes may be needed to achieve manageable bandwidths.
- Unlike analog signals, the digital signals do not degrade gracefully and are subjected to a cliff effect.

The digital video technology is sweeping the broadcasting industry. Increased picture processing, transmission and recording capabilities are available at competitive costs. With the accelerating implementation of DTV, video signals will be kept in the digital form up to the viewer's home in order to provide a higher quality product with more user-friendly features. ■

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

Send questions and comments to: michael_robin@intertec.com

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Managing bandwidth between television facilities

BY BRAD GILMER

Last year I discussed some of the issues surrounding bandwidth management inside television facilities. This month we will look at the issue of bandwidth management between television facilities.

Let's say, one day the boss walks in and says to you, "We need to be able to move video the same way we make a phone call. I want to be able to call our affiliate in New York, send a feed and when I am done, hang up." No problem you think. Then he says, "I also want to be able to call Chicago... and Atlanta... and Seattle..." Your head begins to spin a little bit — this won't be a simple router feed after all. Just for good measure, he adds, "in real time, and inexpensively" as he heads out the door.

As you begin to evaluate your options, you may consider telecom service providers, dedicated satellite, dark fiber (if available), existing private network (if you are extremely lucky) and so on. Each one of these has its advantages and disadvantages.

One question you may need to answer is whether you are looking for point-to-point connectivity, a broadcast path to multiple recipients at the same time or whether true dial-up capability is required. Point-to-point and broadcast technology has been around since the AT&T Long Lines days. Frankly, the most intriguing case is the last one, where you would like to establish connectivity between a number of locations.

The concept is simple — and appealing. Imagine that a local television station receives a call from a production house in town. The news promo graphic elements are finished. A tape operator in the production house dials a VTR at the television station. She initiates recording at the station and then plays back the graphic elements from a digital disk recorder. In a few minutes the transfer is complete. She hangs up the connection and moves on to her next task. You can imagine how this simple capability could be used at station groups and large television networks as well.

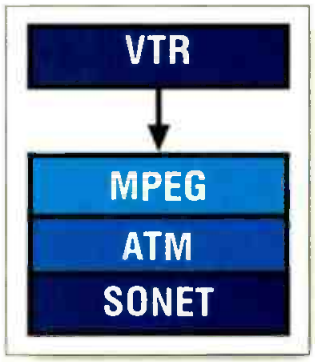

Figure 1. Protocol stack for NTON test.

You might be thinking that this is all a dream, but in fact, dial-up connectivity has already been demonstrated at 270Mb/s across 2500 km of fiber using various manufacturers' switches and network components, and with machine control. Tests were conducted using the National Transparent Optical Network (NTON) established by the NTON Consortium. (You can find out more about NTON at www.ntonc.org.) These tests proved that the example above could work.

There were three key components to the NTON test — SONET, ATM and MPEG. Synchronous optical network (SONET) is the core technology for most of the telecommunications infrastructure in the United States. Asynchronous transfer mode (ATM) is the predominant method for moving switched data across high-speed interfacility networks. MPEG stands for the Moving Picture Experts Group and is one of the predominant compression formats for transmitting video. Figure 1 illustrates that each component — SONET, ATM and MPEG — contributed to the total protocol stack. This is a great simplification; but SONET provided raw bandwidth, ATM provided transport and switching, and MPEG provided compression.

In deciding on a technology for interfacility links, one of the choices you must make early on is whether you will use ATM. ATM has many advantages for interfacility connections. First, it is a known quantity to most service providers. Second, equipment is now readily available to provide video connectivity across ATM. Third, some service providers have adjusted their ATM pricing to be more competitive. You may remember that this had been a big issue in previous articles.

There could be a bonus here — if your interfacility network is designed correctly, it may be possible to transport MPEG over ATM one minute and IP over ATM the next. In fact, most of the world's Internet (IP) traffic goes over ATM/SONET/SDH

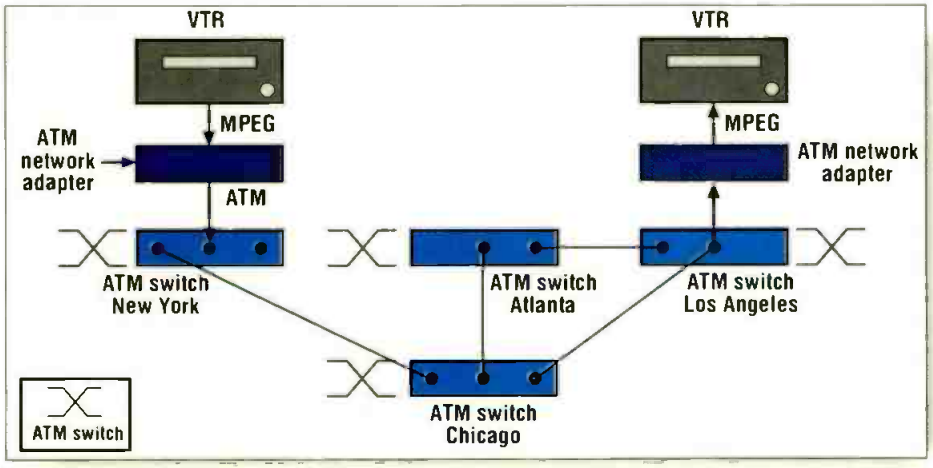

Figure 2. An ATM connection from New York to Los Angeles via Chicago. Quality of service negotiation is automatic.

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transport. You may have heard the buzz word "IPOA" (IP over ATM). Given the right architecture, it is possible to get ATM transport, then configure that bandwidth on the fly to support either real-time or FTP of content. It is possible to design a system such that voice, data, Internet access and content transport (real time and FTP) all move over the same backbone. The architecture includes Gig-E NICs in machines that will create and move content through OC3/OC12 access facilities to ATM network transport to OC3/OC12 egress facilities to Gig-E NICs in other machines.

The perfect world

Extending the NTON example, here is how a connection between two "MPEG compatible" devices might work. (See Figure 2.) An editor in New York needs to get a dub of a tape that is currently in Los Angeles. He talks to a tape room operator in Los Angeles, asking her to dial up an ATM connection between Los Angeles and New York.

The Los Angeles tape operator enters the ATM "phone number" into the ATM network adapter. The adapter then begins a dialog with ATM switches between these locations, attempting to find one with enough bandwidth (50Mb) and the right kind of connection (CBR). When it gets a commitment from one switch to provide the connection — in this example, let's say Chicago — it then moves on to the next switch. Once the switches along the way commit to the bandwidth (and other QoS parameters), the circuit is completed and the transfer can begin. When the transfer is complete, the tape operator in Los Angeles hangs up the connection, and the bandwidth in the switches is released.

In ATM language, the connection between Los Angeles and New York is a *switched virtual circuit* (SVC). The process of setting up an SVC using ATM is like laying a 3/4-inch pipe from one location to another. The pipe is capable of carrying a certain capacity from one place to another. To expand the analogy a little further, you can think of the SVC as a pipe inside another larger pipe, perhaps a SONET OC-12. (See Figure 3.) Although there may be other traffic flowing through the OC-12, the data flowing through the SVC "pipe within a pipe" is unaware of this other traffic. A switched virtual circuit between two cities will be totally unaware of other traffic that is being carried alongside it.

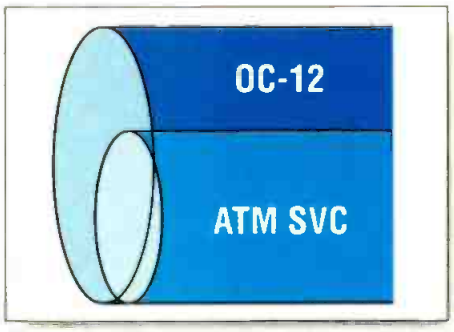


Figure 3. ATM SVC is like a "pipe within a pipe." Traffic passing through the SVC pipe is unaware of other unaffiliated traffic passing through the larger OC-12 pipe.

Also, like a pipe, once the path is established, all packets sent from Los Angeles to New York will take the same path. This means that the latency between Los Angeles and New York will not change. This is very different from the way the Internet works. One IP packet may go from Los Angeles to New York via Chicago; the next packet may get routed via Alaska. With conventional IP networks, there is no way to know what path the packets will take from one packet to the next. ATM networks do not suffer from this problem. Once an ATM circuit is established, its configuration remains stable until the circuit is torn down. Of course, if you are using FTP to move completed video clips from one place to another, then traditional IP works just fine. Streaming video is another matter.

There have been some developments in IP technology that are changing this. Using multiprotocol label switching (MPLS) and IP V6, a customer can get functionality that is roughly equivalent to constant bit rate (CBR) in ATM transport. But to do this you will need a network interface device that can handle ASI input from an MPEG or other encoder and map the ASI to IP. Then if one configures the IP network properly with MPLS or IP V6, then transport over IP at speeds in the range of 50-80 bits per second is possible.

The reality

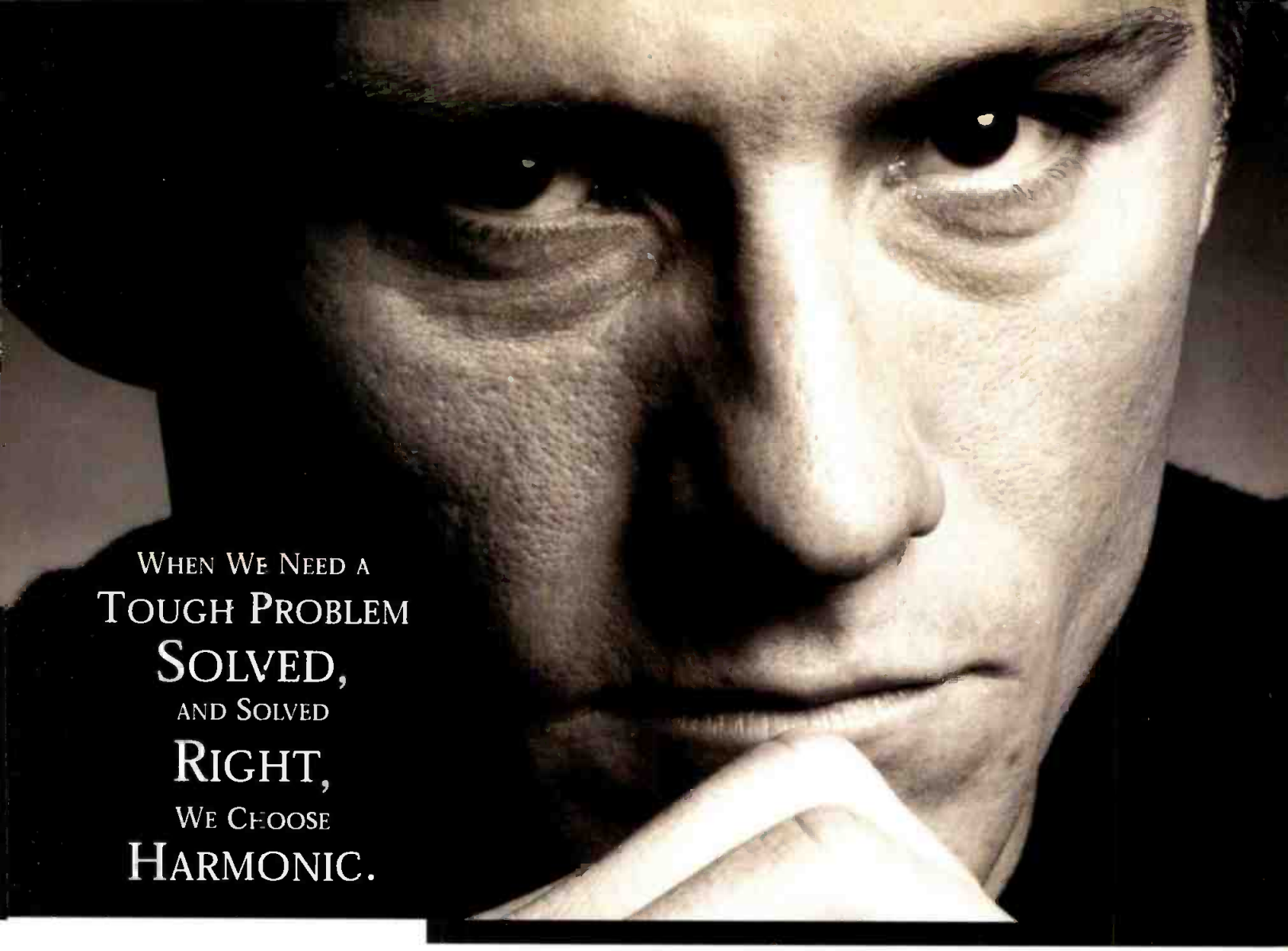
Frankly, while the technical feasibility of this example has been demonstrated, there is some way to go. One of the challenges we face is in the provisioning of circuits by the service providers. A service provider typically builds a circuit based upon an order. Once the user is finished with the circuit, it is dismantled. Most service providers are not organized to allow the user to configure their own circuits. What this means from a practical standpoint is that, in most cases, it is not currently possible for an end-user to implement the example described above. This is unfortunate — broadcasters can intuitively feel that having the power to make high-bandwidth connections on demand would be very compelling, if the price were right.

That said, there are some service providers who do allow the customer to have bandwidth on an ATM network "on demand." The customer is provided with a software application for making the call, a network interface device, a local access channel (E3/DS3/STM1/OC3), an ATM switch port and ATM bandwidth on demand. With this configuration, a customer can dial up other similarly equipped facilities and exchange files, IP traffic and even streaming video. All classes of service AAL1-AAL5, constant bit rate, variable bit rate, and available bit rate can be selected along with bandwidth required. ■

In deciding on a technology for interfacility links, one of the choices you must make early on is whether you will use ATM.

Brad Gilmer is executive director of the AAF Association and president of Gilmer & Associates, a technology consulting company.

Send questions and comments to: brad_gilmer@Intertec.com



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Repurposing your on-air program material

BY STEVEN M. BLUMENFELD

Why would you want to repurpose material that has already been seen? Do you really think your viewers want to see things that were shot last year? If this is the case, why do we have film crews roaming the country? Couldn't we just show edited stock footage for every newscast?

Of course not.

Last month I had the opportunity to sit with some friends while they went through a huge vault of material. The topic of the day was how to continue to monetize content collected over the years.

We discussed a number of issues from royalty payments to whether certain technologies fit better with specific content. After talking about the specific technical aspects of streaming media, DVD, HDTV and others we determined that it is not necessarily the content, but the user experience, that determines which technology should be used.

As we looked more closely at the specifics, we realized that the technologies themselves actually had different sociological impacts. For instance, DVD content will most likely be enjoyed in a family room on a television with multiple people watching whereas Internet streaming media (remember broadcast is the original streaming media) will most likely be viewed by a single individual on a computer screen at close range.

In the case of streaming, content that speaks to the individual works best.

So why is this important for repurposing content?

In addition to all the technical aspects, some content is better suited to certain technologies. In the case of streaming, content that speaks to the individual works best.

Given this scenario, streaming content requires that extremely careful attention be paid to the encoding of the material. As with all material that is encoded, the quality of the original is extremely important. Today choosing material that is more or less static, thereby reducing the deltas between frames, will produce better quality streaming video at very low bandwidths. Minimal movement is the key to streaming success. Be aware that even though all the Internet pendants talk about "broadband," the simple fact is most Internet users still use a 28.8 modem.

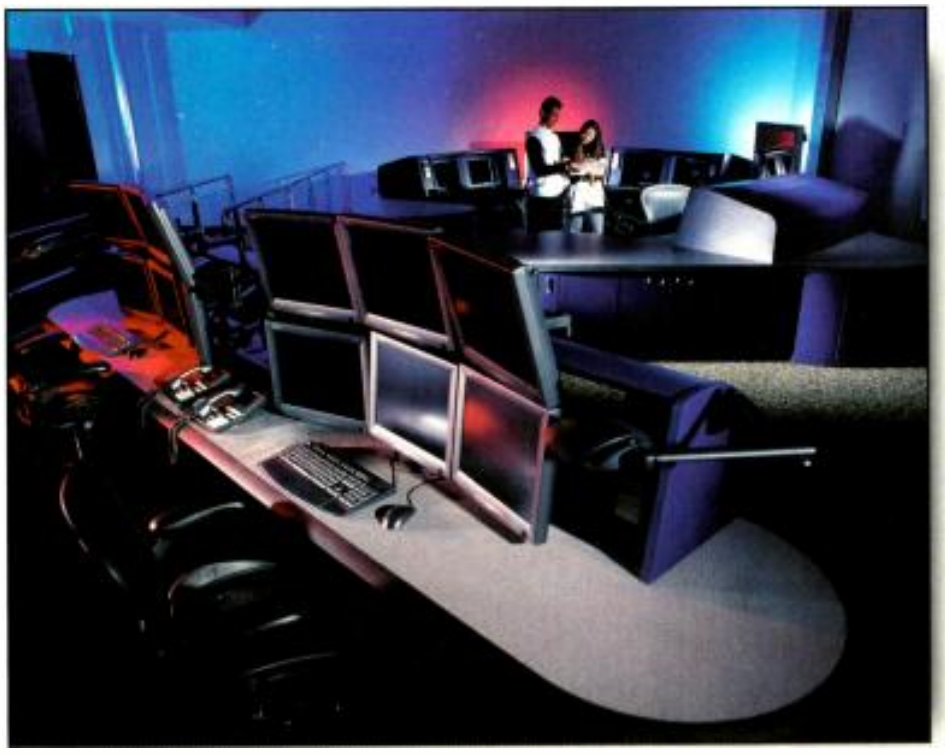
But wait, who wants to watch more talking heads? That's boring. Here is where the real power of the Internet/network comes in – using metadata.

Metadata is additional information such as URLs that can be incorporated into your content to allow the user to interact with the stream, and even give boring material exciting new twists.

Creating metadata to be streamed along with your content was a fairly tedious manual task until recently. Excalibur Technologies (www.excalib.com) has introduced a suite of tools called the Screening Room.

The Screening Room Client automatically captures, analyzes and storyboards analog or digital video assets — including live feeds and associated speech, closed caption text, and annotations. It will automatically generate video storyboards by selecting the most important key frames.

Further, it recognizes and detects cuts, fades, shifts, pans, tilts, blank screens and dissolves (as well as optional salient frames) for highly accurate storyboard



An integral part of the streaming process is determining how to repurpose on-air material for use in streaming facilities like iBeam's (shown above).

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representations. Users can also manually select keyframes on demand for full control over the storyboarding process.

Screening Room extracts closed caption text in several standard formats for concept and pattern searching, and lets users add user-defined metadata and annotations. Lastly it converts speech-to-text when closed caption text is not available for indexing and searching. Annotations can also be added using voice recognition.

It has all the standard capture and management tools you would expect, but its real muscle is in its ability to do indexing and speech-to-text. This is an awesome feature. The product is designed as modular components and actually uses multiple speech-to-text engines.

Imagine being able to convert your vast video library into a searchable archive. Your library now becomes a valuable asset that can be monetized much the same way we currently pay for news subscriptions on the Web today (Wall Street Journal). ■

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

Be aware that even though all the Internet pendants talk about "broadband," a simple fact is most Internet users still use a 28.8 modem.

New encoding technology at CNN

BY JIM B. GRANT

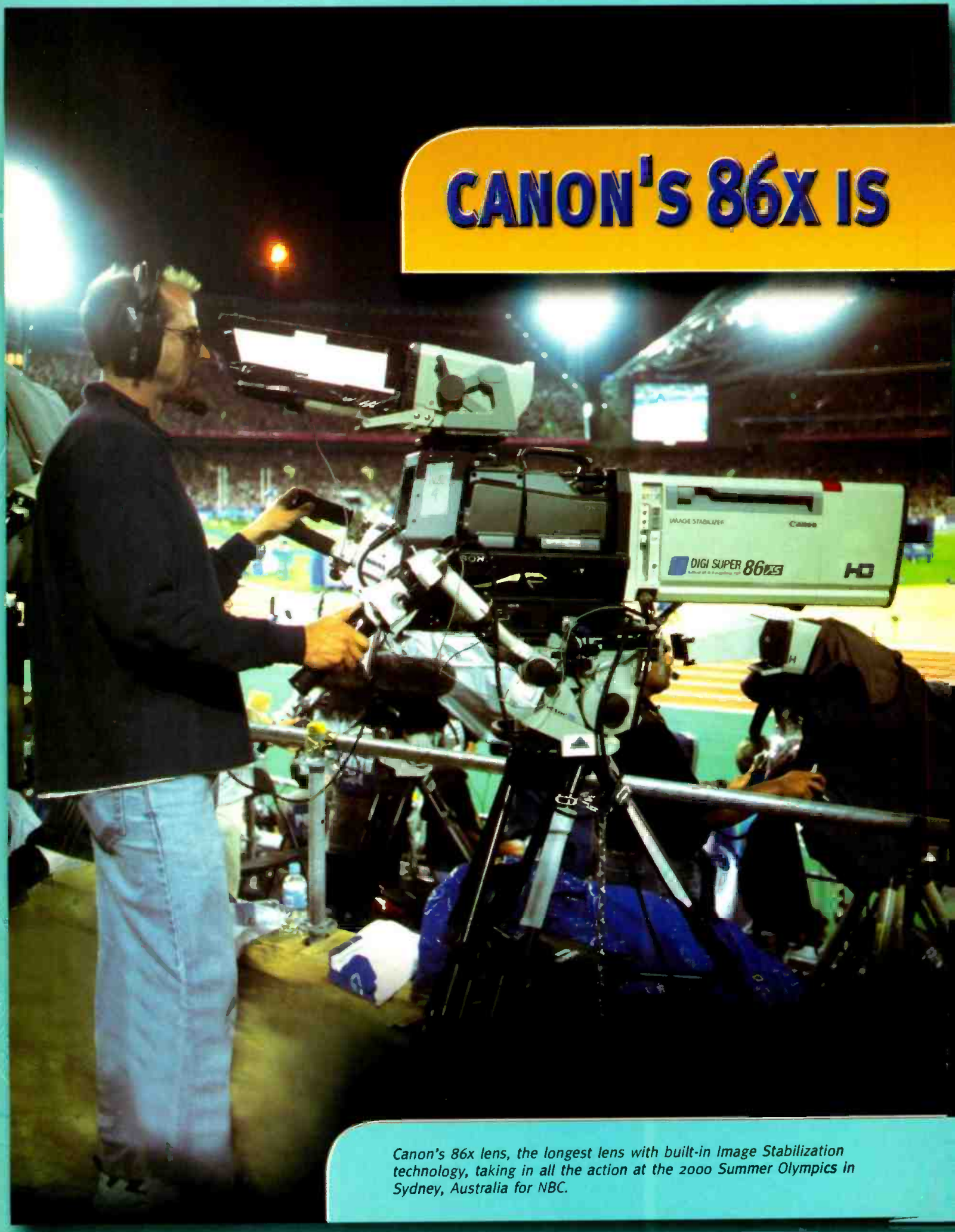
CNN recently selected and installed the Agility Enterprise encoding system from Anystream, Inc. to handle the encoding of completed story clips. This system is promoted as "any input, any output." Anystream automates as much of the process of encoding as possible to insulate the human operator from the underlying complexities. At CNN this has helped to eliminate a significant number of steps from the production process and provides encoding for multiple formats faster than real time.

Agility Enterprise's features include a unified encoding language that is codec-, device- and platform-independent. The programming model is distributed computing built on Internet standards such as TCP/IP and HTTP. According to Darian Germain of Anystream, this allows the system to be fault-tolerant, provide high-performance distributed encoding, offer unlimited scalability, and allow sophisticated remote management and control. The software offers customizing in areas such as billing systems, database systems, media-asset management systems, and network and system management applications.

The Agility product allowed CNN Interactive to eliminate multiple analog-to-digital-to-analog passes. Implementing an all-digital system reduced image degradation and maximized image quality. CNN has estimated that its streaming-media production output has more than doubled without any increase in staff headcount. According to Tom Gerstal, CNN Sport Illustrated has been using the Anystream system since Oct. 1, 2000. "They have gone from having regular encoding glitches [with the old method] to not having one complaint since the Anystream system started. It has tremendously improved reliability here," explains Gerstal.

Jim B. Grant is a video producer and software testing consultant in Atlanta.

CANON'S 86X IS



Canon's 86x lens, the longest lens with built-in Image Stabilization technology, taking in all the action at the 2000 Summer Olympics in Sydney, Australia for NBC.

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Dave Mazza, Vice President of Engineering for NBC Olympics.

"It's certainly lived up to what we expected - which was a lot. The performance of the Digi Super 86xs is just extraordinary."

George Hoover, Senior VP and General Manager of NEP.

"The Canon Digi Super 86xs gave us memorable shots that made a definite impression on our viewers. It worked especially well in our Super Slo-Mo setup, by allowing us to live at the end of the lens in night game situations. The Image Stabilization worked very well to ensure that even the tightest shots - of the pitcher's fingers as he released the ball, for instance - were also totally smooth."

Jerry Steinberg, VP of Field Operations for Fox Sports commenting on the recent World Series.

"When we saw this at NAB we were sold on the specs alone, but seeing the Image Stabilization in operation made the decision to pick them up immediately."

Dan Grainge, VP of Fletcher Chicago.

"When we got into the long lens market we wanted a lens that was the market leader and Canon's 86x with built-in Image Stabilization is just that."

Marker Karahadian, President, Plus 8 Video.

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SYSTEMS DESIGN SHOWCASE

GWNS' digital server system

Redundancy for multiple networks

by Jonathan Perkes

In GWNS' master control facility, above, up to twenty fully-automated networks can originate from a room that in the past, was large enough for only two networks.

Group W Network Services (GWNS) pro-vides major broadcast, cable and corporate clients with full-service program origination production and transmission, handling more than 7000 hours of traffic each week from its facilities in Connecticut, Minnesota and Singapore. GWNS introduced a second-generation video file server system — fully protected and redundant across two unique facilities — to provide greatly improved reliability for these multiple discrete network feeds.

The facility creates a fully automated, digital multichannel network origination center using current and emerging technologies to control, monitor and alarm.

Improved reliability and protection

The video file server systems significantly improve reliability and protection, with each installation being able to run independently of the other. The unique infrastructure can support multiple discrete networks from two video file server clusters, each with 24-hour protection and backup of all programs, commercials, promotional spots and public service announcements.

loading content to the servers. The MPEG-2 video files are transferred from the ingest server to the redundant system via Gigabit Ethernet connection on fiber optic, with both systems ready for air at all times. Custom software manages the media inventories on and executes file transfers between the two video servers. This system runs in parallel and shares priority information with the proprietary GWNS automation system.

automation development was required to control Odetics robotic tape loaders to allow simultaneous ingest of twelve digital videotapes, plus a thirteenth deck outside the robotics system.

New control stations

The new control room houses five master control stations, each handling four networks. The new system consists of two seven-node SeaChange Broadcast MediaClusters, one in GWNS' Harbor Plaza facility and the other at GWNS' Glenbrook Satellite Earth Station. These two servers hold identical material and, in fact, both play out simultaneously, one backing up the other.

Each video server will initially originate eight network feeds:

- Arts & Entertainment East Coast
- Arts & Entertainment West Coast
- The History Channel East Coast
- The History Channel West Coast
- The Biography Channel
- History Channel International
- NBA.com TV
- Recovery Network

> Room lighting was also critical, as projection screens are used at each station to monitor video.

The transition to emerging video server technology will provide:

- a four-to-one reduction in manpower requirements to operate the networks;
- a significant reduction in hardware maintenance costs;
- the ability to create one video file per commercial to be shared across 10 or more networks; and,
- a reduction in space, cooling and power requirements.

The new system structure reduces the possible points of failure, provides protection of all material for air and provides a backup signal equal in quality to the primary. Under this unique arrangement, the redundant system is geographically removed from the origination facility and on completely different backup power sources. Should there be any problem with a feed from one server, the operator can immediately route the material to air from the other.

Totally digital integration

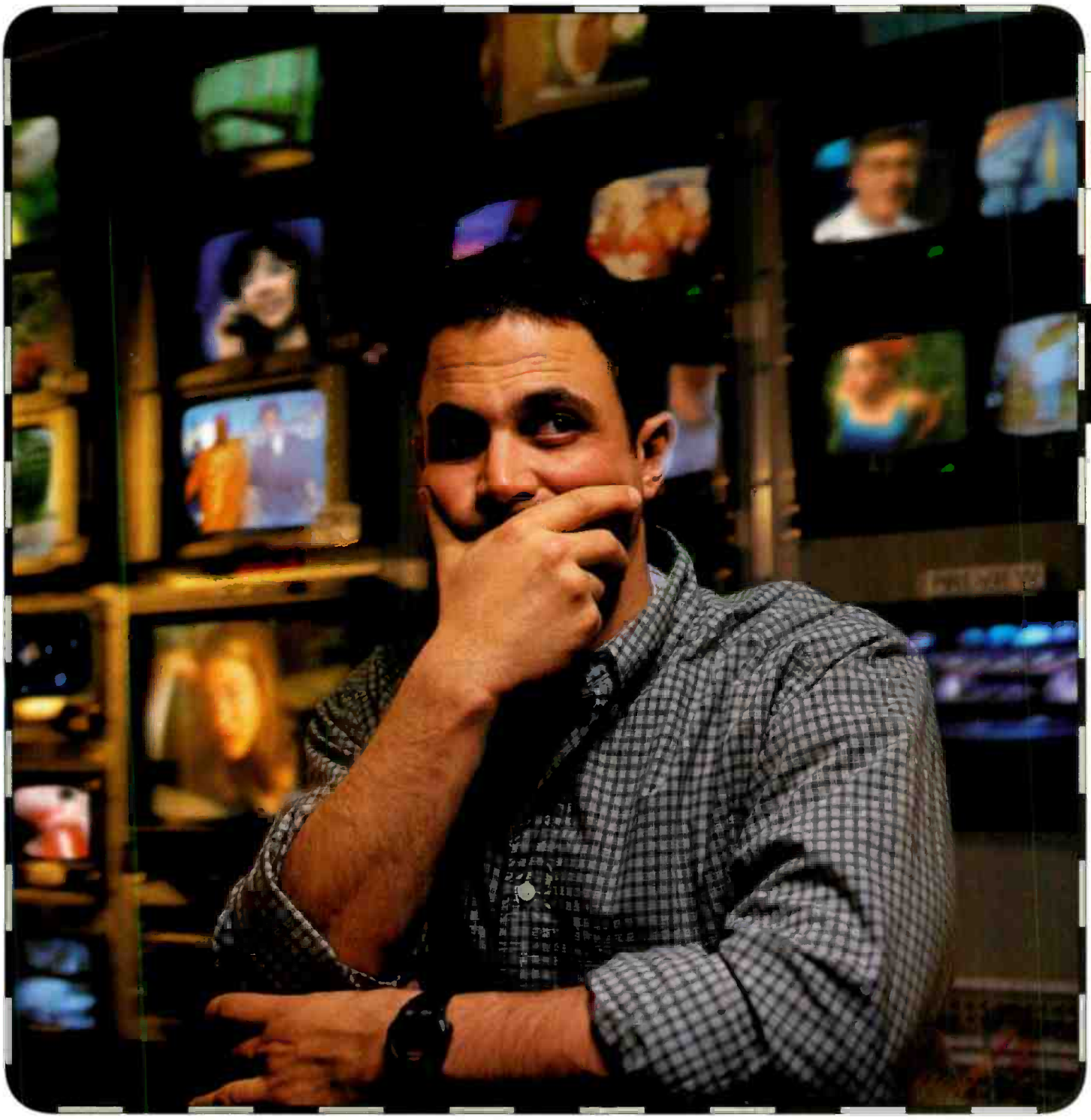
The totally digital system integrates two redundant video file servers, both operating under a single-control platform. Videotape will no longer be played directly to air, but will be used only for

GWNS' innovative approach required finding the right technology for constant remote control of automation computers, as well as a second video server and switching and keying equipment. The master control room is approximately four miles away. In-house

In the master control facility at GWNS' Harbor facility, above, each operator can customize the projection screen layout in order to efficiently monitor four networks.

Yippee. Digital is here.

And so are four times the number of channels to monitor.



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The master control facility is at Harbor Plaza, as are all the ingest functions (transfer from videotape into the server). Automation and control functions are duplicated in each facility. Monitoring and control of both locations' equipment is provided in the master control room at the Harbor facility.

Content is delivered to Group W Network Services on Digital Beta or Beta SP tapes. It is encoded and stored on the Harbor SeaChange server as MPEG-2 files and decoded back to SDI at the output. Remote control of the equipment provides all the protection and flexibility needed to maintain these networks on air at all times. The fact that they are geographically separated becomes transparent.

In GWNS' master control facility, five master control stations each handle four networks, monitoring four video images for each network's signal path.

The SeaChange Broadcast MediaClusters provide multiple layers of protection, and accept standard 601 SDI inputs with four channels of embedded AES/EBU audio. Compression rates as high as 30Mb/s are possible, but rates between 15- and 22Mb/s are used in order to maximize storage without compromising broadcast quality. Audio can be uncompressed if so desired, requiring 6Mb/s over and above the video rate.

Because the master control room is now purely a monitoring station, the overall technology is infinitely flexible. Ingest areas and video servers are located across the building in sealed equipment rooms. The video servers provide for exchange of hard drives to larger capacity models, as well as an upgrade path to HDTV. MPEG files can be stored at various bit rates simultaneously, allowing for everything from Internet streaming to I frame only.

Video images are multiplexed onto a single display, routed from the transmission facility to master control and projected onto a large screen. Each network's signal path requires four video images to be monitored. The audio is monitored visually on-screen and audibly from a router output. Integrated alarm and monitoring systems are used to check closed-captioning, V-chip, MPEG decoding, audio, video and outgoing DTMF tones.

The Glenbrook server is the primary unit for decoding and playing back all material for air and is connected to the transmitter, scrambler or compression system, as required by each network. The Harbor server decodes and plays back the identical material, and these feeds are routed to Glenbrook or any

> Remote control of the equipment provides all the protection and flexibility needed to maintain these networks on air at all times.

Design Team:

System design:
Jonathan Perkes, Director, Engineering, GWNS

Development and installation:
Engineering Department, GWNS (Peter Zackowski, Joe Olejniczak, Richard Rosevalt, David Bingham, Tom McWilliams, George Parson, Andy Solywoda, Clifton Beckford, Jay LaPrise, Rick Holman, Tom Douglas, Ripton Hazel, Philip Laskowski, Bill Malchow, Tom Alessi)

Operating concepts/procedures:
David Lostracco, Director, Operations, GWNS; Joe Romaniello; Ken Breitenstein; Bob Summa; Heather Weber; Brian Hitney

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other available location to serve as backups to be switched to air in an emergency.

The home viewer cannot detect any difference between the quality of the signals from Harbor and Glenbrook. The only difference is that the Harbor signal is transported on a digital studio-to-transmitter link (STL), while the Glenbrook signal is "originated" at Glenbrook. In effect, all broadcast material is delivered a day in advance to within a few feet of the transmitter. Three-hour advance playout feeds from the server are monitored in master control, allowing time to correct any discrepancies that may not have been caught in the prior check procedures.

Technical plant integration

Older sections of the existing technical plant are being remodeled to allow GWNS to use the existing computer network infrastructure and interconnections to the transmission facility.

Accommodating the master control and a supervisory console in a space roughly 40' x 28' caused concern about acoustics because five operators would each have their own speakers to monitor audio. As a result, acoustic materials were applied to dividers and walls, and the ceiling was changed to a higher acoustic rating. Lighting was also critical, as projection screens are used at each station to monitor video. Strategically placed track lighting provided the right amount of light to read documents without compromising screen images. ■

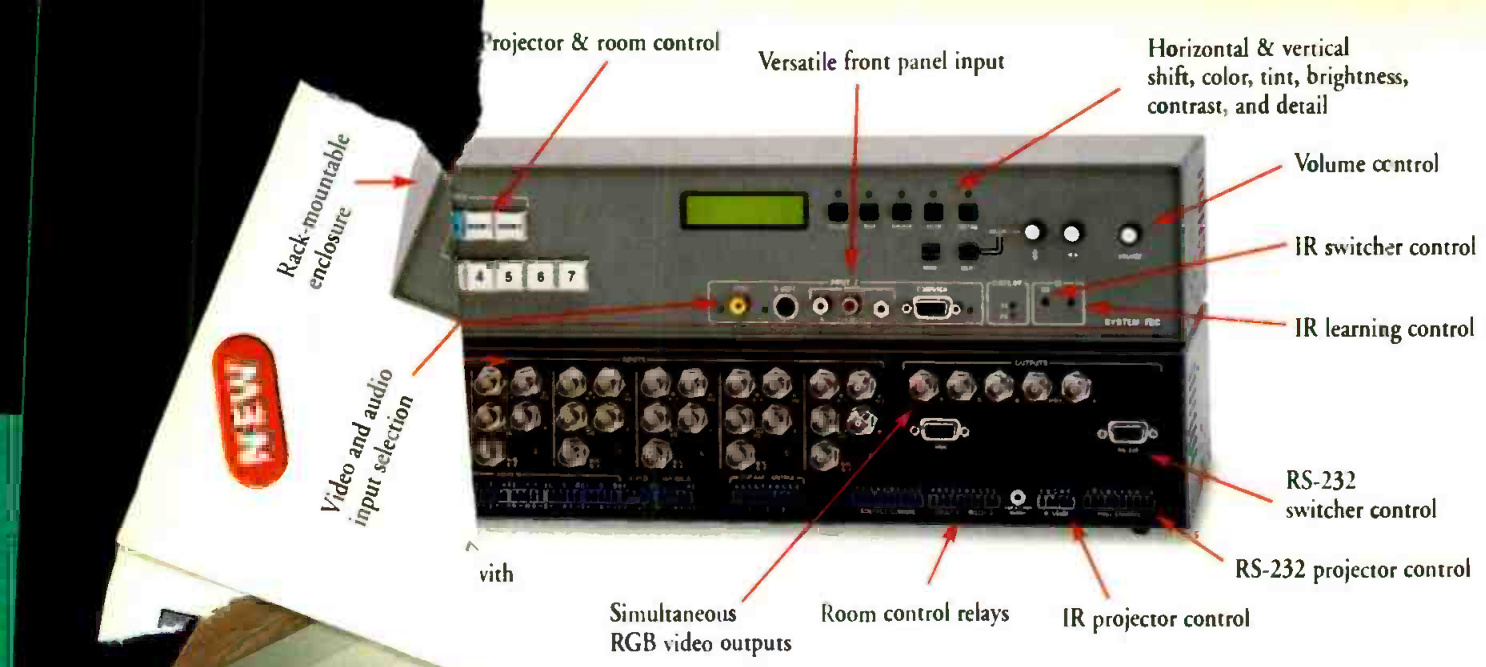
> Because the master control room is now purely a monitoring station, the overall technology is infinitely flexible.

Jonathan Perkes is director of engineering for Group W Network Services. He can be reached at jperkes@gwns.com.

Equipment List:

- SeaChange Broadcast MediaCluster 1237
- Oxtel IS2 Imagestore automated master control & channel branding, with Easyplay, Easysound, Squeezy DVE
- Oxtel EK1Easykey switcher/ downstream keyer
- Miranda Kaleido multi-image display system
- EVS Broadcast Equipment Super Split multi-image display system
- Evertz 7760 AVM serial digital video, audio, CC and V-chip monitoring
- Evertz 8084 closed-captioning encoders
- Tektronix PQM 300 program QoS monitor
- Videotek VTM multiformat on-screen monitor
- Philips Venus routing
- Sony DVW A510 Digital Betacam players
- ADC DV6000 fiber optic transport
- Crestron touch-panel control system
- Avocent DS1800 Remote computer control system
- Straylight Digital Cluster Sync

The master control facility at Harbor Plaza serves strictly as a monitoring station for automation systems in both facilities. Besides the monitors and projectors, there is no other electronic equipment in the control room.



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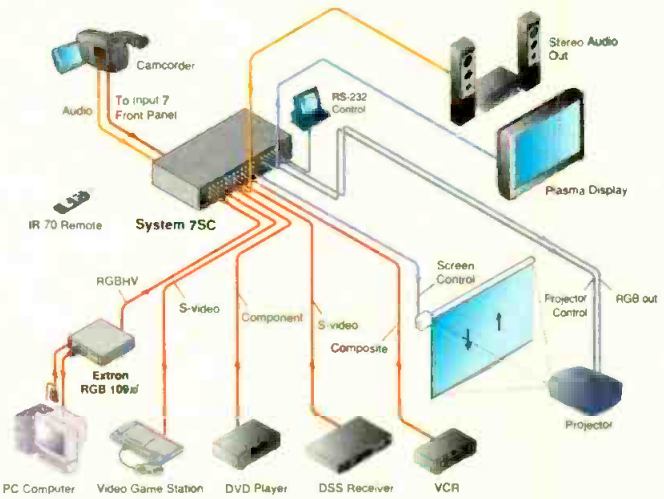
- Seven fully configurable inputs accept composite, Y/C, component video, or RGB computer video
- 350 MHz (-3dB) video bandwidth helps maintain signal integrity
- Upscales NTSC, PAL, or SECAM video, component video, and 480p signals
- Scaled RGB outputs are provided at industry standard computer-video, plasma, or progressive HDTV rates and resolutions
- Universal IR or RS-232 projector control, remote IR learning capabilities, and IR remote control for easy operation
- Room control (lighting, screen settings, or other functions) via internal relays
- Horizontal and vertical shift, color, tint, brightness, contrast, and detail controls for each input
- Dual audio output, one with fixed level and one with variable level, adjustable with the front panel knob or through RS-232
- Extron's Simple Instruction Set (SIS™) for simplifying RS-232 control



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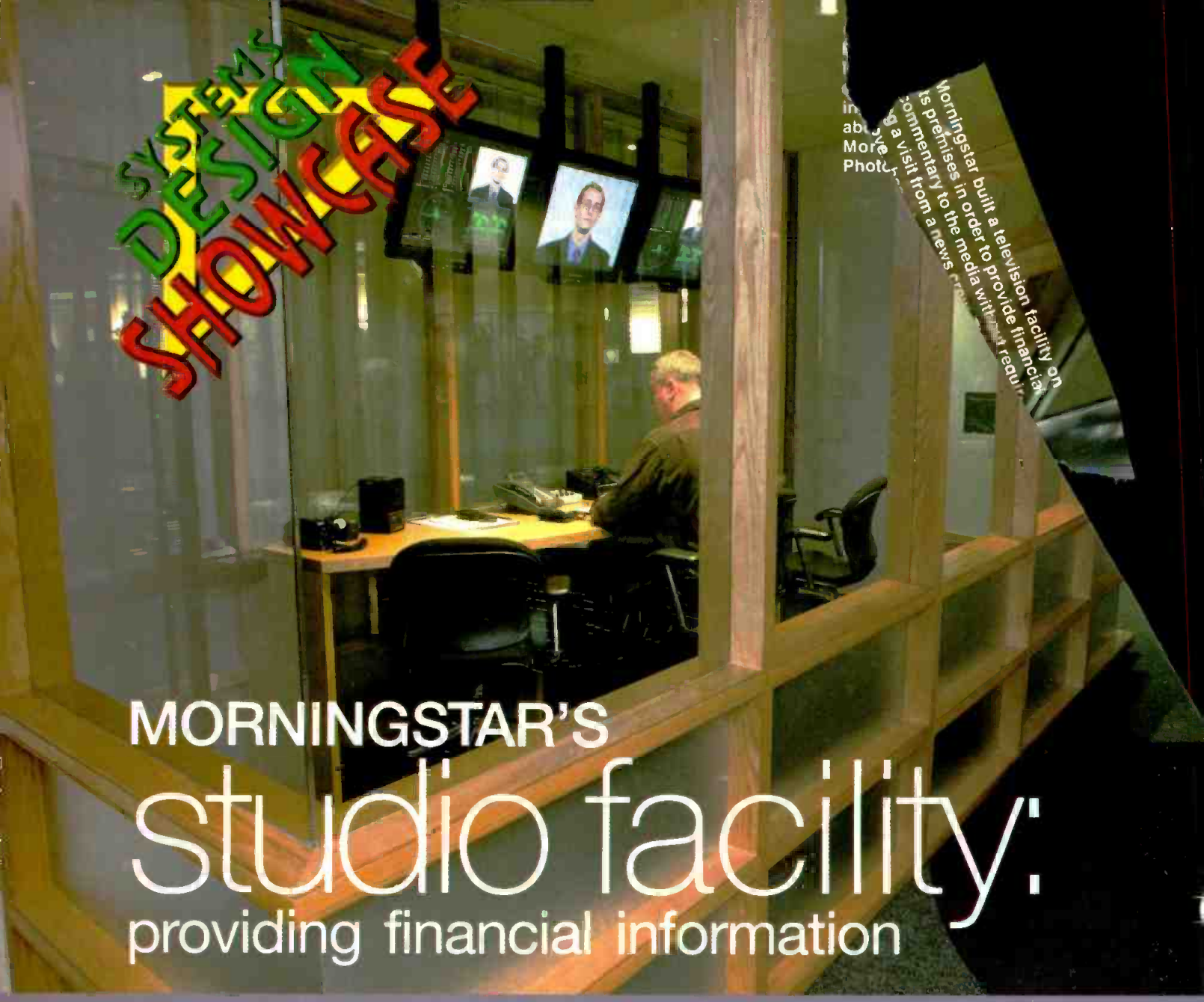

Morningstar built a television facility on its premises in order to provide financial commentary to the media with a visit from a news crew

MORNINGSTAR'S studio facility: providing financial information

By James J. Skvaril and Mark Sarantakos

In order to fill broadcasters' need for current, accurate economic information, the Chicago-based provider of stock and mutual fund investment information, Morningstar, has often been called on for comment and clarification. This demand for their analysts' knowledge often meant a visit from a news crew or a trip to a local production facility. This tended to tax the already busy schedules of both the Morningstar analysts and the broadcast media. To meet the content demands of broadcasters and make the best possible use of its analysts' time, Morningstar's management decided to install a television studio on its premises.

Production Craft, Inc. of Chicago, was called in to design the facility and consult with Morningstar officials, along with the project architect and general contractor. Production Craft realized that Morningstar did not have a technical staff on hand to operate the broadcast equipment required for such a facility. Therefore it was an important design requirement from the outset to make the studio operable by non-technical public relations professionals.

It was also important to Morningstar that the facility fit rigid aesthetic concerns, as the studio would be located just off the main reception area and thus be visible to visitors and staff.

MTS Systems, Inc. provided color line drawings of all audio and video paths, cable designation, lease hold construction supervision, system installation and integration. Utilizing AutoCAD, MTS also completed all technical documentation, from conceptual signal flow to presentation to as-builts.

Architectural

Special design considerations were required. This facility was to be a "techno" point of interest attached to the Morningstar main reception area and office space. The build out took place in a recently constructed concrete and steel office high rise in downtown Chicago. From an aesthetic standpoint the facility was to have glass walls separating the control area from the reception area and the control

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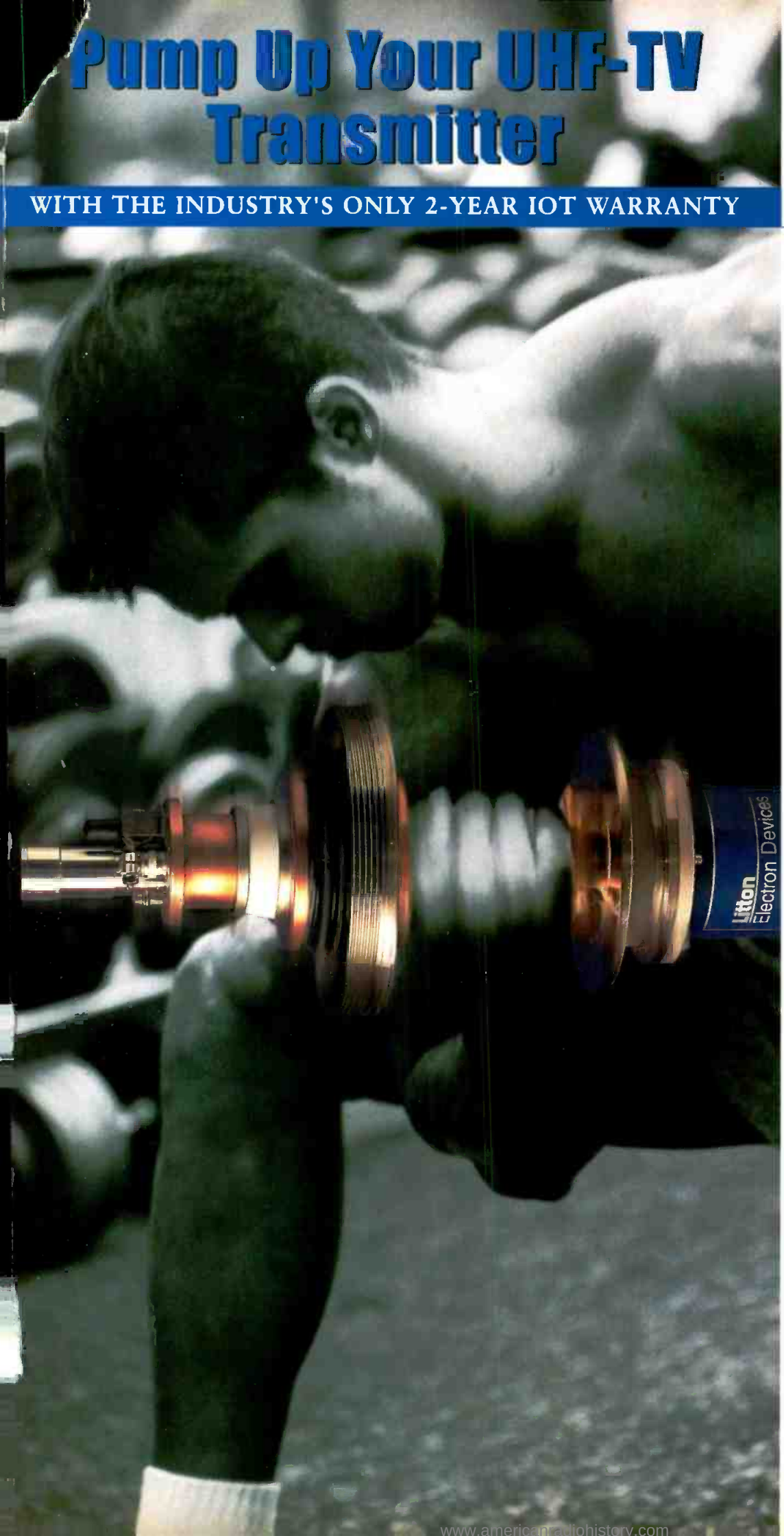

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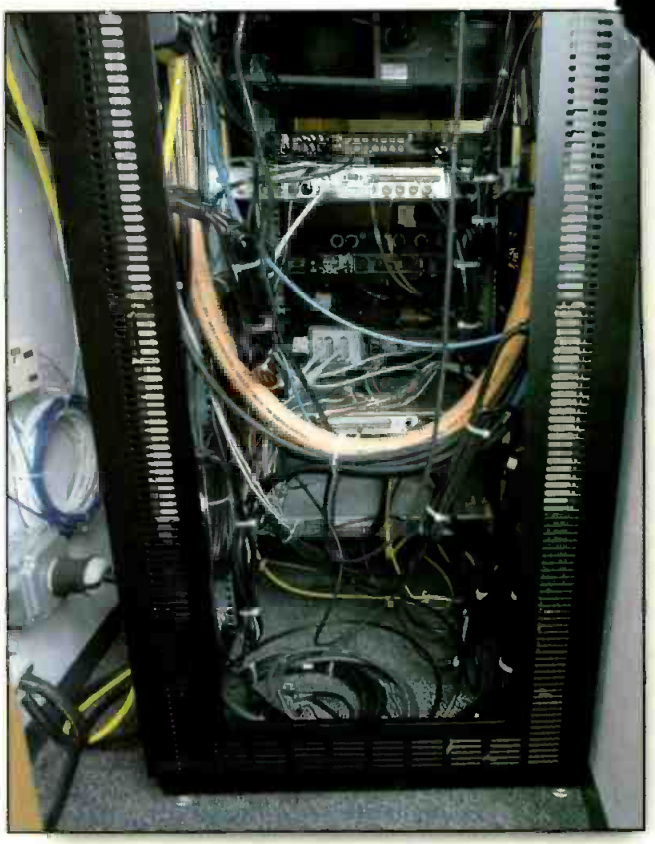
room from the studio space. Although these glass walls allowed visitors to see the studio in action, it obviously caused concern with regard to sound isolation and reflections. In order to compensate for these aesthetic design criteria, mechanically isolated double panes of 1/4-inch tempered glass, splayed 15 degrees off parallel top to bottom were specified. This would limit sound from lobby activity in the studio to an acceptable level. Additionally, it would minimize direct reflections of the analysts' voices back to the microphones during broadcasts. The remaining three walls were constructed slab-to-slab out of three different thickness of drywall laminated together without common joints. In addition, the parallel drywall surfaces were treated with acoustical panels to minimize mid- and high-frequency reflections between those surfaces. Padded carpet and an Armstrong acoustical 2 x 2 ceiling system were deployed to handle vertical interference.

The studio was located in proximity to the main HVAC distribution path for the entire floor. Neither the vent nor the studio could be relocated. To help isolate this source of noise from the studio, oversized supply ducts with canvas couplers, spring isolators and low noise diffusers were specified to reduce static pressure and velocity.

Video

This was to be an analog composite facility and no accommodation was made with regard to digital television transition requirements. It was decided that the cost of retooling this rather simple facility in the future would be less expensive than incorporating any digital equipment at this point.



Rear of rack during construction of Morningstar's new in-house studio facility.

> With regard to the audio, it was again important that minimal operator intervention be required.

The Shure FP-410 and Aphex 320 Compellor were major audio components of the new studio.

The design for the facility incorporated a single remote controlled three-chip camera, and an audio system with an auto-mixer and a compression/expansion device to keep levels within normal ranges without the need for operator intervention.

The camera chosen for this installation was the Sony DXC-950. The box design of this camera does not provide for or require the additional cost of a viewfinder, which for this application is unnecessary. Control of lens iris, camera pedestal and paint parameters is accessed via the RMC-950 remote control panel positioned in the control room. The camera's glass is a Fujinon 7mm X 14 power. For audio and video quality measurements we installed a Videotek VTM-183 rasterizer, which provides for accurate, dynamic graphic displays of signal levels on a VGA display. The display can be configured in a wide variety of layouts including any combination of waveform, picture or audio levels as may be required. Audio display was included. The VTM-183 was fed to one of an array of three 25-inch plasma displays provided by Morningstar to help achieve the techno look desired by the client. The other two plasma displays were fed discrete DSS receivers with BVS CC100 closed caption decoders in line. However, after composite decoding, color space conversion, and re-resolving to its native resolution, the image on the plasmas was suitable for casual viewing at a distance, but not for reasonable picture quality assessments. So for shading and composition, a Sony PVM

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Morningstar used Electrograph Plasma monitors displaying Videotek VTM-183 waveforms for audio and video quality measurements.

8040Q 9-inch CRT was installed.

For distribution of video signals we made use of Videotek's Model VDA-16 and RS-12A.

Lighting

For lighting, the talent is illuminated by three Kino-Flo Diva 400 instruments. These lights provide a stable 3200K output with a power efficient, non heat producing, high lumen output. They also feature an on-board dimmer, which varies the light output over a broad range without affecting color temperature.

Robotics

To allow non-technical operators to frame and compose a proper news style head shot, we utilized an ESI Model 180 controller with a companion ESI DPT 133 pan tilt head. We went with this for its separate rocker switches for control of zoom and focus.

The camera is positioned by an operator standing in the control room watching a monitor and listening for shot direction from the broadcasters via a coordination phone line.

An important design goal in the construction of Morningstar's facility was to make operator consoles like the one shown above operable by non-technical public relations personnel.

Because of the need to carry a TelePrompTer as well as the camera, we upgraded to the ESI 133, which is capable of moving up to a 15-pound load, provided it is balanced properly fore and aft, left and right.

Audio

With regard to the audio, it was again important that minimal operator intervention be required. For pickup convenience, we utilized the Shure Brothers U4D UHF Diversity wireless microphone system. The active diversity antenna array was mounted to the lighting grid, and a walk test after installation provided drop-out free performance until we were almost off the fourth floor of the building.

The system includes WL-61 mics and two Shure U1 body pack transmitters, which transmit to separate receiver modules for redundancy in the event of a failure. The output of the receivers feed a Shure Brothers FP-410 Auto mixer, which selects the mic system that is currently active. The output of the mixer feeds an Aphex 320A Compellor, which actively and noiselessly expands low levels or compresses signal levels above a user-definable preset.

As the main function of the studio was to provide for the production of live interview shots of Morningstar analysts reacting and answering questions posed by an off-site interviewer, a dependable, simple to operate IFB system was necessary. For this application we specified a Gentner Auto Coupler that feeds a Vega RMT-10 single channel transmitter. This system feeds wireless audio to the Vega PL-2S body pack receivers. To provide for additional functionality, we installed a parallel speaker in the control room to allow other Morningstar personnel to hear the questions that the on-camera guest is asked. Also included was a Shure Brothers Microflex MX412 push to talk microphone, so that status cues could be provided to the talent. The signal from this mic was mixed into the IFB circuit.

A Studio Technologies Model 81 Stereo distribution amp handled audio distribution. The audio installation was further simplified through the use of ADC ICON cross connect blocks.

> It was an important design requirement from the outset to make the studio operable by non-technical public relations professionals.

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The studio's Sony DXC-950 camera with ESI robotics (shown above) was positioned by an operator in communication with broadcasters via a coordination phone line.

Transmission

Our outbound video and audio feeds went to an ADC fiber optic transmitter provided by Ameritech Broadcast Services. This transmitter is located in our control room and linked by single-mode fiber to the phone room. By locating the fiber transmitter in our control room, the exposure to RFI or common mode generated interferences encountered when making a long run with video coax is eliminated. In the phone room our local fiber meets the Ameritech T-3 circuit and makes the run to the local VYVX POP.

Toward the end of the design phase of the project it became apparent that besides its original broadcast purpose, an important additional function for the studio would be to provide video content for the Morningstar.com webpage.

> This facility was to be a "techno" point of interest attached to the Morningstar main reception area and office space.

To this end an additional fiber link to a provider of video compression and streaming services was installed. The company packages the Morningstar analysts' segments with a lead-in commentary originated from another studio facility. The completed segments are then linked into the Morningstar.com website and are available as streaming video three times daily.

The Morningstar studio went online in early October. The first broadcast usage was a taped segment for CNBC. Since then it has provided many additional segments for CNBC, Bloomberg TV and CNN-FN. In fact the demand placed upon studio facilities has been so great that a studio manager has been hired to coordinate usage requests and operate the facility. ■

The above rack is viewable from Morningstar mainreception area, to create a "techno" point of interest.

James J. Skvaril is vice president of Production Craft, Inc., and Mark Sarantakos is president of MTS Systems Inc.

Equipment List

Sony
DXC-950 video camera with Fujinon VCL –714 BXDEA Lens
RMC-950 camera remote control
PVM 8040 8" monitor
SVO-1630
B50D DSS receivers

Videotek
VTM-183 rasterizer
VDA-16 video distribution amp
RS-12A 12X1 stereo audio /video router

Shure Brothers
U4D UHF diversity receivers
U1 UHF transmitter bodypacks
FP-410 4 channel auto-mixer

Vega
RMT-10 single-channel IFB transmitter
PL-2S bodypack transmitter

ESI
Model 180 controller
DPT-133 pan-tilt head
Kino– Flo Diva 400 D4 120 lights

QTV
Win Cue Prompter software
FDP-11 Prompter hardware

Aphex
320A Compellor

Studio Technologies
Model 81 stereo audio distribution amp

Electrograph
DTS25 25" plasma monitors

ADC
ICON I-WA QPC cross connect

Design List

James J. Skvaril, Production Craft, Inc., Project Manager
Mark Sarantakos, MTS Systems, system design
Jon M. Salzman, Architect, Eastlake Studio
Morningstar Managers: Stephanie Kerch, Kathy Habiger
Michael Laszuk, Studio Manager
Construction: Tom Murray, Larry O'Connell, Scott Pillsbury

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Transmission & Distribution

The rules we live by

BY DON MARKLEY

Let us all humbly face the center part of the East Coast of these United States and quietly acknowledge the home of our exalted leader, the Federal Communications Commission. From the un-ivied halls of that great institution, via the government printing office, are regularly issued those guidelines with which we, as broadcasters, must comply. We normally refer to those guidelines as the Rules and Regulations in all of their various parts, chapters and volumes.

Every station should have a complete and up-to-date set of the applicable sections of the rules on hand. In a pinch, the rules are available in a hopefully current condition via the FCC webpage at www.fcc.gov. A nice, time-consuming and frustrating search of that page should result in one being able to find any particular rule of concern. That really doesn't replace an on-site set of the rules. At least parts 73 and 74 should be maintained.

Part 73 contains the basic rules for radio broadcast services. That includes full-service AM, FM, non-commercial FM and television operations.

Part 74 covers auxiliary services including low-power television, STLs, intercity microwave and related areas. If a really complete set of the rules is desired, include what is normally referred to as Volumes 1 and 2.

A woman scorned doesn't compare to the action of the Commission if it finds that someone lied on an official document.

The rules change often and with no real notice. Unless one either reads the Congressional Record every day (lots of luck) or carefully checks the FCC Daily Digest, rule changes will be missed. However, there is a solution.

There are Washington firms that offer the rules for purchase and provide updates to the rules on a regular basis. Such a service is offered by the venerable and respected Pike and Fisher (800-255-8131), Rules Service Company (301-424-9402) and others. It is possible to bring the station files fully into the modern era by buying the rules on disk. For example, the author subscribes to a service that sends updated rules monthly on disk, along with a program to access the rules in a mysterious and confusing fashion. Once the rules are safely established in a computer, they can be reviewed in a fashion that consumes much more time than if they were on paper. That same service provides hard copy sets of the rules that are updated on a somewhat regular basis by sending the pages containing changes for insertion into loose-leaf binders. The normal routine is to look for the rules on the computer until frustration reaches a level that sends the user either to the printed version of the rules or to the nearest source of behavior modification (like in a black, square bottle.) In reality, the computer version is very handy for checking on a quick point. The paper version is better when studying a significant problem in detail.

As to the rules themselves, broadcasters have been lulled into a false sense of security by the so-called deregulation process. For example, the rules used to contain lengthy and detailed requirements for devices used to maintain a transmitter's operating

FRAME GRAB

A look at consumer side of DTV.

Will NTSC ever die?

Without government rules or encouragement for multi-room video distribution, analog TV will be with us for another 25 years.

US DTV Receiver Sales Forecasts Annual Shipments

1999	130,000
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2001	470,000
2002	750,000
2003	1,200,000
2004	1,700,000
2005	2,400,000

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frequency. Older technicians will remember when the rules even specified the acceptable range of temperature to be maintained in crystal ovens. In addition, frequency monitors were required to be type accepted with their own strict set of operating requirements. All of that is gone, along with even the requirement for frequency monitors. That really makes sense, as low cost frequency counters are readily available to check a station's frequency that offer far more than the necessary stability and accuracy. However, the lack of regulation concerning the frequency controlling devices and those for frequency measurement has tended to mislead the broadcaster.

There has been no relaxation on the tolerances for operating frequencies. The relaxation has simply given the broadcaster the option of determining the manner in which he will maintain the station operation within those tolerances. If the Commission checks a station when their monitoring truck is in the area and finds the frequency out of tolerance, notification will be made and an appropriate fine will be assessed. The operating requirement is still there – only the manner in which that requirement is met has been opened to the broadcaster's method of choice. If the frequency counter the chief engineer bought at the ham fest and which he has never bothered to check for accuracy has led to the station being 1kHz beyond the allowable error, the fine will still be assessed.

A similar situation applies to the station logs and other records. For years, the rules specified various parameters that had to be measured and logged. Those logs were required to be maintained for at least two years and made available to the Commission upon request. Now, the logs that have to be maintained only have to contain the record of the tower lights, Emergency Alert System operations and a few other special requirements (Check 73.1820). That has not eliminated the need to maintain power with its associated measurement. It has only eliminated the need to write the information down. Most quality operations still maintain a complete log with regular meter readings. That is still in accordance with good operating practice – it just isn't required by the rules.

Equipment performance measurements that used to be required on a periodic basis are now only required for new installations or "as needed" to maintain operation within the rules. The station is allowed to determine when such measurements are "needed," but will feel the full wrath of the Commission if found not to be in compliance when inspected or monitored.

The Commission is still very testy concerning the public reference file. The requirements in that regard are still rigidly defined and contained in great detail in the rules (See Sec. 73.3527). If the chief engineer does nothing else to comply with the regulations, he should at least check the file against the rules to determine that all required documents are included. That includes, in part, a copy of all licenses and applications. It isn't brain surgery to keep a complete public file, but it is totally unacceptable to allow the file to be incomplete. The public file is one issue where the Commission is adamant concerning the contents, and where the fine will be significant if a station is careless.

One more little point: On the logs for the tower lights and EAS operations, if something is done wrong (such as transmitting an EAS test warning of a tidal wave in Boise) log it the way it happened and leave it alone with the fond hope that no one will ever notice. You only have to worry for two years and then you can destroy it and breathe easy. The station would be exposed to a much greater level of punishment if the log were found to misrepresent actual events. The old adage "Hell hath no fury..." doesn't really apply today. A woman scorned doesn't compare to the action of the Commission if it finds that someone blatantly lied on an official document. That would include the station's logs. If someone screwed up, let the admission of that error exist in the appropriate files – don't try to cover it up with a second error.

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

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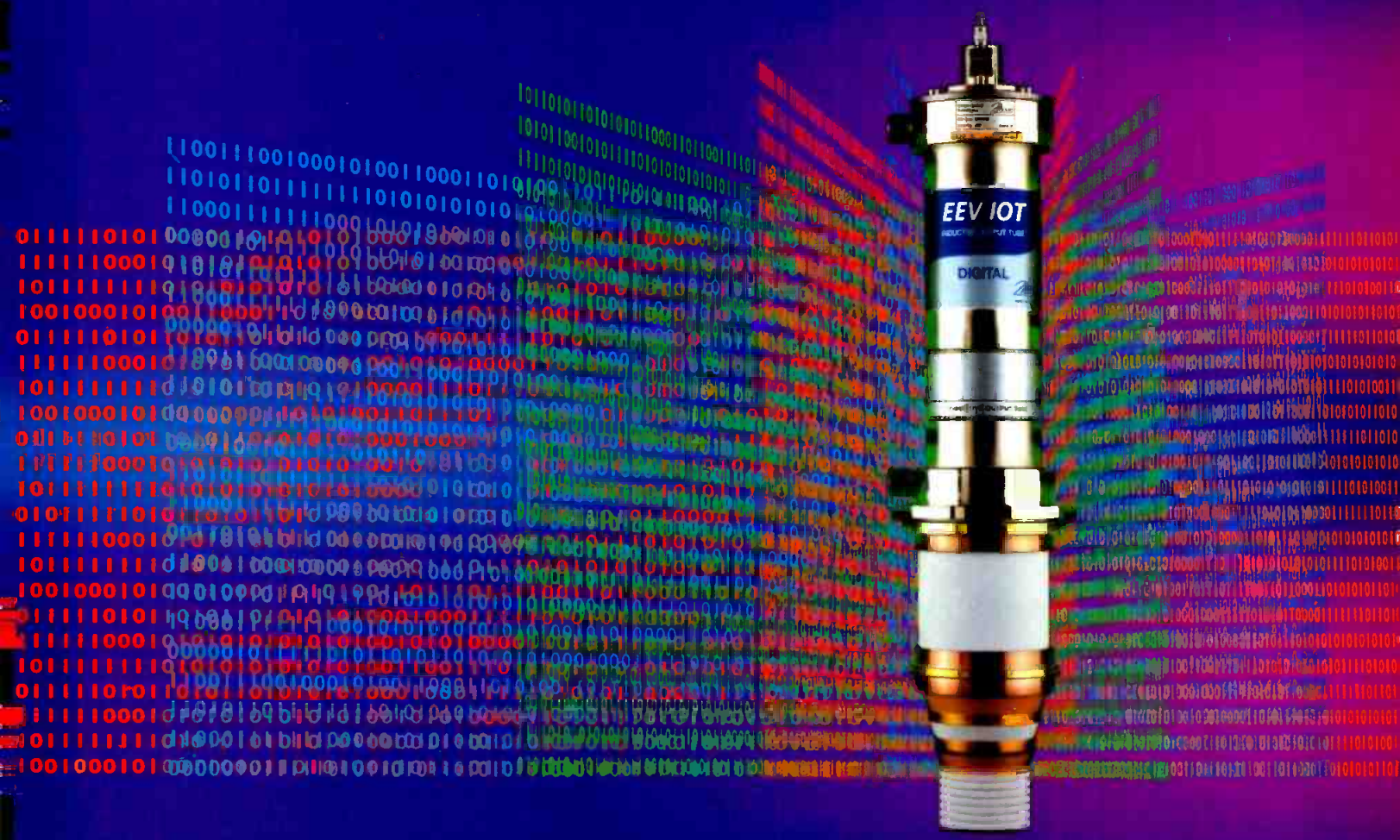

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Helpful tips for audio post

BY ROB FRITTS

In today's high-tech and fast-paced world, the tools we use make our jobs easier and more convenient. But be aware, fewer knobs and claims of "anyone can use it" are reason enough to worry.

A dedicated and specialized production space affords isolation from machine and ventilation noise. Spaces like this studio at Henninger's Capitol Facility in Arlington, VA, lend a neutral acoustic ambiance to a recording. Photo courtesy Henninger.

Digital phone patch recommendations

How many engineers have received a digital phone patch that, sonically, has little to be desired? I'll bet it's more times than the state of Florida can count accurately. When it comes to recording a voice or any audio source, there are many factors to consider. One is room acoustics. Studios spend untold thousands of dollars building rooms that have a neutral acoustic ambiance and excellent sound and vibration isolation. These studios add character to a recording and don't sound like back bedrooms or oversized closets. More and more, voice-over talents record themselves in their own homes, in recording spaces that lack a neutral ambiance. Back bedrooms offer little isolation from the outside world. This introduces unwanted rumble from ventilation systems and various other household noises. The method of delivery is most often via ISDN, a network audio transceiver. Unfortunately, too many of these recordings lack in sonic integrity.

Reference the tone of your source tapes before loading and be sure to match time code frame rates.

Another source of sonic degradation is how the microphone and microphone pre amp are being used in conjunction with compression and equalization. Do not over-compress your recording, leaving it with little or no dynamic range. This leaves the recording sounding very dull. It is one thing to compress a musical instrument to make it "breathe" in time with the song, but this is not the effect you want on a narration track. When recording, it is usually best to lean toward light compression and equalization. You can always add more but you can't dial it back once it's been recorded.

Furthermore, be aware of overmodulating your microphone pre amp. If the signal is too hot at the input, then insert a pad at the microphone. An easy way to tell if the pre amp is being overmodulated is to see if the signal distorts or sounds very crunchy. Increasingly, some microphone pre amps are digital devices. They convert the analog signal from the microphone to a digital signal inside the pre amp. Working in the digital domain is a fantastic and very flexible method as long as everything is synchronous. This means that if your microphone pre amp is set to a sampling frequency of 48kHz, and that signal is passed through a digital mixer referenced to a sampling frequency of 48kHz, then when sending the signal to the digital phone patch device it too must be set to a sampling frequency of 48kHz. If any one of these devices is not set to the same sampling rate, or there is no sample rate conversion taking place, you will experience erroneous audio known as alias frequencies. You can recognize an alias problem by listening for harmonic distortion, clicks or pops. The recording will also sound very thin and metallic in nature. Avoid this problem by keeping all your digital devices synchronous to one another and properly convert to a single consistent sample rate.

It is in the best interest of the voice-over talent to record the highest quality sound possible. The sound quality

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of their voice is what sets them apart. If you can't record at a studio and must send the narration over a digital phone patch, then the suggestions noted should make for flawless recordings.

Open media framework preparation

These days, more and more producers are purchasing and using nonlinear editing systems. Nonlinear systems are becoming much more affordable and easier to use for the everyday producer and so are proliferating in the post production world. Such systems allow video editors to export the audio tracks via Open Media Framework (OMF) to audio engineers. This efficient method of importing edit decision lists (EDLs) into a dedicated audio workstation eliminates hours of prep time in an audio studio, leaving more time for exciting and creative audio decisions. I'm sure you have heard the phrase "we will fix it in the mix." Yes, audio engineers have been fixing problems in the mix stage for years, and will continue to do so for many years to come. However, there are a few things that could help keep projects on time and under budget: Nonlinear editor operators should pay close attention to these audio details.

First of all, most field audio is recorded with two discrete audio tracks. One is usually a boom and the other a lavalier microphone. If that is the case, make sure the audio is loaded into the nonlinear editing system as two discrete audio channels. I know this sounds obvious, but it is a mistake most editors make. The audio from the source arrives at the mixing board on two discrete channels and the mixer sums the two channels together when loaded onto an editing system. Make sure the two channels are panned hard left and hard right and sent out a stereo bus to the input of the editor and everything will be great. Let's say your source is from a digital betacam and you are loading the audio into your editor digitally, but your editor has a sampling rate set to 44.1kHz. This will result in a sampling rate problem. You will need to sample rate convert the 48kHz source down to 44.1kHz or record your audio into the editor via the analog inputs. Always reference the tone of your source tapes before loading and be sure to match timecode frame rates. These are a few easy but often overlooked parameters to loading your audio correctly.

Second, when you prepare the tracks for the OMF, always deliver both sets of audio tracks per source if available. Let the audio engineer decide which sounds better for the final mix. Also, make sure to render all your fades and to add at least 60 frame handles for each edit. Be sure to match the timecode frame rate of the final event list with the timecode on the master tape. If all these details are met, you should have a perfect OMF.

All of the aforementioned details may sound obvious, but it's often the most obvious things that get overlooked. ■

Rob Fritts is an audio mixer for Henninger Digital Audio.

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Digital networks: Piecing it together

BY JOHN LUFF

The conceptual design of video facilities has begun to move away from the paradigm that has sufficed for the analog facilities and the transitional "digital baseband" facilities being commonly implemented today. When viewed at a macro level, most digital facilities replicate NTSC approaches with SMPTE 259 or 292 bearers. At the edge of the topological map you will find new facility techniques intended for both uncompressed component digital video (SDTV and HDTV), as well as emerging classes of media that are beginning to take advantage of other methods of interconnection appropriate to the media content.

Central to this emerging theme is the widespread use of compressed video as an object in both production and distribution. Analog techniques do not apply and questions of time dependency can now be evaluated to find the best fit to available technology and operational techniques. Real-time playout is no longer the only way to deliver to the transmission point. Rather, a "best effort facility" can deliver the media to a buffer at the transmission point, where the final program is assembled from media streams (or files) sent at any speed (faster or slower than clock time) so long as an intelligent buffer understands the transmission requirements. Using SDTI-CP on either SDI or HD-SDI bearers can permit a wide range of options, as can other topologies. Conventional computer networking techniques can achieve the same result depending on the network topology available. The faster the network, the wider the topological options available on both ends of a circuit.

The faster the network, the wider the topological options available on both ends of a circuit.

In the past, a video facility was often based around layers, usually with conventional routing in each layer. For instance there might have been discrete hardware for video, key signals, RGB component analog signals, system control and multiple analog audio layers. An eight-level routing system would not have been unusual. In such designs it is often necessary to plan a facility where levels are not fully utilized. This may be done for simplicity, though it can waste crosspoints in routing systems. In Figure 1, crosspoints for which no logical connection is correct are shown in white.

Multiple levels cost more to assemble than single levels, except when the crosspoint count in a router is driven higher by increasing I/Os. Such increased costs move as the product of the I/Os, and can take step-wise increases when a new router or distribution frame size is required. Size does matter, and multiple frames will cost more.

Even with the advent of a number of new formats in the last 25 years (SDI, ASI, HD-SDI, AES, Dolby E, AC-3 and other compressed audio, ASI, SSI, SDTI, HD-SDTI, etc.) the number of levels necessary to carry a multiplicity of formats can be reduced to perhaps three: 270Mb, 1.5Gb and AES. Unlike conventional design topology where segregated signals in levels were necessary to ensure compatible signals connected in logical circuits (and to reduce total crosspoint count creep), it is now possible to use sophisticated control systems to accomplish the same

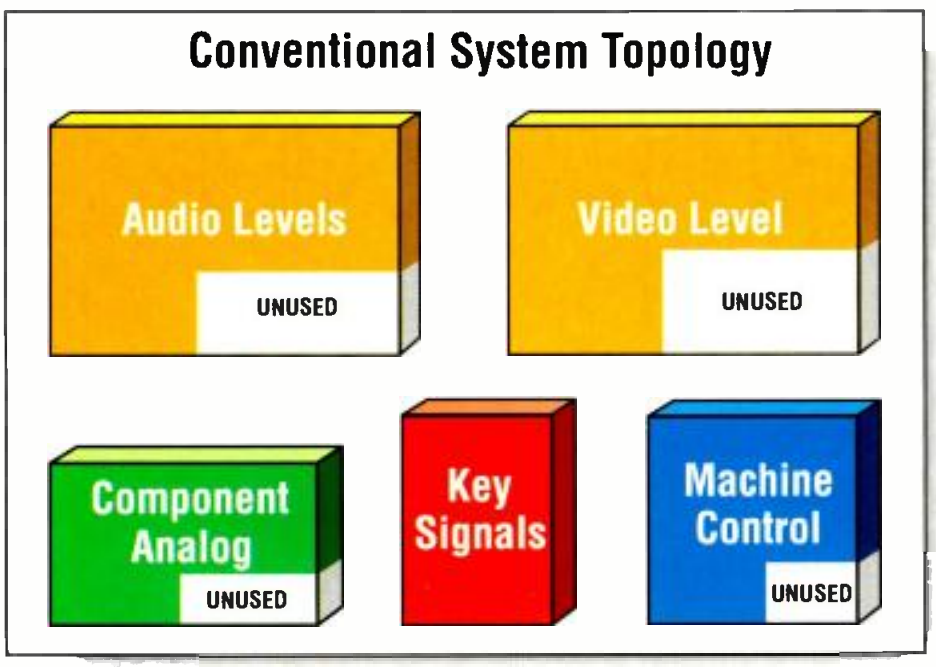
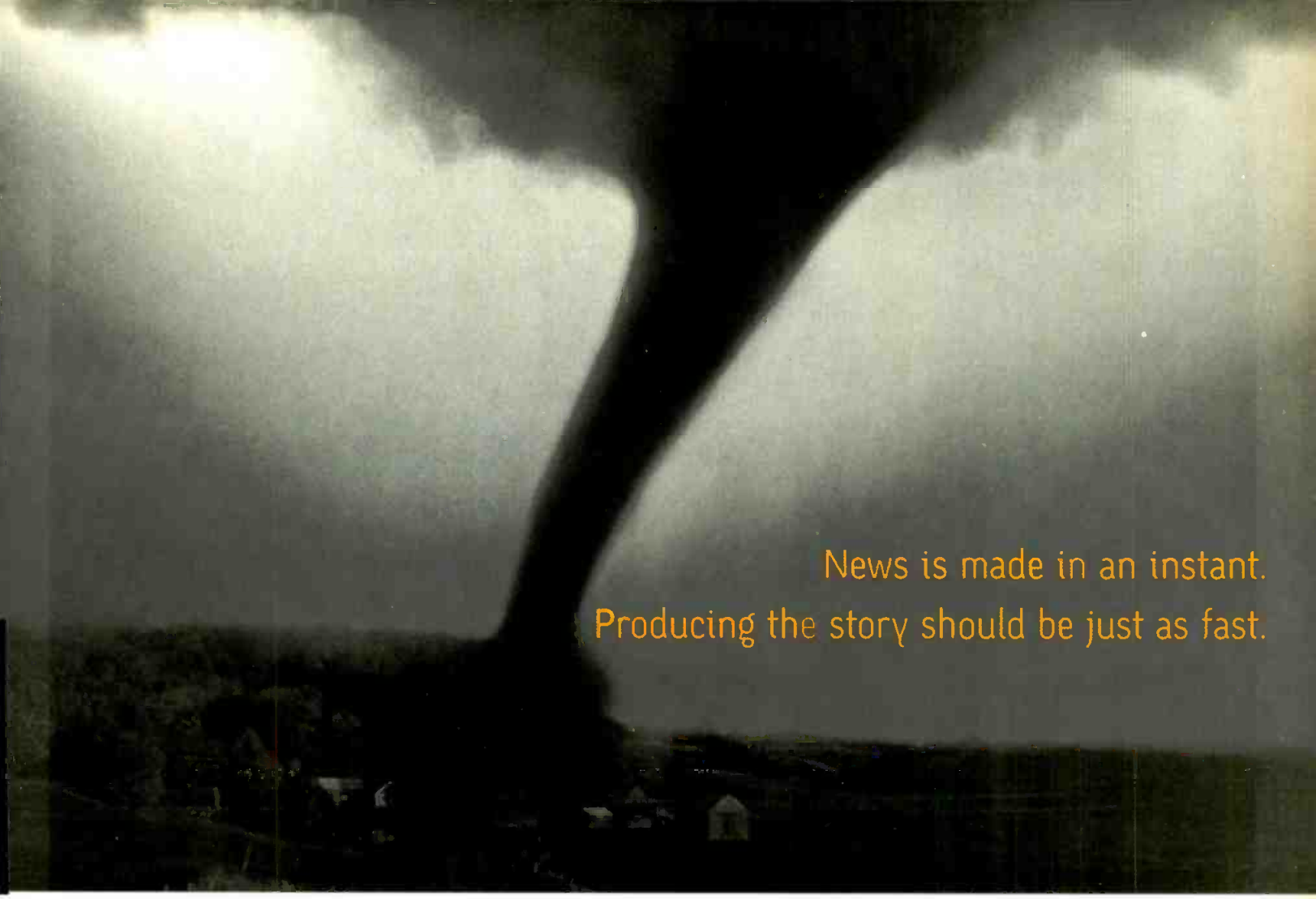


Figure 1. Video facilities were often based around layers in the past, with conventional routing in each layer. This arrangement often made it necessary for levels to be underutilized, resulting in wasted crosspoints in routing systems. Crosspoints for which no logical connection is correct are shown in white.



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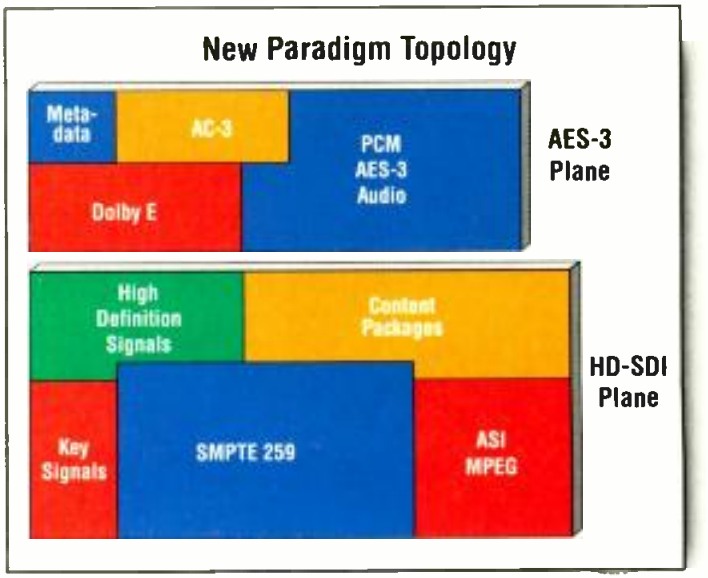

Figure 2. In the new paradigm topology, the metadata is handled as a unique media element. AES-3 has been chosen as the bearer to eliminate the need for an additional plane.

thing. Some of the complexity is moved from wiring to the control system. Using components that are capable of handling both SMPTE 259M (270/360Mb), as well as SMPTE 292M signals, can yield a very efficient topology where fewer components are underutilized.

This approach can radically change the complexity of the physical connections. Instead of multiple signal levels, designers can execute multi-use planes, including the physical media planes (SDI, HD-SDI, AES), system control planes (proprietary, TCP/IP or other structures on a variety of physical bearers), as well as a device control plane (RS-422, Ethernet or other methods). Despite the increase in the types of signals carried, the low number of planes reduces complexity. Extensions into the wide area can extend each plane using standard computer network architectures with appropriate interfaces.

Size does matter.

Note that in Figure 2, metadata first shows up as a media type. Though facilities have been built with limited metadata for many years, carrying closed captioning both embedded and in parallel with the relevant content for instance, handling metadata as a unique media element is now not uncommon. It is important to note that AES-3 has been chosen as the bearer to eliminate the need for an additional plane. Not shown is the control plane, which intelligently moves media to where the content is needed, controlling multiple classes of record and playback, processing, and routing equipment. ■

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

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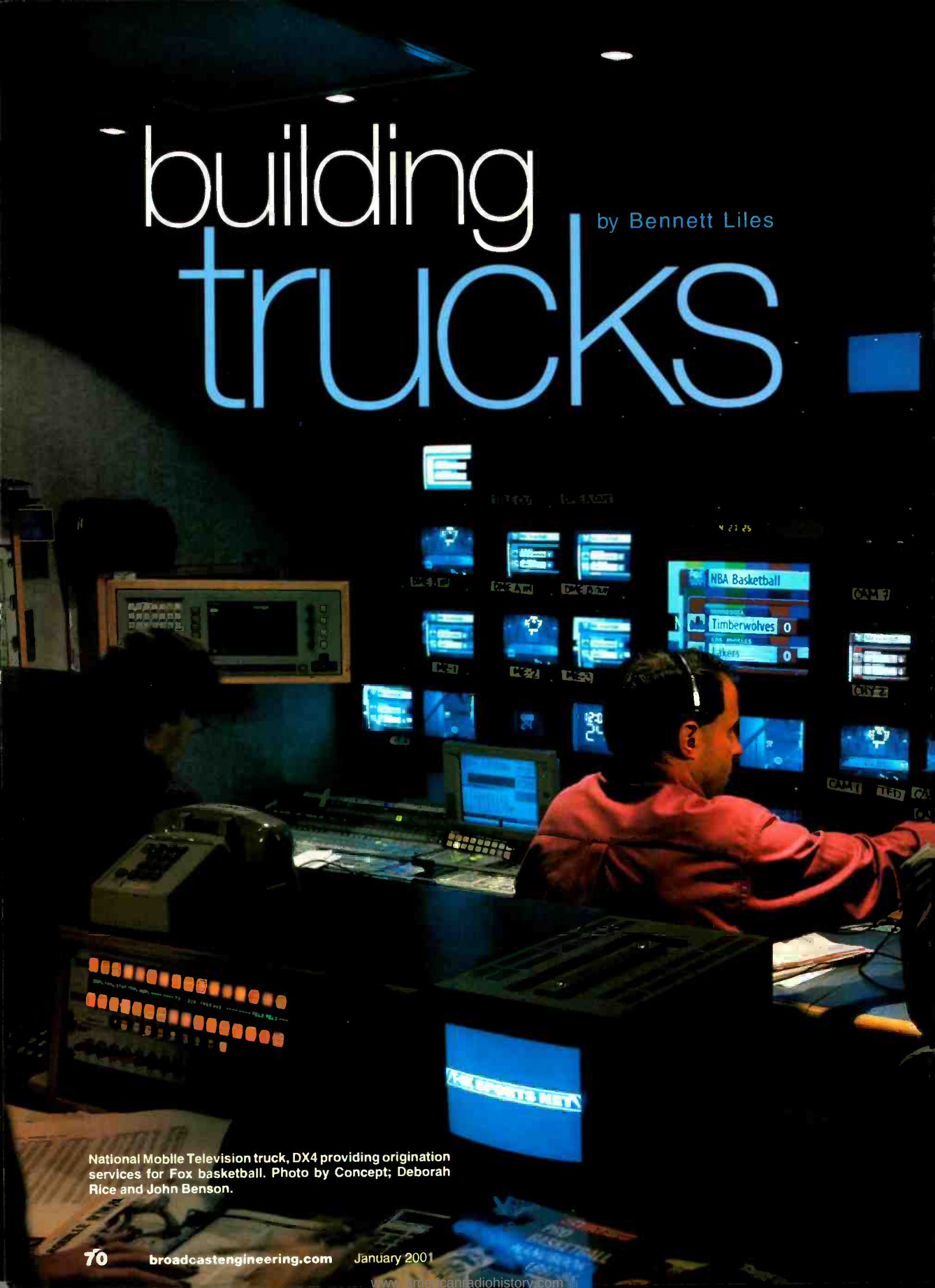
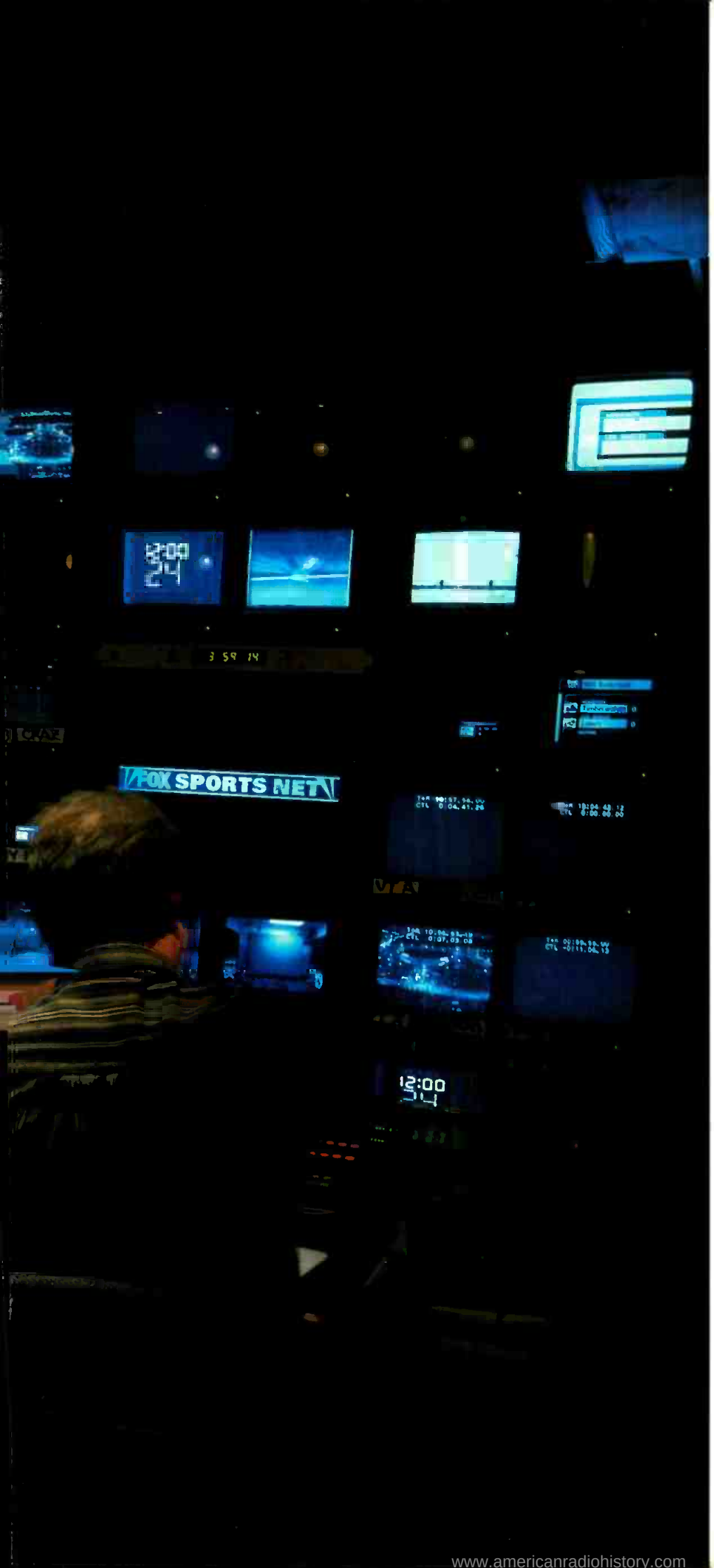
building trucks

by Bennett Liles



National Mobile Television truck, DX4 providing origination services for Fox basketball. Photo by Concept; Deborah Rice and John Benson.



Building a truck for broadcast remotes is an expensive and time-consuming task. Anyone embarking on such a venture must start the process with good reason. Perhaps your company's experience and workload dictate that an additional truck, available on short notice and with a known configuration, is needed. It is possible that a long run of specialized productions justifies a custom-designed and equipped vehicle. Whatever the reason, once the decision to build has been made, there are some tips to keep in mind while you still have the project on paper. It's always best to begin by getting solid answers to the two most basic questions: How will it be used? What will be analog and what will be digital?

Size for the mission

Think long and hard about how the truck will be used and then expand a little in the specific areas where there is room for doubt. The first meetings should include all the major players in your organization. Engineers will build and maintain it and the production people will use it, but the marketing people will have to sell its services. What capabilities must it have to best earn its keep? Missed communication at the basic concept stage will cause problems at every later step. For simple live shots and for interviews shot for post, a two-room uplink truck with two or three cameras and a single effects bank switcher, a couple of tape machines, and an eight-input audio board is all you need. More complex productions will require separate rooms for the various production operators.

The tape area is big and bright and noisy while the video engineers need a dark, small and relatively quiet area. The audio op must have a separate sound environment so that various sources can be selectively monitored pre-fader without distracting others. Get as good a collective picture as possible on what the truck will be expected to do.

Analog or digital? One day soon, the question itself will be obsolete, but while we stand on the cusp of these technologies, analog still has its spots. For video, there is no good reason to remain in an analog world. Digital cameras and switchers allow complete video operation in the digital realm. All these devices and EFP cameras allow detailed setup parameters to be saved and recalled easily, saving both time and dollars.

In recording technology, digital videotape and hard drives share a complete truck. Both are used for their respective advantages and any truck used for sports or other live events should have digital tape and hard drive recording features. Hard drive video enables simultaneous record and build, but for sustained, long-term recording, digital tape still has the cost advantage. A smartly-designed truck will use this recording media to its best advantage.

Wiring equals weight. The weight of the wire and cable used in a truck is a critical matter. A savings here can actually permit the addition of another tape machine or other critical device. Shown here is a wiring closet on an NMT truck. Photo by Concept; Deborah Rice and John Benson.

In sound, the big analog audio boards still rule many large trucks but for 24-input and smaller mixers, digital boards have become a bargain. Some capable digital boards for small, project recording studios can be used in remote trucks for under five thousand dollars, but the large, digital mega-mixers will still cost much more than analog boards with the same number of inputs. Recording boards have an extra, though unintended perk for remote truck use. Their individual channel metering can give instant visual cues to a sound op as to which inputs are active, and a constant, steady level indication can instantly warn of hum or buzz on the line. Recording boards are also excellent for musical formats when used with modular digital multitrack recording equipment such as ADATs. Once the general concepts concerning mission and budget have been decided, the actual construction details can be attacked on a solid foundation.

Recording boards have an extra, though unintended perk for remote truck use.

Power issues

In remote truck operation, the most basic point is power. Because the truck is mobile, a host of different power situations will be encountered. The main rule here is that power components are not the place to save money. Only the best cable, connectors and breakers should be bought, solidly installed and frequently checked for rigid mounting. The truck will get a lot of shaking around and loose power components. With the high current they carry, this can cause arcing and fire. Beyond that, keep your circuits organized into the areas they serve. It can be handy to shut down video without having to kill the audio or to power up the intercom while other things are dark. At the same time, you don't want to use a 50-amp breaker to run a few intercom stations. One good feature to have on a separate circuit is outside

floodlights and storage bin lighting for setup and strike. It's wise to mentally run through various shoots and consider actual situations in detail when thinking out your truck's power needs.

Every piece of gear that goes into the truck must be listed for power consumption, physical dimensions and weight. The power needs of every component must be known because having to redo power circuits is one of the worst retrofits imaginable. One of the best power features is pre-main breaker metering, and it is surprising how many trucks don't have it. The voltage and phase indicators are installed directly after the terminals so that the truck can be AC-connected, the meters switched in and AC parameters can be measured before exposing any subbreakers or equipment to that power.

Wiring and weight

Wiring is threaded into the truck in small increments, a handful here and a few ounces there, but you would get a real appreciation for how much it all weighs if you had to pick it up and hoist it all at once. Wiring is the most insidious weight factor on any truck. It is estimated that fifteen hundred pounds can be shaved off a large truck's weight by using lighter cable and efficient routing. Mini coax is rated at about forty percent of the weight for standard RG-59. For digital audio applications, folded foil-shielded cable can be used in place of braid shielding for significant weight savings in a large installation.

Careful placement of equipment racks can reduce cable use by hundreds of feet. Care should be taken to route AC cable, as well as all others, on opposite sides of the rack when possible to also avoid coils of AC cable. Where conduit will be used, avoid damage when pulling cable through them. One pull-length should involve bends totaling no more than 180 degrees. If insulation is scraped away while pulling and shield-conduit contact is made, noise and ground loops could result and finding them later would be difficult if not impossible. Check cables for continuity and shorted grounds as part of the installation. Avoid overstuffing conduits. To figure the right fill, get the inside diameter of the conduit, multiply the number of cables by their outside diameter and use no more than forty percent fill, which is the American standard. Fish tape and pulling compound will make the job much easier on hands, arms and cable.

> Note what runs hot and what runs cool. Use appropriate rack placement and spacing.

While speaker cables can be run just about anywhere, special care must be taken with low-level lines for microphones. Particular attention must be given to keeping mic lines properly braid-shielded, routed away from AC and "pre-amped" at the earliest possible point. Intercom and mic cables are also subject to hum if routed near video monitors. Audio cables must maintain a floating ground. This is especially important when phantom power and "wet" (DC-carrying) intercom lines are used.

One frequent problem area in many trucks is using the wrong connectors for the type of cable used. There have even been multi-pin intercom connections made where the cable was too big for the connector shell, so the shell was simply left off, exposing the bare pins and solder joints at the end of the wire!

Another weight-saving step is to use plastic or aluminum rack tops and sides rather than steel. This can save nearly forty pounds per rack. Take note of what goes where because the truck must be properly load balanced to save undue wear on tires and to be safe on the road. Insufficient weight over the drive wheels can reduce traction and cause loss of control at higher speeds and on slick highways.

What's hot

One of the most common problems in new trucks is equipment overheating because of poor air circulation. Note what runs hot and what runs cool. Use appropriate rack placement and spacing. Power supplies should be separated from other equipment by at least five rack units. Power amplifiers will cook anything mounted just above them, and even some wireless microphone receivers run surprisingly warm. Separate these things with ventilated spacers rather than solid rack panels and allow the hot air exiting the top of the racks to be vented out. Air conditioning and heating outlets should be positioned away from where operators will sit and should offer some degree of local control. People don't work well with hot or cold air blasting into their faces or down their backs. Air conditioners make noise, so it's a good idea to have the sound op position as far away from these units as possible.

Creature comforts

Aside from air blasts, operators also hate being constantly whacked by doors that open the wrong way or block storage bins. Sliding doors are the best solution and should be used wherever possible in operator and storage areas. The truck's exterior storage bins should span the width of the truck body and open to both sides with garage-style doors on tracks. In the design phase, sit in the operator position in each room, taking note of the reach radius. The most frequently used equipment should be closer. Intercom buttons, compressor panels and camera controls should be within reach while patch panels and power supplies can be more distant. Video monitors need to be mounted as close to eye-level as possible, particularly when they are small and close. Speakers pointed over the audio operator's head will not offer full high-frequency response. It won't help the sound op to have a window if there will always be producers or Chyron people sitting in front of the production monitors. If this is the intent, the audio section must be elevated. Patch cables should not hang in front of video monitors and intercom stations. To avoid these silly things, production people need to work with installation engineers during design and construction.

Communications

This area involves intercom, IFB, telephones, telco interfaces and squawk boxes. Aside from having intercom stations mounted where they can be reached and used with gooseneck panel mics of sufficient length, the number and type of stations is an issue. Director, producer, T.D., audio, video and tape ops will usually need multiline stations so that a number of private conversation modes can be set up. Because these units and IFB lines involve carrying DC, it's best not to send these signals through patch panels except where they exit the units in "dry" lines. Multiline telephones are a must, and each line should terminate separately on the audio breakout panel with both RJ-11 and binding post connectors.

Headset cables should connect where they will not have to be run across video switchers, audio boards and other heavily operated gear. A good place for headset connectors is usually in the edge or just under the edge of the console on which the equipment is mounted. Recessed connections are the best way to avoid being constantly banged by passing legs and hands. Telco interface with intercom is needed to avoid clumsy situations using speakerphones and wearing multiple headsets. The auto-answer feature on some of these units is very much worth the extra cost. Breakout panels need to have intercom stations with speakers. These units are very handy during setup and strike, but they also serve to keep an engineer's hands free when working with someone inside to trace problems with lines.

If the truck will be integrated with others in a combined shoot, a good feature to have is an expandable tally system. This can interface two or more trucks with data cable connecting with standard RJ-45 plugs and can allow another truck's camera tallies to operate as if directly connected to the main video switcher.

Many of these design features seem obvious when looking at a properly designed truck, but they don't just happen. All those things that just fall into place when working with a well-built remote truck spring from a great deal of discussion, planning and work. ■

Bennett Liles is an engineer with Georgia Public Broadcasting.

Covering the bases at the 2000 World Series

By Brad Dick, editor

The first Subway Series since 1956 began with a 12-inning thriller. Through the Fox Network's innovative use of technology, viewers were brought even closer to the field. From a technical standpoint, this year's World Series coverage was set up much like those of the past. However, this year, new technologies offered the capability to do more with less. In this case, "more" included dazzling effects, POV cameras and behind-the-scenes integration. On the "less" side, the broadcasts were accomplished with fewer people and fewer problems.

Both of the Series' venues used similarly equipped NMT digital trucks, with one significant difference: the switchers. The truck at Yankee Stadium had a Sony DVS switcher (used for games one and two), and the truck at Shea Stadium had a Grass Valley (used for the next three games).

Unlike many sporting events, the location of the World Series' games remains up in the air until the last minute. Because of this, the time available for setup is significantly reduced. Crews, equipment and their associated details need to be set up and finalized in minimal time. This year's World Series needed to be set up in just two days.

Change is not always good

Different equipment in each venue added to the stress of the crew. Luckily, crews did not have to bounce back and forth between venues. Doing two games in the Yankee Staduim venue followed by three games at Shea made things much easier than having to relearn everything every night. Even simple things like buttons being in different places can slow response time and increase the possibility of mistakes. TDs don't want to think about where buttons are located, they want to do their jobs quickly and accurately. When faced with different switchers, different layouts and even different programming sequences, even professionals make mistakes.

Two stars of this year's coverage were Sony's DVS-7350/DME-7000

Sony DVS-7350/DME7000 production switcher used in coverage of the Fox Networks 2000 Wo Series broadcast. Photo by Ben Luzon.

switcher/DVE and its MAV-555. One reason for their popularity was the seamless integration between these devices. Several aspects of the switcher's design made the job simpler, including a 32-button shot box. Because each of these buttons can be labeled individually, the amount of thinking needed to perform tasks is greatly reduced. In addition, macros provide a method for calling up and combining snapshots, and timelines and crosspoints can be preset. Combined, these items reduce the load on the technical crew, allowing them to concentrate on more important tasks.

Fox used a separate truck for the pregame shows, which ran between eight and 20 minutes each game. After the pre-game, the feed was switched during a commercial break to the NMT truck. The show open was then done from the announcer's booth and was usually live. Several cameras, including one robotic camera, made it easy to get a quick working shot of the booth. Using subrouters, all the cameras from the pre-game show were made available to the main feed. Included in the five cameras used for the pre-game show were two that watched outside the locker rooms, ensuring that any unexpected activity didn't go unnoticed. Viewers saw pictures from these cameras during the Yankees victory celebration in the locker rooms.

A total of 29 cameras (including "fluff" cameras such as an unmanned catcher cam and the pre-game studio and locker room cameras for post-game celebrations), 20 tape machines and four channels of Chyron were part of the coverage. Switcher inputs numbered 70-75 including videos and keys. For the pre-game show on the field, Fox used Sony hand-held cameras. The hard cameras for the game were Philips. The tape machines were Sony, and a combination of Sony and DNF controllers provided the necessary playback control. Also used for the broadcasts were two EVS machines and a Profile on the pre-game show.

Remote control is critical

Machine control is integral to the Sony switcher, making it unnecessary to tie up a DNF controller to control the MAV-555. This simplified MAV operation and freed up personnel. Tape operators (or the technical director) could load the clips in themselves, while still allowing the TD to have complete control over the unit. Syncing up devices was also very easy. The TD could scroll to the in-point, mark an in-point on the switcher, find an out-point and hit "Enter." The same thing was done on the B channel. Hitting "Play" provided a ready-made matte and fill simultaneously.

Although remote control has been part of switcher design for many years, today's switchers require far beyond simple tally circuits. Machine control through intelligent systems is possible and, in cases such as the World Series, coverage is almost expected. Functions such as marking in/out points (both numerically and on the fly), preroll, syncing multiple machines and even nonlinear functions are part of today's broadcast switchers. By marrying the control capabilities of a computer/nonlinear editor with the broadcast quality and expansive capabilities of a high-end production switcher, this sophisticated nonlinear editor/controller can be used in such unforgiving arenas as live sporting events. When coupled with high-quality playback systems capable of slow-motion and reverse play, the result is a live production system that can be used in any environment, including mobile applications.

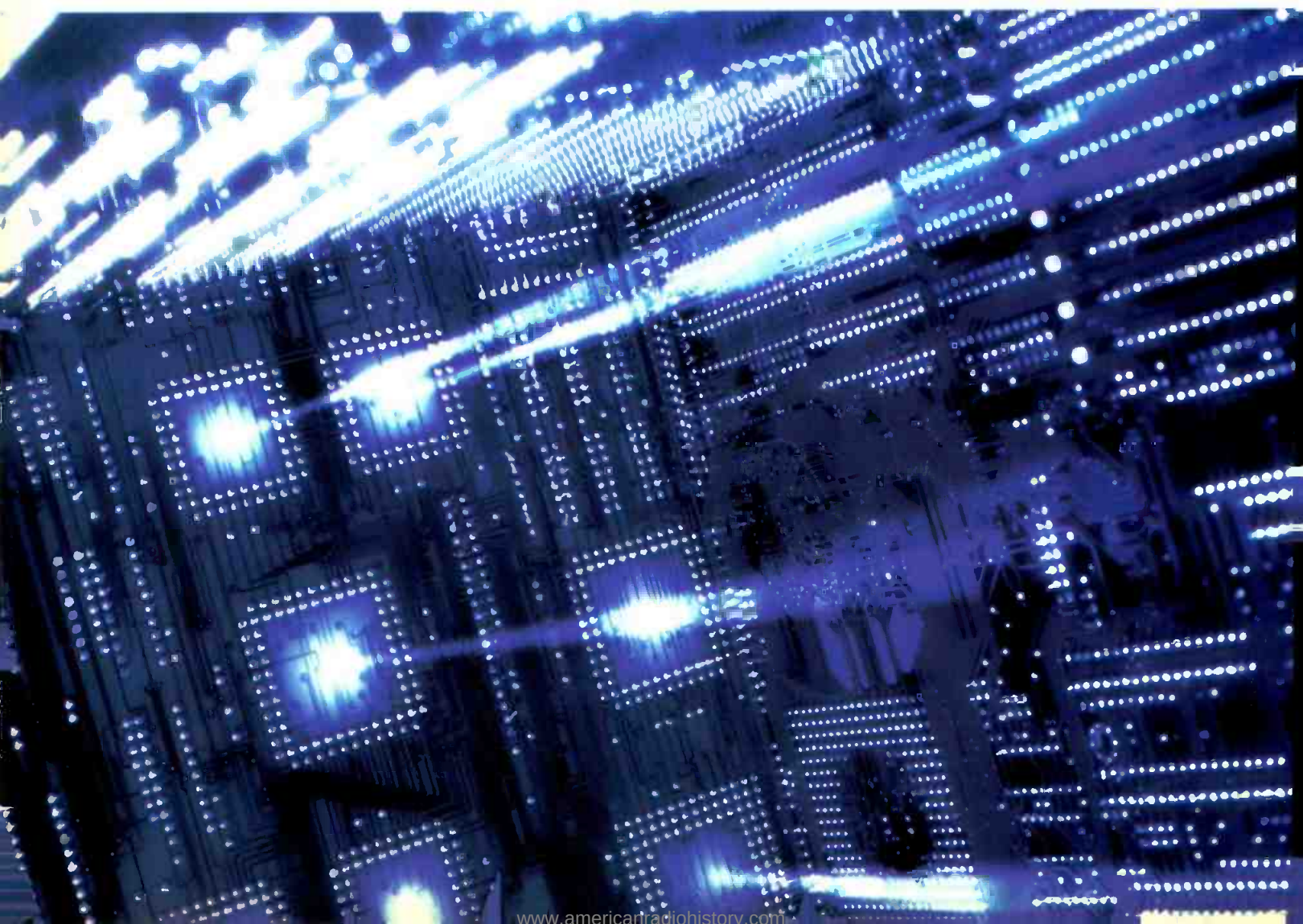
As serial digital control and intelligent systems become part of nearly every piece of broadcast hardware, it is increasingly important that these systems are well engineered and integrated. Connecting device A's control system to device B's control system is relatively easy today. However, getting meaningful control capabilities from the connection is much harder. As control systems (and the data world structures) are standardized (like the BVW-75 protocol) it will become much easier to simply "plug and play." Well-integrated systems allow one or two key people to do the work of several. In many instances, that reduction of personnel also results in increased accuracy and creates a win-win for facilities and management. Today's manufacturers are working hard to provide the tools for tomorrow's facilities today.

In the hoopla of a live sporting event, especially a major event such as the World Series, it is easy to get caught up in the technology. Having access to well-integrated systems such as the DVS-7350/DME-7000 switcher/DVE and the MAV-555, makes it easier for the production crew to use the equipment to extend the coverage for the viewer's sake, without having to add additional manpower. Plus, automated systems that are simple-to-operate make last-minute changes easier to deal with and less likely to result in on-air disasters. ■

> When faced with different switchers, different layouts and even different programming sequences, even professionals make mistakes.

Darryl Lawson and Keith Kice in NMT's production truc
Photo by Concept; Deborah Rice and John Benson.

broadcasters



Broadcasters are increasingly looking to become broadband providers in today's digital age. Sometimes these new ventures require partnerships with firms like iBEAM. These relationships are often unfamiliar territory for TV stations.

and broadband

By Steven M. Blumenfeld

"Warning, caution — there are no customer accessible parts inside — removing the cover may void your warranty" exclaimed the tag on my new piece of equipment. As a long-time engineer, those words of warning were just the incentive I needed. I found my Phillips screwdriver and began the counterclockwise dance of my fingers and the handle of my 1950-vintage wood-handled driver.

After I removed what seemed like 100 machine-tightened screws, the cover finally came off. Much to my surprise there, taped above the circuit board, was a note that read: " Removing the cover of this prototype piece of equipment just voided the warranty — but I bet you knew that already — and warning you of further tampering with this device is probably fruitless, so go to www.company.com

and we will save you the embarrassment of telling us your dog destroyed this box."

Wow, I thought to myself as I happily turned to my computer and typed in the URL. To my astonishment there was a full description of all the parts and functions, as well as a fully documented white paper on its applications.

Well, so what does this have to do with broadband and broadcasters? This very thoughtful hardware company gave me immediate and valuable access, in this case, to important information about their hardware. Your Internet presence should give your viewers access to the information they want.

Provide a variety of feed formats and speeds for the variety of ways in which your content will be received. Yahoo's FinanceVision provides Windows Media format feeds at 300k, 100k and 56k speeds to best meet demand for their content.

Many chief engineers have been given the task of creating a Web presence. Why? Because with a number of the decisions that are made regarding its eventual implementation, it crosses the lines of station technology. Not every station needs to have the ultimate 24-hour simul/streaming site. Your station should have pertinent information for your community and your viewers. Ask your marketing people to get you a breakdown of your viewers. Then ask for a study of your viewership, their use of the Internet and what types of Internet access they most likely use. You might find that almost all of your viewers want weather information and only have access to a 33.8 modem.

You can't run broadband streaming over that. There is a dirty little secret that we in the broadband world have been hiding for a good long time. The secret is that broadband today is not so broad, there are no instructions hiding under the covers, and there are no rules on how to make you a success on the network.

First, way back in the heyday of interactive TV, a mere seven years ago, we characterized broadband as anything over 128k or dual-channel ISDN.

> Your Internet presence should give your viewers access to the information they want.

Today even with my 1.5MB ADSL service I can only rely on 128k. My ISP told me I should read my contract — that is all they committed to.

You can not predict how your content is going to be received by your viewers on the Net. It is incumbent upon you to look at your user base and develop a program to supply the proper type/bandwidth of content. The packetization and the network delivery of your content will be your future.

After no small amount of soul searching, you go forward with a streaming project. Your first decision is whether to outsource or build in-house. If you are new to the streaming game and you want to build in-house my advice is to wait. Streaming hardware is just now hitting its second generation and you can use any one of the many streaming outsourcing companies to learn the ropes: Akamai, Real Broadcast Networks, iBeam, Digital Island and Globix.

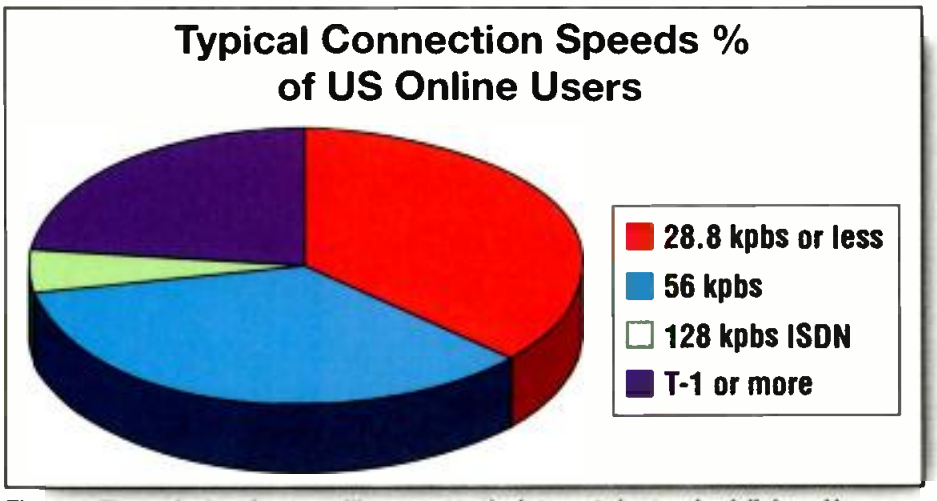


Figure 1. The majority of users still connect to the Internet via standard dial-up. However, by 2005 it is estimated that nearly 200 million devices will connect at broadband rates. Chart source: Zona Research 1999.

Globix

This new group is based out of Santa Clara, CA, and specializes in live/archived streaming. They are one of a growing number of outfits finding new ways to address the immediate concerns of content providers seeking a high profile in the broadband marketplace.

Globix's *Earthcache* is a method of dynamically allocating resources to its clients and a means of getting your content "to the edge." Its unique caching scheme will reduce the network load on their international backbone by placing clients' content in the data center with the closest proximity/connection to the peering partner or NAP from which an end-user's request originates.

This allows Globix to service more simultaneous streams. The company has absolute control over its network infrastructure. Therefore it is able to connect the caches to any location in its network that will give it optimal performance and the best access to any given peering connection (i.e. right into the peering router/switch), rather than being relegated to a co-location network deep in a service provider's network.

The kind of control granted by this approach obviates the need for arcane, custom-built methods to get the request to the right cache. With total control over their routers and routing tables, this allows the company to direct content over specific network connections. Also, it allows much better control over redirection methods, as they only have to incorporate their own significant network in the solution, as opposed to having to deal with a variety of third- party networks they have no control and little influence over.

A key benefit of the overall network infrastructure is the fact that it is a "content agnostic" solution. The platform is capable of delivering all types of content, not just streaming. The addition of new content types as they come into existence will be possible as the solution is protocol, not application, based.

Ok, now you have made the smart decision to look for outside help. A company like Globix has come in and told you they can do it all — from ordering you a data line to their facility to delivering your content to your users.

Next you have to decide what format you think your users are going to want to see your streams in. Is it Real Networks, Windows Media, Quicktime or even MPEG? This will take some research on your part. In Scott Billup's book "Digital MovieMaking," he says: "If you want your movie to be accessible to the widest possible audience, you'll need to offer it in a couple of bandwidth choices on at least two of the major platforms. A critically important factor to keep in mind is that the four leading OS/computer platforms all have very different gamma settings. What appears well-balanced on a Windows machine is blown out on a Mac."

Your marketing department might be able to help you here, or you might just have to make the best educated guess you can. Because you outsourced your streaming, you can try a number of different streaming technologies.

Wireless

I'll bet most of you have not even thought about getting your content onto a wireless platform. You should now. Within the next 18 to 24 months Wireless 3G systems will be available and deployment will begin. 3G is not a technology but a collection of high-bandwidth wireless approaches to allow cell phones, PDAs and other devices to receive in excess of 2Mb/s. In recent tests with a technology called wideband orthogonal frequency division multiplexing (W-OFDM), 32Mb/s rates were achieved with a car traveling at 70 miles per hour. Amazing.

> In the next few years wireless devices will supplant wired devices as the primary streaming receivers.

In the next few years wireless devices will supplant wired devices as the primary streaming receivers. This opens up interesting new opportunities for your content.

The use of wireless data technology will grow to 1.3 billion users worldwide by 2004, according to a study by Cahners In-Stat Group. Additionally, it said that more than 1.5 billion phones, handhelds and Internet appliances will have wireless capabilities by the end of 2004.

In the online world it is hard to generate an audience. There is just too much stuff out there. In the wireless world you as a local broadcaster actually have the advantage. The type of information that will be most useful to wireless devices will be location-based. Specifically, data that is local in nature and can target a small, dedicated audience will be very attractive. You should be able to monetize your relationships with each audience member one at a time. For years you have been thinking about one-to-many, broadcast, mass communication. Now it is time to realize you have a one-to-one relationship with your viewers. Think individually. ■

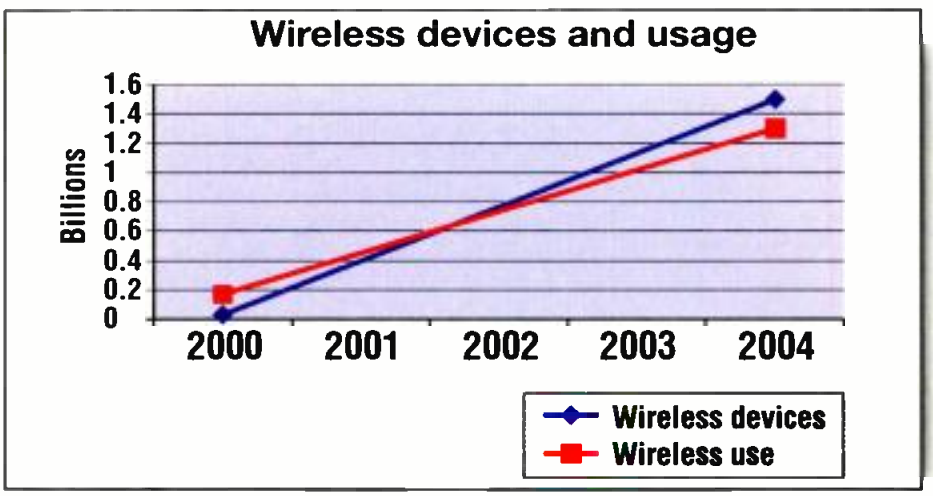


Figure 2. It is estimated that more than 1.5 billion phones, handhelds and Internet appliances will have wireless capabilities by the end of 2004. Source: Cahners In-Stat Group.

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

Applied Technology

Netcom PatchAmp: Streamlining connections

BY JIM TRONOLONE

One of the most significant — but often overlooked — advances in technology involves the packaging of several technological advances. The PatchAmp patching and distribution system is not rocket science, but it is revolutionizing the design and construction of new broadcast and cable studios.

The new high-density system reduces engineering, installation and wiring material costs by up to 50 percent, as well as reducing studio facility real estate requirements.

Netcom's PatchAmp, shown above, allows facilities to reduce their wiringrequirements.

Eliminating wiring

In the course of designing and installing new digital facilities, half of the serial digital video wires that have to be fabricated and installed are between the patchpanel racks and the distribution amplifier racks. These wires can be eliminated by using the PatchAmp, a new patching and distribution system. Sources can be connected to a rear panel input connector on the system, which is wired internally through a self-normaling jack to the distribution amplifier input. Four outputs of the amplifier are wired similiarly to the rear panel output connectors. The connection is then made to the destination. A fifth non-patched output of the distribution amplifier also is available on the rear panel. (See Figure 1.)

This permits grouping the patchpanels by inputs, which is typically what engineers prefer.

In a production studio or a production vehicle, this setup allows sources including cameras, VTRs and graphics generators to be connected through the unit to typical destinations such as a routing switcher, production switcher, monitor wall and test position with 50 percent less wiring.

In a master control system, VTRs, file servers and control room feeds can be connected to the primary switcher, backup switcher, monitor wall or test position.

The PatchAmp was designed with these combinations of sources and destination in mind. It combines five 24-position patch panels and 24 1x5-distribution amplifiers for serial digital video and

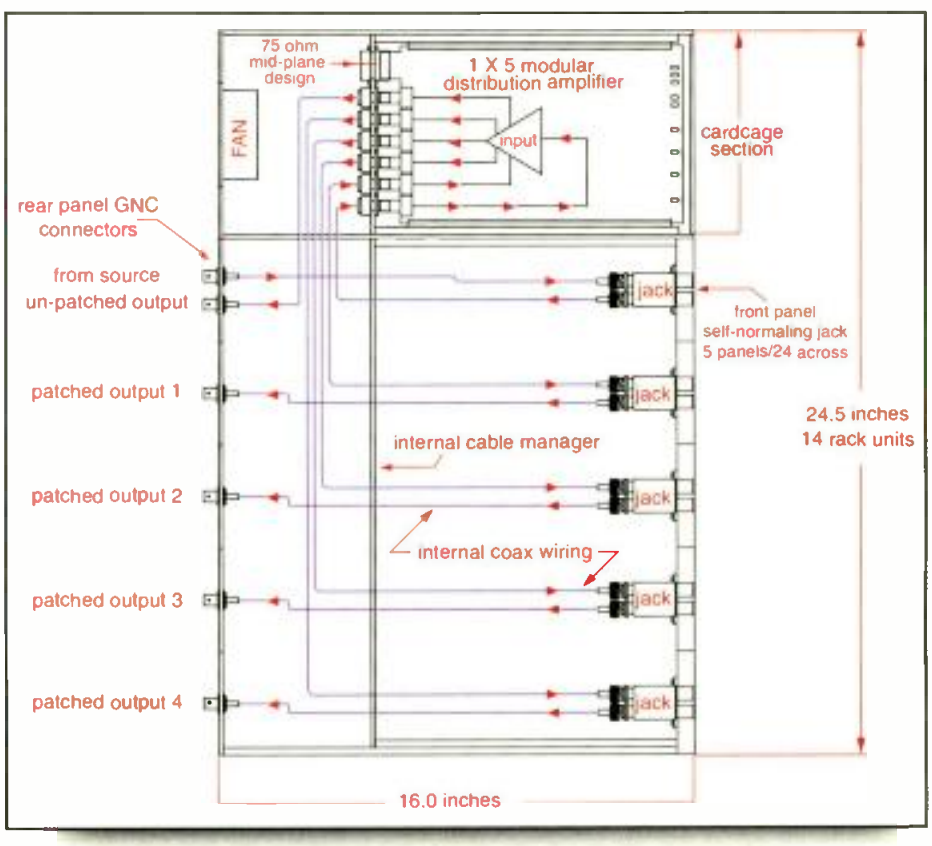


Figure 1. Internal wiring diagram. Sources are connected to a rear panel input connector and routed through the distribution amplifier to the output.

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AES applications. All elements are internally wired in a 14RU frame, with the sources oriented horizontally and the destinations arranged vertically. This permits grouping the patchpanels by inputs, which is typically what engineers prefer.

This design also reduces the racks needed for the core system and raised flooring height requirements. Another benefit of the setup is that it permits broadcasters to upgrade from SD to HD without rewiring the distribution system — only the distribution amplifier has to be changed. Netcom offers a serial digital high-definition distribution amplifier card to meet this need.

PatchAmp provides a true 75Ω impedance high-definition frame, low insertion loss mid-plane design, power consumption of less than 3W per module, high-density 24-module frame, true hot-swappable circuit boards and a hot-swappable, redundant power supply.

Reductions in cable and chip size together with surface mount technology were required before PatchAmp could be developed and patented. While the design is new, the components used are standards well respected in the TV industry. Gennum manufactures the chips in the main distribution amplifier, the cable comes from Belden and Trompeter manufactures the jacks.

PatchAmp is designed to offer performance improvement, simplified engineering and installation, space savings, operating ease, studio standardization and cost savings to broadcasters planning their transition to digital. ■

Jim Tronolone is president and chief engineer of Netcom.

Another benefit of the setup is that it permits broadcasters to upgrade from SD to HD without rewiring the distribution system.

The PatchAmp patching and distribution system enables broadcasters to eliminate unnecessary wiring using five 24-position patch panels and 24 1x5-distribution amplifiers. Sources within the system are oriented horizontally and destinations are arranged vertically.

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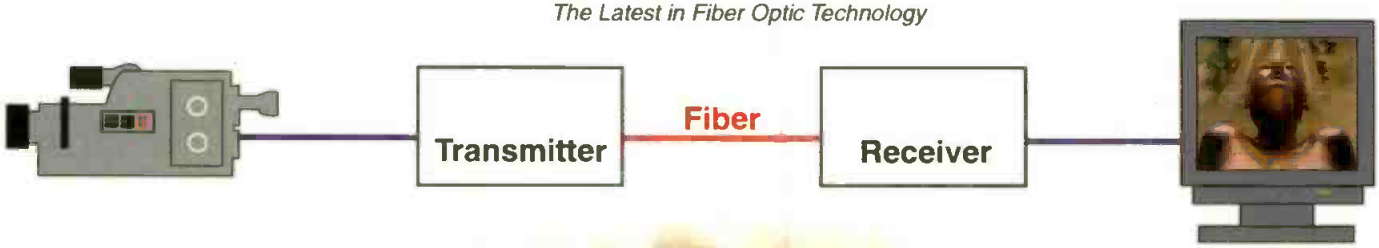

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possible to measure this packet loss at the program layer. The graph in the inset of Figure 1 shows two superimposed graphs of blockiness levels — before packet loss and at the receiving end of a transmission that encountered a single packet loss. A single packet loss will result in a slight elevation of the blockiness level for the single B frame that was impacted and is shown in the graph as a red line where the two measurements are no longer the same.

Figure 2 shows a much more severe example of packet loss. Three frames of video are shown. The last frame shows severe packet-loss artifacts caused by a packet loss in a neighboring I frame. This packet loss is barely discernible in the I frame but its effects are severe in the B frame. Notice that the severe blockiness that occurs in the third frame takes place in the background blocks but not the foreground blocks.

System issues

System elements that should be taken into consideration when choosing a monitoring system include:

Clock synchronization. Comparing measurements from separate probes requires a coordination and synchronization of time.

Inference engine. Although experienced operators can draw inferences from the results of various probes, a more automated solution would use an inference engine. This is a software module that maintains a collection of rules and actions.

No system can test for every condition all the time. It is therefore necessary to draw conclusions and to make inferences from a subset of measurements.

It is also important to acknowledge that most errors or measured artifacts have a root cause associated with a particular layer. Measurements from neighboring layers clarify system problems and help determine what further tests might be applied or what solutions might be available. ■

Greg Hoffman is a product marketing manager for Tektronix.

Figure 2. Lost packet in an I frame results in severe blockiness in a neighboring B frame.

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Solid State Logic's Audio Bridge: Professional audio networking

BY MARK YONGE

Imagine if you will the task of getting several channels of live audio across town, or to another town. What are your options? Phone lines lack quality. Leased telco lines are expensive and hard to obtain, and the quality may still not be great. Digital phone connections using ISDN can be unreliable and require lossy codecs for data compression. All of these are used every day despite their drawbacks, but a better way exists.

To send your audio data as a live stream, you could use the same techniques that are used to ship other types of digital data. But be warned: Practical applications for live audio and video streams have been elusive.

Local area networks (LANs) have become ubiquitous in the workplace, and the Internet is a global reality. But for professional streaming, the application should be considered when using either of these technologies. They're fine for file transfers, but that isn't the most critical part of the broadcast chain.

What happens when you need transmission delays low enough to sustain a conversation in a TV interview, for example? There are applications for networks in digital audio, but one size definitely does not fit all.

Audio transmission

Timing in an audio studio must be fast, fixed and predictable. A complex system such as an audio mixing console may be supporting many hundreds of simultaneous live streams at full professional bandwidth. The relative timing between different streams must be absolutely dependable: sample-by-sample, day-by-day, month-by-month.

Digital audio studios work best when fully synchronous. In a studio, digital audio is typically connected with a cable carrying AES/EBU data. This is a synchronous audio stream, distinct from audio streamed over a network. While connections can be streams, not all streams work like connections. A traditional LAN may be specified as 10Mb/s, but the available data transfer rate is much lower than this because of the need to accommodate many data transactions between many connected units. IP-based systems, such as the Internet, extend the unpredictability further. The over-arching strength of the Internet is its connectionless structure. A series of packets of data sent from one place to another can take many different routes to reach the destination, each packet being stored and forwarded by every server it encounters. If one path becomes unavailable, the server will simply choose another path. The downside of this connectionless structure is the long and unpredictable time taken to traverse the Internet.

There are applications for networks in digital audio, but one size definitely does not fit all.

As a result, applications designed for Web streaming tend to compress the data as much as possible to minimize the data bandwidth. They rely on large data buffers at the replay end to hold enough data to sustain playback during a worst-case holdup in data flow.

In professional audio applications, the delays inherent over the Internet may be acceptable for file transfers and simple streamed contributions, but certainly not for anything that has to be usefully interactive or close to real time. Fortunately, there are some interesting network alternatives.

Most high-bandwidth network offerings are intended for physically small installations and LANs. For example, Fibre Channel and FireWire (IEEE1394) are designed for high-speed links, but only over limited distances. At the other end of the range, SONET and synchronous digital hierarchy (SDH) architectures carry long-distance data for international telecommunications but don't provide networking directly.

Regular telephones use architectures like SDH with additional time-division multiplexing (TDM) to provide a large number of interactive point-to-point connections. Wide area networks use the same tools with different transport protocols to carry connectionless IP data. The most important of these is asynchronous transfer mode (ATM), which forms networks using a series of point-to-point links via hublike switches. (See Figure 1.)

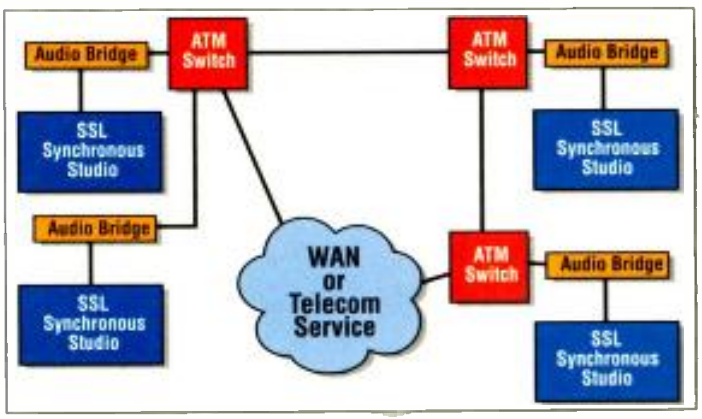

Figure 1. Digital audio transmission utilizing ATM, which forms networks using point-to-point links via hublike switches.

ATM advantages

ATM packs payload data into a rapid series of very small packets called cells and transmits them point to point. The packets are small, so very little time is taken to fill and empty them, and the switched point-to-point transmission reduces the transit time to the minimum.

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An ATM link, in effect, emulates a telephone-style connection, rather than the store and forward behavior of IP transmissions and can handle huge amounts of data. Even the simplest ATM interface handles 25Mb/s — nearly 400 times the capacity used by the telephone.

But interface speed isn't the whole story. Because it's a network, you are going to have to share the physical bandwidth of the transport medium with other tasks or users, and some priority decisions will need to be made. ATM handles this with a quality of service (QoS) scheme that determines, at the time the connection is made, what bandwidth and priority will be provided to each task. This selectable QoS makes broadcast sense of an IT utility. Broadcast sound engineers can specify an ATM Virtual Circuit with, say, a bandwidth of 9.216Mb/s and be sure that is exactly what they'll get. The producer, on the other hand, may wish to connect a laptop computer and specify Available Bit Rate, which will be fine for Internet browsing and e-mail without necessarily being real time. These two users can share the same ATM transport and the broadcast audio feed gets where it is going by the fastest possible route with a guaranteed, high-integrity connection that's as simple to manage as a phone call.

SSL's Audio Bridge, above, utilizes ATM to transmit broadcast audio between geographically separated facilites.

The AES Standards Committee is seeking to standardize professional audio over ATM in its project X92. This standard will allow studios to interlink compatibly using equipment from different manufacturers.

In its Final Report of September 1998, the EBU/SMPTE Joint Task Force for Harmonized Standards (TFHS) identified ATM as the preferred networking method for video and audio material precisely because of its QoS flexibility and its ability to span both local area and wide area networks. Many broadcasters are now installing ATM fabric within their plants as part of new technology expansions.

Solid State Logic's large-scale digital audio systems use a synchronous architecture for its speed and predictability. It makes sense to use ATM to link multiple studios over significant distances. The physical interconnection can be private fiber or an ATM service provided by a telco provider.

Solid State Logic recently introduced the Audio Bridge, which provides eight channels of uncompressed audio, inputs and outputs, together with integrated routing to send streams to one or more destinations. This will allow, for instance, 5.1 distribution in production and post, or active collaboration between two or more stations including program sound and communications. ■

Mark Yonge is market manager, Broadcast and Post, for Solid State Logic.

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Video servers – finding your best fit

BY EDWARD E. WILLIAMS, CSTE

It seems that the thing to talk about these days is video servers. The discussions take place in boardrooms, workshops, master control rooms and general managers' offices throughout the industry. Because there is a good chance that one of these discussions will be coming to an office near you soon, what do you look for when considering a video server system?

How do you wade through the near miasma of conflicting data, sales claims and the "best solution" of 25 different manufacturers? How do you hack and chop your way through the mountain ranges of buzz words – words like "rich media," "interoperability," "metadata" and "storage area networks?"

We're going to dispense with a nuts-and-bolts discussion of every single aspect of server systems. There isn't enough space in this entire magazine to fully cover the topic. We'll take it for granted that all video servers can ingest material, store it, retrieve it for playback and manipulate it in at least basic ways such as copying, transferring, etc.

We will focus on three main areas of technology here that have shown the most growth and development over the last year – data management, physical storage media and networking.

Data management

Perhaps the single most important thing to consider in a server system is the data management system that it is connected to. Beyond storage size, beyond which MPEG flavor the system is using and beyond how fast material is being encoded, the ability to manage the data associated with that material is paramount. When your sales manager wants to browse a spot at her desk, she is going to need to be able to find it and retrieve it.

If you think that the people moving material in and out of the box will be the key to your data management system, you're only partly correct. Ask anyone who has had a basic nonlinear editing system in their plant for more than six months – they'll tell you that without strict, even draconian, rules and regulations, material can become hopelessly lost in no time.

A great data management system, based on common, industry-shared interoperability standards will be critical.

A data management system has to be more than just an electronic filing cabinet. The great data management systems available today allow a vast array of relational database information to be kept on file. This is information that only has to be entered once. It's information that can be added to over time as a piece of material moves through the plant — information that can be searched, bundled, parsed, scoured and pulled out in an assortment of reports, lists and displays. Most importantly, it's information that never leaves the material it's associated with.

The best data management systems are based on standards. The Pro-MPEG Forum is working on the Material Exchange Format, or MXF. The Advanced Authoring Format Foundation is working on AAF. There are even signs that MXF and AAF may eventually coexist peacefully. Most of the major manufacturers are members of both organizations and will support both standards. This will be a world of media objects – a media object will end up being a video file, a video/audio file, an audio file, a still graphic, a set of animation cels, photographs, scanned images – anything that you might use in the "rich media" business we're all heading into.

If your server is going to be placed into or will migrate into a shared workgroup environment, a great data management system based on common, industry-shared interoperability standards will be critical. If you are looking for a small, stand-alone system that will be used by a limited number of people or run purely by an automation system, then maybe a more basic file system will do.

Physical storage media

It wasn't very long ago that the only option you had when putting a server system together was to assemble a group of magnetic disks into a RAID array and start filling up your system with material. (And, boy, did it fill up quickly). When a "big" drive was between 4- and 9Gb, it was only the largest systems that could hold reasonable amounts of data. With magnetic disk prices running close to 50 cents per megabyte, even very large companies had a hard time assembling reasonable systems. This is where the "near-line" archive systems came in. Store a few hours of material on your very precious hard drive space, move it off onto relatively inexpensive data tape when it wasn't needed, then call it back from tape again when it was needed.

One of the most exciting developments in online mass storage this past year is built around optical media – previously relegated only to archive systems because of throughput speeds. Several manufacturers are now beginning to use new RAID systems built around fast DVD-RAM drives. A

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massive amount of relatively cheap, rewritable optical storage is now possible with read times as fast as 88Mb/s and write times as fast as 42Mb/s. With small optical RAID arrays clustered into storage area networks, we will very shortly get to the point of having many thousands of terabytes of material immediately available for a reasonable cost. Is this the end of the near-line tape archive? The signs are encouraging – systems available now are delivering optical storage at media prices in a range from about 1.2 cents to 2 cents per megabyte. This directly rivals today's average magnetic disk media, which is in the range of 0.6 to 1.25 cents per megabyte.

You can, for now, still get faster data retrieval speeds on some magnetic hard drives, so if your server application is using uncompressed data, or is expected to serve up material at rates faster than 88Mb/s, then you may still want to stay in the magnetic realm. If your need is for very large quantities of data available quickly without having to go to near-line storage, you may want to consider optical disk technology.

Networking

Another area where exciting advances are being made now is in storage area networking. If you're not familiar with one, a storage area network (SAN) is a group of storage devices – hard drives, RAID arrays, optical devices, etc – arranged in a configuration that allows multiple workstations to use any of the material stored on any of them, usually simultaneously. The SAN has, until recently, been a sort of stumbling area for a lot of vendors. The main problem was one of resource sharing – because so many of the earlier server systems could only "talk" to one RAID at a time in a semi-dedicated fashion, a SAN was impractical for video and media.

A SAN is another place where standards are king. Storage area networking works well only if all of the workstations attached to the network can speak at least some of the same language that the SAN uses. Two things have made the SAN more viable in recent months. One is the fact that many of the vendors in the business have figured out how to separate their encoder/decoder boxes from their RAID boxes. The second is that a good-sized group of third-party vendors has stepped in to help out by marketing data engines, protocol translators and the like, which take some of the nuts-and-bolts level work out of actually making the various boxes talk to each other.

The fit is the key

Selecting a server can be a daunting research task. The key, however, is in knowing what the system must do for your company. Once you have that nailed down, assembling the various technologies available into a system is almost easy. Like many things in broadcasting, it's a matter of finding the right tool for the job. ■

Ed Williams, CSTE, is director of engineering for KPDX Engineering, Portland, OR.

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Viewgraphics DTV:Net 2.0: features enhanced IP-based video transmission performance and support for multicasting, Linux OS and industry-standard signal protocols; new remote session management allows users to monitor and manage transmitters and receivers across the network; allows operators to prioritize IP packets to aid in system management and real-time traffic administration; 650-903-4900; fax: 650-969-6388; www.viewgraphics.com.

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Video Products Group VPG4100: four-channel device allows broadcasters to utilize a fiber optic backbone for video transport of up to eight DWDM wavelengths on a single fiber; can be configured as a four-channel E/O or O/E transposer or a four-channel transposer/multiplexer; optional DWDM coupler allows for simultaneous bi-directional transport on a single fiber; features include support for data rates ranging from 34Mb/s to 622Mb/s and a link budget of greater than 20dB at 1550nm DWDM wavelengths; 888-375-2855; 805-383-5500; fax: 805-383-5519; www.vpginc.com.

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Tiernan Communications THE1: new 4RU configuration is capable of encoding and statistically multiplexing up to eight 525/625 television channels for multichannel terrestrial, cable and DSL applications; offers parallel path operation for greater transmission security than conventional redundancy switched systems; available in either 4:2:2 or 4:2:0 configurations, allowing the unit to grow from four to eight channels as needed in the field; unit can also be upgraded from 525/625 operation to HDTV by adding a module; 800-323-0252; 858-587-0252; fax: 858-587-0257; www.tiernan.com.

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DIGITAL MIXING CONSOLE

Studer Professional Audio AG On-Air 1000: features 10 channel faders and two master faders, two stereo bargraph meters, two phase correlators, and a monitoring and talkback feature set; offers integrated memory and the option of inserting PC cards to store preferred mic settings or console snapshots; features time sync, clock sync, serial interfaces and two telephone hybrid controls; two models available for use in digital and analog environments; +41 1 870 75 11; fax: +41 1 870 71 34; www.studer.ch.

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Philips DCR 1500N HD: offers HD recording with eight channels of audio; compatible with standard-definition formats including DVCPRO50, DVCPRO, DV and DVCAM; can be operated with an optional internal converter board so standard-definition DVCPRO cassettes can be played back as HDTV signals; 800-962-4287; 818-729-7700; fax: 818-729-7710; www.broadcast.philips.com.

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MPEG-4 SOLUTION

Philips WebCine: turnkey solution incorporates an encoder, a server and player software; brings the MPEG-4 standard to IP networks, allowing streaming to extend to emerging wireless and broadband consumer platforms; WebCine can be adopted in multimedia-enabled devices such as PCs, STBs and mobile devices; 800-962-4287; 818-729-7700; fax: 818-729-7710; www.broadcast.philips.com.

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Business highlights from broadcast and production

BY LAURA COLLINS, ASSOCIATE EDITOR

Pixel Power and OmniBus are partnering to integrate Pixel Power's Collage, Graphite and Clarity systems into the OmniBus automation environment. This will enable broadcasters to access the full feature set of Pixel Power's graphics systems within the OmniBus system.

Miranda and Pixelmetrix have reached an agreement to integrate Pixelmetrix's DVStation monitoring system as an option to Miranda's Kaleido-QC visual monitoring solution.

Doremi Labs has moved operations to a new building. Its new address is 306 East Alameda Avenue, Burbank, CA 91502.

The BBC ordered three Kalypso systems from Grass Valley Group for its news operations in Leeds, Tunbridge Wells and London.

HUGHES Network Systems purchased more than $1 million worth of test equipment from Tektronix to test DirecTV receivers.

Televised shopping service QVC chose Videotek's TVM-821D serial digital waveform monitor to test its continuous, live operations. QVC uses the equipment in its edit and graphic suites to check video levels and color saturation for spec violations.

Leitch selected Ciprico's NETarray 1000 RAID solution for use as the storage component in its VR line of video servers. The NETarray provides storage through a built-in Web server.

Harris was chosen by Belo Corp. to provide transmission, encoding and monitoring equipment, and installation services for 19 of its U.S. television stations. Stations that will receive the equipment include KONG-TV in Seattle, KENS-TV in San Antonio and WWL-TV in New Orleans.

Thomson-CSF recently became Thales in a rebranding of its global operations. The new name reflects the company's corporate identity and its new strategy to achieve growth in military and commercial markets. Thales works in the aerospace, defense, and information technology and services industries.

Numeric Video and Getris Images have merged their activities. The two companies' commercial activities will be joined in Getris' commercial offices in Paris, and the research and development activities will be merged on a single site in Grenoble. Both are held by the Dutch company IMadGINE Video Systems.

Raycom Media ordered 29 Thomcast transmitter systems, and 34 encoding and master control equipment packages for installation in its facilities throughout the United States.

Evertz is moving its corporate headquarters to 5288 John Lucas Drive, Burlington, Ontario L7L 5Z9.

Snell & Wilcox recently opened a new office in Miami to expand its service to the Latin American market. The office will provide sales and customer service support to South America, the Caribbean and Mexico, in addition to the greater Miami area.

TVNewsweb.com, a global portal for television news, chose ClipMail Pro and

Screen Shot

Exploration captured with DVCPRO HD

PBS is using DVCPRO HD equipment from Panasonic to produce an upcoming high-definition special on Robert Ballard's explorations of the Black Sea. The one-hour special will tell the story of Ballard's discovery of evidence of human habitation under the Black Sea. The Panasonic AJ-HDC20A camcorder was chosen to capture Ballard's three-month search.

Fujinon lenses used to shoot Discovery Channel special

A recent special on the Discovery Channel allowed viewers to take a look inside the experimental space station before it was completed. It showed how the station was built, and what it would look like, using computer-generated images and feature film techniques. Also featured was the X-38 Crew Return Vehicle, an experimental "lifeboat" for space.

The one-hour special was shot on NASA properties in the United States and Canada, and aired in 149 countries and 32 languages. The special, which included test runs of the X-38, was shot entirely with Fujinon's HA20x7.5, HA15x8 and HA66X13.5 HD lenses.

ClipExpress digital media delivery products from Telestream to enable their clients to contribute news content over standard Internet connection.

Thomson Multimedia recently acquired a majority interest in Philips Professional Broadcast through a holding group established by Philips.

Panasonic DVCPRO50 480 progressive scan equipment will be used to produce features on the NBA's Cleveland Cavaliers for airing on Fox Sports Net, as well as for features on the WNBA's Cleveland Rockers and video segments for scoreboard presentations during home games. Equipment purchased by the Cavaliers includes a DVCPRO50 Progressive camcorder and two progressive studio VTRs.

Panasonic equipment was also used by the NFL Europe League in New York for training and game analysis applications. The league purchased 67 pieces of DVCPRO and DVCPRO50 equipment including camcorders, slow-motion players and dockable VTRs.

Video equipment rental house Plus8Video purchased two sets of HDTV Cine Style Prime lenses from Fujinon. The lenses are being used on Sony HDW-F900 Cinealta progressive scan high-definition cameras.

Mobile truck NEP purchased eight Fujinon lenses for use on eight Sony cameras in their Supershooter 22.

Orad's CyberSet NT virtual set system is being used by Fox affiliate FOX34 KJTV in Lubbock, TX for the broadcast of its nightly news program. The station also plans to use the system for programming in its in-house stations Telemundo 46 and UPN22.

Los Angeles station KCAl purchased 14 Angenieux lenses for use on its Sony Betacam SX ENG cameras.

PEOPLE

Kurt Krinke

Kurt Krinke recently joined Professional Communications Systems as vice president.

Panasonic named Steven Cooperman product marketing manager for video servers and nonlinear editing systems.

Lifetime Television recently named George Krug vice president of network operations.

Omneon announced two new additions to its staff: Gary Stager as vice president of engineering and Adolfo Rodriguez as director of product marketing for platforms.

Colin Pringle was appointed managing director of Solid State Logic. ■

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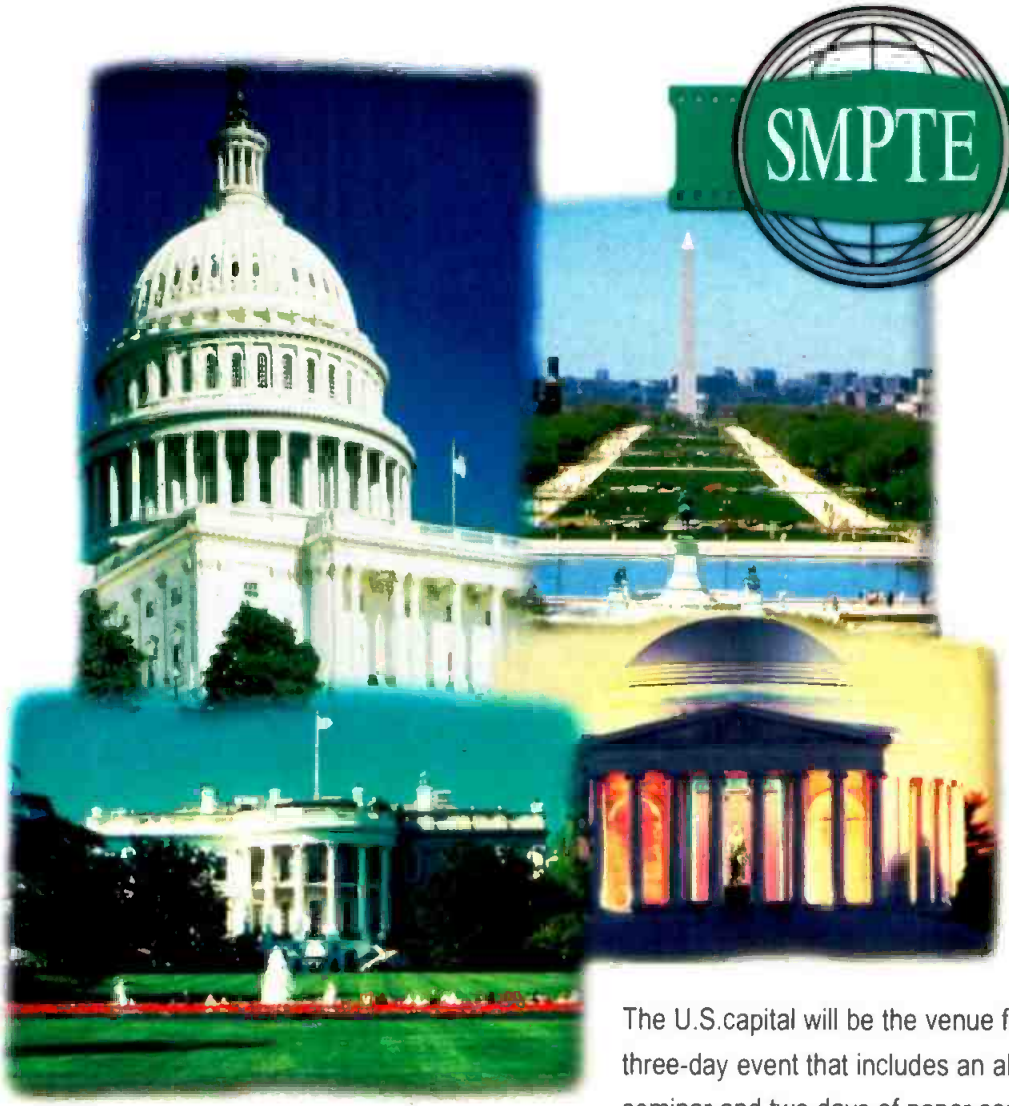

The U.S.capital will be the venue for this three-day event that includes an all-day seminar and two days of paper sessions, providing a comprehensive exploration of topics in Ancillary Data, Metadata, and Datacasting.

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SONY

QUICK DIAL 74

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
- **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
- One touch auto focusing in manual focus mode.
- 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 achieved. 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

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 tape, 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 **DSR-40** List Price $5,100
For B&H price ..... Call **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.
• It also has a simple recording function which can be controlled either manually or via its RS-422A interface.
• The DSR-40 is not equipped with a synchronization capability, the editing accuracy is performed by pre-roll and play.

DSR-30 DVCAM Digital VCR

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

- 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

SONY

DCR-VX2000

3-CCD DV Camcorder with LCD Monitor

The new **DCR-VX2000** is based on the highly acclaimed DCR-VX1000 Digital Video camcorder. Offering higher resolution, wider color bandwidth, and lower noise than virtually any other analog format with many new innovative features

- Advanced "HAD" CCD Technology
- Progressive Scan CCD System • Frame Recording Mode
- Up to 530 Lines of horizontal video resolution
- 12X Optical/48X Precision Digital Zoom
- Optical Super SteadyShot Picture Stabilization
- 16:9 Widescreen recording • 6 Picture Effects
- 12/16 Bit PCM Digital Audio • 5 Digital Effects
- 2.5" Precision Swivel Screen™ LCD Display (200k Pixels)
- Precision Color Viewfinder (180k Pixels)
- Interval Recording • Manual Mic Level control
- Still Imaging using Memory Stick Digital Media Capture VGA resolution (640 x 480) still images
- MSAC-US1 USB reader for Memory stick digital media
- Memory Mix Allows the user to super-impose a still image on top of the video recording.
- Analog Recording Inputs Convert or video source to DV

JVC

GY-DV500

1/2-inch 3-CCD Professional DV Camcorder

The world's first DV camcorder designed from the ground up for professional ENG work, the GY-DV500 combines the convenience and cost-effectiveness of Mini DV with the performance and features you need. 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 (less 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 Specifications

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

Professional Performance

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

Professional Audio

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

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
- Super VHS ET Recording
- Pro-Cision 19 micron width EP Heads
- 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

Circle (154) on Free Info Card

anton bauer

HyTRON 50 Battery

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

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

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

QUAD 2702/2401

Four-Position Power/Chargers

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

IDX

NPH-50

50 Watt Nickel Metal Hydride Batteries

Packed with 50-watts of power, these batteries provide long run times using them as you would a traditional NP-type battery. Equipped with IDX's proprietary SF technology, they can even be charged in existing Negative Delta V style chargers, like the Sony BC1-WD, or any IDX nicad battery charger.

Both batteries are identical except that the NP-H50DX adds a power indicator.

- High capacity NiMH cells • Standard thermal and short circuit protection, extra thermal fuse for safety, special plastic design for added strenght.
- Environmentally safe • High efficiency/low temperature module • Capacity: 50Wh (13.2V/ 3.8Ah)
- Camera run time: 115min @26 Watts)

NP-H50 ..... 129.95 NP-H50DX 149.95

JL-2 PLUS

2-Position Multi-Format Charger/Power Supply

Universal Charger/Power Supply.
2-channel sequential quick charger and power supply for Lithium-Ion, NP/BP-type NiCad and NiMH battery packs.

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

UVW-1200/UVW-1400A

Betacam SP Player • Player/Recorder

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

- Ideally suited for work in computer environments, because RGB signals can be converted into component signals and vice versa with minimum picture degradation.
- 25-pin serial interface allows external computer control of all VCR functions based on time code information. Baud rate can be selected from between 1200 to 38,400 bps.
- Built-in Time Base Stabilizer (TBS) locks sync and subcarrier to an external reference signal as well as providing stable pictures. High quality digital dropout compensator further ensures consistent picture performance.
- Equipped with two longitudinal audio channels.
- Both read LTC Time Code) and UB (User Bits). The UVW-1400A also generates LTC and UB (Free-Run/Rec-Run).
- 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.
- 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 UVW-1400A List Price 8,400
For B&H price .....Call For B&H price .....Call

UVW-1600/UVW-1800

Betacam SP Editing Player • Betacam SP Editing Recorder

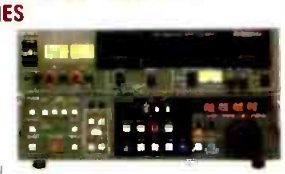
The UVW-1600 and UVW-1800 are the other half of the UVW series. They offer the superiority of Betacam SP with sophisticated editing features. They feature an RS-422 9-pin interface, built-in TBCs and Time Code operation. Inputs/outputs include component, composite and S-Video. **All the features of the 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 UVW-1800 List Price 11,300
For B&H price.....Call For B&H price .....Call

PVW-2600/PVW-2650/PVW-2800

BETACAM SP PRO SERIES



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

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

PVW-2600 List Price ..14,900 PVW-2650 List Price 21,300
PVW-2800 List Price..22,400 For B&H prices .....Call

PVW-2650 Only

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

PVW-2800 Only

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

PVM-20S1WU

20-inch 16:9 Color Production Monitor

The PVM-20S1W incorporates all of the superb features of Sony production monitors for 16:9 viewing in post-production and broadcast stations. It features multi-system compatibility, blue gun, underscan and H/V delay. It also offers flexible signal connections, a full range of optional functions and ease of operation.

- 16:9 aspect ratio CRT with dark panel for high contrast image reproduction • Accepts component (Y/R-Y/B-Y), RGB, Y/C and composite signals • Beam current feedback circuit for stability in the color balance
- Optional component serial digital interface kits BKM-101C (video)/102 (audio) available • Switchable aspect ratio (4:3 and 16:9) • Color temperature D65, D93 or user preset (3200K to 10000K) selectable
- On screen display for adjustment/ operation • User preset function
- Underscan, Blue Only and H/V delay mode available
- Auto chroma/ phase setup
- Accepts external sync
- Digital 3-line comb filter • Auto/Manual degaussing
- Mountable into an EIA standard rack with the optional SLR-103 slide rail kit.

B&H SPECIAL $999

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-1D1C (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 10000K).
- Blue gun, underscan and H/V delay capability

PVM-14M2U List Price 1,265 PVM-20M2U List Price 2,525
PVM-14M4U List Price 1,570 PVM-20M4U List Price 2,920
For B&H prices .....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	1.69	T-60 Plus	1.99	T-90 Plus	2.09
T-120 Plus	2.19	T-160 Plus			2.69

HGX-PLUS VHS (Box)

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

BQ Broadcast Quality VHS (Box)

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

BQ Professional S-VHS (In Box)

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

Betacam SP

B30MSP	13.49	B60MLSP	19.99	B90MLSP	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	P6-30 HMEX	8.19
P6-60 HMPX	6.79	P6-60 HMEX	11.99
P6-120HMPX	8.99	P6-120HMEX	15.99

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

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

KSP-S10 (mini)	10.49	KSP-S20 (mini)	12.29
KSP-10	10.99	KSP-20	12.69
KSP-30	14.29	KSP-60	18.59

BCT Metal Betacam SP Broadcast Master (Box)

BCT-5M (small)	11.99	BCT-10M (small)	12.49
BCT-20M (small)	12.99	BCT-30M (small)	13.49
BCT-30M (small) (10 Pack)			ea. 12.99
BCT-30ML	14.99	BCT-60ML	21.99
BCT-90ML			30.99

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

DV-120MEM	24.99	DV-180MEM	26.99

PDV Series Professional DVCAM Tape

PDVM-12ME (Mini)	14.49	PDVM-22ME (Mini)	15.19
PDVM-32ME (Mini)	15.49	PDVM-40ME (Mini)	15.99
PDV-94ME (Standard)	32.99	PDV-124ME (Standard)	37.99
PDV-184ME (Standard)	44.95	PDVN-64N	24.95
PDVN-124N	31.95	PDVN-184N	39.95

PLAY. **Trinity**

Live Digital Component ProductionSwitcher, Chroma Keyer and Still Store

The heart of Trinity's live production capabilities, the powerful digital component switcher lets you mix up to eight video sources, two still stores, and a matte generator in real time at full D1 resolution. In addition to traditional dissolves, fades, and color correction, Trinity offers exclusive capabilities like soft edged organic wipes, animating 24-bit graphics, recursive digital decays, and color remapping effects. Pull the T-Bar to instantly control the wipe and matte generators, graphics alpha channel, upstream and downstream keyers, still store and organic wipe patterns.

The Chroma Keyer generates sharp, crisp keys with key color spill suppression providing perfect realism for blue/green screen effects. While meeting the highest broadcast quality specifications, it preserves soft-edged-shadows and allows arbitrary color luminance ranges to be simultaneously defined for the best key possible.

- High-resolution chroma keyer with advanced key color spill suppression
- Border types include matte colors, gradated colors, bitmap graphics and live video sources
- Infinitely variable color space remapping effects including solarization, posterization, color swapping and sepia tone • Expands to multiple simultaneous key outputs • Output program or key in four or more different formats simultaneously
- Dual channel still store can recall CCIR-601 frames in less than a half second
- Operate still store with mouse, key pad or automatically via preset timeline
- Still store imports/exports standard image formats including BMP, JPG and TIFF
- Software control of overparameters like comb filter adjustments and chroma H/V shift
- Support for tally lights and bi-directional GPI triggers

3D Digital Effects

Trinity's Warp Engine can duplicate any visual effect ever created, but is becoming known for consistently pushing visual effects to unprecedented heights: such as the ability to map live video onto multiple arbitrarily complex user-defined 3D animating objects, with colored highlights, true video reflections, photo-realistic texture maps, variable transparency and soft shadows. Based on custom chips, Warp Engine is a massively parallel video geometry engine capable of manipulating live video streams into stunning visual effects far beyond the reach of any existing system regardless of cost.

- Performs all 2D effects with perspective including flip, push, pull, squeeze, zoom, tile mirror, tumble, spin and rotate
- Create real-time 3D effects with live video mapping on animating user-defined objects such as logos, products or human faces
- Includes Personal FX application for custom effect creation
- Semi-transparent colored light sources generate highlights on warped video and cast soft-edged shadows in real-time
- Integrate graphic elements into or on top of video effects including over-the-shoulder and picture-in-picture treatments
- Apply true 3D procedural distortions to live video, including waves, ripples and peels

Includes: PrEditor — Linear Online Editing

TITLEWAVE—Live On-Air and Post Production Character Generator

Unlike software-based titling systems, TitleWave drives Trinity's high performance hardware making it perfectly suited for live broadcast environments as well as serious online post-production. Advanced features include infinitely variable font treatments with multi-point color gradients, 24-bit textures and variable transparency on each text face, outline, border, and shadow. Simply drop TitleWave thumbnails into the Trinity Switcher for live use, or onto the Preditor timeline for 'no rendering' post-production character generation. TitleWave even provides unprecedented options for high-end text manipulation with powerful warping effects including peel, spin, explode, bend, twist and ripple.

Virtual Sets For combine live actors and 3D computer graphics to generate super realistic digital sets in real-time. Trinity synthesizes these photo-realistic scenes by using its sophisticated Virtual Set software and the combined power of the Warp Engine, Switcher and Chroma Keyer. These scenes include semi-transparent shadows, environmental reflections, refractions, shadows, light sources and virtual camera pan, scan and zoom. When standing in a Trinity Virtual Set, you'll see your own reflection mapped onto surfaces, see your image refracted through glass, have your body obscured by foreground objects and see your shadows mixing seamlessly with the synthetic background. Now anyone can create the illusion of shooting in exotic locations, as well as on dramatic imaginary sets that would be impossible to actually construct.

Time Machine Non-Linear/Linear Online Editor

Time Machine is a stunning achievement in non-linear editing, providing the superior image quality and true random access normally associated with systems costing over $200,000. Fully integrated into Trinity, Time Machine brings non-linear video and audio streams to editing, compositing, paint, animation and live production, all without dropping a frame. Using a next generation Wavelet-based compression algorithm, Time Machine visibly outperforms the older M-JPEG technology. The addition of Time Machine transforms Trinity into the ultimate video production powerhouse. Time Machine requires Trinity 2.0 software, and works with a variety of hard disk drives.

- Use video from tape decks and optional disk storage systems on the same timeline • Simple drag-and-drop operation for visual editing • View video clips, effects, graphics and titles instantly by dragging through the timeline • Interactive trim, slip, and roll clip controls
- Four built-in RS-422 VTR controllers for A/B/C roll editing with support for common VTRs
- Timeline fully supports optional real-time audio mixer for pan, fade, mute, effects send/return and three band parametric EQ • Independent color correction settings for each clip, or on a tape by tape basis
- Performs ripple and non-ripple style editing • Supports sequential and checkerboard style auto-assembling
- Real time 3-band EQ, real-time rubber band gain adjustments.
- 32 and 48 kHz sampling rate, with down sample to 22 and 11 kHz for multimedia.
- Over 50 transitions, including dissolves, motion & color effects, superimposition, horizontal and vertical wipes, chroma and luma keys, picture in picture, flips, flops, resizes, spins, peels, pushes, squeezes, and many more.
- Integrated , anti-aliased titling tool
- Export to MPEG1, 2, Microsoft Windows Media (ASF), AVI, QuickTime, or RealMedia

The Service

IBM is maintaining a server where you can obtain disk space for approximately five hours of compressed streamed video, where your client can download your video from a customized web page, at no charge to you for the first three months (after three months it is fee based). This service eliminates small businesses from having to devote their own resources to set up and maintain their own servers.

- IBM IntelliStation M Pro (6868-92U/94U).
- 733/933 MHz Pentium III processor.
- 256MB Full Speed ECC memory.
- Matrox Millenium G400 4X AGP with 16MB of RAM.
- Ultra2 SCSI 9 GB (7200 rpm)drive for operating system.
- 18/36GB drive for video and audio storage.
- CD-ROM (20x -to- 48x)
- Windows NT 4.0 with Service Pack 5.
- Complete system integration and testing.

All for the Unbelievable price (733 MHz) **6,599.95**
or ..... (933 MHz) **6,999.95**

Avid / IBM

Xpress DV On IntelliStation

Avid Xpress DV on IntelliStation is a turnkey digital video solution designed to give professional content creators in corporations, education and government institutions, the power to communicate with video. The solution consists of IBM's award-winning IntelliStation M Pro workstation, and Avid's Xpress DV digital video content creation software. Simply plug your DV camera into the IntelliStation workstation, launch Xpress DV and begin assembling a video. Using the high-powered and reliable able IntelliStation M Pro and intuitive Xpress DV software, you'll be creating professional-looking video and multimedia content for a wide variety of uses including sales and marketing videos, training videos and web-based teaching solutions-in no time.

The Hardware

The completely redesigned IBM IntelliStation M Pro features a high-speed Intel 840 chip set, 600/733 MHz Pentium III processor, 133 MHz Front Side Bus, a Canopus DV Raptor, and a Matrox display card.

Designed with the Intel 840 chipset, the IntelliStation M Pro supports high-speed ATA-66 disk drives, as well as up to 1GB of high-performance ECC memory. The solution is pre-installed with the Matrox millennium G400 4X AGP graphics card (capable of 1GB/per second transfers) with 16MB of on-board memory, and the Canopus DV Raptor Adapter IEEE1394 interface for DV I/O. It also includes two Ultra2 SCSI hard drives: a 9.1GB drive for the operating system and programs, and an 18.2GB drive for capturing data.

The Software

Avid Xpress DV software combines powerful video and audio editing tools, digital mastering, and extreme ease of use. Xpress DV captures and edits DV video, adds effects, mixes audio, and outputs the finished results over IEEE1394 FireWire for impressive video. Or transcodes the content to all major new media formats. MPEG-1 (for CD-R) MPEG-2 (for DVD-ROM) 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 Avid graphical user interface (GUI) based on the 3.1 version, offering powerful audio and video tools including:

- 4 tracks of nested video tracks with single track transitions
- 8 tracks of audio with real-time mixing
- Batch digitizing, and RS-422 deck control.
- Integrated EDL support with built In logging
- Thirty-two levels of undo/redo, making changes, painless!
- Tight timeline with precise timecode editing.

Pioneer

DVR-S201 DVD-Recordable Drive

The DVR-S201 is a DVD-Recordable (DVD-R) drive designed for industrial DVD authoring and long-term data archival. It provides write-once capabilities to DVD discs allowing storage for any type of data including video, audio, images, text, or multimedia programs. Compatible with version 1.0 of the DVD-R standard, the drive offers 4.7GB GB capacity - roughly eight times more than a CD-R disc. With its relatively low cost per megabyte, compact design and portability, it is ideal for short-run, desktop DVD authoring and long-term data archiving. An external SCSI-2 device, it writes and reads both 4.7GB or 3.95GB media. Writing at 1X and reading at 2X speeds, a complete 4.7GB disc can be written in approximately one hour and is compatible with existing DVD playback devices including DVD-RDM drives and DVD-Video players.

Whatever your data storage requirements are; video, imaging, graphics—the DVR-S201 is an affordable way to record discs compatible with DVD-RDM drives and DVD-Video players.

DVR-S201 Includes pre-mastering software and three blank 4.7GB DVD-R discs..... **4,399.95**
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The GALLERY

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THE JOURNAL OF DIGITAL TELEVISION

Classifieds Help Wanted

BROADCAST MAINTENANCE ENGINEER. Beachwood Studios, a producer of national television series is seeking a qualified maintenance engineer to work in our video production center's engineering department. The selected candidate will perform preventative and corrective maintenance on broadcast analog and digital equipment, must have familiarity with MAC, NT and UNIX platforms, computers, and be able to troubleshoot at a component level. Must have a "can-do" attitude, be self-directed and work as a team member. Minimum 2 years experience in a production facility. We offer excellent benefits, and salary commensurate with experience. Check out our website at Beachwood Studios.com. We are the finest production center in Northern Ohio – check us out we are a real gem. Send or fax a resume to M. Owen, **Beachwood Studios,** a division of EDR Corp., **23330 Commerce Park Rd., Cleveland OH 44122 Fax: (216) 292.1765**

40/hrs. wk; 8am-5pm;$60,000.00yr; must have 2yrs technical school certificate in electronics, and 5 yrs exp in job offered or 5 yrs related exp as a chief engineer/asst. chief engineer/technical supervisor. 8% travel per year. Responsible for the project mgt and design of the electronic facilities within broadcast television stations. Commencing w/ customer, contractor, and manufacturing meetings to define the scope of the project and to prepare proposals. This is followed by detailed design of the system using AUTOCAD software and various Microsoft6 office products (Excel, MSWord). Supervision of the installation staff (varies 0-1-) during the building of the system, testing and programming of the system and training of the customer's staff. During this whole process the project procedures, budgets, staffing, materials and time mgmt., are managed to ensure a smooth and profitable project. Send resumes to: Agency for Workforce Innovation, PO Box 10869, Tallahassee, FL 32302-0869. Job Order #FL-2130112.

DIRECTOR OF TELEVISION OPERATIONS PULLIAM CENTER FOR CONTEMPORARY MEDIA: DePauw University, a liberal arts institution of 2300 students in Greencastle, IN, seeks a Director of Television Operations to manage TV facility in multifaceted media center. Applicant should have administrative, creative and technical experience in similar multi-media environment and the ability to support on- and off-line television equipment, studio and web operations. Facility formats include Hi-8, Beta and non-linear audio/video equipment including an Avid Express. Successful applicant will have academic and professional credentials appropriate for teaching and administrative duties, and will work closely with facility engineer and faculty advisor to student television. Responsibilities include supervision of curricular and extra-curricular student television facility, support for student television productions, university supported video projects and professional production for the university. Important to the job is the ability to impart technical skill in a liberal arts environment and a vision for a cost-effective shift to digital production. For suitable candidates, and as other duties permit, part-time teaching may be arranged. Start date: January 29, 2001. Please send letter of interest, names of three references, resume, tape/cd and other supporting materials to TV Search Committee, Pulliam Center for Contemporary Media, 609 S. Locust, DePauw University, Greencastle, IN 46135. Review of applications will begin immediately and continue until position is filled. AA/EOE www.depauw.edu/special/ccm, www.depauw.edu/special/ccm3

ASSISTANT CHIEF ENGINEER: Scanlan Communications Group seeks highly motivated individual to fill the position of Assistant Chief Engineer. The successful candidate will be located in Traverse City, Michigan and will assist in the planning, installation, maintenance and repair of analog and digital technical facilities at all Scanlan Communications facilities located throughout northern Michigan. Applicant should have a minimum of 5 years experience in television broadcast maintenance engineering, and should hold an FCC General Class license or SBE certification. To apply please send cover letter and resume to Director of Engineering, WGTU/WGTQ 201 East Front Street, Traverse City, MI. 49684. No phone calls please. Scanlan Communications Group is an EOE/AA employer.

Classifieds

Help Wanted

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Mayo Clinic is an affirmative action and equal opportunity educator and employer.

Mayo Clinic has an opportunity for a Video Systems Engineer. Responsibilities include the design, installation, operation and maintenance of broadcast level analog and digital video communication systems, both satellite and terrestrial transmission media.

Qualifications include:

- FCC General Class Radiotelephone or SBE certification
- Experience with the operation, and repair of multiple videotape formats; production and audio techniques, studio and video operation, studio lighting, and live broadcast programming

As a leader in healthcare, Mayo Clinic offers an excellent salary and benefits package including relocation assistance. Please submit resume to:

mayo

Mayo Clinic
Ben Ziemer, HR Staffing Center, OE-3 200 1st Street SW, Rochester, MN 55905

Mayo uses optical scanning technology. Please use a 12 point font in your resume with minimal use of bullets, italics, underlining and bolding.

fax 507-266-7766 **e-mail** careers@mayo.edu **www.mayo.edu**

COMEDY WORLD, INC. has openings for broadcast engineers and operators. The successful engineering candidate should have computer experience with Windows and/or Mac OS, analog and digital audio, and general electronics. Video experience is a plus SBE Certification preferred. Send Resume and information by mail, fax or email to: Barry Thomas, CSRE, Director of Engineering Comedy World, Inc., 5333 McConnell Avenue, Los Angeles, CA 90066 (310) 301-6485 fax: barryt@comedyworld.com

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TRANSMISSION SYSTEMS SUPERVISOR. WPTZ/WNNE, Hearst-Argyle owned NBC affiliate in the heart of the Northeast's ski capital, is looking for an experienced RF technician to oversee transmission facilities and remote microwave sites. Must have VHF/UHF transmitter and microwave/satellite experience. Successful candidate will play a key role in the transition to DTV. Send resume w/ cover letter indicating referral source to: Transmitter Supervisor Search, WPTZ/WNNE, 5 Television Drive., Plattsburgh, NY, 12901 or by e-mail to: www.wptz.com. EOE.

Engineering

The mission of **ABC Cable Networks Group** is to create and develop new networks and oversee and manage a portfolio of properties. These include: Disney Channel, Toon Disney and SoapNet, which launched in January 2000, built around the long-standing success of ABC Daytime Soap Operas. Based in Burbank, CA we currently have an opening for a full time:

Director,Systems Engineering

This proactive individual will lead the design and development of all new television broadcast and production systems, coordinate facility upgrades, research new technologies including the selection and purchase of equipment, oversee the maintenance of system documentation, and maintain and develop technical standards.

Position includes interfacing with other engineering management and creative staff, management of project budgets, development of design staff, vendor negotiation, synthesizing complex issues into summary reports, accurate future budget planning, and being open to new ideas and methodologies.

Candidates must have 5+ years experience in broadcast system design, knowledge of broadcast and post production, operational practices and an understanding of all relevant digital and analog technologies. Must be highly computer functional, with experience in AutoCAD and Microsoft Office.

To apply, please submit resumes via fax to: (818) 846-8281 or e-mail them to **disneychannel.hr@ Disney.com**. EOE.

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National Organization with 126 Office Locations Looking For Qualified Account Executives To Sell Sony Broadcast Equipment: Digibeta, Cameras, Decks, Editing Systems. Join the MCSI Team With Over 1 Billion Dollars in Annual Sales. Opportunities In Our NY/NJ & Boston, MA Locations. Excellent Benefits & Compensation Packages Including 401K, Healthcare.

Please Send Your Resume To:
Kevin Lavoie (kevin.lavoie@avai.com) VP Sales
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VIDEO, AUDIO VISUAL SYSTEMS ENGINEERS

We Are Building One of the Strongest Design and Engineering Departments In Our Industry. Join the MCSi NorthEast Team, a member of the largest network of Computer Technology and Visual Communications Systems Companies in the Nation, with over 1 Billion in Annual Sales. Personal Satisfaction With Your Work and the Design and the Creativity You Provide is Crucial. Our Company Culture Insists on Personal Development and Training. Placing the Clients' Needs First and Working as a Team is Standard Practice. Quality of Life Issues Are Real and They are Treated as Such. We Do A Great Deal More Than Specify Technology. We Use It. Positions are Available in our Boston, New York/New Jersey and Connecticut Offices. Real Opportunities are Available for the Right Candidates.

Please Send Your Resume to:
Martin Calverley — VP of Engineering
(martin.calverley@avai.com)
AV Associates, An MCSi Company

AV Associates, Inc. MCSi Media Consultants Systems Integrators

Classifieds Help Wanted

MORGAN STANLEY DEAN WITTER is seeking dedicated and motivated professionals to join our Multimedia Engineering team in our New York offices. Both full-time and free-lance positions are being considered. Our opportunities require familiarity with both TV and radio broadcasting equipment, as well as traditional and advanced Audio/Visual and teleconferencing equipment. Successful candidates will also possess excellent computer skills, including a good understading of PC hardware and software operations. Please send your resume and a cover letter with salary history to Morgan Stanley Dean Witter, 750 Seventh Avenue, 31st Floor, New York, NY, Attention: TECHBE or fax to (212) 762-0757 or email to: hrapcov@msdw.com. Please reference TECHBE in your subject line. MSDW is an EOE.

TELEVISION

CHIEF ENGINEER

LONG ISLAND LOCATION

NEWS 12

Excellent opportunity for individual to head up Engineering Department at News 12 Long Island.

SENIOR ENGINEER POSITION ALSO AVAILABLE.

Candidate must have experience with full range or production equipment including ENG cameras, VCRs, switchers, routers, video file servers, non-linear editing, computer systems and networking. Ability to prioritize and oversee engineering jobs a must. Design skills and ability to implement new equipment and technology a plus.

We offer a competitive compensation & bnfts pkg. Send resume, which must include **REF # 0101BE0403KMF** in cover letter, to: **Rainbow Staffing, Attn: KMF, 1111 Stewart Avenue, Bethpage, New York 11714, Email: careers@cablevision.com (Include REF # in subject line of email).** EOE.

STUDIO MAINTENANCE ENGINEER: Must be able to perform the following duties: install and maintain studio transmission equipment video switchers, audio consoles, DVE, CG, SS, cameras, and robotics. Familiarity with automation systems and master control environment. Should possess a general computer/networking background. Must be able to work on a rotating shift schedule. Candidate should have an engineering degree or equivalent technical training. SBE/FCC certification a plus. If you want to be a part of the exciting transition to HDTV in the most exciting city in the world, please send your resume and cover letter: Kurt Hanson, Chief Engineer, WABC-TV, 7 Lincoln Square, New York, NY 10023. No telephone call or faxes please. We are equal opportunity employer.

MIDWEST broadcast network has immediate openings for senior engineers. Send resumes to: networkengineers@writeme.com

MPO VIDEOTRONICS
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Work with the nations leading video and audio systems integrator for business and industry. Based in Newbury Park, CA, we are seeking individuals for key positions:

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Corporate hdqtrs. and NYC branch office. Experienced in video projection, data and composite video and head-end systems, good interpersonal and communication skills. Proficient at WP and spreadsheet applications.

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Please fax resume and salary history to Dept. 251 at 805/499-8206 or e-mail to hr@mpo-video.com. Compensation based on skills and experience. Excellent benefits

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Classifieds Help Wanted

ENGINEERS

Turner Broadcasting System has career opportunities for experienced television engineers. These career positions demand an extensive background in equipment maintenance, digital video and audio, and knowledge of computer systems and networks. Please mail or fax your resume and cover letter to:

Jim Brown
Assistant Vice President of
Engineering Services
Turner Broadcasting System, Inc.
One CNN Center
P.O. Box 105366
Atlanta, GA 30348-5366

Fax: 404-827-1835 • Phone: 404-827-1638
e-mail at: cnn.engr.jobs@turner.com
TBS is an equal opportunity employer.

CNN
THE WORLD'S NEWS LEADER

Turner EARTH STATION ENGINEERS

Turner Teleport in Atlanta has career opportunities for experienced Satellite Communications Engineers. These positions demand an extensive background in fixed based and SNG engineering. Equipment maintenance and operational experience is required. Please mail or fax your resume and cover letter to:

Jim Brown, Assistant Vice President of Engineering Services
Turner Broadcasting System, Inc.
One CNN Center, P. O. Box 105366
Atlanta, GA 30348-5366

Phone: 404-827-1638
Fax: 404-827-1835

CNN
THE WORLD'S NEWS LEADER

TBS is an equal opportunity employer (E.O.E.)

TECHNICAL DIRECTOR. Northern California's #1 network affiliate seeks an experienced studio/remote technician to TD news and other live broadcasts. Must have 2 years large-market experience, demonstrate mastery of creative production techniques and exhibit a superior attitude. Familiarity with GVG4000, DVEous. Profile/DNF a plus. Send resume to KRON-TV Human Resources, fax (415) 561-8142, e-mail jobs@kron.com. No phone calls please.

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Brian Huber
1-800-896-9939
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BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other management personnel at commercial and public TV stations, post-production and recording studios, broadcast networks, cable, telephone and satellite production centers and networks.

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EOM

Conning through technology

BY PAUL MCGOLDRICK

A lot of people opened Christmas packages last month to the requisite oohs and aahs and found the latest generation of electronics staring back at them. A lot of that technology was likely requested, but it is unlikely that the giver understood the set of features the receiver truly needed, or wanted. Many people are probably still trying to figure out how to use their fabulous presents, and many of the gifts may already have reached the loftier shelves in the front closet...only to be seen again at the next garage sale.

It is almost like there is a conscious effort by some manufacturers of electronic products to gyp us at every possible opportunity. Often this is achieved by offering features nobody could care about, by missing features that users absolutely should have, or by making the connections, software, or instructions as difficult as possible.

The last telephone I bought for the house is a neat 2.4GHz number that has exactly the right range and a nice set of features, but the volume of the handset is far too low. Yes, you can turn it up (linearly, fortunately, not like the 6dB steps that seem to be favored by public and hotel phones), but there is no way to make a higher volume the default setting for the phone. The last telephone I bought for my office — after the last one fried itself in the sun — is a neat 900MHz product with a tolerable digital recorder (as long as you are used to listening to SSB). The problem with that phone is the ringing volume, which must have been designed to wake the dead. And, guess what: There is no way to lower it.

The digital still camera that I bought this time last year blew the serial port the first time it was connected to the computer - that was an expensive motherboard changeout. It is now working fine on the USB port (although the scanner is another story entirely), but you cannot depend on the battery life if you are using the LCD display screen.

As always, it is the smaller things that make you really feel gypped: The Sony remote control that assumes hitting the power button means you want to turn everything off. The infrared sensors positioned in the places that are most likely to be out of vision in a cabinet. And, of course, there are the ever-present software problems that many of us live with day-to-day after spending a great deal of money just for the right to license the products. I frequently waste an hour a day rebooting things or being thrown out of applications because they have committed some crime against Microsoft.

As always, it is the smaller things that make you really feel gypped.

But, getting gypped recently by a TV program product really got to me. Many of us who remember the cult TV production of "The Prisoner" (starting 1967) were delighted to see the release of a DVD version. The first two sets were watched very quickly, but one of the productions was a gyp. The feature included was a "Rare, Alternate Version of the Episode 'THE CHIMES OF BIG BEN'." It represented 25 percent of one set and when compared with the broadcast version of the same episode there were exactly two differences. One was an additional scene with the Prisoner apparently making a clandestine astronomical device so that he could fix the geographical position of the "Village," and the second was a cuter set of closing titles. In terms of quality, the difference was that you had to endure a telecine-transfer from an edited, non-clean negative with a poor sep-mag track and no final mix. Bonus? Gyp!

And what about our election? President Bush won the White House by being the person least gypped by technology. Are we so technologically challenged that we cannot read votes with any accuracy with machines? Joseph Stalin said that real power is not in the hands of those casting the votes but that it resides in the hands of those who count them. He has been proven correct. Clearly, the technology that broadcasters are using to prophesy voters' intentions within moments of a poll closing either needs a lot of tuning or it needs to be cast away completely. How is it that news departments have gotten into the business of predicting news rather than reporting it?

One would like to think that gyps are not deliberate on any provider's part - that product planning, testing with your customers, and listening to feedback are quite important attributes of a quality manufacturer. Yet no matter how carefully you read the information on the packaging of an electronic product, there always seems to be something that ends up getting to you about the item after the fact. We have all but moved from saying "Let the buyer beware" to "Let the buyer prepare...to be disappointed." ■

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

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