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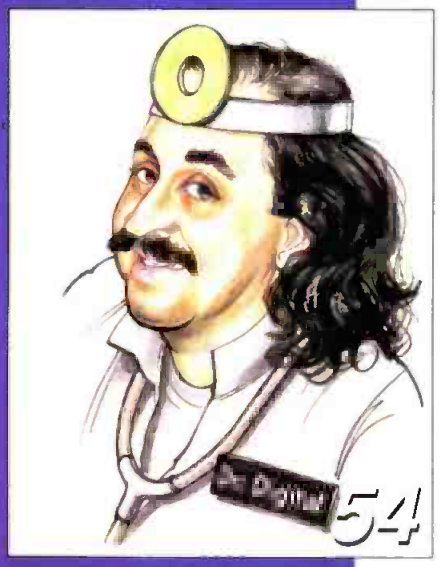
January 1998
Volume 40
Number 1

Broadcast ENGINEERING
THE JOURNAL OF DIGITAL TELEVISION

IN THIS ISSUE



Features

Beyond the Headlines

Digital Handbook

(Continued on page 8)

The true measure of a GREAT FORMAT is how far it can go.

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ON THE COVER: *This month's issue required two covers. The outside photo was first seen on the May 1962 cover of* Broadcast Engineering *magazine. The accompanying story told readers how stations were using the latest in technology to "get close to the story" in high tech remote vehicles like this 1965 Chevrolet van. The inside, second cover, was supplied by Sony showing the latest in technology housed in the new National Mobile Television truck, DX4. What a difference 33 years makes!*

Systems Design & Integration

New Products & Reviews

Departments

FREEZE FRAME

A look at the technology that shaped this industry.

Do you remember?

In the August 1964 issue of *Broadcast Engineering*, the article on WPIX's new remote truck describes a key feature as a rooftop camera platform. How did they get the cameras up there?

Answer: A special built-in crane was used to lift the 65lb. cameras onto the reinforced rooftop platform.

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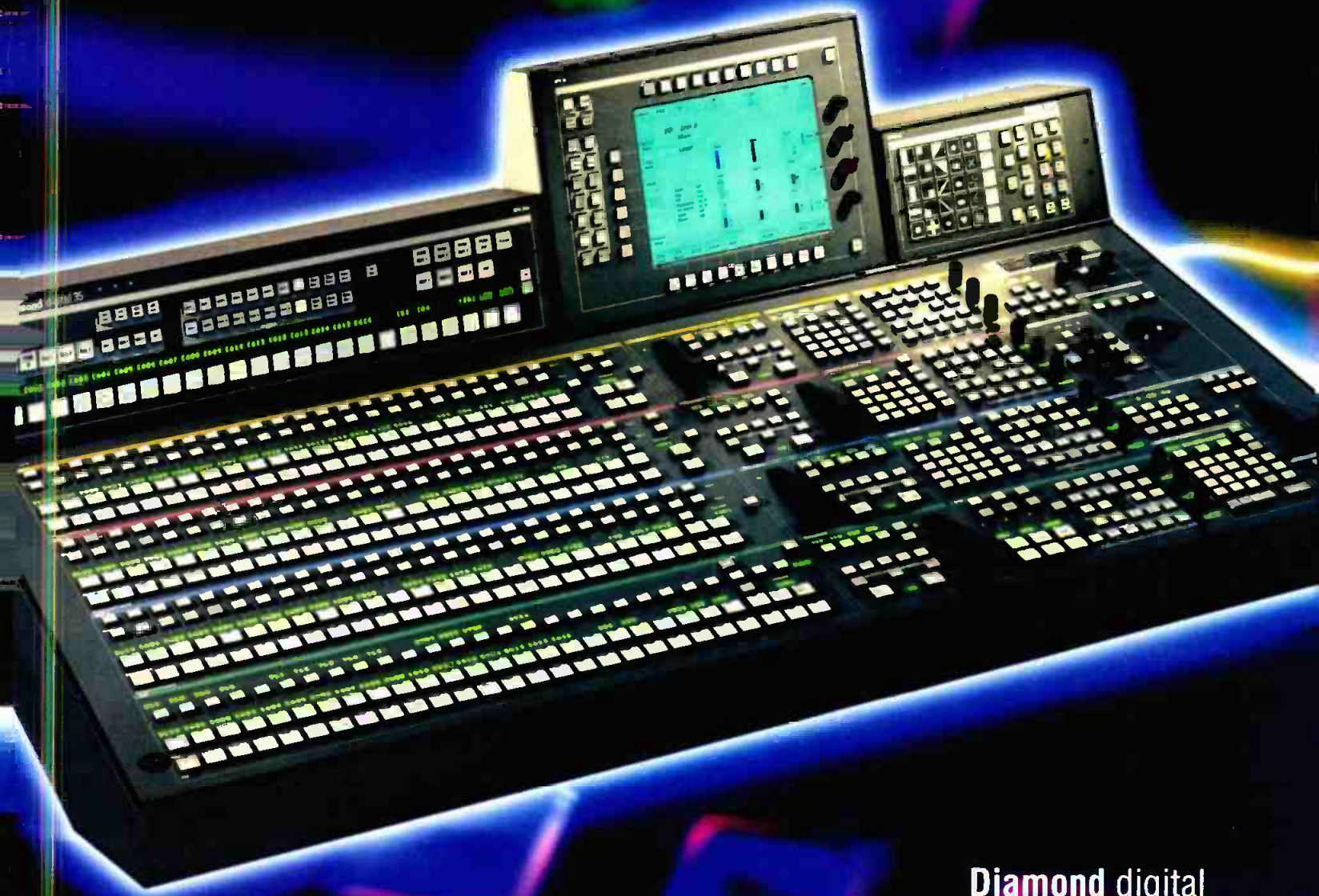
Digital live production. It doesn't get any better than this.



Diamond digital DD35

DTV READY

If you're ready to move up to digital live production, move to the new Diamond Digital DD35 switcher from Philips. Loaded with dozens of enhanced features, it makes you and your show look good. The robust DD35 has three M/E banks with advanced program/preset designed in the traditional layout. Plus button-per-function, name-follow-video mnemonics, integrated machine and DVE control, 16:9/4:3 switchable, two key bus rows per M/E, MaKe-Memo, unlimited application setups, and more. The DD35 live production switcher. Designed by technical directors. Built by Philips. Ready for the future.

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Editorial

A new year and a new look

January ushers in another year and a new look for *Broadcast Engineering*. Surprised by the cover? We wanted to catch everyone's attention and something historical does that. But, the point is not to emphasize the old, but to remind readers that *BE* goes way back in covering the broadcast and production industries. In fact, 39 years back, and no one has more experience than we do.

We've covered the changes from black-and-white to color, from plumbicon to CCD and transmitter changes from tubes to solid-state, Diacrode and klystrons. We've also chronicled the regulatory changes that forced thousands of engineers out of the business and now are bringing them back in droves.

Broadcast Engineering has a proud history of being the engineer's magazine.While other pubs have distanced themselves from the engineering community, we've never apologized for our long-term support and relationship with engineers. Whether it was through our decade-long support of SBE or with our technical articles, *BE* has always been the must-read magazine for those charged with operating high-tech broadcast and production facilities.

As the industry embarks upon the latest journey, the move to DTV, *BE* is at the forefront. With this issue, *BE* launches a brighter, bolder look, filled with more editorial "meat" than ever before. The design is based on five sections. The sections include: "Beyond the Headlines," "Digital Handbook," "Systems Design & Integration," "New Products & Reviews" and "Departments."

We also provide you with the only feature editorial well in this industry. The feature articles are contained in one section — all without advertising. When talking about commitment to the reader, we set the standard. Want more?

Everyone does news, but only *Broadcast Engineering* provides you with "Beyond the Headlines," a detailed, no-holds-barred, behind-the-scenes look at industry news and technology. We don't just tell you what happened, we'll tell you why it's important to you.

Got a problem with a piece of gear or with a manufacturer that won't respond? *BE's* Dr. Digital can help. Send those technical questions and vendor problems to our technical editor (and former TV chief engineer), Steve Epstein. He's already "curing" reader ills as shown on p. 54.

If you're looking for ideas on building that new suite or studio, look no further than the "Systems Design Showcase." A visual feast of high-tech facilities is cram-packed with ideas. An equipment list is included with each feature, so you'll know what others are using to solve problems.

Ever been told, "Sure we can deliver it," only to find that the equipment isn't real? *Broadcast Engineering* now tracks who's shipping what. Don't be fooled by claims of "new and available." Check out "No Vaporware" in the New Products section. There you'll find the latest list of products and services that are real — and shipping today.

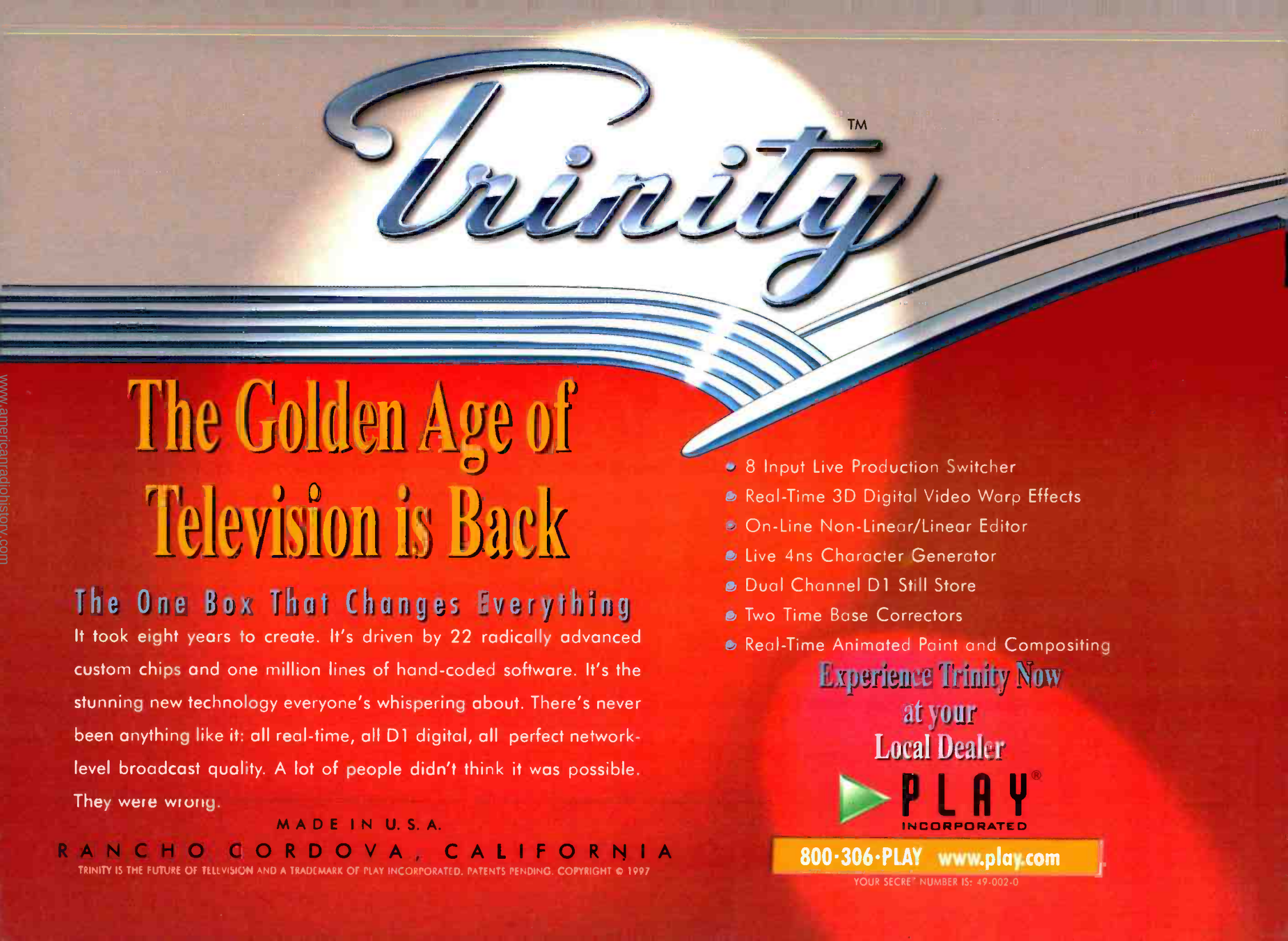
Finally, and something of which we're very proud, *BE* webmaster Deanna Rood, has produced the hottest and most useful broadcast web site around. Packed with current *BE* articles and a developing base of archival material, make sure to bookmark **www.broadcastengineering.com** on your browser.

We've worked hard to reinvent this classic. After 39 years, it's hard to top what's already best. Let us know what you think.

Brad Dick

Brad Dick, editor

direct: brad_dick@compuserve.com
website: www.broadcastengineering.com



Reader Feedback

In response to the October Editorial, "Predictably Unreliable"

Dear Brad:

Hey, when you use your "trusty dusty" DOS computer, do you usually open programs and then just shut the machine off right in the middle of the program? Or, do you exit the program and return to the "C:\" prompt before turning off the system?

There is a wonderful book called "Welcome to Windows 95" that has helpful information on how to shut down your computer. I have three laptops and four desktops running WIN95 and NT and never, NEVER had one crash. You don't know what you're missing.

M. Chanez
KOSA-TV

Mr. Chanez:

Thanks for the report on how well WIN95 works for you. Glad you haven't had any start-up problems. No one else I've talked to has been so lucky. What is the secret — Texas weather?

Brad Dick

In response to the October Digital Basics "A TV Station for Less Than $150?"

Gee, Mr. McGoldrick, maybe you should investigate the items before you make strawman arguments to obliterate them. The Wireless Video Sender is analog not digital. But, we hams have been using them for links, up to 20 miles, with perfect pictures/sound using external antennas. With a simple modification and the appropriate FCC waiver, they can be used for short-haul ENG links and free up our crowded 2/2.5GHz band channels for more distant signals. And, guess what? The signal quality difference between the $122 marvel and my $35,000 ENG link, while measurable on a scope, is invisible to the eye.

Henry Ruh
KB9FO,
Publisher,
Amateur Television Magazine

Grannies in Europe in response to the May Editorial "Granny Factor"

Hi Mr. Editor:

We, too, have Grannies in Europe. In 1985, we switched off our last VHF transmitter in London. It was a 45kW, 406-line, B/W system. The BBC was so embarrassed because the last granny was still watching, well listening, actually. She was virtually blind, so the BBC social club bought her a new 625-line UHF set and sent a man around to install it for her.

To put this into perspective (regarding the U.S. nine-year time frame for DTV implementation), 625-line UHF PAL had 94% population coverage by 1971.

Cheers,
Ian Wheeler
MSc MIEEE

In response to the September Editorial, "Stupid Rules"

Brad,

As I pondered your comment regarding the ATMs and blind drivers, it dawned on me that my car has a rear seat with a matching window. Therefore, my blind passenger in rear could use the ATM in the drive-in without leaving the vehicle.

Sheldon Daitch
Voice of America

Voting engineers

Dear Brad,

I only hope that voting engineers read your editorial on stupid rules. Here's another example of our government's attempt to legislate their brand of intelligence.

Janet Reno wants to micro-manage Microsoft's marketing of technology. Apparently it is illegal, or "unfair," for Microsoft to give away its Explorer program with Windows '95. By the time that she gets Bill Gates in court, Win '95 and Explorer will both be deader than DOS.

While there is enough hard evidence to warrant an investigation of Microsoft's marketing practices, Ms. Reno can't find fault with the campaign contributions that President Clinton accepted from Indonesian and Chinese sources. She also can't find anything wrong with Al Gore's fund-raising calls from his White House office although there is a law prohibiting the practice. Vice president Gore was correct when he stated, "There is no controlling legal authority!"

Meanwhile, how much of our tax money will Ms. Reno spend chasing computer technology? Fortunately, we don't get all the government we pay for.

Sincerely,
Walt Lowery
Broadcast Sales Manager

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News

BY LARRY BLOOMFIELD


Larry Bloomfield

Plans hinted at SMPTE meeting

At the SMPTE New York section meeting last month, the subject focused on what the big boys were planning to do with DTV. Those in attendance didn't really hear much of anything new. And, many appeared to be somewhat gun-shy after the recent Congressional inquires on multicasting vs. HDTV.

Terry Poon of PBS made it clear that the network planned to transmit SDTV multicasting during the day and HDTV at night, with data transmission filling what it calls "opportunistic" bandwidth at any time the network had material to transmit. PBS has gone on record saying it supports flexibility with respect to using the spectrum. The network is the only one, to date, that has published a clear-cut plan on its intentions. For more information on PBS's plans, visit its web page at **www.pbs.org.**

The other participants and attendees I spoke to, Frank Garaty of Tribune's WPIX and Tom Hankinson of ABC's WPVI, indicated that their companies were taking a wait-and-see attitude while business plans can be developed. Bob Ross of CBS said his company has no plans for multichannel. Ross did say that: "...common sense tells you I'm going to buy an encoder that has card slots to be flexible for whatever happens, including multichannel." He also said that another problem is the lack of multiflexible encoders that can handle multicast and HDTV. Ross indicated that when the encoder problem was resolved, life would be much easier for everyone.

What could develop into a major, non-technical problem for the networks centers on the unions. If an NTSC show is simulcast with HDTV, many problems go away, but if there is any sort of time separation or delay in broadcasting the same show, union considerations may become, as one participant told me, "a big issue."

Sinclair's plans

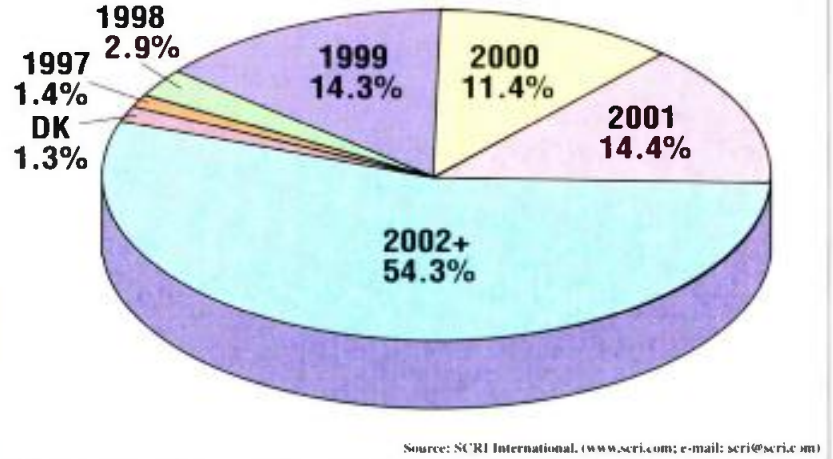
Although not at the meeting, Nat Ostroff of Sinclair Broadcast Group spoke on his company's DTV plans. First, Ostroff sees DTV as an opportunity to expand services in many markets. He said that from seven to nine multicast channels are feasible given a 6MHz channel allocation. When speaking with most of the directors of engineering on this subject, it became apparent that SDTV multicasting is familiar ground to broadcasters where HDTV is going to require not only a lot of new equipment, but a whole new approach. The biggest drawback with HDTV, according to Ostroff, is not technical, but business. No one's got a business model for HDTV. Once that is successfully developed, he says Sinclair will provide the service.

Ostroff also indicated that HDTV would be a hard-sell item. History shows that viewers often have no problem watching programs recorded at superslow speed so they could get eight hours on a T-120 cassette. He said it will be difficult to convince the average viewer to spend thousands of dollars to get HDTV. Added to this, in our discussion, he stated that recent demonstrations of 480P next to a 1,080I on a pair of 36-inch TV sets were hard to tell apart. ■

FRAME GRAB

A look at the issues driving today's technology.

When do stations expect to be transmitting DTV?



Source: SCRI International. (www.scri.com; e-mail: scri@scri.com)

The scramble for channels

The biggest fly in the ointment in getting DTV on the air is the request to the FCC for reconsideration of channel assignments. The NAB, the Association of Local Television Sta-

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Delivering video and audio quality that was "much better than microwave" for a period of four months, Canobeam II, Canon's Optical Wireless Broadcast Transmission System, operated "flawlessly" during the hostage standoff in Peru —that according to a news article that quoted CBS Technical Supervisor, Dallas Bureau, Perry Jones.

Jones, who helped set-up the system in Peru, when local authorities prohibited the laying of fiber-optic cable for security reasons, described the Canobeam as "a great technology that delivers superb video and audio quality, and is much better, and much cleaner, than microwave transmission. With the Canobeam you do not experience any 'breathing of chroma', 'hashing of video, or 'audio noise' like you would with microwave. You get just nice clean audio and video with Canobeam."

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tions (ALTV) and the Association for Maximum Service Television, Inc. (MSTV) have submitted comments to the commission identifying two systemic problems in the table of DTV assignments. The group has proposed a scheme that will enable many DTV stations to increase power under certain interference criteria.

The biggest concern is that changing the allocation of any DTV station in the more spectrum-congested areas of the country will impact the remainder of the stations in that area. The MSTV identifies two sets of problems — "the high incidence of interference in the Northwest, Great Lakes and California coastal regions . . ." and the "newly discovered DTV-to-DTV adjacent-channel interference." MSTV states in its comments to the FCC that "the 357 changes to the DTV Table . . . ameliorate the most egregious interference problems that arise in the three regions . . ." MSTV says that the problems are inseparable and must be addressed together, especially in the congested markets.

MSTV says that with more than 1,600 licenses involved, and the necessary trade-offs being made between coverage and interference, some stations will inevitably feel injured by the changes. MSTV points out that the allocation of 24MHz of spectrum between 746MHz and 806MHz for public safety services does not help the situation, but suggests that their submission to remedy these problems does not disturb that process. Keep in mind that there are nearly 100 analog TV stations still using channels 60-69, not to mention the multiplicity of translators serving a good part of America's heartland on those channels, as well.

The ALTV has addressed the concerns of many UHF broadcasters who claim that there is too great a difference in assigned power levels between U-to-U stations on one hand and the DTV stations of VHF broadcasters assigned UHF-DTV channels on the other hand. Although there is little question that these and other issues need to be addressed, all these requests for reconsideration will likely create further problems in the implementation of DTV markets. ■

Mt. Sutro project

Until a station knows its assigned channel and ERP, it is impossible to buy any RF equipment. An example of this problem is evident at the Mt. Sutro tower project in San Francisco. Gene Zastrow, general manager of Sutro Tower, pointed out that this presents a serious problem to the stations on his tower. In addition to those FCC questions, the EPA and local zoning boards are additional issues broadcasters have to deal with.

The plan for the Sutro complex is to have each of the 10 stations feed their DTV transmitters into one of four combiners. These will, in turn, feed one of the four-panel antennas to be mounted on the side of the 760-foot Kline tower. When the transition to DTV is complete and present NTSC service has been retired, the plan is to move the DTV antennas to the top of the tower to replace the NTSC antennas that currently extend an additional 200 feet up from the top of the tower.

Some work has already been done at Sutro, but until the San Francisco stations have been assigned channels and power levels, they have to wait. Keep in mind that because San Francisco is the fifth largest market, the stations on Mt. Sutro are supposed to be in the first wave of DTV stations. It doesn't take a rocket scientist to figure out that the FCC's (in)action and those of the EPA and local zoning boards could delay greatly the implementation of DTV across the country. In the real world, Murphy's Law will probably play a big role in this novella, if it hasn't already. ■

DTV in the Desert

HDTV was real at January's Consumer Electronics Show (CES). And, to further emphasize broadcaster's support of the format, Harris Broadcast orchestrated a full day of activities to show the consumer industry that broadcasters support the transition to DTV.

At the CES symposium hosted by Harris, the company's vice president/general manager of the broadcast division, Bruce Allan, released the results of a new Harris survey into broadcasters' plans to build DTV stations.

According to the survey, 93% of the stations contacted felt they were likely or somewhat likely to convert to DTV within five years. Some 66% said they could afford the conversion, compared with only 42% who felt it was affordable in last year's survey. Expressing optimism about DTV's future, 83% of the stations said they hope the conversion will become a reality, up from 72% last year.

Further support of DTV was shown by broadcasters through the two Las Vegas stations transmitting HDTV signals. KLAS and KLVW provided live, off-air feeds for the many HDTV receivers throughout the exhibit hall.

DirecTV goes HDTV

Even the satellite folks got into the act with DirecTV announcing a cooperative venture with Thomson that will result in two channels of satellite-delivered HDTV programming from DirecTV beginning later this year. Many broadcasters felt this action would further move stations toward an early implementation of DTV.

When combined with the launch of DTV by some broadcasters this year, as many as 30% of U.S. households could shortly have access to digital signals.

Some engineers interviewed at the Harris event felt that support of HDTV by satellite companies could help broad-

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How easily can you adapt to the digital television future? Snell & Wilcox has many of the answers you need. Especially on the question of HDTV. After all, we've been developing High Definition technology for the past ten years.

Can I use my existing facility for production and then upconvert to HDTV for transmission and still adhere to the FCC requirements?

Yes. FCC regulations only require the transmission of a digital signal, but don't specify the digital transmission or production format. Standard Definition (SD) formats such as 480I can be upconverted to higher quality formats, and component digital signals from clean sources upconvert fairly well to HDTV. NTSC is not so good because of its limited bandwidth. D-2 and D-3 digital signals are better than analog because of the reduced noise. The ideal pictures for this purpose are those downconverted from HD.

So the best solution of all is to use HDTV cameras for acquisition and downconvert to SDTV for post production prior to up-converting. This also means you get continuing value out of your existing SDTV hardware investment.

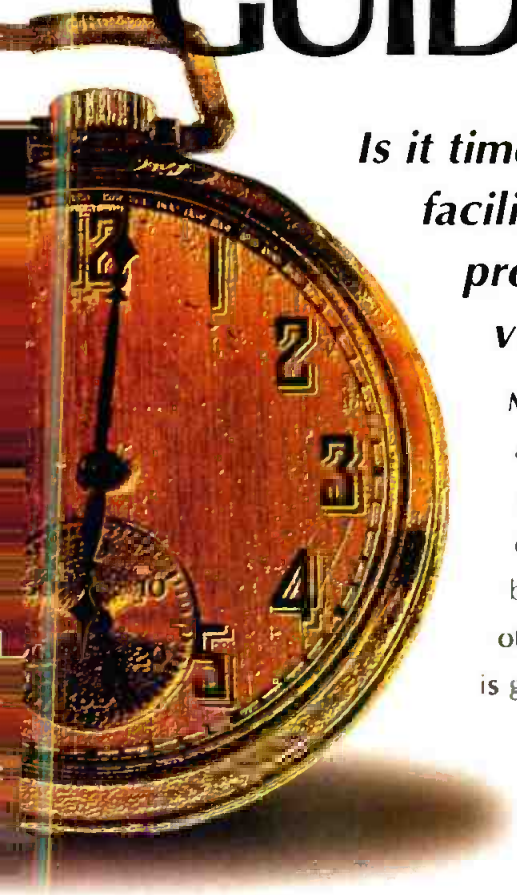
How do I deal with a

Easy. Compared with clean 601 digital signals, archive material typically suffers from problems such as tape noise, film grain, poor quality transfer, motion weave and sometimes the degradation of old age.

Can I downconvert a signal so that I can do local production?

Yes. Studio quality baseband HD feeds just require a suitable downconverter set to the required aspect ratio. If the source is an ATSC MPEG bitstream, it's got to be decoded back to baseband video with the highest possible quality before downconversion.

GUIDE TO HDTV



Is it time to transfer my facility to a 601 type production at the very least?

Maybe. 601 isn't HD and will still require upconversion, but the output quality will be much better than upconversion from other sources. If your NTSC quality is good, you could use a high grade decoder and an upconverter to output HDTV in the short term. If it isn't, you should fix it because upconversion reveals poor quality and MPEG encoders don't like noise.

Can I pass through an HDTV signal if I'm not doing any local HD production?

Yes. The HDTV signal you pass through will be MPEG encoded and provided you don't modify it in any way, it's a cinch.

ny archive material?

Careful noise reduction and pre-processing of these SD signals prior to upconversion will tackle each of these problems and enable you to maximise the value of your archives.

What kind of quality can I expect when I upconvert my local production for transmission in HD?

Best results are from a 601 digital source. Then analog component is the next best, finally the least good results come from a composite NTSC source. When you have no choice but to use composite, you will need the best decoder. With less than excellent decoding, residual NTSC color subcarrier can remain in the decoded video signal. This is then treated as video by the MPEG encoder, wasting valuable bandwidth.

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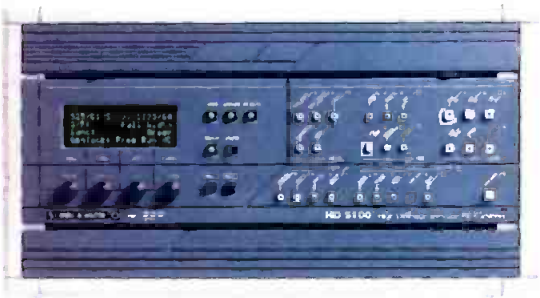

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SNELL & WILCOX

casters by further differentiating the quality differences between off-air and satellite signals and those from cable. There has been surprisingly little public-voiced support of early DTV implementation by the cable MSOs.

The consumer show went all out to show its support for HDTV. With every major TV manufacturer showing HDTV sets in their booths, it wasn't hard to be convinced that not only will HDTV happen, it's going to happen a lot sooner (and less expensively) than many think.

FCC to announce channels

At the Thursday Harris symposium, FCC commissioner Susan Ness may have let the cat out of the bag when she said that the FCC should have resolved the channel allocation issue by month's end.

She went on to explain that the staff was almost finished with an examination of the petitions for reconsideration. Furthermore, it was her opinion that the commission would be able to announce the results of that work by the end of January.

This should come as good news (depending on what you're granted) to stations, especially those needing to be in the first wave of DTV stations on the air. Many have complained that without an early 1998 decision on channel allocations, major market stations would be unlikely to meet their promise of being on the air in late '98 and mid '99. ■

The eye of the beholder

I've been inundated with E-mail from several fellow broadcast professionals about claims they've recently heard with respect to certain companies stating they could produce high-definition pictures from standard NTSC sources. One such press release from Faroudja, Inc. announced that it has a "prototype upconverter . . ." that will give "revolutionary delivery of HDTV-quality images from conventional broadcast sources." These broadcasters' concerns were the result of conversations we've had and things written on the subject of bumping NTSC up to HDTV. I had said that it was not possible to deliver the same high-quality 1,080I or 720P pictures, in comparison with what could be the presentation where the source was in a true HDTV format.

To be fair to all concerned, let's look at this in two lights: in the real world and as a purist. We know that the human eye is an amazing thing, but it plays tricks on us and we depend on that to reach our goals. We cease to see individual pictures somewhere above 16 frames per second (fps) and the flicker tends to disappear in the neighborhood of 70fps. We can take three colors — red, blue and green and fool the eye into thinking that there is a full spectrum of colors. No two people see the same thing the same way. For example, group tests of random individuals have demonstrated that it is difficult to distinguish the difference between a good "studio"-like-quality NTSC picture on a 36-inch screen when compared to an HDTV picture on a comparably sized screen. I found that hard to

believe until I had actually seen this demonstration for myself. Most folks familiar with HDTV will say that HDTV really doesn't come into its own unless it is displayed in the larger-screen formats.

Here's where the confusion begins. Anyone claiming to be able to deliver HDTV-quality images from conventional broadcast sources has got to be assuming that the picture is being displayed on a small screen where the differences are not perceptible. The ratio of pixel information when comparing NTSC to HDTV is something in the order of 1:5, with HDTV having five times more information. Therefore, to create an HDTV image from an NTSC source would require that each pixel be used five times (figuratively).

Adolfo Rodriquez of Snell & Wilcox said that his company's upconverter is not meant to be a substitute for high-definition television, but a tool to be used in conjunction with it. "You can improve what you get in upconversion by cleaning up the NTSC. Remember, upconversion is like an indiscriminate magnifying glass and good composite decoding and noise reduction can do wonders. Also, while upconversion may not be a substitute for the real thing, it still can deliver an enhanced viewing experience," said Rodriquez.

Snell & Wilcox upconverter.

On the other hand, despite my purist attitudes, I see short-term and long-term uses for such devices. A few stations will be able to make the leap directly to HDTV production capability, but most will not. In these cases, a device like this would be a beneficial temporary measure. Once widespread HDTV broadcasting is in place, the availability of HD material should be widespread and there should be less of a need for upconversion devices. However, in the short run, any device that can create an HDTV-like image from NTSC source material may be of tremendous benefit. And, the DTV bitstream won't know the difference. Of huge benefit is that the cost of such a device, when compared to the cost of converting an entire facility from NTSC to HDTV, will be insignificant.

Undoubtedly, more issues like this will crop up. If anyone tells you that they have an upconverter that will convert NTSC into HDTV, remember the laws of physics haven't changed. You still can't get a silk purse out of a sow's ear. ■

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AvidNews shipping

Joe Snelson, director of engineering for the Meredith Broadcasting Group and chief engineer at KCTV in Kansas City, said he was buying the AvidNews newsroom computer system in his efforts to upgrade Meredith's news operation in Kansas City. "It will fit nicely into our existing plant, increasing and upgrading our capabilities without a major interruption to our operation. The plan is to have it work with five of our nine NewsCutters," Snelson said. The key advantages of the AvidNews PC-based system is that it enables journalists, editors and producers to access video and share scripts and rundowns, making news production a faster, more efficient process without sacrificing creativity.

The FOX O&O KRIV-TV in Houston has also ordered an AvidNews system for its newsroom, which will complement the station's recently completed studios.

Avid has announced the sale of a 171-seat system for WSB-TV, Atlanta's ABC-affiliate. It's all part of the station's new, all-digital studio. Mike Howey, WSB's director of engineering said that the new AvidNews would seamlessly integrate with his existing system, saving him money and expensive training time.

The new system will be used with a Sony news server. Avid software will work with the Sony servers to control playback and will integrate Sony's low-resolution desktop video editing on the same AvidNews PC screens.

Other recent Avid sales include the Spanish national broadcaster RTVE in Madrid, Spain and all 22 of the FOX TV stations O&O news operations stations. ■

A marriage of the Titans

When two big, and I mean big, names in the wonderful world of computers get married, it could only take place in Silicon Valley. Silicon Graphics, Inc. (SGI) has formed an alliance with Microsoft (MS). The companies claim to be "defining the future of graphics," in a project code-named Fahrenheit. The goal of this collaboration is to provide a common set of low- and high-level APIs that integrate the elements of research and development that SGI and MS have individually developed.

The marriage isn't something new. The two companies have worked together in the past to develop OpenGL for Windows NT. Fahrenheit will pave the way for a truly

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scalable computer graphics software framework. This is something the industry has wanted for some time.

On the other side of this coin, the Fahrenheit technologies will be available on current and future Silicon Graphics hardware systems. Until Fahrenheit can be delivered, it is expected that SGI and MS will work together to support the development of graphics applications for professionals and consumers through existing APIs. For further information about the Fahrenheit APIs, check out the SGI web site at **www.sgi.com/fahrenheit** or the MS web site at **www.microsoft.com/directx**. ■

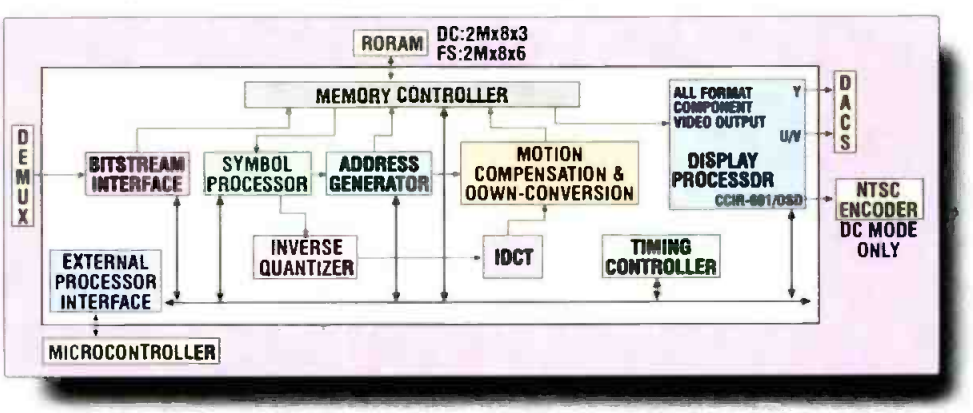
Tool, toy or what?

One of the areas authorized by the new TV standards for digital delivery is data. Intel is planning to develop a link between television and the PC. The company plans to use an experimental FCC license to transmit digital material in concert with several PBS stations. As they say, "If PBS doesn't do it, who will?" An Intel Company spokesperson said that there are a great number of things it wishes to try out including the possibility of 3-D broadcasts and interactive education. To this end, Intel plans to launch several data broadcasting market tests during the first half of this year. In addition to its application to use Channels 6, 12, 28 and 62 in Santa Clara, CA, it would not surprise me if the company did some testing with KQED-TV in San Francisco, KTEH-TV in San Jose and WETA-TV via satellite in Washington, DC. The Intel studies with the digital signals will also permit PBS to check out new uses for its Infinite CD platform, which was co-developed with Intel.

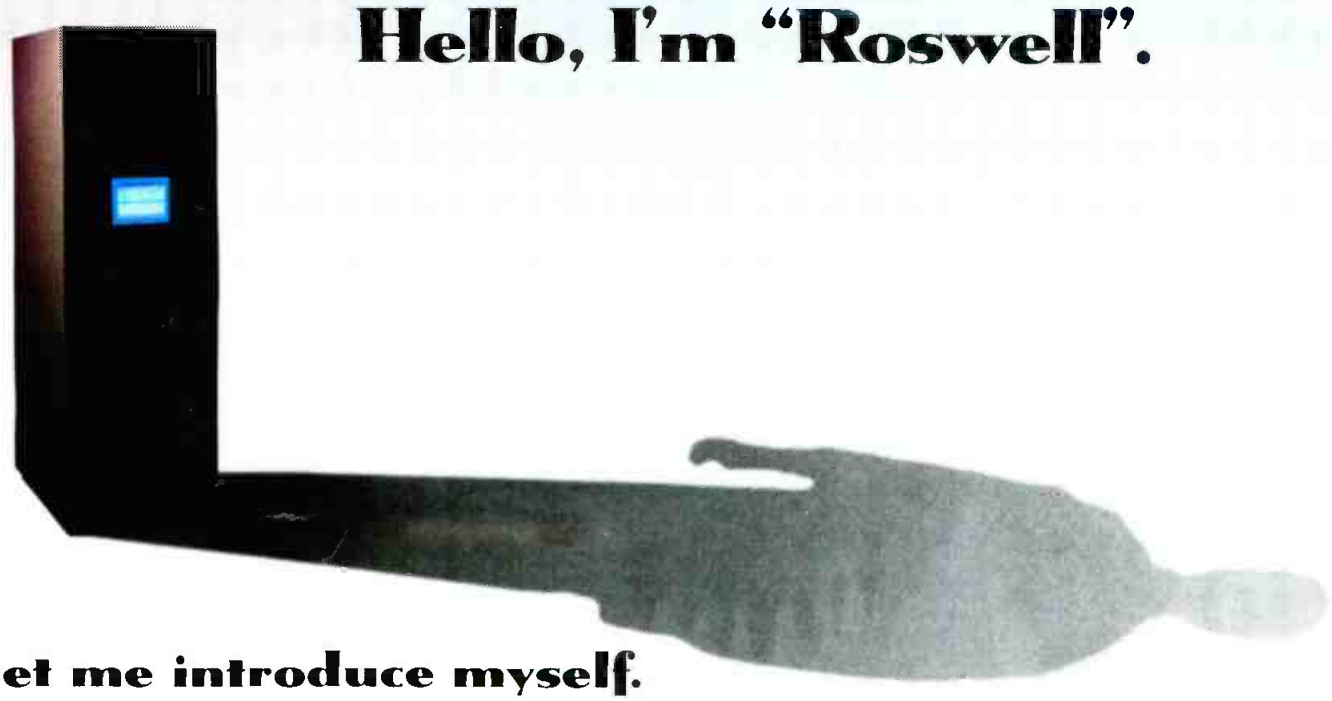
In addition to working with PBS, Intel is also working with Nickelodeon and Lifetime. The technique is called Intercast. With the addition of a $100 tuner card and a source for Nickelodeon and Lifetime programming, PC users are able to receive TV signals with data embedded in the signals. The signals carry information that Intel says will complement or enhance the video programming. In conjunction with NBC, Intel's Intercast is currently in use on some NFL games and *The Tonight Show*. So when PBS didn't do it, we now know who did. ■

If this is Secaucus, it must be Panasonic

By the time broadcasters get their problems sorted out, it looks like the set manufacturers will be able to provide receivers. Panasonic has recently completed development of the world's first single-chip device that will decode digital TV video signals and format them for display. The chip was designed as a low-cost solution for use in DTV receivers and set-top converter boxes that can be used with today's analog TV sets, as well as with computers and other digital products under development. The IC can decode and



Hello, I'm "Roswell".



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Panasonic calls its new chip a digital TV MPEG-2 Main Profile@High Level video decoder. It is used after a receiver's MPEG-2 transport demultiplexer, which splits the signal into digital video, digital audio and data. When the chip receives this digital video stream, it then processes it in two ways. The chip will decode the stream for display in its original format, the full-spec mode, (HDTV) 1,080-line interlace or the 720-line progressive scan modes, or it will convert down for use with today's analog devices in its SDTV 480-line, either interlace or progressive, scan formats.

The single-chip operation is made possible by use of 500MHz concurrent 16Mb ram bus DRAMs. What makes this chip particularly unique is that it is fabricated in a 0.35 micron process in a 240-pin device package.

In an interview with Dr. Sai Naimpally, vice president of Panasonic's American Laboratories, Inc., he told me that the chip would be available in the third quarter of this year. Naimpally emphasized the fact that his chip will be the basis for downconversion of all formats to NTSC, extending the life of today's TV sets past the demise of today's analog service.

To make sure there was no miscommunication, I asked if the Panasonic chip would support large-screen displays, such as projection, with quality. Naimpally said, "Yes. HDTV is for larger screens, but this chip will allow you to watch downconverted signals on a smaller screen. So, while HDTV is great for large screens, our chip can also support small-screen units. You may quote me on that." ■

DTV '97 a success

Broadcast Engineering's fourth annual conference on digital television, DTV '97, in Chicago, Dec. 3-5, was a standing-room-only show with more than 230 broadcast industry professionals in attendance. The conference provided a unique forum for the latest developments in the DTV arena. Dr. Joseph Flaherty, CBS, was the keynote speaker and addressed "America's Digital TV/HDTV Millennium." Laurence Thorpe, Sony, spoke on "The Great Debate: Interlace vs. Progressive" and Bruce Miller, WHD-TV, spoke about "DTV: How Do You Define It?"

Additional speakers and conference sessions covered a range of important topics from digital studios to digital transition to RF and digital production. For more information on the conference and the papers, visit **www.technicalpress.com**. ■

Larry Bloomfield is a former chief engineer, industry consultant and author, located in Bend, OR.

FCC Update

Auction rules proposed

The FCC, in a Notice of Proposed Rulemaking released Nov. 26, proposed auctions to resolve the mutual exclusivity among pending applications for new broadcast facilities. These proposed rules would affect most of the 450 applications for new TV stations that are now pending. Following are the highlights of the auction proposal:

• In cases where an entire group of mutually exclusive applications was on file before July 1, 1997, only those applicants who achieved cut-off status by June 30 will be eligible to participate as bidders. Additional applicants/bidders may be solicited by the commission in situations where one or more applications were filed after June 30, 1997. This is the case even where the cut-off or window notice was issued before July 1.

• Groups of mutually exclusive applicants may settle their cases without regard to the settlement cap rules where all of the applicants reached cut-off

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status on or before June 30, 1997. Applications filed after June 30 will be subject to the settlement caps, and settlements will be permitted only if the commission decides to allow licenses in such cases to be awarded through settlements rather than auctions.

• In connection with settlements of cases involving groups of pre-July 1 applicants, the commission is inclined to permit "white knight" settlements, which involve awarding a permit to a non-applicant third party.

• The commission is proposing to defer resolution of basic qualifying issues regarding auction participants until after a winner is selected, and petitions to deny or to enlarge issues would not be accepted until after a winning bidder is announced.

An auction participant who hasn't filed a Form 301 (long-form) will not have to file unless it wins the bidding. Only a brief identifying form (Form 175) will have to be filed in advance.

• Winning applicants may not be required to certify reasonable assurance of transmitter site availability in their long-form applications. Instead, the commission would rely on strictly enforced construction deadlines to ensure speedy initiation of service.

• All applications for LPTV and TV translator stations that are mutually exclusive with others will be made subject to the "open" auction procedures described above, even if they reached cut-off status before July 1, 1997.

Minimum opening bids for auctionable commercial broadcast licenses will be set. A minimum up-front payment will have to be filed by each bidder with its Form 175. The payment amount will represent a percentage of the projected value of the license as determined by the FCC.

• Within 10 days after the FCC's release of a public notice identifying the winning bidder, the successful bidder will have to supplement its up-front payment so as to bring its total deposit up to 20% of the winning bid. The remaining 80% of the winning bid would be due 10 business days after public notice that all challenges have been resolved and the CP is ready for grant.

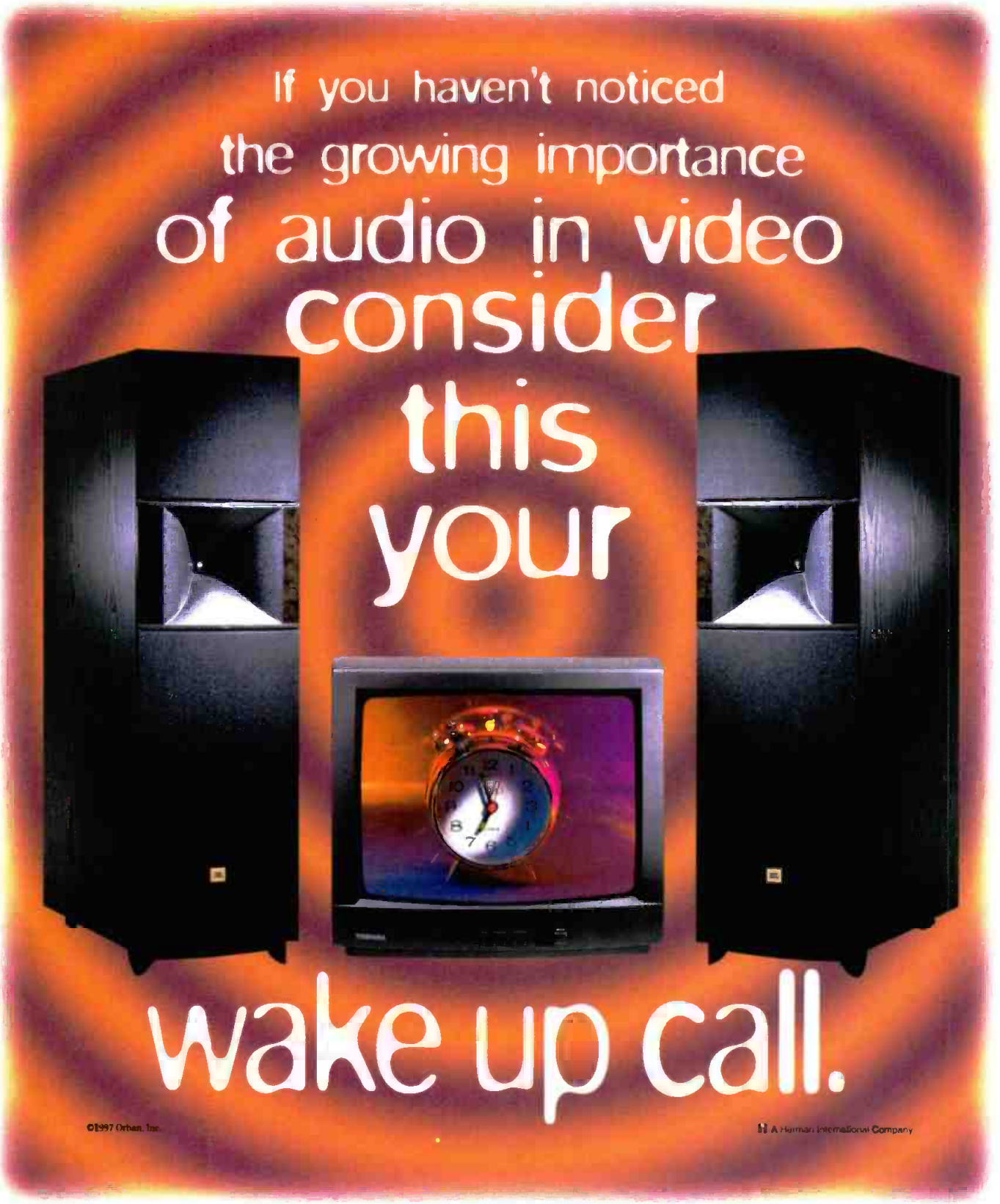
• Consistent with prior law governing auctions, the commission is seeking comment on whether it should extend bidding credits, reduced up-front payments/down payments and/or installment payment terms to small businesses, minorities and rural telephone companies. The comments were due this month. The commission should adopt its auction rules this summer and conduct its first auctions next fall. ■

Dateline

TV stations in Kansas, Oklahoma and Nebraska are required to file their renewal applications by Feb. 2. TV stations in Texas must file their license renewal applications by April 1.

Commercial TV stations in the following states must file their annual ownership reports by Feb. 2: Arkansas, Kansas, Louisiana, Mississippi, Nebraska, New Jersey, New York and Oklahoma.

Tower owners in California and Ohio must register their towers between Feb. 1 and Feb. 28.



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DTV Update

Facing reality

BY LOUIS LIBIN

Louis Libin

Digital television is really on its way! The final details are now falling into place. Broadcasters will have the correct channels, stations will be able to purchase the correct equipment and build workable facilities, and viewers will be able to watch digital television. After all these years of discussion, consumers will see and hear the benefits of high-definition digital broadcasts.

Broadcasters have promised the FCC that there will be at least one DTV station in each of the top 10 markets by November of 1998. At that time, digital television will premier in at least the 10 largest TV markets: New York, Los Angeles, Chicago, Boston, Philadelphia, Washington, Atlanta, Detroit, Dallas-Fort Worth and San Francisco. Other markets must soon follow. By May of 1999, the top 10 markets must be on the air and the top 30 markets (reaching 50% of U.S. TV households) by November 1999. Broadcasters will continue to carry traditional analog NTSC broadcasts until at least 2006. Currently, the FCC timetable requires broadcasters to surrender their licenses by 2006 for all NTSC channels.

The transition

Stations have three basic choices to make regarding the switch to DTV. This means that stations must decide how extensive the conversion to DTV equipment will be in the initial station DTV build. The first choice is to be the market leader. The station could choose to produce the local news, weather, sports, commercials and programs in full HDTV. This would require the entire studio and production centers to be replaced or changed to digital in order to handle either uncompressed or mildly compressed HDTV. This scenario does load the station with the maximum possible investment in equipment — upconversion hardware, new cameras, production/on-air switchers, DVE and graphics equipment, DTV-capable storage devices and a host of smaller support equipment.

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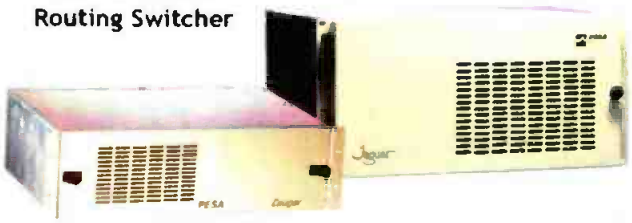

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Going halfway

The second option is to simply upconvert the local NTSC to DTV. In this scenario, all locally produced NTSC is upconverted to digital (SDTV or simulcast HD) and network feeds are passed through without modification. This signal is then mixed with the network feed. Network pass-through equipment and a DTV upconverter and MPEG-2/transport encoder are required. This approach represents a medium-cost selection.

The minimalist approach

This scenario will be the initial solution for many small-to-medium stations. It is known as *the network pass-through scenario*. In this case, the digital (DTV) network feeds are stored on digital VCRs and/or video servers, probably at 19Mb/s. The broadcast is then sent through new digital transmitters. This scenario poses the minimum investment that can be made for DTV transmission. The basic equipment needed are the transmitter, the antenna and waveguide, the downlink and 19Mb/s-capable storage devices.

Limited help from above

Networks are now beginning to make plans for their owned-and-operated stations, as well as the affiliated stations. It is not clear that the networks are planning well for the affiliate stations. The affiliate stations must make their own determinations on their entry into the DTV world. Station managers are going to have to decide how DTV will fit into the facility. NTSC will continue as the only revenue generating stream — perhaps for a long time. This means that the NTSC programming and technical facilities cannot be compromised in any way. This could require additional technical and operations personnel.

Begin doing your homework now. Develop a cost-benefit scenario for each of the three general approaches. Once dollars are attached to operational features, your station's specific plans can be determined. ■

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

Expert's Corner

Facing reality

One issue central to many engineers is compression. That would be difficult enough to grasp, but add to that the likelihood that delivered signals may have passed through several different compression encoders or systems and the potential for quality impairments looms large. To see how fellow engineering leaders are handling the issue, *BE* contacted two readers and two vendors of compression technology for their viewpoints.

The questions posed included:

- What user problems do you see with the widespread use of compression?
- Are sufficient solutions available?
- Is there sufficient compatibility between the different compression products to ensure trouble-free exchange of materials and programming?

User problems:

Joe Snelson, vice president of engineering, Meredith Broadcasting, director of engineering, KCTV, Kansas City.

One that immediately comes to mind is off-air recording. Many stations rely on off-air demod feeds of local stations for sports clips. These clips could be archived in a news tape morgue for use later, so it will be interesting to see how one decode and re-encode of the 19.39Mb/s stream really works.

Maybe the 19.39Mb/s stream will provide its own inherent copyguard system for home VCR duplicating. Video/audio latency is another issue and one that must be dealt with.

Cascading of compression devices:

I see a big potential for problems here especially if different algorithms are used in the devices. However, I read that someone (Snell & Wilcox) is working on carrying the motion vector information through on a decode and re-encode. This may make it possible to do several decodes/re-encodes before visible artifacts appear. Handling the

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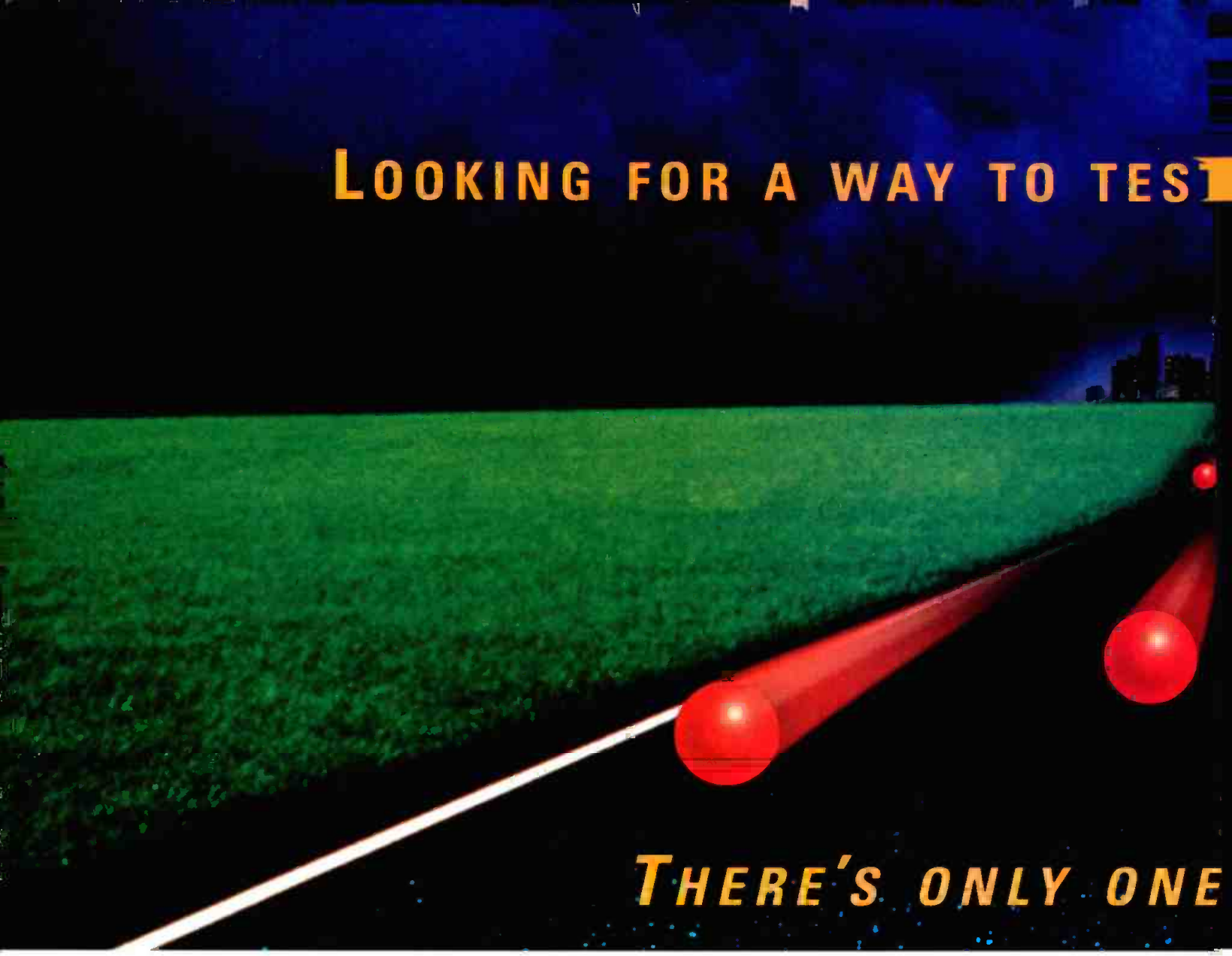

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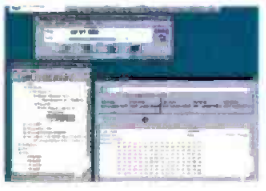

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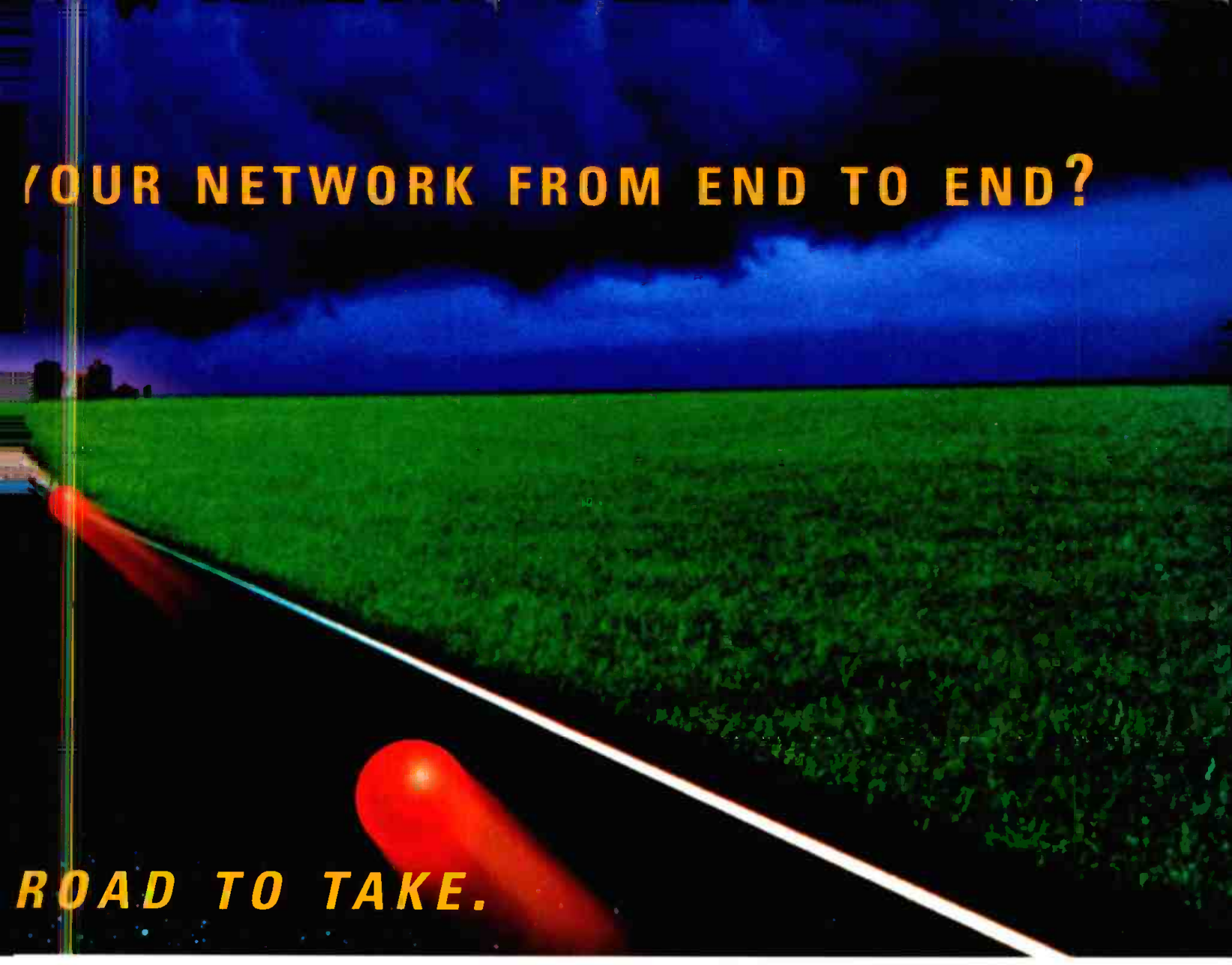

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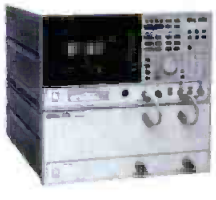

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decode and recoding of AC-3 wasn't mentioned. As I understand it, Dolby only designed that to be one pass-through for the transmission system (speaking of the Grand Alliance stream).

Light compression of the original material and subsequent feeds through cascaded devices (also using light compression) will work. It must work because so much of our production material is layered. I feel 360Mb/s (SMPTE "mezzanine level" compression) will be the logical answer in the future.

Are solutions available today and are they compatible?

I think solutions are available, it's the product that you can't buy, yet. We don't even know what kind of plug to use on the end of the cable at the present. Should it be parallel, coax or fiber? We desperately need standards. SMPTE is working on this.

The product is too new. This is particularly true in compressing HDTV into the Grand Alliance stream. As an example, there were initially compatibility problems between the MELCO and Grand Alliance encoders/decoders.

Ed Fraticelli, director of engineering, Production Masters, Inc. Pittsburgh.

User problems:

Mainly, the problem area of widespread compression use surrounds the DTV standard of using MPEG-2 compression of video signals. MPEG-2 is a compression technique that allows subjective variables that must be "tweaked" for optimum results, depending on the program content. The position of "compressionist" has come into being as a result of this. Facilities that prepare feature film material for DVD use, for example, rely on this person to optimize compressed files, as much as the colorist who transfers them. With the DTV broadcast model that I have seen, all digital video is "baseband" video, of whatever resolution is being used, and an MPEG-2 compressor is part of the encoder that is placed before the transmitter, which is set, I suppose, to some preset parameters.

Cascading of compression devices:

There is a possibility that compression devices connected in serial could cause a problem with image quality, especially if broadcast production departments and independent production facilities begin to use compression in the production chain. At this point, uncompressed video is the production standard for final program materials, but this could change, if non-linear "loss-less" compressed systems and tape formats that use compression come into use in production. For instance, Beta-SX uses MPEG-2 4:2:2-profile compression, while Avid uses JPEG compression, and DTV uses MPEG-2 main-profile, etc. Does each turn of compression introduce artifacts that trigger other artifacts in the next compression level? How do we test this? Many questions remain to be answered.

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Are solutions available today and are they compatible?

One solution that is missing is a standard way to "transport" pre-compressed material to broadcast outlets. There no standardized tape format or other electronic transfer method to accomplish this, and mention of it does not appear in the DTV models I have seen. There should be a way for production facilities to compress program material at the production phase, and deliver an exact duplicate of that material to every broadcast station and to every viewer receiver's decoder. This will be a problem when HDTV material is broadcast, because it will be highly compressed. ■

Vendor Views

We then posed the same questions to two companies who produce compression products.

Dr.Christopher Bennett, vice president of systems engineering, Tiernan Communications Systems.

User problems:

The problem is that the majority of users are unfamiliar with what the new technology can do. Because it is digitally based, it behaves differently from traditional analog technology. For example, the optimal structure of a compressed signal that is intended for editing, in terms of I, B and P frames, will be different from one that is intended for playout. Another example is the multiplexing structure of a digital MPEG-2 transport stream, which allows users to package signal components in ways that are not possible with analog systems.

Cascading of compression devices:

This is an operational issue, and the systems designer must choose a level of compression that will limit the degree of impairment to acceptable levels after repeated compression. However, the need to decompress and re-compress the signal repeatedly will be reduced as the studio and transmission systems become digital, through use of digital turnarounds, digital transcoders, etc.

Are solutions available today and are they compatible?

Compressed digital television is in its early stages of development. For certain applications, such as digital satellite news gathering, and event backhaul, the industry has provided excellent solutions, MPEG-2 4:2:2 studio profile heing the latest.

However, the technology is still evolving rapidly, to provide enhanced performance or additional capabilities, or to create new systems such as HDTV, or to take advantage of miniaturization, leading to such things as digital encoders in the camera. We are a long way from seeing a full range of solutions covering all the user needs.

Through the use of common standards and well-publicized interoperahility tests, such as those conducted hy Intelsat, ISOG and EBU, the industry has achieved a high degree of compatihility. Tiernan has always regarded this an important objective, and was one of the first companies to demonstrate interoperability. We believe the question is so important that if we encounter non-standard modes we upgrade our equipment to make them available rather than leave our customers without an interoperable solution.

Ahmad Ouri, Americas marketing manager, server line of business, Philips Broadcast. (Photo not available.)

User problems:

The main problems pertain to compatibility and interoperability issues hetween the existing compression formats. Also, there seems to be some confusion on what compression format to use for contribution vs. distrihution and the quality level needed for each of the two entities. For example, it is advised to use a compression that preserves each frame of video (e.g. Motion-JPEG) when dealing with contribution applications such as editing. Other problems include misconceptions and lack of education about compression. End users see compression as an economical process that will help increase profits. However, choosing the wrong compression format for a certain application for the purpose of savings in capital expenditures has proven to be a deadly mistake for some end users. Therefore, for compression to be a winning technology in the broadcast industry, we must educate ourselves and our customers ahout the various compression format offerings.

Cascading of compression devices:

There is theoretical and experimental proof that intermixing compression formats or performing multiple generation coding using certain compression algorithms will result in serious image degradation or concatenation errors. Therefore, when specifying devices for a facility infrastructure, you should consider the flow of information within that facility and the amount of processing that information will be subjected to. Based on that information, the appropriate compression format and bit rate can be selected.

Are solutions available today and are they compatible?

There are many solutions on the market today that use compression technology. Many of these solutions address specific applications and are formidable answers to a demanding customer hase. However, on a system level, there is a lack of control interfaces and format/file compatibility between most of these systems. For example, there is a need to standardize Motion-JPEG file formats for contribution.

Therefore, there is a need for vendors to realize the need for these interfaces and standardizations. The first step is to have the control interfaces completed while using baseband serial digital video as the common format. The second step would involve adopting an industry standard compression format. ■

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The CCIR-601 component digital standard

BY MICHAEL ROBIN

North American and European digital standardization efforts resulted in CCIR Recommendation 601, "Encoding Parameters of Digital Television for Studios," now known as ITU R601. This recommendation established an agreement on a component digital approach that is compatible with the 525/59.94 and 625/50 scanning standards and is at the root of all subsequent component digital developments.

The recommended digital coding is based on the use of one luminance (E'_Y) and two scaled color-difference (E'_{CB} and E'_{CR}) signals or the green (E'_G), blue (E'_B) and red (E'_R) signals. The coded signals are defined by the following expressions:

$E'_Y = 0.587\,E'_G + 0.114\,E'_B + 0.299\,E'_R$ (referred to as Y in North America)

$E'_{CB} = 0.564\,(E'_B - E'_Y)$ (referred to as P_B in North America)

$E'_{CR} = 0.713\,(E'_R - E'_Y)$ (referred to as P_R in North America)

These signals have the following characteristics when representing a 100% color-bar signal without setup (known as a 100/0/100/0 color-bar signal):

- The luminance signal has a peak positive value of 700mV, no setup and a sync amplitude of -300mV resulting in a signal amplitude of 1Vpp.
- The scaling factors for the E'_{CB} and the E'_{CR} color-difference signal were chosen to obtain a bipolar signal with a p-p amplitude of 700mV. These scaling factors differ from those used with the composite analog NTSC and PAL signals or those used by the Betacam and MII component analog VTR formats.

Sampling rates

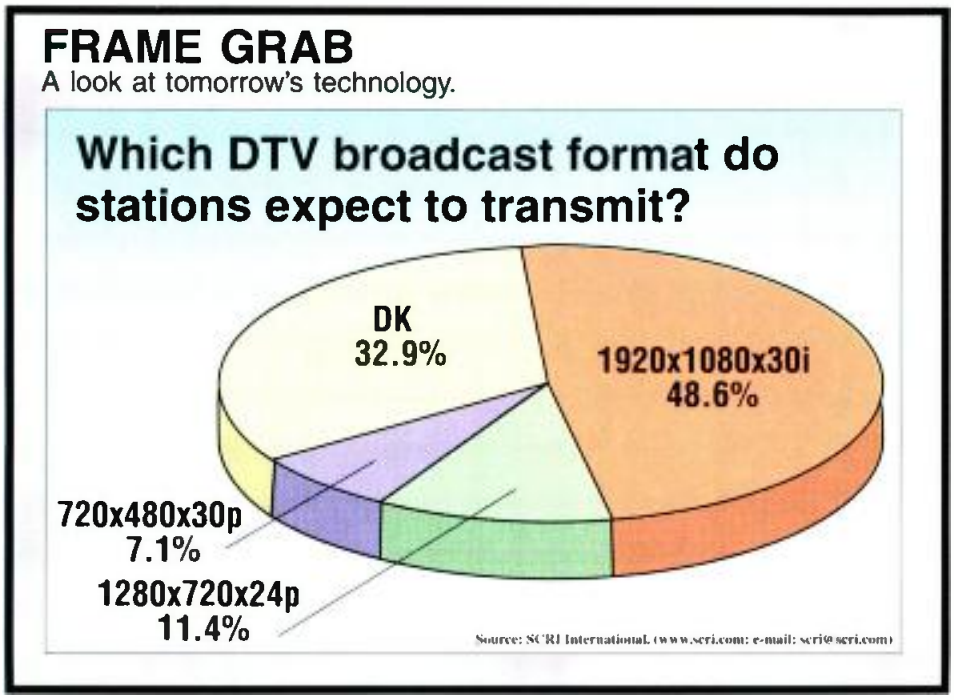
Early proposals for the values of the sampling frequencies of the Y signal specified a multiple of the subcarrier frequency (f_{SC}) of the associated composite video signal. This resulted in the 4:2:2 concept whereby the Y signal is sampled at a frequency of $4f_{SC}$ and each of the two color-difference signals is sampled at $2f_{SC}$, hence 4:2:2. The major achievement of CCIR-601 is specifying a set of sampling frequencies common to 525/59.94 and 625/50 scanning standards. The selected frequencies are common multiples of the horizontal scanning frequencies (f_H) of both standards. (See Table 1.) A family of sampling rates, common to both scanning standards and based on 3.375MHz has evolved. Table 2 shows how the sampling rates are derived.

Sampling frequency has a direct bearing on the frequency response and the number of horizontal picture elements (pixels) that the system can resolve. Rec. 601 specifies the low-pass filter (LPF) characteristics of the anti-aliasing (ahead of the A/D converter) and reconstruction (after the D/A converter) filters that determine the analog in/out frequency response characteristics.

For the 4:2:2 format, the resulting luminance bandwidth is 5.75MHz. This is a compromise between the slightly higher requirements of the 625/50 scanning standard and cost-optimized A/D conversion circuitry, and is worse than the analog studio signal distribution elements and state-of-the-art cameras. The color-difference signal bandwidth for the 4:2:2 format is 2.75MHz, which exceeds the chrominance bandwidth of the NTSC or PAL analog composite standards.

The 4:2:2 format provides high-quality pictures in scanning standards and allows for high-quality chroma-keying. The bandwidth is adequate for a single A/D and D/A pass. Multiple passes using analog in/out connections result in a progressive deterioration of the frequency response. The 4:4:4 format provides superior quality and has applications in high-end teleproductions. In this format, the luminance signal, as well as the two color-difference signals, are sampled at 13.5MHz.

Alternately, G, B, R signals may be sampled. The 4:1:1 format is used by some equipment and is suitable for situations where the bandwidth of the



color-difference signals does not need to exceed 1.5MHz.

The sampling frequencies result in an integer and equal number of sample periods during the active line periods for the two scanning standards. The sampling strategy is called orthogonal sampling. In the 4:2:2 format, with twice as many luminance (Y) as chrominance samples, the chrominance samples (C_B and C_R) are time-coincident (cosited) with odd Y samples.

SCANNING STANDARD	f_H (Hz)	E'_Y SAMPLING FREQUENCY (MHz)	E'_{CB} SAMPLING FREQUENCY (MHz)	E'_{CR} SAMPLING FREQUENCY (MHz)
625/50	15625	864 f_H=13.5	432 f_H=6.75	432 f_H=6.75
525/59.9	15734.25	858 f_H=13.5	429 f_H=6.75	429 f_H=6.75

Table 1. 4:2:2 component digital format sampling frequencies.

Sample resolution

The sampling process results in signal amplitude values measured periodically at the sampling rate. Analog signals may assume an infinite number of amplitude values inside established limits. The quantizing process results in converting the measured voltages into digital data. It results in *quantizing errors* (Q_e), which are inaccuracies in the digital representation of the analog signal, related to the number of bits per sample. CCIR-601 specifies a resolution of eight bits per sample, which allows for 256 levels (2^8) of amplitude information to be represented for each component. This number is reduced slightly by the need to provide some headroom, which helps avoid analog signal clipping and results in a specified *quantizing range*. With eight or more bits per

SCANNING STANDARD	525/59.94			625/50		
COMPONENT	E'_Y	E'_{CB}	E'_{CR}	E'_Y	E'_{CB}	E'_{CR}
SAMPLING FREQUENCY (MHz)	13.5	6.75	6.75	13.5	6.75	6.75
NYQUIST FREQUENCY (MHz)	6.75	3.375	3.375	6.75	3.375	3.375
LPF CUTOFF FREQUENCY (MHz)	5.75	2.75	2.75	5.75	2.75	2.75
HORIZONTAL RESOLUTION (LPH)	≈455	≈218	≈218	≈449	≈215	≈215
SAMPLES PER TOTAL LINE	858	429	429	864	432	432
SAMPLES PER ACTIVE LINE	720	360	360	720	360	360
SAMPLES DURING H BLKG.	138	69	69	144	72	72

Table 2. 4:2:2 sampling structures and horizontal resolution.

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sample, Q_e manifests itself as random noise. The choice of eight-bit resolution is based on the state-of-the-art technology of the 1980s, and is satisfactory only with analog source equipment having a signal-to-noise-ratio (SNR) of about 50dB, which effectively masks the eight-bit Q_e.

Current studio equipment uses a resolution of 10 bits per sample. In 10-bit systems, there are 1,024 digital levels (2^{10}), expressed in decimal numbers varying from 0 to 1,023 or in hexadecimal numbers varying from 000 to 3FF.

COMPONENT	8-BIT RESOLUTION	10-BIT RESOLUTION
Y	58.3dB	70.35dB
C_B AND C_R	58.7dB	70.74dB

Table 3. Theoretical SNR capabilities of eight-bit and 10-bit 4:2:2 formats.

Figure 1 shows the relationship between the E'Y, E'CB and E'CR analog component signal levels corresponding to a 100/0/100/0 color-bar signal, as well as the 10-bit Y, CB, CR digital sample values. Note that the sync portion of the luminance signal is not

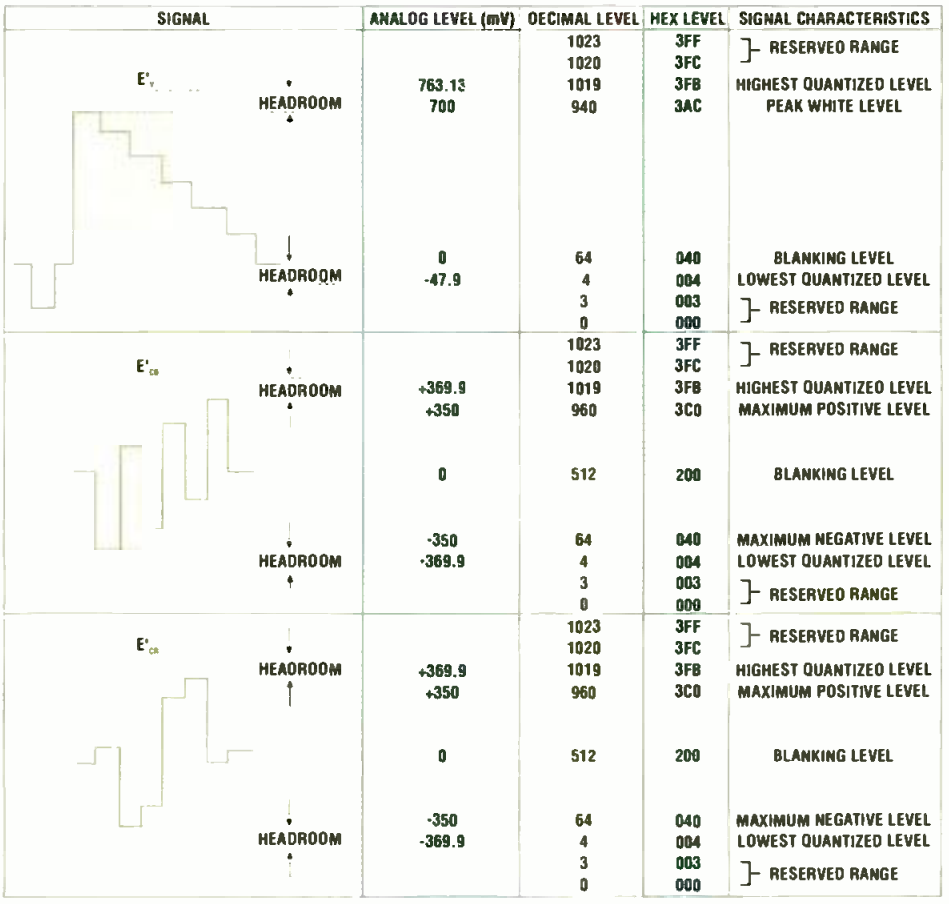
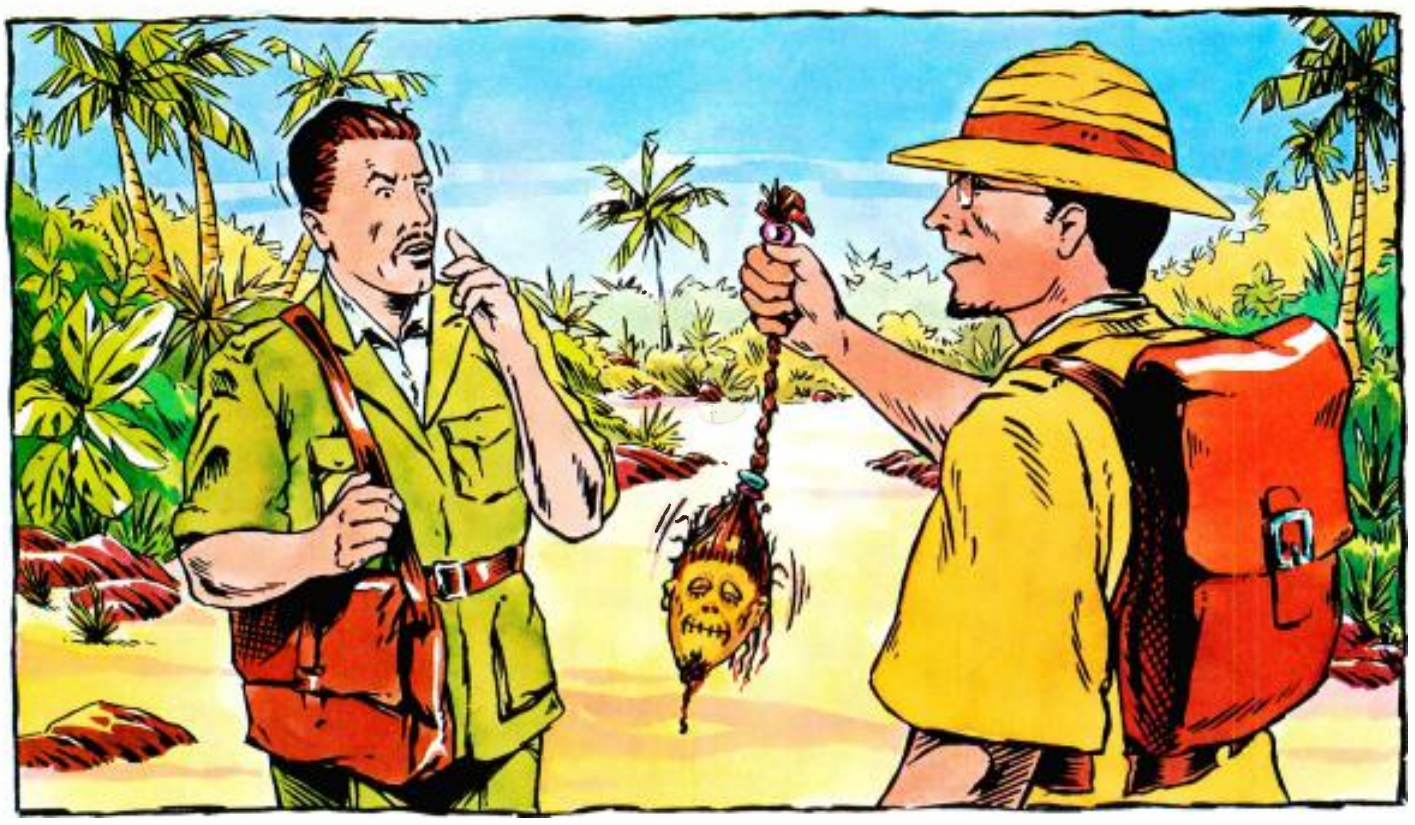


Figure 1. Relationship between component analog signal levels and 10-bit sample values.



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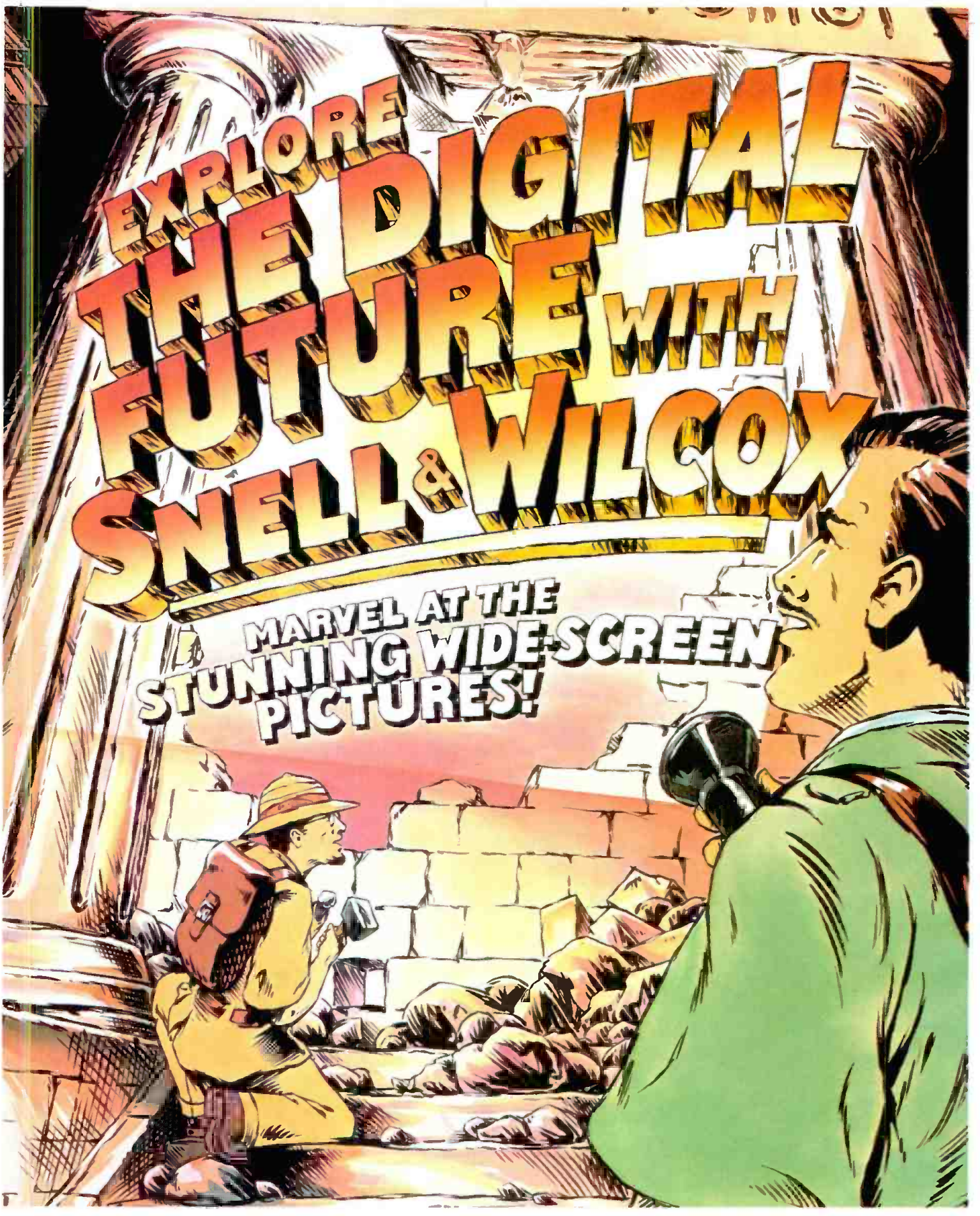

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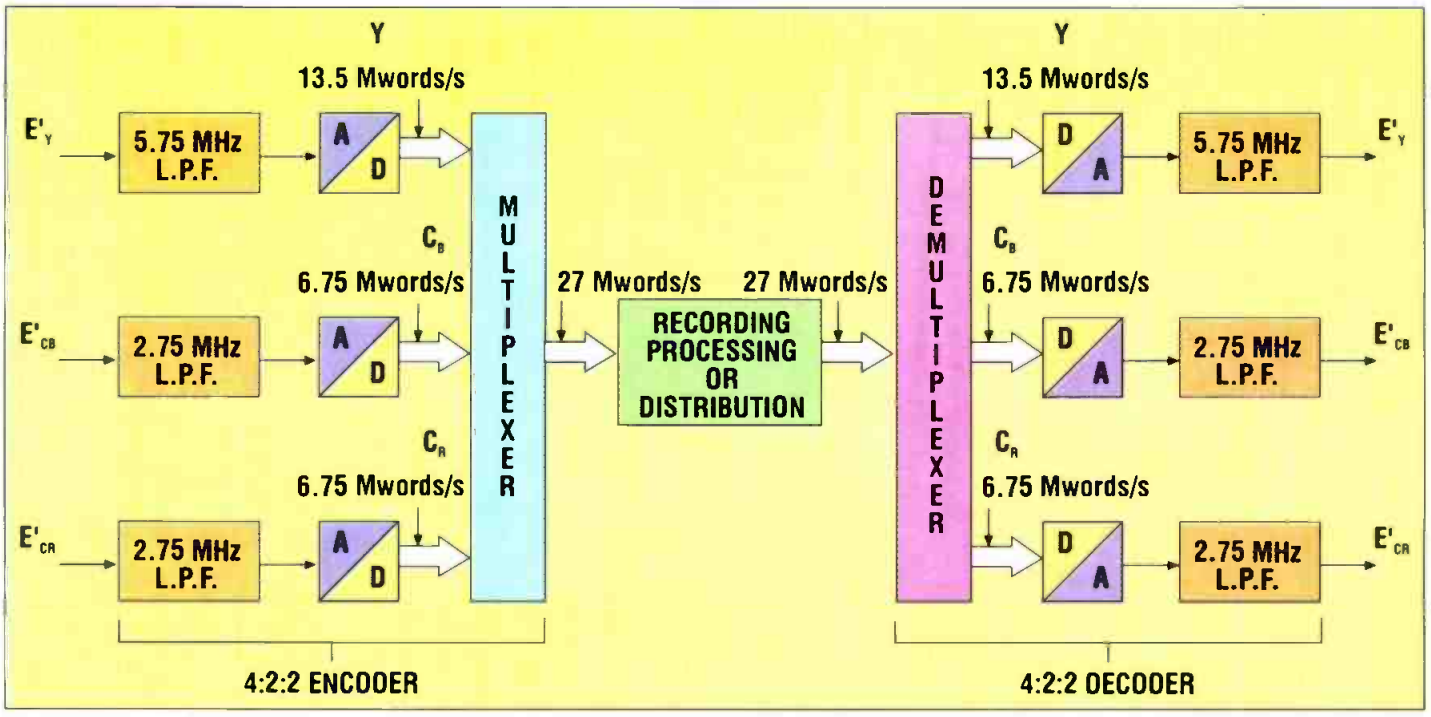

Figure 2. Simplified block diagram of 4:2:2 component digital system.

sampled. Digital levels 000, 001, 002, 003 and 3FC, 3FD, 3FE, 3FF are reserved to indicate timing references. The 700mV luminance signal occupies a range extending from blanking (64 decimal or 040 hexadecimal) to peak white (940 decimal or 3AC hexadecimal). The bipolar (±350mV) color-difference signals are shifted up by 350mV to fit the A/D converter that requires unipolar signals. They occupy a range extending from the digital equivalent of the maximum negative level (64 decimal or 040 hexadecimal) to the digital equivalent of the maximum positive level (960 decimal or 3C0 hexadecimal). A small amount of bottom and top headroom allows for misadjusted or drifting analog component signal levels. Contemporary technologies have made available cost-competitive 10-bit 4:2:2 products, which offer improved SNR performance. (See Table 3.)

The component digital standard does not provide for the sampling of the analog sync pulses. The time-division-multiplexed 1,440 words per active line (720 Y words, 360 C_B words and 360 C_R words) are preceded and followed by four-word timing reference sequences (TRS) namely: start-of-active video (SAV) and end-of-active video (EAV). Each TRS consists of a four-word sequence. The hexadecimal levels of these words are, respectively, 3FF, 000, 000, XYZ. The first three words unambiguously identify the SAV and EAV sync information. Video data cannot assume these reserved levels. The XYZ word is variable and identifies the fields, as well as the state of vertical and horizontal blanking.

Some of the unused samples in the horizontal and vertical blanking intervals can be used to carry ancillary data, including up to 16 AES/EBU digital audio channels (eight stereo pairs), time-code, error detection and han-

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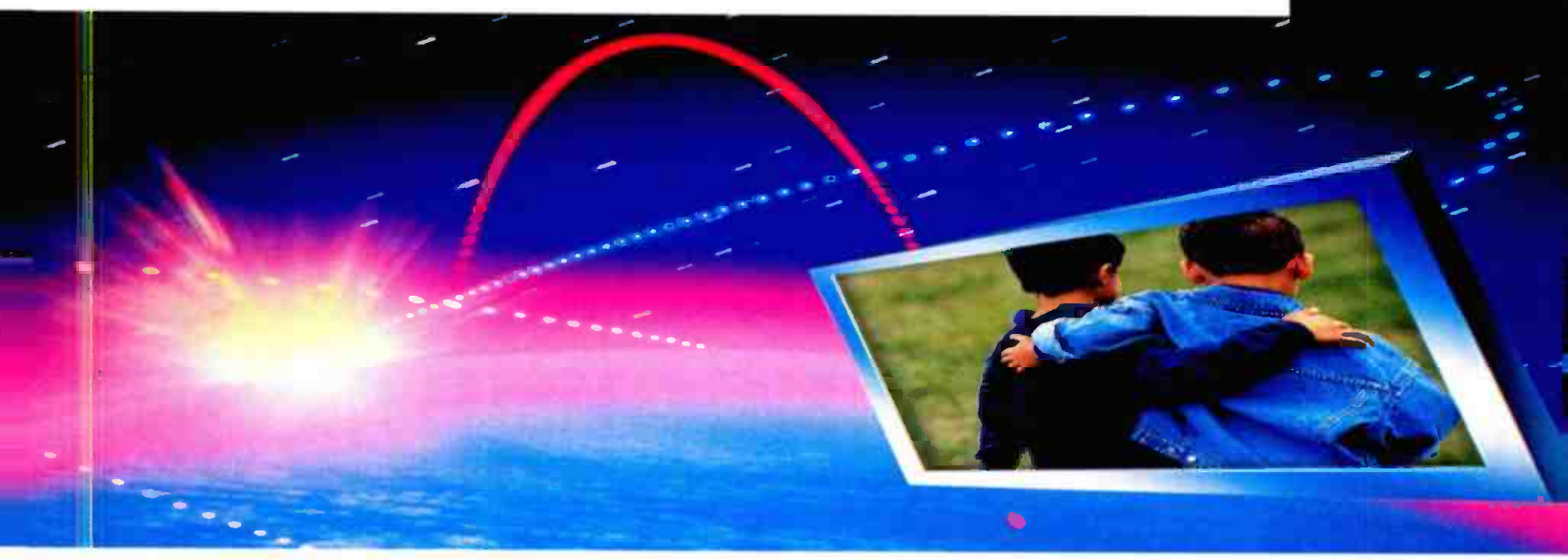

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dling (EDH) data and other types of information.

The system concept

Figure 2 shows a simplified block diagram of a 4:2:2 component digital system consisting of an encoder, a processor and a decoder. The encoder consists of three A/D converters. The data rate exiting the Y A/D converter is equal to 13.5Mwords/s. The data rate exiting each of the C_B and C_R A/D converters is equal to 6.75Mwords/s.

The three digital datastreams are time-division-multiplexed and transmitted sequentially (C_B, Y, C_R, Y...) resulting in a data rate of 27Mwords/s. The first three words (C_B, Y, C_R) refer to cosited luminance and color-difference samples and the following word (Y) refers to the following luminance-only (isolated) sample. The first video data of each active line is C_B.

The decoder demultiplexes the 27Mwords/s data and recovers the analog component video signals. The "processor" function in Figure 2 may be a digital signal distribution channel, a videotape recorder or a digital production mixer. The bits of the digital words that describe the digital signal can be transmitted in a parallel arrangement using a shielded twisted 12-pair (balanced) cable and DB25 connectors. This type of digital signal distribution is adequate for short distances and simple point-to-point signal distribution patterns. The SMPTE 125M standard describes the 4:2:2 bit-parallel digital interface. Parallel interconnections have been largely superseded by bit-serial implementations. Serial connections use standard 75Ω coaxial cable and BNC connectors, which are more practical in large installations. SMPTE 259M standard describes the 10-bit serial digital interface. ■

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

Computers & Networks

Networking basics

BY BRAD GILMER

Brad Gilmer

Let's say you are facing the task of installing your first network. What are the steps involved? What are the choices you face? This month's article can help get you started down a new road that is educational and interesting.

Basic decisions

Here are some things to consider:

- Did you purchase a system that requires a network to operate? Or do you have to interface to existing networks or networkable equipment? If so, many of the decisions may have already been made for you.
- How many users will be connected to the network at any given time?
- Does the system use proprietary hardware or non-standard protocols?
- Are you strapped for cash so that you must make a minimal investment or do you have the luxury of building a basic infrastructure that can be expanded at a later date?
- What is the maximum physical distance separating network devices?

Establishing a cabling method

Once you can answer those questions, you can start to establish a topology and decide on a protocol for your network. Over the last five years, networking technology has seen several different topology methods come and go. The ones that seem to have stuck are 10BaseT and Thinnet.

10BaseT uses unshielded twisted pair (UTP) cable and a "hub-and-spoke" topology. UTP cable is similar to telephone cable with one notable exception — the twist-per-foot is carefully controlled. In these applications, UTP is actually a transmission line and the twist-per-foot is critical to the cable's performance. Other parameters are also closely controlled, but twist is the most important. The cable has a low cost-per-foot, is easy to install and can be installed by most telephone installers using similar tools.

In systems that use hub-and-spoke topology, all desktop cable runs return to a central hub or concentrator. The hub serves as a central connecting point for all devices on the network. When you draw out these systems, they tend to resemble a wagon wheel, with the hub at the center and the desktop computers at the ends of the spokes. In the past, the cost of hubs made this topology prohibitive for small installations. Today, 12-port hubs can be purchased for around $75 to $100 each.

When wiring 10 Base-T Ethernet connections, only two pairs of conductors are needed. One pair connects pins 1 & 2, the other pair is for pins 3 & 6. However, cabling for network applications typically has four pairs. Standard connections are shown, the T568A configuration is preferred, and directly compatible with two-pair voice and token-ring systems using six-position connectors. The T568B method is optional and directly compatible with AT&T phone systems.

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Thinnet (occasionally called 2BaseT) connects networked devices using RG-58 and BNC connectors. There is no central connection point — the cable runs from computer to computer. BNC "T" connectors are used to tap into the cable and plug into the back of the computer. It is important that the cable system have two and only two 50Ω terminators, one at each end. If you leave one end of a Thinnet system unterminated, or put terminations in the line along the way, you will create unpredictable (bad) results because of transmission line reflections.

Thinnet is great for small installations. All you need are a couple of BNC "T"s, two terminators, a roll of RG-58 and a handful of BNC connectors. However, there are a few problems with Thinnet that you should know about. First, you would think that because there is no central point, that Thinnet is more reliable than 10BaseT; this generally is not the case. Thinnet is a little bit like those inexpensive Christmas lights you fought with last year. The ones where when one bulb burns out the whole string goes dark (even though the box says they won't). In a Thinnet system, if the cable opens somewhere on the network, the whole thing goes down. With a 10BaseT system, if a cable opens or shorts on the way to a desktop, only the device at the end of the cable is affected. Second, in the TV environment, it is easy to substitute RG-59 for RG-58 and 75Ω terminators for 50Ω terminators. Building a Thinnet system based on 75Ω components is possible, but as you enlarge the system, it will fail. Do yourself a favor and start with 50Ω components.

Establishing a protocol

Protocols are basically the languages that computers use to communicate with each other across the network. If you purchased a complete system from a vendor (for example a CG system with desktop connectivity) the vendor may have already selected a protocol for you. If you are a beginner, it is probably best if you stick with what they have selected. If you are starting out fresh, you may have the freedom to choose the protocol that best fits your needs. If you are trying to communicate with a server, you will have to run the same protocol as the server.

I like TCP/IP for most applications. It is almost universally supported, it is the basis for the Internet, it can be routed over great distances, and it coexists well with other protocols. There are many other protocols available, including IPX/SPX and AppleTalk, but these protocols have not gained the nearly universal acceptance of TCP/IP.

This article has only covered a few of the basics of computer networking. You could devote your life and your career to the subject and never run out of material. If you have access to the Internet, there is a wealth of information available. Point your browser to any of the major search engines and type in the word ETHERNET. Next month we will look deeper into the subject of networks within broadcast facilities. ■

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

Ask Dr. Digital

BY STEVE EPSTEIN

Welcome to the first issue of the new *Broadcast Engineering*, and welcome also the first "Ask Dr. Digital" column. *Broadcast Engineering*'s goal has always been to help you get your job done easier and more efficiently. With this new column, we are taking that concept one step further. Each month, Dr. Digital will take selected reader questions and problems and answer them.

If you are having a technical problem that you just can't seem to get an answer to, maybe a camera that refuses to gen-lock or a misbehaving transmitter, let me know. For example, once I had a problem with a Chyron CG. All the letters made up of horizontal and vertical lines, the Es and Ts, looked fine, but those made up of curves and diagonal lines, the Os and Vs, had serious aliasing problems. I dug and dug and it turned out that a flip-flop that was supposed to toggle each field wasn't. Everything else seemed fine. Changing the gen-lock source eliminated the problem in the Chyron, but I still had to find the source. Later, in a darkened room (so I could see the dim trace), using the scope's 10X expanded mode, I found it. The sync generator was no longer generating RS-170. The first full horizontal line in field 2 had a slight notch in the middle of it, making it appear somewhat like the last half line in field 1. From the Chyron's viewpoint, the sync generator was sending out an endless stream of field 1s. For whatever reason, the Chyron was the only device sensitive enough to catch it.

If you have one of those technical headaches, send me a brief description of what's involved, what you've tried and the results. I'll do a little digging and try to get you an answer. If a manufacturer is involved, let me know who you have talked to, as well as their response. I can't promise to fix all of the problems, but working for a magazine has its advantages. It's amazing how easy it is to get some people's attention (especially promotion and marketing managers) when you tell them it's *Broadcast Engineering* magazine calling.

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A53 meltdown

Our A53-D melted down and we're having trouble getting Abekas to call us back. Do you have any suggestions on whom to call to obtain information on the A53-D?

Steve Kline, Production Manager
Catwalk Digital, Charlotte, NC

You know, if the darned thing melted down, I'm not sure I'd want to power it up again. Next time, it may take the whole building with it. Did you know that Abekas was bought by Scitex and is now called Scitex Digital Video (you can contact them at 650-599-5111; fax 650-369-4777; E-mail:info@scitexdv.com; www.scitexdv.com). I've dealt with Abekas (now Scitex) in the past and found them to be a pretty reasonable bunch. And, checking with a few buddies in the field confirmed that the Scitex customer service track record is pretty good. I called Evan Sirof, Scitex's marketing communications manager. He was also surprised to hear about customer service problems (aren't they all?). Shortly thereafter, Evan called to say there was no record of any request from anyone at Catwalk. However, he said that contact between Scitex and Catwalk had been established, and a board was on the way.

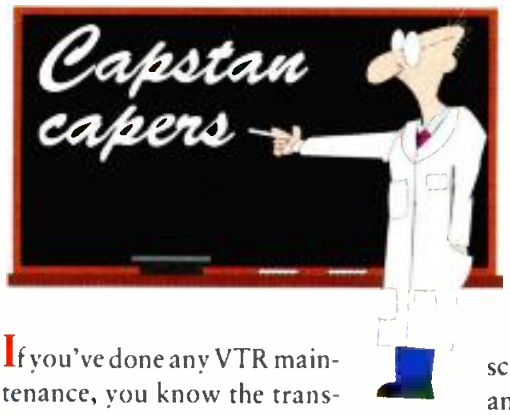
A few weeks later. . .

Thank you for your reply and assistance in helping us contact Scitex Digital Video. Once we established contact with the A53-D expert, the process of troubleshooting moved right along. The board the company shipped wasn't the answer, but the control panel that was shipped the next day was. The situation is now resolved. I appreciate you getting in the middle of it. I believe you really helped expedite the situation.

Steve Kline

See, it works! If you need a little help with a technical problem or manufacturer, send me an E-mail at dr_digital@intertec.com and I'll see what I can do.

Steve Epstein



If you've done any VTR maintenance, you know the transports can get filthy. It shouldn't be much of a surprise, because tape is comparable to 1500 or so grit sandpaper. After you run enough of that through a deck, it leaves its mark. In Sony's Betacam decks, after 10,000 hours or so, the capstan surfaces can develop a half-inch-high groove in the tape contact area.

Ultimately, the capstan assembly has to be replaced. Getting the assembly in and out isn't too time-consuming, but re-aligning the servo electronics take about two hours. After doing the first one, I decided to take the old capstan assembly apart and found that the groove in the shaft was far enough off-center that the shaft could be flipped over and the "bad" section was no longer in the tape path.

As it turns out, the shafts can be flipped and the assembly reused. Making it even better, if the assemblies are reinstalled in the same decks, the servos don't need to be realigned.

If you want to try this experiment, first try it on an old one. The basic procedure is to first pull the assembly out of the machine. (See Figure 1.) Remove the one small screw holding on the plastic cover, then loosen the two set screws holding on the flywheel and remove the flywheel. Underneath, you will find three screws securing the shaft holder. Note the position of the shaft holder on the base (draw an outline around it with a scribe or pencil) and remove the three screws. At this point, the shaft holder can be removed from the base and the shaft can be driven out. Using a punch, carefully drive the capstan shaft out of the bottom of the holder.

With the capstan shaft out, check the location of the two "bands." The relative positions of the two bands need to be reversed. Take an old Betacam pinch roller and with a punch, drive the two bushings and the roller bearing out of the pinch roller. The bushings are the same size as the bands. Set one of the bushings on a vise leaving the jaws open wide enough that you won't damage the capstan, tap the shaft to move the band up approximately 15mm. To move the other band, first take the other pinch roller bushing and with a hacksaw, cut out a section wide enough to slip the capstan through. Then, using the cutout bushing, move the other band up 15mm. Place the roller bearing on the other end and reassemble. Make sure that there is no up and down movement of the shaft within the assembly. Adjust the bands if needed.

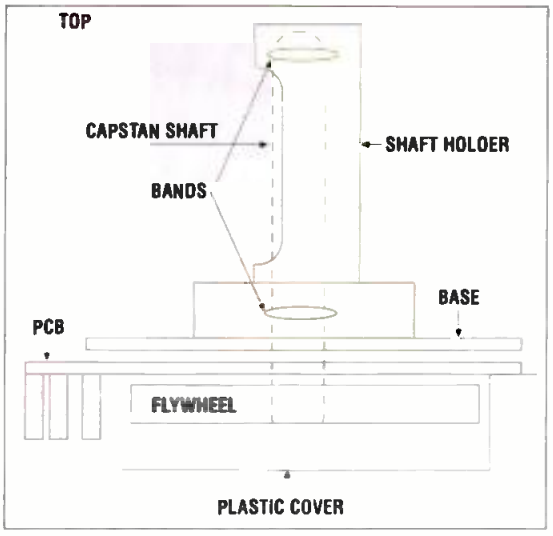


Figure 1: Sony BVW capstan and servo assembly.

A quick check of the electronics and you're done! Let me know how it turns out, and save the pinch roller bushings for the next time! ■

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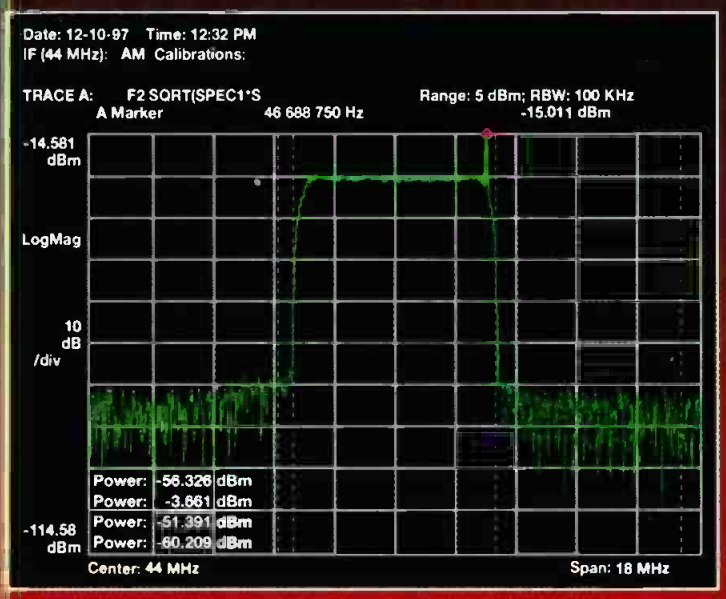

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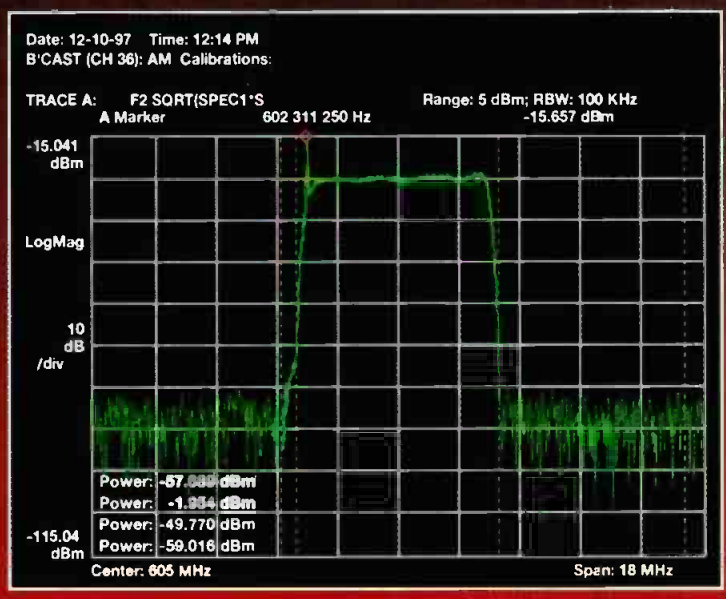

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Transmission & Distribution

The box we call the DTV exciter

BY DON MARKLEY


Don Markley

At *Broadcast Engineering*'s November DTV conference in Chicago, the DTV transmitter was described by one speaker as a modem with a power amplifier. Although this tongue-in-cheek description caused laughter at first, it also made the attendees reflect and realize how much the industry is changing. Many (this author included), are still in awe over the performance of the SAW filter. Technology is changing at an alarming rate! New DTV exciters perform many new functions, albeit retaining some of the essential elements of the old. Relative to new DTV exciters, the operation of existing analog exciters seems simple.

Reviewing analog exciters briefly, the inputs are simple: audio and video and maybe some additional subsidiary signals. The signals, primarily the video, are processed somewhat to correct for downstream errors. Simple amplitude modulation of the video portion is completed with the resulting signal filtered to obtain the familiar VSB signal. The audio signal is FM modulated on a frequency-controlled carrier and the resulting signal is either added to the VSB visual signal or maintained separately depending upon the type of amplifiers in use. The result is one or two TV signals operating on an intermediate set of frequencies. These signals are then upconverted to the desired channel and amplified sufficiently to drive the amplifier stages. Although this may have been considered complex, it pales in comparison to the new generation of exciters.

Basics

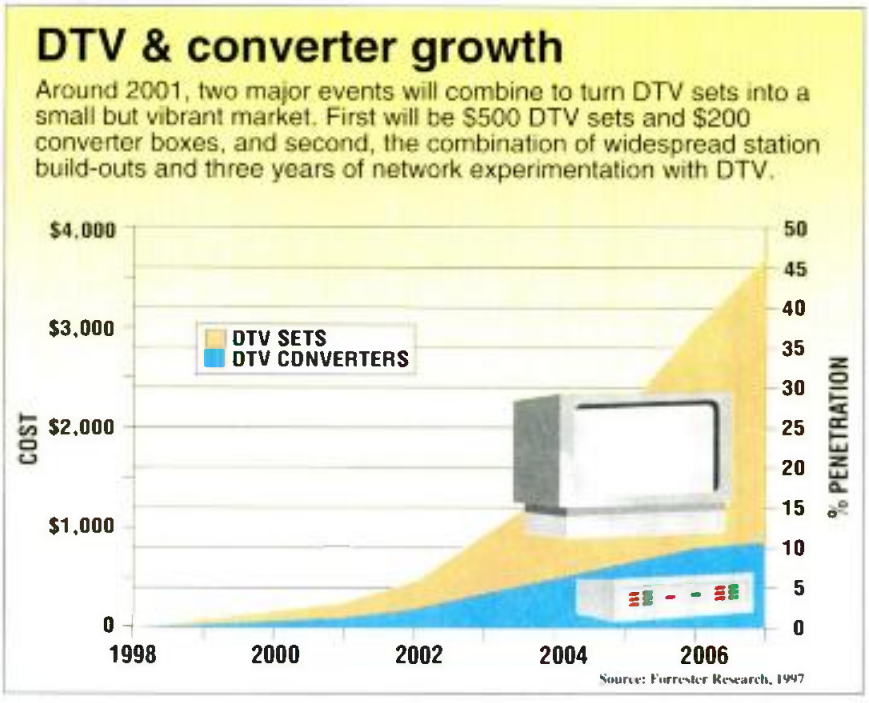
DTV exciter operation starts with an encoded 19.39Mb/s digital datastream. The datastream contains all of the video, audio and data to be transmitted. The information is contained in 188-byte data packets. In many cases, for remotely located transmitters, the datastream will be best formed at the studio and sent to the transmitter on a digital STL. Although it may be possible to deliver the multitude of independent signals to the transmitter site separately, it is typically not preferable because of the bandwidth requirements of a baseband STL, as well as equipment such as the MPEG encoder that will then need to be located at the transmitter. Regardless of its location, the exciter itself will simply look for the input datastream.

As explained in prior issues (see "Understanding and Testing the 8VSB Signal," in the November 1997 issue), the exciter randomizes the signal and generates a usable flat spectrum that contains the necessary information. Failure to randomize the signal could create a transmitted signal which, depending on the input data, might cause unacceptable interference to existing NTSC stations. Look at it this way; without randomization, a condition such as loss of input data could cause the transmitted signal to exceed the acceptable envelope in much the same way that overmodulating an analog transmitter can cause spurious signals to cause interference over a wide piece of the band.

Once randomized, the data is then encoded using a method known as Reed-Solomon encoding. This stage includes the addition of error-correction signals to be used in the decoding process. The sync data is removed prior to encoding and new segment and field sync signals are added downstream from the encoder. The data is then multiplexed and the pilot signal is added. The resulting signal is then

FRAME GRAB

A look at the consumer side of DTV.



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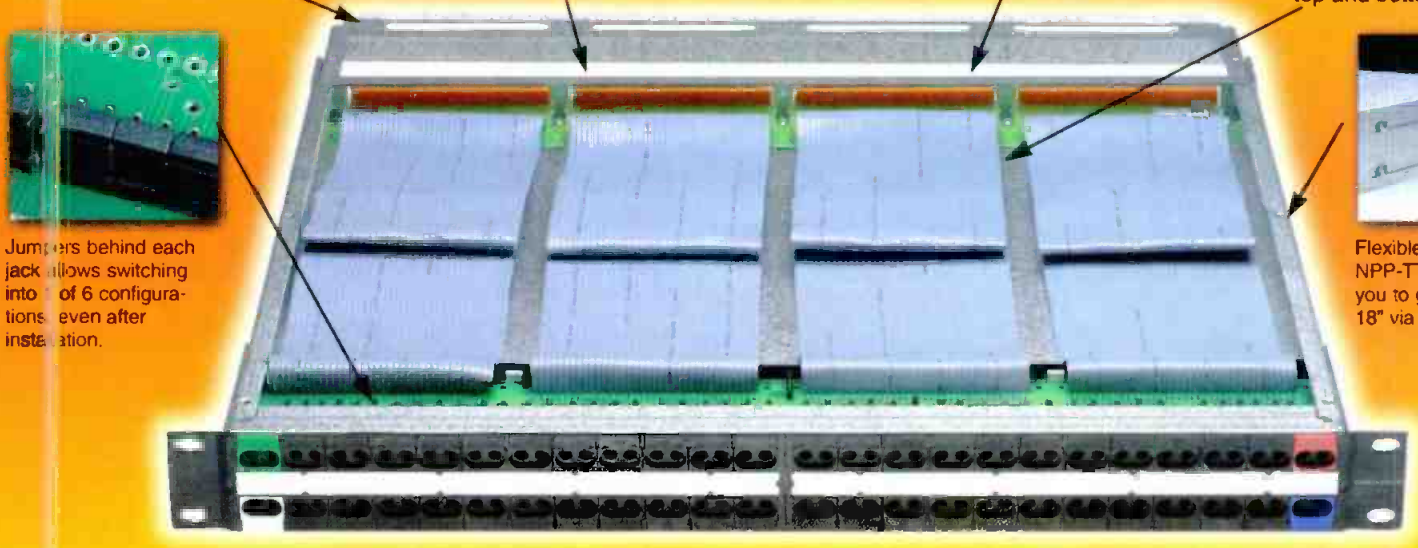

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filtered and converted to an analog signal with high-speed digital-to-analog converters. Now, the DTV exciter starts to resemble analog exciters in that the resulting 44MHz IF signal is upconverted to the final operating frequency for driving the amplifier stages.

The big picture

An important point here is that the overall processing and filtering process must correct for errors in the amplifiers, transmission line system and antenna. To an even greater extent than in analog systems, the total transmission facil-

The Harris CD 1 8VSB DTV exciter.

ity must be treated as a complete system. Ideally, the amplifiers and antenna system would have a flat frequency response and group delay. There has been a lot of concern in the industry concerning group delay in waveguide runs and the combiners. This has been particularly true in attempting to deal with adjacent-channel NTSC and DTV systems. One manufacturer working on the worrisome N+1 combining problem has run into significant problems in group delay, which are considered to be beyond the normal correction capabilities of the exciter.

Despite this, it appears that a great deal of correction is possible in the exciters. This correction will compensate for errors that have been measured in the amplifier stages and combiners (N+1 excluded). This includes at least one system using an N-1 combiner. Transmitter manufacturers with whom this has been discussed all feel that enough equalization is possible to compensate for all anticipated problems in practical antenna systems.

In direct opposition to the gloom and doom that many have promulgated concerning DTV, it appears that the industry is rising to meet the challenge. Just as in the past, when technical problems have appeared to be beyond reasonable capabilities, transmitter designers come up with the equipment necessary to do the job. Sure, there will be more problems that will develop as DTV matures, but this writer sees the glass as more than half full, and expects to see all of those problems not only met, but beaten. Of course, I also liked both the Edsel and the Tucker. ■

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

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Production Clips

Lately in audio post

BY DON BARTO

Have you ever caught yourself mixing as you edit or editing audio material without listening to it? Have you done any editing in fast forward (or fast rewind?) or how about multiplexing three or four projects at once?

At a crucial point in a difficult mixing job would you be willing to reconfigure the equipment in your control room to do an incoming ISDN voice-over session, complete with an on-site producer in the control room and a room full of clients sitting in on the session at another location in the country via a two-way phone patch? What if you were able to reconfigure it all instantaneously with a few keystrokes? And then, after doing a few long-distance edits, flutter effortlessly back into that original mixing job a minute or two after disconnecting from the ISDN feed?

Sound far-fetched? Not really. Reckless? Not at all. Unorthodox? Definitely not. It's just that the latest generation of digital audio workstations has given us faster, more powerful tools to shape and manipulate sound, as well as change the fundamentals of how engineers in audio post approach their work.

Serial tracks vs. parallel tracks

Many sound editors and mixers working in the audio-for-video field got their start in music studios. This discipline has always demanded dedication to the project at hand, tireless attention to production and technical details and a talent for skillfully and efficiently organizing the many sound elements that make up a project. This includes knowing where all the good takes are, and being able to hear and to selectively and effectively alter the simultaneous and the near-simultaneous components of those sounds.

In music and television, the serial or sequential structure of sound is usually a given for the sound person. Sequential structure is something that is dictated by the musician or by the sequence of events in a video scene, although it can be altered a little here and there with a razor blade or a time-code offset.

Don Barto, sound editor for Big Shot Productions, sitting in front of his digital audio workstation.

As technology has increasingly provided and encouraged, the simultaneous or parallel nature of sound is the domain of the well-armed sound editor and mixer. Mixing consoles have evolved from suitcase size in the 1940s, to the concert grand-size versions in use today. First, there was inch-wide recording tape, then two inch; 16 tracks, 24, 48, and even pairs of 48 tracks rolling in sync together. Conventional wisdom tells us that the only valid way to control complex sound events is to deconstruct them into discrete elements and then arrange those elements vertically (and logically) across a wide piece of tape where they can be presented horizontally across the many input modules of a mixing console.

So, after more than 20 years of tackling most of my mix and sound design problems through parallel track building, it seemed natural for me when the 240-channel digital audio workstation was hoisted into my control room, to spend a couple of years using it to build virtual versions of what I had been doing previously on multitrack tape. Though it was happening much faster and more smoothly, I was basically doing the same things I had always done; meticulously breaking out related sound elements onto their own tracks or groups of tracks — checkerboarded production tracks, narration, voice-over, A&B stereo music tracks, A&B stereo presence tracks and the rest for sound effects. I was making digital pictures of tape. That was the correct way to do it. Right?

It seemed right until I started getting more into the mix automation. The re-examination first started when I would need to put a stray mono sound effect onto a vacant spot on one side of a pair of stereo presence tracks. (Sometimes, I would even put the mono effect on both tracks, think-

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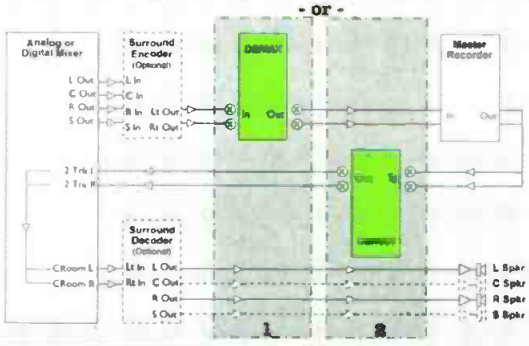

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ing this would somehow make it all right.) As much as I felt I was doing something wrong, the pan pot automation could easily deal with the minor indiscretion. And it did not cause any grief when I had to lay off a surprise M&E mix either.

This approach shifted into a higher gear when I started taking advantage of the powerful real-time dynamic equalization and dynamics processing capabilities of my workstation. I stopped routinely checkerboarding my dialog tracks because I felt comfortable using my mix automation to rifle through the necessary level, EQ and dynamics changes. It made it possible for me to effectively control extremely complicated mix moves sequentially. I was able to zip through projects tackling just about anything in a head-on, serial fashion. I was still affecting the mix in much the same manner as before, but the mode of visual presentation and thinking had changed.

Now, when playing back a mix, my console sometimes looks like a pinball machine, with faders, pan pots, aux sends, equalizer and dynamics indicators ripping and racing around — doing the same sort of processing as before, but applying it in a more sequential manner, concentrated on a much smaller number of tracks. The mix sounds much like my previous parallel constructions, but I'm not working as hard or as long. Of course, I still do a lot of editing, but the difference is that the organization is more fluid and I start mixing much sooner. In fact, sometimes I start mixing first.

Mix first, then edit?

Well, not mixing mixing, it's just that my workstation lets me start to roughin and save some of my initial mix impressions as I'm editing. Previously, many of us would approach sound editing and mixing as separate operations. If you wanted to drive a sound mixer nuts, all you had to do was ask him or her to recut some narration in the middle of a mix session or to add a boat horn or more seagulls. Now, the distinction between editing and mixing is starting to blur and it's because digital audio workstations are making it practical and desirable.

When editing, it makes good sense to set initial trim and pan settings and tackle needed EQ and dynamics adjustments as they are encountered. Also scope out what the overall dynamic range of the program needs to allow for. Have you ever been faced with deciding whether to live with a puny-sounding sequence that is supposed to be big and pounding and explosive, but you ran out of headroom? Should you pull the program master down or would it be best to just start the mix from the top again?

When editing, it makes good sense to set initial trim and pan settings and tackle needed EQ and dynamics adjustments as they are encountered.

And conversely, now we can painlessly edit in mix mode — it's never a problem again, because of the equipment (be sure to save the mix prior to re-editing something — faders can get jostled around when we're not careful). The editing capabilities of these workstations have spoiled me so much that I have been catching myself topping and tailing and removing breaths from dialog clips in fast forward. Sometimes, I do it visually based on the waveform display. I seldom listen to edits when I'm looping presence. I know there will be opportunities to check everything out and correct as necessary as I mix. It makes the sessions fly by. And speaking of sessions, what about that ISDN nightmare scenario I mentioned earlier?

Project data

Moving confidently and effortlessly from a mix session to an ISDN session is made possible through project data. Project data encompasses all signal paths, gains, signal-processing choices, automation — everything. Project data was intended to be the means by which mix automation and the necessary console configuration for a specific mix could be reliably and conveniently stored and recalled.

Customarily, there is a default project that is designed for each specific studio, taking into account the peripheral equipment that is connected to the system and the preferences of the operator(s). Recalling this default configuration takes about half a minute and takes everything in the system to the point where you would want it to be to begin a new project. Loading a previously completed project would configure the system to play back an existing mix and re-perform the mix from original mix elements.

Projects also can be defined and stored for later use that configure the system for anything, including the tricky two-way signal routing of an ISDN voice-over session or to record six feeds from my synthesizer rack, complete with the gains, panning and EQ. Now, when I get a last-minute call from scheduling to do an emergency ISDN session, my biggest concern is wondering if I'll be able to remember how to reset my stopwatch.

Project data lets me effortlessly multiplex many projects throughout a typical work day. Sometimes, I feel like an air traffic controller bouncing back and forth between the half a dozen or so projects that are usually sitting in my disk store, adding new elements as they come in-house, running mixes as they are needed, recording voice talent to pictures as they become available or as their lines are written.

The right tools make the job

As our medium and the industry continue to evolve, more and more of us will be using the kinds of tools we need to do the best job we can. And, we will continuously re-examine the way we are using them. ■

Don Barto is sound editor, mixer for Big Shot Productions, Baltimore.

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SYSTEMS DESIGN SHOWCASE

On-air switching is done with the BTS Philips Saturn digital switcher. This switcher provides a path to automated, multichannel operations.

KCPQ goes all digital

BY GREG DOYLE

KCPQ FOX 13 entered the world of digital broadcasting with the launch of its new Seattle facility in September. Designed by the Sparling broadcast division, this facility incorporates component serial digital video and AES digital audio throughout. Sparling provided consulting, design and project management for the station's critical areas, including electrical power systems, telecommunication and data infrastructure, lighting and broadcast technical systems.

The Pacific Northwest has experienced rapid growth. This prompted KCPQ to leave its old analog facility and begin anew with an all-digital facility located near Lake Union in downtown Seattle. The building, originally a warehouse, underwent remodeling and upgrades, plus an addition of a third floor. KCPQ is now housed in a 72,000-square-foot TV station. Key technical elements of the facility — which provide a solid foundation for the coming DTV era — are the switching systems, DVE, camera and recording systems. All of these systems are capable of generating and recording component serial digital material in 16:9 format. By keeping the facility within the serial digital arena, a path to the future has been established as technology and DTV standards are more clearly defined.

Signal management

In modern facilities, one of the most important pieces of equipment is the routing matrix. KCPQ chose Philips Venus digital audio, video and RS-422 routing matrices. The present system is configured as 120x120 with room for expansion up to 160x160. The Philips Jupiter facility control system was chosen for router and machine control. Though challenging to program, the Jupiter control software provides a powerful, dynamic, virtual matrix control system. The Jupiter system is essentially a relational database that defines inputs and outputs to all switching matrices, keeping the facility in controlled orbit. In the technical center, a PC running Windows 95 is connected by Ethernet to a pair of Philips VM-3000 virtual matrix system controllers in a redundant configuration. Updates or changes to system configuration are uploaded to the VM-3000 via the Ethernet. SI-3000 expansion serial interface units provide additional control panel ports and RS-422 machine control. These are assigned in the Jupiter configuration tables.

The air chain

Also connected to the Jupiter Ethernet is a Saturn master control switcher. Saturn has 16 direct source feeds with five additional inputs tied to the Venus router matrix. Feeds are assigned to Saturn with a unique label based on connection to Saturn's direct internal matrix or signals provided by the Venus matrix. Using careful signal management, it is possible to provide full access to any signal in the facility by assigning them to the Saturn input tables in Jupiter software, while still operating independently of the Venus router if desired. A Philips Mars 24x4 digital router is connected downstream of the Saturn for redundancy. All feeds associated with the Saturn master control switcher are

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distributed to the Mars router.

Commercial insertion is done with a Hewlett-Packard Spot Bank automated server and long-format air-play from an Odetics TCS-90 LMS under Roswell automation control.

A Grass Valley Group 64x64 Horizon router — used in the analog facility — will continue to provide service in the new facility. The router, under Jupiter control, is used to create satellite pathfinding and monitor wall assignment in the production control room. A salvo can be written to assign monitors and tallies based on the type of production being done. Analog monitor feeds can become scarce in an all-digital facility. This was overcome in the KCPQ facility using Tekniche 6021M, 1x5 monitor DAs. The 6021M is able to provide five serial digital outputs or, by jumper selection, up to four of the outputs can be set to eight-bit composite analog output.

Analog to digital

All incoming NTSC analog feeds are pre-processed with Ross Truck Amp series equalization processors and then sent to the Horizon analog router. An output of the Horizon is fed back to satellite control analog scopes and QC monitors for assessment of analog audio and video. By selecting the incoming feeds at the satellite control location, quality and signal level adjustments are optimized prior to conversion to serial digital.

Satellite and inner-city fiber feeds are directed to Tekniche model 6017 analog-to-digital decoders, 6060E frame synchronizers and 6024 stereo-to-AES decoders using a method called pathfinding. Satellite pathfinding is similar to telephone trunking systems. Presently, there are 16 incoming feeds received for archiving or direct-to-air broadcast. These feeds are sent to the analog router via the Ross Truck Amp processors. Eight outputs of the Horizon are then connected to eight Tekniche analog-to-digital decoders and digital frame synchronizers. The serial digital frame sync outputs are sent to Venus router inputs as pathfinding trunks. When a Venus output has selected one of the 16 satellite or incoming video feeds, Jupiter identifies the desired signal, finds an unused path through the eight Horizon pathfinder outputs, then directs the Venus output to select the pathfinder input the desired feed was assigned to, thus completing the path.

Digital to analog

Although the facility operates in the digital domain, the transmission path will remain analog. This digital-to-analog conversion is made just before leaving the facility on fiber. DS-3 fiber is used for the STL to Capitol Hill, east of downtown Seattle. The fiber feed is decoded and then transmitted by microwave across Puget Sound to the transmitter on Gold Mountain, west of Seattle.

Post-production

Production is built around a Quantel Clip Box server located in the technical center and Panasonic D-5 serial component tape machines. The Clip Box provides eight hours of non-compressed or up to 40 hours of compressed CCIR-601 storage with eight SDI input/output (I/O) ports. Four of the I/O ports are dedicated to edit suites and three are used with a PC-based virtual controller.

There are three on-line edit suites using Quantel Edit Box 2000 editors and two off-line rooms, one of these using a Quantel News Box 200 and the other providing cuts-only, machine-to-machine editing. All edit suites share a Chyron Infinit! character generator by patching the keyboard and prompt monitors to individual suites as needed. Edit suites also share a Quantel Picture Box still-store. RS-422 keyboard control from the Picture Box is sent to users via the Venus RS-422 router matrix. When an edit suite user panel has selected the Picture Box, the keyboard control is captured by that station. This connection is not able to be reselected by another user until the first station has released the Picture Box. This provides a flexible use of equipment while protecting users from interruption.

Power systems: Be prepared

With computer server technology in mind, Sparling designed a power backup system providing a 750kW diesel generator and a 300kVA/240kW UPS. The UPS provides filtered, uninterrupted power to all technical and studio areas. In the event of a power failure, the UPS will keep all air-critical systems — including emergency HVAC — on-line until the generator comes up to speed.

Sparling's mission for the KCPQ project was to develop a framework for a flexible infrastructure to accommodate today's and tomorrow's broadcast technologies. Equipment was chosen and systems designed so that new technologies can be easily integrated — a consideration made especially important with DTV. ■

Greg Doyle can be contacted at 206-224-3622 or via E-mail at gld@sparling.com.

Editor's note: Tekniche standards conversion and format conversion equipment was inadvertently left out of the '98 Buyers Guide. For more information, call Tekniche at 888-TEKNICHE.

Design Team:

Architect: Callison Architecture
Electrical, Telecommunications & Broadcast Technical Systems: Sparling
Architectural Lighting: Candela, a division of Sparling
Studio Lighting: Strand Lighting
Mechanical: Holaday Parks
Construction: Sellen Construction
Equipment Acquisition: Digital Systems Technology

Equipment List:

Philips Jupiter facility control system; Philips Venus, 160x160 serial digital video, 160x120 AES audio and 32x32 RS-422 router switchers; Grass Valley Horizon, 64x64 analog audio, video router switcher; Philips Saturn, master control switcher; Philips Diamond 30, 2-M/E production switcher; Tekniche A/D, D/A and SDI distribution equipment; Questech Charisma TenX, three-channel DVE; Quantel 8-channel Clip Box; (3) Quantel Edit Boxes, on-line editors; (1) Quantel News Box, off-line editor; (3) Quantel Picture Boxes, still-store; (1) Quantel Hal, multilayer paint and animation editor; (1) Quantel Paint Box, graphics creation platform; Hewlett-Packard Spot Bank, commercial playback server; Odetics TCS-90, Roswell on-air automation; (3) Philips LDK-9 studio cameras; (24) Panasonic AJ-D580 VTRs; (11) Sony BVW-75 VTRs with CCIR-601 output; (3) Ampex VPR-6 1-inch VTRs; Tektronix, master sync generators, reference scopes; Nvision A/D, D/A and digital audio distribution; SSL Axiom 36-input mixing console; Yamaha O2R 24-input mixing console; (2) 360 Systems, Digicart & Instant Replay; Clearcom Base III, 50-channel intercom matrix; Comscope/Gepco coax and audio digital cables

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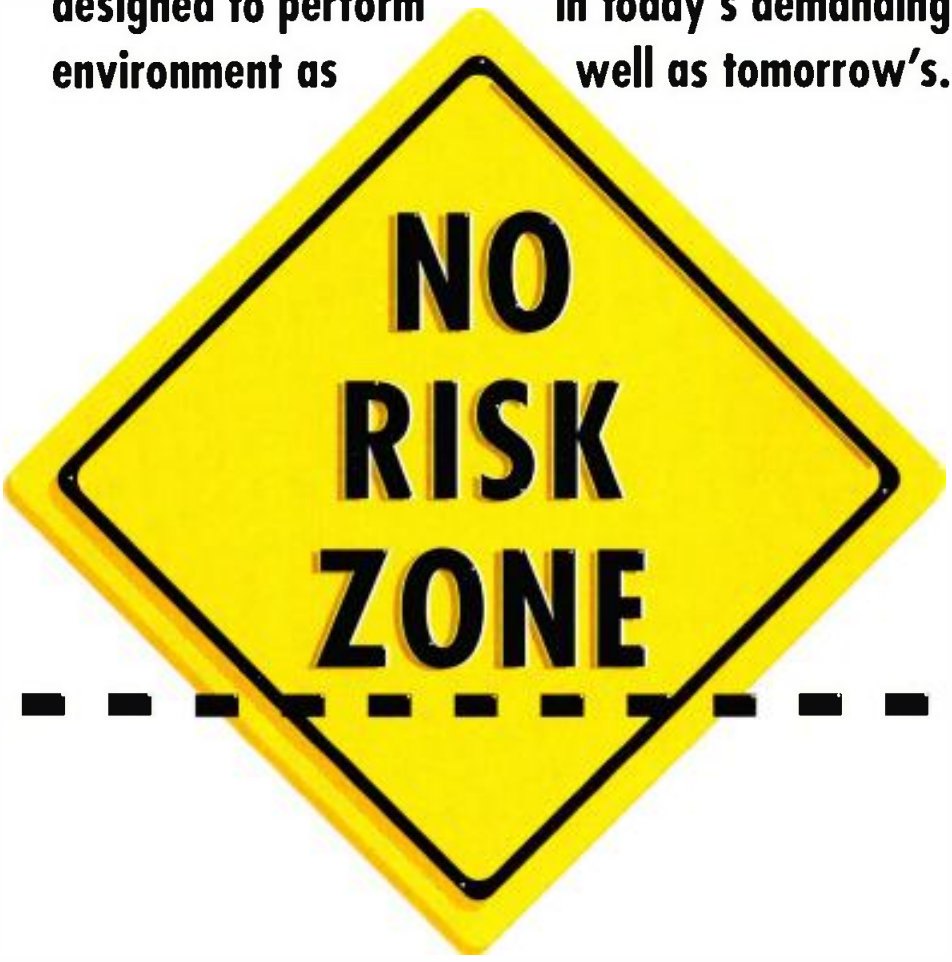

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SYSTEMS DESIGN SHOWCASE

Betelgeuse editor Ed Givnish at edit room 6 with the Sony BVE-9100.

BUILDING AN EDIT SUITE IN LESS THAN 30 DAYS

BY GEORGE VELOSO

I am writing this article in my office at Betelgeuse Productions (pronounced "beatle-juice") surrounded by packing boxes, computer hardware, blueprints and circuitry. You see, I'll be moving my office down the hall over the next few days to make room for a new integrated multimedia and graphics room. Before I moved into my current location, my office had been located adjacent to the scheduling office and the editors lounge. That space, however, was needed to construct edit room 6, which is at the core of this story.

In the years that I have been with Betelgeuse, the company has expanded from four edit rooms and a staff of 35 to the current size of 22 post-production rooms and more than 80 people. Currently, the operation is spread over five floors in two different office buildings in mid-Manhattan, and if history is any indication, it is a safe bet that our most recent construction won't be our last. In fact, I am certain it won't, because tacked to my soon-to-be former office are the plans for further edit-room upgrades in April.

The bulk of the Betelgeuse client base consists of network sports producers whose work ranges from finished shows to program reformatting. We have been a lead post-production facility for the last several Olympic Games and are currently the exclusive U.S.-based edit facility for the CBS production of the Nagano Olympics. It was partly the commitment from CBS that led Betelgeuse to construct two new digital component edit suites. The consistent quality and workflow efficiency of digital component systems makes it an excellent investment for high-end broadcast and post-production applications.

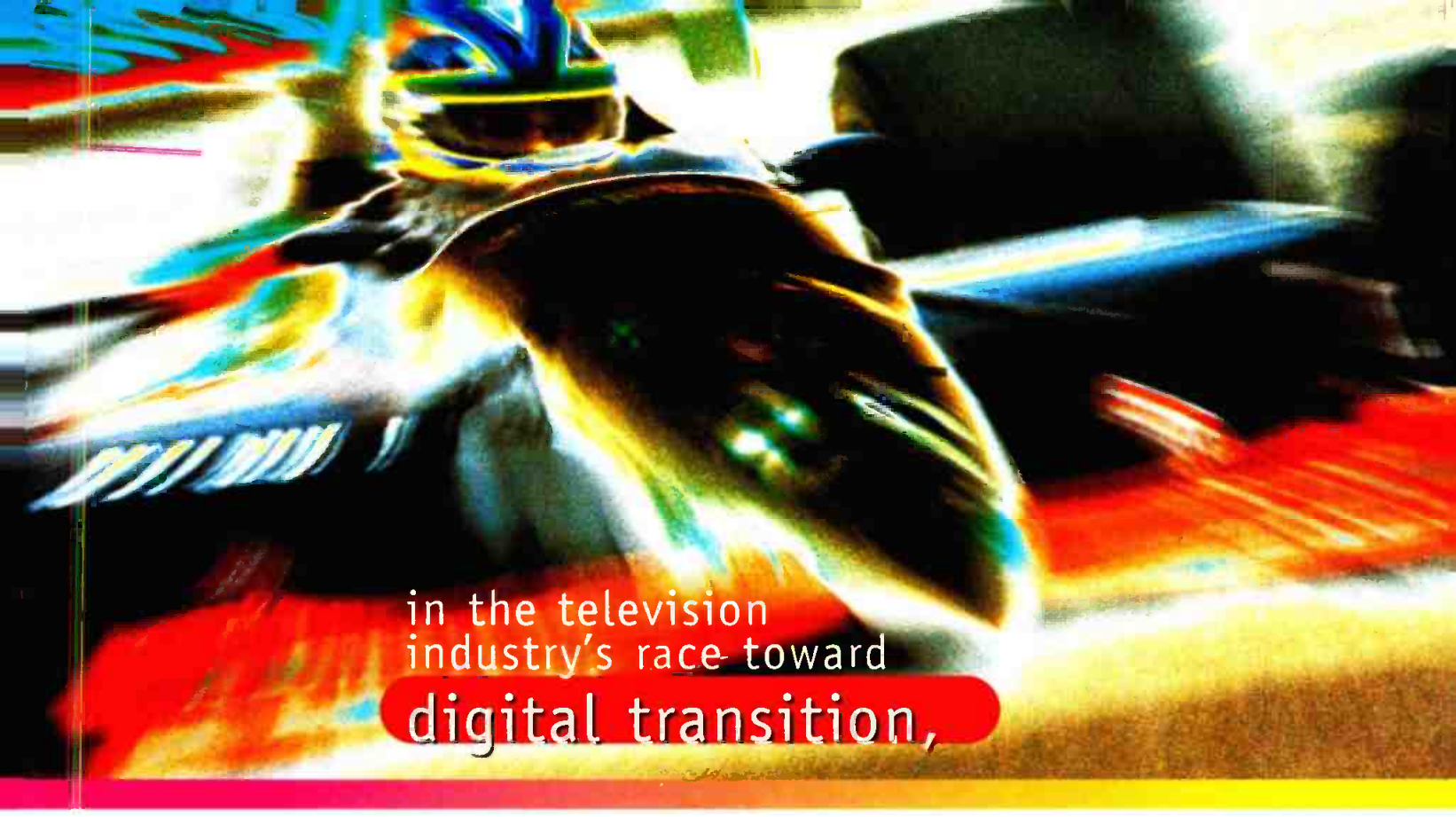
The Sony solution

In early August, Betelgeuse made the decision to become the first post-production facility in New York to construct a Sony digital component suite, and we agreed to make the two rooms mirror images of each other. The first suite (edit room 6) would be all new construction, while the second suite (edit room 1) would be installed in what had previously been a room with a Grass Valley digital switcher and Kaleidoscope. Because CBS had booked time in the first room for Sept. 16, only 30 days away, our challenge was at hand.

Integration is one of the industry buzzwords we hear time and again, yet, for Betelgeuse, it had dual meaning for the pending construction. Integration refers to Sony's system approach to edit suites — editor, switcher, DME, VTR all speaking the same language — as well as to the work of the company's System Integration Center (SIC) in managing edit suite installation from design through project completion. Typically, installations can take anywhere from 60 to 90 days, but we had to meet a much shorter deadline. All of the editing equipment is 4:3/16:9 switchable, which we believe is an essential investment for the near future.

Ergonomic design

My first task was to develop the plans for the two rooms.



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As any facility engineer knows, an essential consideration in design and construction are the elements needed to make the editor feel comfortable. Edit room design must not only optimize the features of the hardware and software, but it also must be sensitive to the human demands imposed on a work environment.

For instance, over the past few years there has been a noticeable shift in the relationship between producers and editors. The hierarchy that was once understood between them has been erased and inside the edit room, editors and producers are more like peers. That evolution is manifested physically in the desire of producers to sit alongside the editor and share in the intuitive feel for the effects that are being executed. Most editors are appreciative of the opportunity to work at the same level as the producer and that need had to be accommodated in the configuration of the editor, switcher, DME, character generator and the ergonomics of the console housing hardware for edit room 6. At the same time, the need of many of our sports producer clients to view isolation shots and make changes on the fly also necessitated creating a separate console with monitors elevated behind the edit area.

Our Olympic productions deadline meant that it was impossible to construct everything on site. However, we were able to trim days from the total construction schedule by completing all of the pre-wiring for the jack fields, switcher and DME at the Sony facility in San Jose, CA. The plan, which worked well, was to complete all of the pre-assembly and system wiring in San Jose, then tear them down there and have the pieces shipped to us for on-site assembly. In edit room 1, we were able to work with about 80% of the existing cabling and the AC power system did not have to be changed.

The equipment arrived ready for installation on Sept. 2, and we had the good fortune of spending Labor Day weekend dropping equipment into consoles constructed by Time Based Consoles. Additional A/D, D/A and D-2 to D-1 converters were needed to support the new room and integrate it into our existing D-2 and analog tape rooms. We soon began to understand what operational adjustments we would have to make to implement the new system software that would route all the audio and video functions through the BVE-9100 editor.

Fortunately, all of the needed equipment was available, except for the DVS-7250 switcher control panel. Because so much of the pre-wiring had been completed at the factory, our timetable for installation was met and everything was up and running on Sept. 16.

Of course, it would have been unwise to put our editors in the position of tackling a new room and facing a client without adequate training. In order to avoid that, we installed a temporary pre-fabricated Sony environment system at Betelgeuse during the edit room 6 installation. This allowed us to train our editors on equipment that closely approximated the new room. The editors continue to get more comfortable with the system every day and the results have been good.

Betelgeuse president John Servidio (foreground), editor Jeff Wurtz (background) at work in edit room 6.

When it came time in October to construct edit room 1, the process was even more streamlined, and the actual on-site installation was completed in only four days. For businesses like ours, the hard lessons learned over the years can be applied to make the task of radical technological changes and reconstruction less daunting. We believe that working in close contact with a key supplier, in this case Sony, can only pay dividends for both parties.

Ultimately, the viewer is the final judge. Perhaps, when you are watching the athlete profiles from the Nagano Winter Games, you will see for yourself that delivering broadcast-quality material can indeed be produced in rapid fashion, with minimal heartache and optimal quality. Those are golden words for post-production facilities and their clients. Now, back to my drawings for the April upgrade. ■

George Veloso is vice president of engineering, Betelgeuse Productions, New York.

Equipment List:

Edit Rooms 1 & 6: Sony DVS-7250 switcher; BVE-9100 editor; DME-7000; DVW-A500 VTR; DVR-20 D2 VTR; BVM-20E1U program monitor; PVM-14M42 program monitor; Graham-Patten 820 audio board; Chyron Infinit!; Miranda Crystal converters; Tekniche D-2 to D-1 converter; Tektronix 601 i; 1740a WFMs and 764 audio analyzer; Leitch DFS-3121 dual-channel still-store; Zaxcom TBC; Grass Valley video and audio D/A (edit 1); Ross video and audio D/A (edit 6); Urei 813 control room monitors and Spendor A500 monitors; Crown K1 audio amplifier

Editor's note: Tekniche standards conversion and format conversion equipment was inadvertently left out of the '98 Buyers Guide. For more information, call Tekniche at 888-TEKNICHE.

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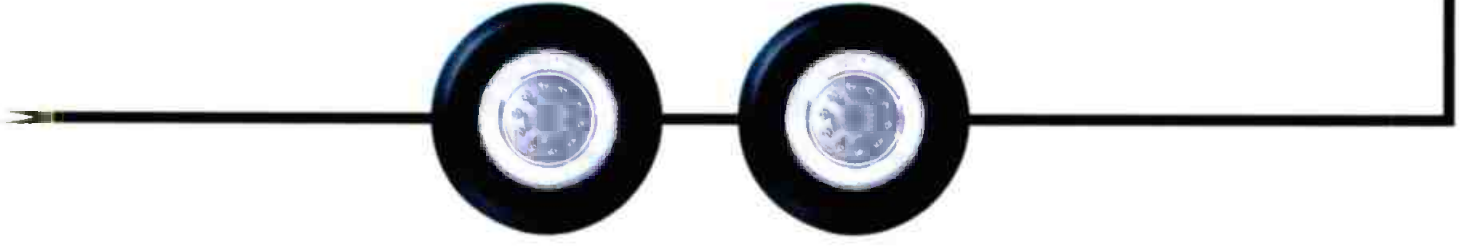

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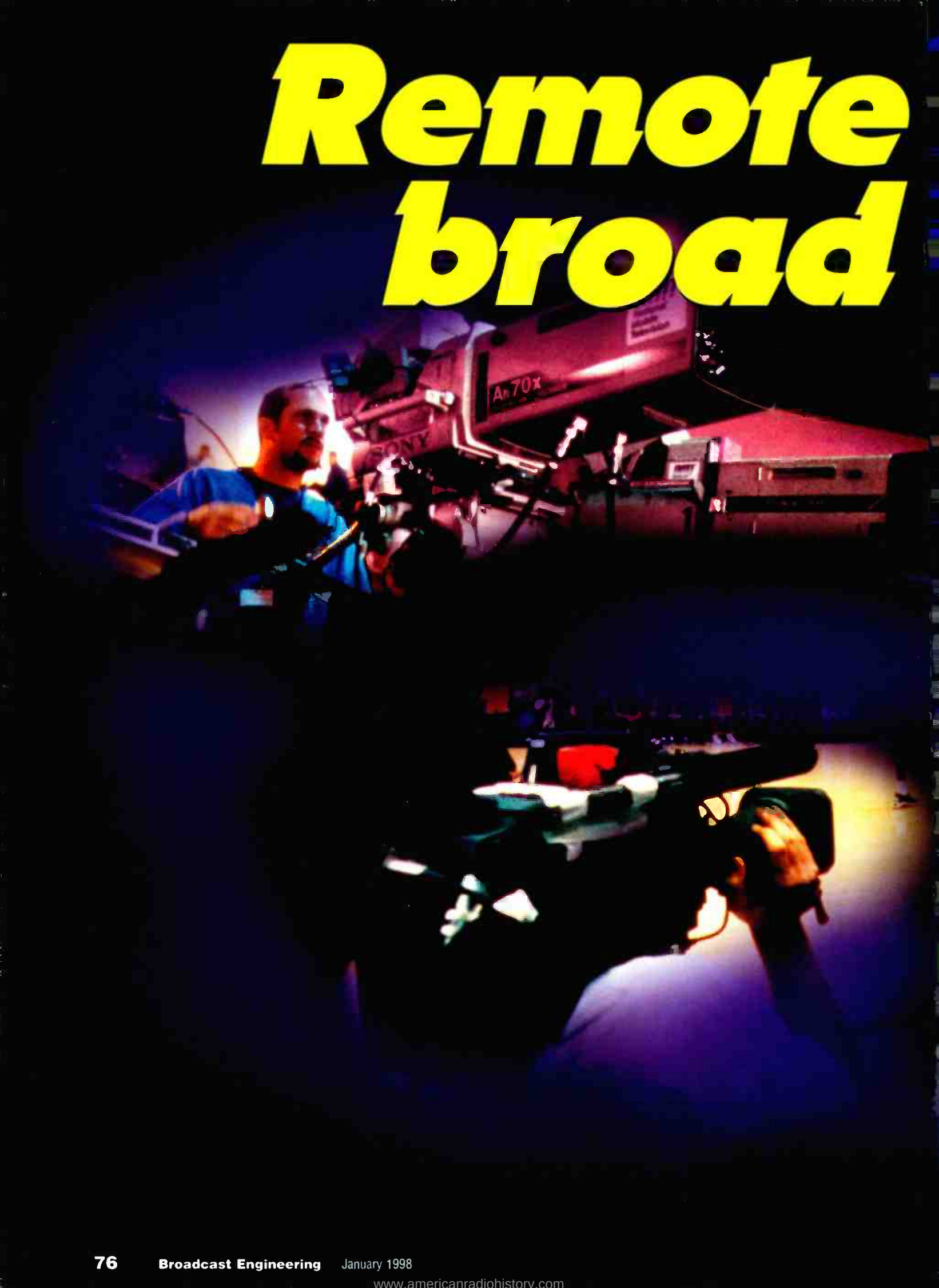

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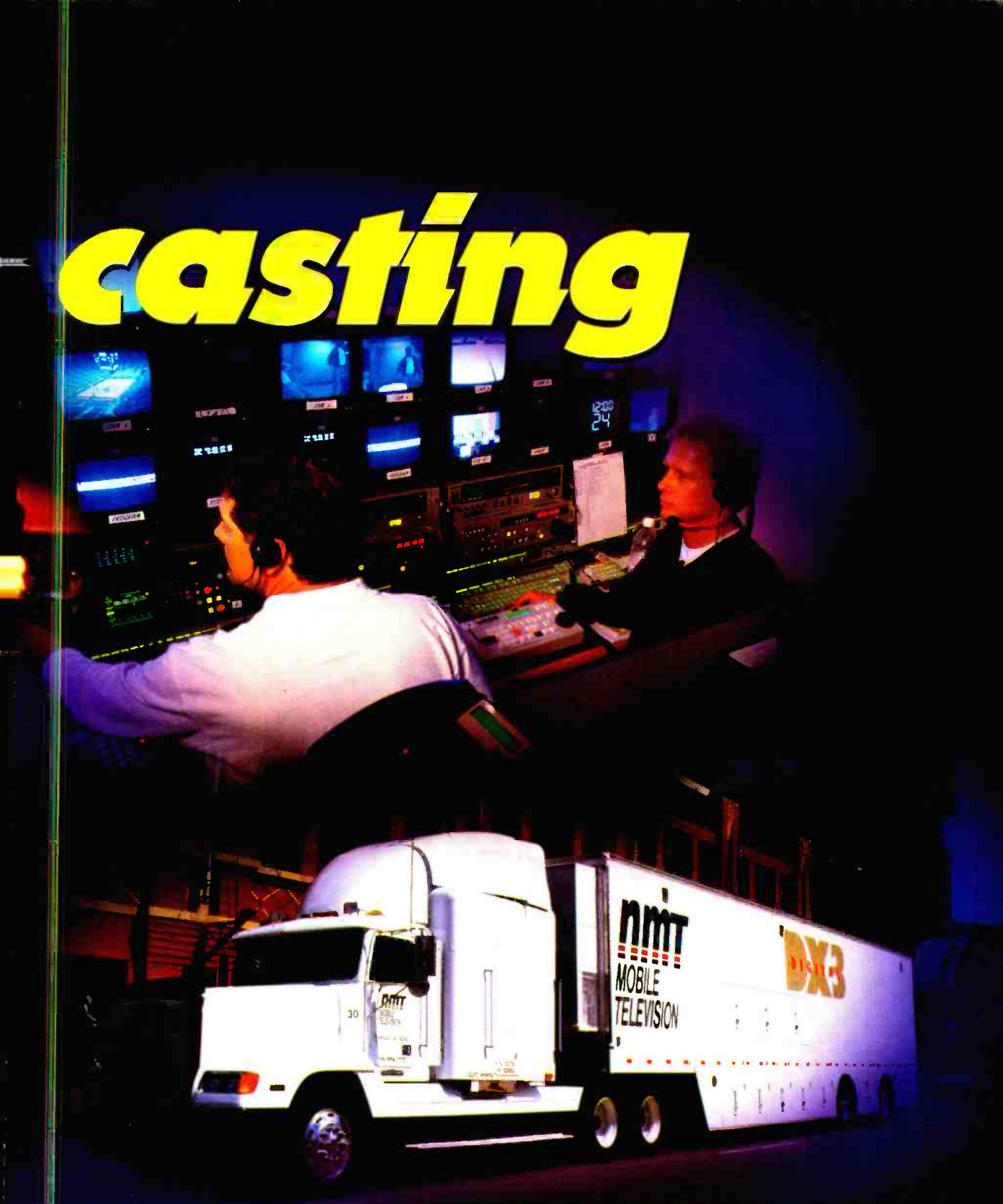
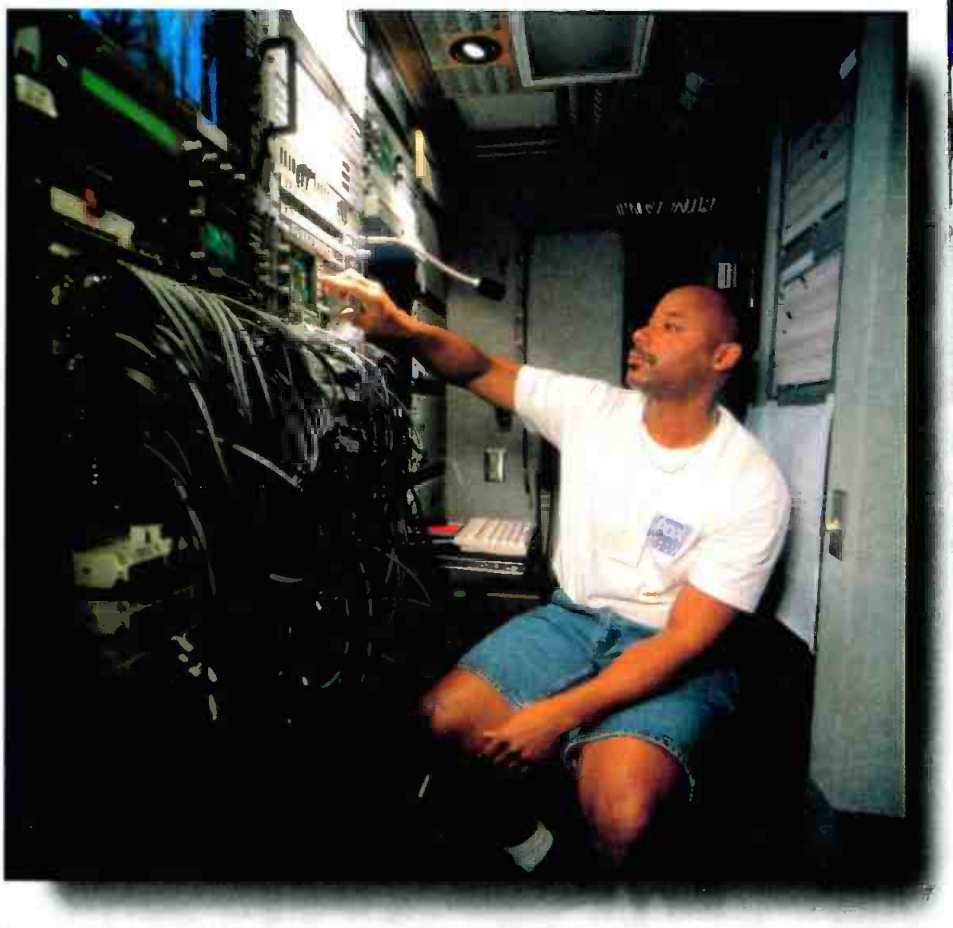


DIGITAL LINKS FOR SAT TRUCKS

Compared to wideband devices of yesteryear, new narrowband and compressed equipment provide higher-quality video and audio.

By Peter Ludé



Interior of National Mobile Television DX4, built by Sony Electronics.

If you've been on a Ku-band satellite truck, you know the drill. The biggest story comes into the assignment desk at 3 p.m., and the event will hit late that afternoon. Of course, a live shot is absolutely necessary. And, the networks want a feed from the site. A quick check reveals the shoot is well beyond microwave range. By 3:15, the satellite truck lumbers out of the station and starts its long trek to the site. At 4:45, you and the truck arrive — just 15 minutes before the 5:00 newscast.

Having done this before, you know it is doable. You park the truck oriented so the dish can acquire the desired bird. Then, you lower the truck's stabilization jacks, start the generator, warm up the HPA, raise the dish, locate the satellite to be acquired and perform a crosspole in the process. If you are lucky, the satellite provider will automatically provide you with your station's IFB at the right time, as well as instruct you when to illuminate the proper transponder.

If you've been there, you know it sounds naive on my part. A story of any notoriety is likely to turn into a Ku-truck convention, and transponder time is rapidly becoming a rare commodity. At the site, the first station photographer arrived 20 minutes ahead of you, and a second station photographer is now on the scene. Sure enough, a live shot with two cameras and four mics is now scheduled. To top it off, the first photographer has reappeared with 10 minutes of material to feed to the station, but there is only a five-minute satellite window available. It just doesn't get any worse — then it starts to rain.

To help lower your blood pressure during this "stress test," how about using a digital satellite path? No doubt

you have heard the praises of digital when it comes to preventing signal degradation through the transmission path. It can do that, and digital satellite news gathering (DSNG) has a few other tools that can help improve this scenario.

Digital satellite transmission

A new mindset is required to understand the digital transmission process. It helps to think of a digital video stream as data. In a transmission path this becomes imperative. Compared with a baseband signal, an RF satellite path can play havoc on a digital signal. Satellite transmission is comparable to telephone modems. Modems come with many standards, including those that define modulation methods and bandwidth. For digital transmission, the term baud rate also applies. The baud rate must be less than the channel bandwidth. Baud rate is also referred to as the symbol rate. A common misunderstanding is that baud rates and bits per second are synonymous — they are not. Modulation techniques allow more than one bit per symbol, which allows the bits/second rate to be higher than the baud rate. The same thing is true in a satellite channel.

There are far more things that can ruin satellite transmissions than telephone transmissions. One measure of a satellite link's health is a parameter called received carrier-to-noise (C/N). For digital satellite transmission, energy per bit vs. noise (Eb/N) is often stated instead. The difference between the transmitted Eb/N and the received Eb/N is known as the link margin.

Satellite transmission paths commonly have losses in the 200dB range. Uplink and satellite amps have gains in the range of 50dB to 70dB, and send and receive dishes have gains of 40dB to 50dB. With those numbers, there is not much room for unexpected degradation. Rain fades can subtract an additional 10dB on the uplink and/or downlink side of Ku transmissions. As high a transmission effective isotropic radiated power (EIRP) as possible is needed, along with as high a receive signal and as low noise power as possible.

Relative to the received signal and noise, there is a parameter called antenna gain to system noise temperature ratio. A common figure for this is >30dB/K. Noise increases in northern latitudes as the dish is pointed closer to the horizon. Because of the increased angle, the atmospheric absorption of the signal increases and more of the noise radiated from the earth is picked up.

No doubt you have heard the praises of digital when it comes to preventing signal degradation through the transmission path.

To eliminate some of the noise, Cassegrain feed systems are used. In these systems, the feedhorn points at the sky. Lower link margins can occur at the edges of the continental United States as satellite transmit/receive antennas have more gain at the center of the mainland then near the northern and southern borders and the coasts. The difference can be as much as 6dB to 8dB.

Creating a component digital bitstream from analog video means that the signal no longer "fits" in a 6MHz terrestrial AM channel or an 18MHz FM half-satellite transponder channel.

Moving baseband video from analog to digital

Creating a component digital bitstream from analog video means that the signal no longer "fits" in a 6MHz terrestrial AM channel or an 18MHz FM half-satellite transponder channel. The component signal requires several hundred megahertz of baseband bandwidth — at least 540MHz. Some form of digital compression, such as MPEG-2, also is needed.

Various MPEG-2 profiles and levels have been designed for a range of applications. The level aspect of MPEG-2 specifies the horizontal, vertical and temporal resolution, along with the resulting datastream's bit rate. The profile aspect of MPEG-2 describes the features available to keep the data rate within limits. Profiles allow for the decoding of I (interframe), P (predictive) or B (bidirectional predictive) frames and the luminance-to-chrominance ratio (4:2:2, 4:2:0, etc.). Among the profiles and levels of the MPEG-2 compression algorithm are the contribution quality 4:2:2 Profile@Main Level (4:2:2 sampling with data rates from 1.5Mb/s to 50Mb/s) and Main Profile@Main Level (4:2:0 sampling with data rates of 1.5Mb/s to 15Mb/s).

With these bit rates, digital bitstreams can be "slotted" into today's satellite transponders. Transponder widths vary from 24MHz to 110MHz. Common sizes are 24MHz, 36MHz and 54MHz. The 110MHz transponders are two transponders with contiguous feeder link frequencies and with the same offset frequency feeding the same antenna or two similar antennas. However, as any SNG engineer knows, using a whole transponder is considered wasteful for almost all news operations, because there wouldn't be enough transponder space if everyone did that.

For the trip to and from the satellite, analog video is frequency-modulated. Universal deviation rules for bandwidth use of those half transponders have never been standardized, their usage depended on the individual satellite operator. Peak deviation of ±7.50MHz seems to be common, with normal white levels around ±6.85MHz.

DIGITAL LINKS FOR SAT TRUCKS

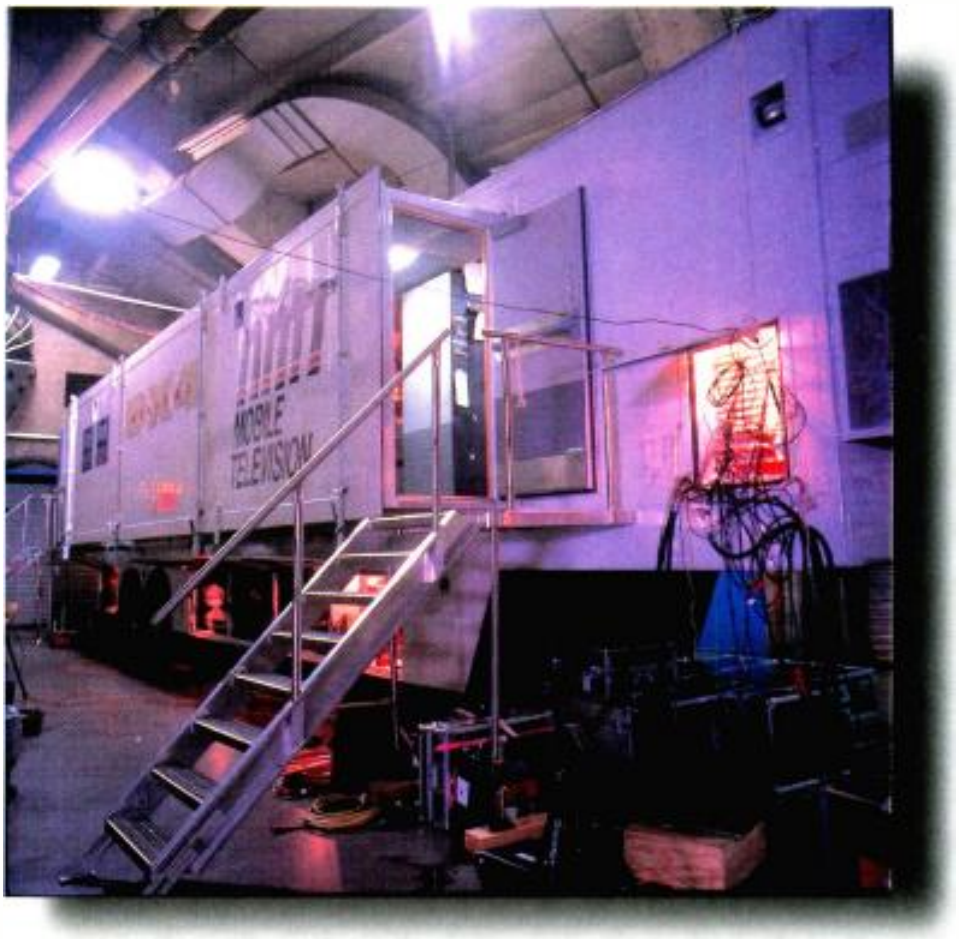
Today, some satellite operators are selling slices of a transponder even smaller than half a transponder. *Spectral occupancy* is based on where the skirts at the edges of the signal fall. One satellite operator considers occupancy to exist between the -26dBc (below peak carrier) falloff points. Satellites are a precious commodity. The cost of launching a satellite is in the $50 to $100 million range, with the cost of the bird rivaling the cost of its ride into space.

Efficient use of these resources has been, and will continue to be, required by the marketplace. MPEG compression can be used to fit the signal into the required bandwidth and, depending on signal quality requirements, can be used to reduce the bandwidth requirements even further. Several streams can be frequency multiplexed into a single transponder. Or, the time multiplex approach can be used. In this case, a single MPEG data-stream composed of multiple elementary streams occupies an entire half (or whole) transponder.

Remember that two-camera feed? Using MPEG compression and digital modulation, video from both cameras could be sent back to the station where they could be treated as two separate sources. They could then be switched at the station instead of being pre-switched at the truck. Instead of sending two different sources, a single source could be sent faster than real time. This solves the 10 minutes of raw tape and a five-minute window dilemma. Finally, a single higher-quality signal could be sent real time.

Digital SNG technology

Digital SNG does not use frequency modulation. Instead, bi-phase shift keying (BPSK), quadrature phase shift keying (QPSK) or the newer eight quadrant phase shift keying (8PSK) modulation is used. Each cycle of these modulation types is considered one symbol. BPSK signifies a high or low bit by a 180° phase shift from one symbol to the next and sends one bit per symbol.



Flexibility is the key to success for mobile production units. Well-designed I/O panels, along with the ability to quickly add to or change the equipment configuration increase a vehicle's flexibility.

QPSK has four phase states. Each symbol or cycle can convey one of four states, which translates to two bits per symbol; with 8PSK it is three bits/symbol. QPSK is twice as efficient as BPSK. But is there a catch? Between BPSK and QPSK there really isn't one, which is why QPSK is often used. Both types have the same power efficiency, but QPSK has better bandwidth efficiency. Power efficiency is the bit error rate that occurs with a given Eb/N.

Neither of these signals has a carrier component in the spectrum, therefore, local carriers must be derived at the receiver. This means that Ku DSNG systems must use high-quality LNBs at the receive end. Local oscillators (LOs) used with older LNBs may drift as much as 2MHz to 3MHz. Digital decoders require 70MHz IF, or in some cases L band, outputs that drift no more than 100kHz. The better LNBs use temperature-compensated crystal oscillators in their PLL circuits. The measurement of LNB LO stability is called phase noise, which measures how much energy is found at various frequencies away from the desired LO frequency. An example of a good phase noise measurement is -65dB@1kkHz.

Another consideration is spectrum inversion. Like analog signals, the digital signal is upconverted at least once on the uplink side, downconverted in the satellite and downconverted at least once on the receive side. These conversions are accomplished through heterodyning. Basic communications theory says the product of this process is the original signal, the local oscillator sine wave, and the sum and difference of the first two. The sum product is a replica of the original signal, but at a new frequency. However, the difference signal has a spectrum at its new frequency that is a mirror image of the signal.

Some frequency converters use the sum product (filtering out all of the other products), while others use the difference product. If an even number of these difference products are used in the path, no problem, the double

inversion cancels out. But if it's an odd number, it can cause problems. Digital receivers must be able to cope with this situation. Analog FM satellite signals do not seem to be affected by this, because once the signal is discriminated, a simple inversion of the baseband signal is all that is needed. Most newer receivers sense the inversion and correct for it automatically. When QPSK receivers are used for digital signals the I and Q signals must be able to be inverted to solve this problem.

Another modulation method is quadrature amplitude modulation (QAM). In the United States, QAM is generally used in terrestrial microwave links and not with domestic satellites. The satellite transponders that are generally available for demand usage have traveling wave tube (TWT)-type power output transponders that are inherently non-linear in amplitude transfer characteristics. Amplitude modulation pre-distortion has been tried, but not successfully, so QAM is left to the Canadian birds. The phase pattern that QAM generates is referred to as a constellation. Just as NTSC/PAL color modulation uses phase and amplitude, so does QAM. The number of points in the constellation, such as 16, determines the QAM type. Sixteen points would indicate a 16-QAM signal. Each point in the constellation signifies a sate. Sixteen-QAM has 16 states. It would take four bits to specify one of 16 states. Therefore, every symbol or cycle of 16-QAM conveys four bits, giving 16-QAM two times the spectral efficiency of QPSK. For 16-QAM to maintain the same average transmit power as QPSK, the constellation must be packed tighter. But, as the space between the points in the constellation diminishes, the error probability goes up. Sixteen-QAM needs a higher S/N ratio for the same error performance as QPSK.

One trick used to minimize errors in QAM is to use "Gray" coding for mapping points in the constellation. This means the value of any point in the constellation is only one bit different from any adjacent point. As we will see shortly, when link budgets and error detection and correction are considered, as data payloads increase, error immunity tends to decrease. Modulation schemes that offer higher spectrum efficiency require higher S/N ratios, which means increased satellite link budgets. Or, you could elect to allow lower link budgets, but add error correction bits to correct for errors received. However, this lowers the useful data rate. In the end, both approaches mean you trade data throughput for error rates.

This data rate/error correction tradeoff takes place through the use of forward error correction codes that are sent along with the video. These codes are used to determine if an error has occurred; they also provide information needed to correct the error. Common codes are Reed-Solomon and Viterbi coding and they are often used together. When this is done, it is considered concatenated coding.

Reed-Solomon builds arrays and adds error correction information to the end of each row. To enhance the robustness of these error correction codes, the array is not always read out the way it was written in. The array might be built a row at a time, but read out by columns. This is called interleaving.

Viterbi coding is more involved. To explain it, we must first touch upon the *Hamming Distance*. If you have a binary number and compare it to a second binary number, the Hamming distance is the number of bits that must change in the first number to make it equal the second number. Using the Hamming Distance, more bits can be added in such a way as to minimize the decoding possibilities if an error occurs. A common ratio of info to error correcting bits is 1:2, which is called a span of three. At the receiving end, at any point in time, the last three bits are used to determine what the value of the next three should be. Of eight possible values, only two have the lowest possible Hamming distances. One is used if the next info bit is a one, the other means the next info bit is zero.

This is known as Trellis coding because the state diagram looks like a trellis or lattice fence. The Viterbi algorithm takes Trellis coding to a higher degree by expanding the span used to ensure correct decoding. A two-step process is used; possibilities are limited based on the Hamming Distance, then dummy zeros are inserted and the Trellis lookup is done a second time. What falls out are the two shortest distances, one representing a one, the second representing a zero. This makes for a robust datastream in a channel that can teem with noise. The tradeoff is that for every three bits sent, only one is payload. The other two are for error correction. Viterbi coding can reduce the required Eb/N by 5dB, thus lowering the required link budget.

The advantage of using digital is that once the signal is in its final domain, it stays virtually transparent until the error cliff.

The advantage of using digital is that once the signal is in its final domain, it stays virtually transparent until the error cliff. For satellite transmission, the error cliff occurs when the noise in the path overcomes the receiver's error detection and correction system. Because errors increase as the carrier to noise decreases, the goal is to keep the carrier-to-noise ratio as high as possible. Understanding and properly computing link budgets can help you keep that carrier-to-noise figure up and keep you away from the edge of the cliff. ■

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BET builds new OBV

The BET TV network brings the show to the road with a new mobile unit and gives us a behind-the-scenes look.

By Steven Lewis

To meet the growing needs of Black Entertainment Television (BET), the network selected Communications Engineering, Inc. (CEI) to design and build a 50-foot mobile unit with an expanding side. The custom design was crafted by CEI vice president of engineering John Wesley Nash and engineering director Jim Conley. The collaboration with the BET engineering staff was led by assistant chief engineer Bill Parker and director of audio operations Robert Jackson.

Form follows function

Taking into account time, space and budget, the detailed evaluation of technology, systems and design trade-offs began in 1996. The truck engineering design process adheres to the same rule of form follows function, with BET's functionality needs addressed and defined upfront, which in turn, determined the truck's shape, size and equipment.

In addition, BET wanted the equipment selection to be predicated on its expected use during approximately 75% of the productions. Only those systems to be used a majority of the time would gain a spot within the tightly designed layout.

When building a truck, an equally important consideration is that the truck be provided with sufficient input and output capabilities to accommodate any unique location needs. This also ensures that the truck is prepared for future technology and can adapt to the myriad of location scenarios that it might face in the future.

Attention to detail pays off

The 50-foot mobile unit design issues that were addressed by the CEI/BET team focused heavily on the important audio

The BET truck audio control area with the SSL SL8000GB console.

and video requirements planned for future BET productions and some anticipated third-party venues.

Calumet Coach Company was selected to build the BET trailer. It's always paramount that any design meet the specific Department of Transportation (DOT) rules, which dictate a trailer's allowable size, weight and weight distribution. Key design considerations affecting production operations and trailer weight distribution issues were analyzed by computer simulation. The design analysis and functional layout deliberations ultimately resulted in the trailer being built with split rear axles, rather than tandem rear axles. This affords better weight distribution and provides more stability.

The BET truck's functionality is shaped by the music venues and special events it is intended to support. Considerations within its I/O panel connections and other design details, such as accommodation for 24 cameras, prepare the truck for sports productions, as well. The trailer's 50-foot length allows it to fit into most stadiums and arenas within the United States.

The audio and video interface panels were designed to support fast, versatile setup and include monitoring equipment, as well as intercom and telephone outlets. The truck's power systems are as versatile as possible and can connect to single or three-phase power feeds with a voltage range of 180 to 275VAC. The overall design of a truck represents a delicate balance between weight, environmental systems and budgetary considerations. The requirements for power and A/C were also evaluated against each technology system. The use of smaller, power-efficient systems dovetailed with the need for the efficient use of space.

From the wheels up

Packed into the 50-foot trailer is a full TV production and control facility. There are four different functional areas of the trailer, each of which presented unique design and implementation challenges.

The audio area is located at the rear of the trailer. This is where the audio portion of the routing switcher, SSL mixing console and 360 Systems DigiCart disk recorder are located, along with a wide variety of external audio processing gear. Integrated and available for audio production are multiple DA-98 Tascam digital eight-track recorders. The dense wiring of the audio I/O panels are arranged to be accessible from the rear underside of the trailer.

Special attention was paid to the acoustic characteristics in the audio area to provide as quiet a space as possible during live productions. Reinforced wall materials and acoustic seals were incorporated into the walls with an internal door that allows movement to other areas of the trailer. Polymer materials surround the hanging speaker enclosures and act as acoustic barriers in the upper air plenum. All this combines to help isolate the audio area from the surrounding noise and vibration.

Located in front of the audio section is the production control room area. The 52 monitors in the monitor wall use a combination of 13-inch and 19-inch Sony color monitors. Production switching is handled by a GVG 4000 3M/E digital production switcher interfaced with an Abekas Dveous DVE system. On-air graphics make use of three-channel Chyron iNFINIT workstations with integrated IMAGESTOR still-store.

The control room space is divided into three rows and takes advantage of the trailer's wider 38-foot expando section. The monitor wall and production console were designed to be unhinged from their folded, traveling position to create a larger control area with integrated seating, console and equipment controls ready at hand.

The production control video wall uses an extensive custom tally system supplied by Image Video. In addition to on-air (red), isolated (yellow) and ready (green) indicators, the take me (flashing yellow) message is available with dynamic integration between the router and production systems.

Moving forward in the truck, adjacent to the control room is the videotape and transmission area. Digital Betacam, Betacam SP and VHS tape formats

BET builds new OBV

are accommodated. Access to the rear of the monitor wall is provided from the videotape area. A Sony Slo-Mo recorder is located in the VTR room. Video and audio monitoring equipment is located here, as well as in the audio and production control areas to provide T&M capabilities. The truck's expando wall and space layout allows for the location of a separate tape associate director's console, which incorporates audio/video monitoring and slo-mo control.

At the extreme front of the trailer is the video control area. Located here are the CCU panels, camera triax patching and remote controls for the TBCs, proc amps and frame syncs.

The BET truck videotape area with assistant director's console in the foreground. (Inset: before the build-out, the truck videotape area with assistant director's console in the foreground.

Design twice, implement once

By the time the trailer's shell had been prepared for installation, the equipment design had been completed with much attention paid toward allowing access to the rear of each and every rack. Maintenance capability and equipment access are provided without any interruption to an ongoing production. Outside, fold-out service platform panels provide access to entire lengths of racks in the videotape and transmission areas. Additional truck features include a reinforced diamond pattern skid pad on the trailer's roof that can accommodate cameras, satellite or microwave equipment.

Given the extensive amount of travel life, the effects of vibration needed to be considered. Connectors and mounting hardware were used with removable chemical-locking compounds to ensure secure mechanical and signal connections. All nuts, bolts, washers, I/O panels and rack installation materials take advantage of this technique to retain a tight fit no matter the vibration.

Wired for success

Belden cable was selected for the installation. The cable paths are distributed through three channels under the floor. Cables were also pulled through the upper air plenum, but arranged so as not to impede the air flow within the trailer.

Among the Belden cable products selected were:

- 30,000 feet of digital video coax;
- 1,000 feet, 24 pair hi-flex audio snake;
- 42,000 feet of precision analog video coax;
- 4,000 feet of AES/EBU digital audio cable;
- 1,000 feet of coax thin Ethernet LAN cable;
- 1,000 feet of nine-conductor control cable; and
- 8,000 feet of triax.

The truck has additional wiring considerations that include those connections for connections with the outside world. A 24-line Lucent phone PBX was selected for flexible voice and data communications. The system is compatible with the Telex RTS ADAM intercom system. The intercom system provides a 72x72 matrix allocating a 16x16 matrix for IFB. The RTS system provides flexibility in arranging the IFB, intercom and outside interconnections in addition to providing a TW intercom interface.

For audio? It's SSL
For video? It's Philips BTS

The BET truck's extensive audio design provides as close to an audio-only truck as you can get in a combined A/V truck.

The SSL 8000 series on-air production and multitrack audio mixing console can provide 40 mic inputs and eight stereo inputs, which already have proven effective in some early productions. The SSL console's flexibility is well-matched to BET's jazz, blues or

BET truck transmission area viewing back into the videotape area.

zydeco music shows, but also can be quickly adapted to sports and "talking heads" shows.

Because many different engineers would be using the console, the system had to be flexible and easy to use. BET engineers found the console's signal and routing versatility to be a key factor in its decision to go with the SSL 8000.

After an extensive evaluation, the team selected Philips BTS LDK-10 cameras with Canon 70X field lenses and BTS LDK-10P cameras with Canon 20X EFP lenses. They connect to a Philips Venus digital routing switcher. The truck is triax-wired for 24 cameras to accommodate future large events and has internal CCU connections for as many as 20 cameras.

BET selected the Philips BTS cameras because of their ease of use and frame transfer technology, which provides excellent overall picture quality, particularly on close-up talent shots. The cameras come prepared for future DTV operations with built-in 4x3 and 16x9 capability through Philips' DPM elastic pixel system.

The Philips Venus digital routing switcher provided a good fit given the truck's premium on space and power. The router retains a compact design and accomplishes lower power consumption.

Expect the unexpected

Previously, BET had used separate audio and video trucks for its music venues. However, the nature of live recording often means unanticipated changes need to be addressed rapidly. All available tools and technologies in this new design allow the truck to be quickly configured to capture any event effectively and creatively.

Much ado about everything

The CEI design and build process allowed BET to weigh the various budget, technology, time and space tradeoffs. The result is a beneficial series of well-integrated compromises that have equipped BET with a top-notch digital platform for immediate needs, as well as the expanding production requirements anticipated in the future.

Already the truck has proved to be an indispensable addition to BET's production capability, whether providing production for its regularly scheduled TV shows at the headquarter's facility in Washington, DC, or out on location for live music and sports venues.

The design process allowed BET to make changes and update the technical and drawing systems databases in real-time. Better yet, within 24 hours of receiving the completed mobile unit, the network began its first live production that led to 43 shows in the first four weeks. Not bad! ■

Steven Lewis is director of sales and marketing, Communications Engineering, Inc., Newington, VA.

Equipment list:

SSL on-air production and multitrack audio mixing console; 360 Systems DigiCart/II; Dolby, Fostex, Genelec, Hafler, Acoustech and Sony monitoring equipment; AKG, Electro-Voice, Sanken, Sennheiser, Shure and Sony microphones; Philips Venus digital routing switcher; Philips LDK-10 cameras with Canon PJ70X9.5BIE 70X field lens; Philips BTS LDK-10P cameras with Canon J20X8BIRS 20X lens; GVG 4000 3M/E digital production switcher with truck control panel; ABEKAS Dveous DVE system; Sony Digital Betacam videotape machines with Slo-Mo controllers; Production monitor wall with 52 monitors; Chyron iNFINIT three-channel workstations with IMAGESTOR; Leitch clock and time code; DFS synchronizer systems; Telex RTS ADAM digital intercom; Tektronix sync and test generators; Tally Display System video under monitor

A history of

remote broadcasting

Last year marked the 50th anniversary of the first telecast of the World Series. Historically, this type of activity has been referred to as a "remote." Describing how to conduct remotes is daunting. In this age where camcorders are as pervasive as toasters, the engineering and technical endeavors required to "pull off" a remote are lost on the average viewer. Today, 50-foot trailers with their complement of equipment are the norm. As we begin the next 50 years of remote TV coverage, it's time to look back to where remotes have been and where they are today.

By Jim Boston

The economics of "remote" production has paralleled the airline industry in many ways. People get into these fields because of the perceived glamour. But don't tell that to the people who do the work, fourteen hours a day, often in the rain and cold. On the other hand, if you like to travel and see new things and enjoy the adrenaline rush from the terror that comes from doing live television, this is the business for you.

The ability to improvise, troubleshoot and engineer under environmental and time constraints is extremely helpful. The draw this business has for many means there is no shortage of people building and operating remote facilities. However, there is a high infant-mortality rate for startups, just as historically has been the case for airlines. The equipment, planes in the case of airlines, trucks in the case of the remote companies, often has numerous owners over its lifetime. Also, like with the airlines, we periodically see a consolidation of players and a few heavyweights emerge, with many smaller providers finding a niche or disappearing.

Mostly for sports

Historically, most trucks were built for sports. Trucks have been referred to as "sport" or "show" trucks. The difference is that "show" trucks have larger, more luxurious control room compartments, while "sport" trucks have more VTR capability, mainly for replays. Audio used to be more elaborate in a show truck, but now audio has taken on increased importance in many trucks.

KSTP-TV took color TV on the road in this fully equipped color cruiser.

Most trucks came about to cover sporting events, although sometimes a station would build a truck for use on a particular show or to show the station's "colors." With the exception of 16mm film, the only way to acquire video was with an electronic TV camera. Long before news departments discovered that an RCA TK-76 and a Sony VO-3800 could go together to allow a TV crew to go almost anywhere, cameras were not portable. The RCA TK-11 had a camera head that weighed 107 pounds and required a 65-pound "suitcase" camera control unit as well as a 62-pound "suitcase" power supply. It needed a thick multicore camera cable (remember TV-81?) and lots of light (many cameras had their own light mounted on top); and it was only black and white. Its picture was harsh, and the orthicon pickup tube was sticky and burned easily. If the camera operator happened to find the sun, you had to buy a new tube. Often, much time was needed shooting white cards to "de-burn" the tube after use. To try to stop the "burning" of the tube, the cameras had an orbitor, which consisted of a motor mounted to the side of the camera that slowly rotated the position of the yoke and tube to slightly move the image continually. However, it was noisy and often had to be turned off in close-up situations.

More cameras tell the story

The zoom lens didn't exist until the mid-1950s. The camera had a turret on its front that accepted four common fixed lenses: 35mm, 50mm, 90mm and 135mm lenses. But no director wanted to see a new lens racked when that camera's tally light was on. "Trucking" or "dollying" the camera was the only way to tighten in on a subject without changing the lens. Today, the 70:1 zoom is found on many sports remotes. Where 15 years ago, head-to-toe shots used to be all that the 30:1 zoom lens could provide from the camera at the 50-yard line, now the nose shoot is creeping into some football coverage thanks to the 70:1 zoom lens.

In the mid-'50s, the color camera found itself in the field. It made the TK-31 seem portable. The RCA TK-41 was the first widely used color camera. It had three orthicon tubes and a camera head that weighed a mere 250 pounds, without the viewfinder, which added another 45 pounds. The whole camera chain weighed almost 500 pounds. Red Skelton Studios had a truck that had a hydraulic lift so cameras permanently mounted on cradle heads and studio pedestals could be stored permanently "built."

Early color cameras required registration and other setup adjustments often. Sometimes, this procedure had to be repeated a second time right before the game as the outside temperature rose for day games or dropped for night games. In 1955, NBC did its first colorcast of the World Series. Partly because of their size and weight, early trucks did not carry many cameras; the first World Series had three. In the 1950s and '60s, many network baseball games had a maximum of five cameras. Many local baseball games, even well into the '70s only used three cameras — usually at high home, first and third bases. If a fourth camera was added, it was at low home or center field. Back then, the event was merely covered. If a camera had a zoom lens, it was either a 10:1 or at most a 15:1.

Today, five to seven cameras is common for local baseball games. FOX uses 11 or 12 when it does baseball. High cameras aren't the rage anymore. High home and maybe high first survived, but now low cameras are used. Cameras at low first and third cover right-handed hitters and left-handed pitchers or left-handed hitters and right-handed pitchers. Center field is considered indispensable for pitcher/batter shots. Now, cameras are added from various angles in the outfield. The object today is not to just cover an event, but to tell the story of the game.

A history of remote broadcasting

Camera evolution

In the 1960s, camera evolution accelerated. The second generation of color cameras included TK-42/43s for RCA and PE-250/350s from GE. They tended to use four pickup tubes — three for color and one for luminance. Although their resolution improved, it took the invention of the "enhancer" to improve their sharpness. Although this device was made available separately, it was first included as part of the camera in Norelco's PC-60/70. This was a third generation of color cameras that used three Plumbicon tubes instead of orthicons (or a mixture of orthicon/vidicom tubes).

Within a couple of years, RCA responded with its TK-44. These camera heads were approximately 70 pounds and made remotes easier. ABC and CBS made extensive use of the PC-70. In the late 1970s, RCA introduced the TK-76. Within a few years, it had a hard camera shell that it could be installed into so it could be used as a hard camera. This was known as the TK-760 and NBC made extensive use of it for remotes. The problem with these cameras was they were still designed to use multicore cable between the camera head and the camera control (although some vendors offered triax systems for the TK76/760).

The next generation of cameras confronted the multicore issue. They also introduced the microprocessor for use as camera controllers. Most camera chains had a microprocessor in the camera head and the camera control unit. These two processors talked to each other over an RS-232 link through the camera cable. The CCU would continually send out a stream of analog values (commonly known as a pulse amplitude modulation [PAM] stream that the head stored in sample-and-hold circuits). These analog values controlled everything from registration and geometry, to video level and iris settings. The microprocessors at the CCU and the camera head-ends ensured that the PAM stream could not get out of sync and have the wrong values written to the various sample-and-holds. The other architectural approach was to have the camera system reside in the head.

Instead of splitting the video processing between a camera head and the CCU, all the processing was in the head and the CCU was not much more than a remote-control unit. These two approaches made triax feasible. To power the head, AC or DC with a potential of as much as 300V is sent down the center conductor of the triax. Most cameras have power safety systems so power is only applied if the right load and current draw is sensed. Cameras on multicore could not have runs of more than 1,000 feet (500 feet was a safer length). Today, half a mile is a common maximum distance from truck to camera head. Many stadiums have as much as 30,000 or 40,000 feet of triax permanently installed.

WGN-TV covered 120 Cubs and White Sox daytime home baseball games during 1960, with four RCA TK-41 cameras.

The second major area on trucks today revolves around tape. The videotape recorder didn't exist until the tenth televised World Series. In the early 1960s, Quad VTRs were installed on trucks. These first-generation VTRs weighed as much as 3,000 pounds if equipped to handle color. They consisted of as many as five racks of electronics and tape deck in the form of RCA's TRT-1B or a console unit and two racks if an Ampex VR-1000. Glenn-Armistead, a production company, had two TRT-1s in a trailer, which were used in taping the Ernie Ford show for NBC on location in the early 1960s.

Tape capability was not common on trucks until the 1970s. The second generation of VTRs in the form of RCA's TR-22 and Ampex's VR-1100/1200 made tape road trips more doable. The VTR fit within one stand-alone box, which was at least six feet long and six feet high and weighed more than 1,000 pounds fully loaded. What was considered fully loaded? Color capability, servos that would gen-lock to external reference and the ability to do insert or assemble edits were all optional. Some machines were used for early attempts at instant replay. But these Quad (four rotary record/play heads) machines would produce no playback video in still and would not output playback video at any speed other then times one (because of their segmented tracks). The digital TBC and DT/AST head to make variable speed possible would not arrive until the early 1970s. An added plus with these machines is that they were slow to accelerate tape in shuttle, and if you were lucky, the machine would servo lock after only two seconds.

At the end of the 1960s, Ampex made the era of the instant replay feasible with its HS-100 analog disk recorder. It allowed instant access and playback speeds other than times one. But its storage capability was only a couple of minutes. Its cost ensured that only the networks would be able to use it on a regular basis. Even then, there was normally only one of these units at a venue. Not until the digital TBC gained enough muscle and the AST/DT playback head was invented would instant replay capability become common place.

The arrival of the type C format VTR from Sony and Ampex created the expectation that all trucks have replay

capability. Today, one-inch VTRs have given way to Betacam and digital Betacam. Last year's Super Bowl used 22 VTRs for replays. The replays' central role in telling the story now dictates that many shows must have a producer to coordinate isolation strategies and playback selection from the slew of machines available. Directors and producers have to understand the strategies and tactics of the teams they are covering. For Monday Night Football, ABC uses a separate truck just to house the 14 VTRs it uses for replay duty.

Audio then and now

Audio also saw its importance grow exponentially. Early audio mixers often had no more than a half dozen inputs; today's mixers have as many as 96. In fact, many times the audio effort was small enough that the mixer was not even in the truck. The mixer would be setup up in the announcer's booth for baseball or football coverage. There was little emphasis on capturing the sounds that comprise the composite event experience. Early efforts at this often centered on marrying snow saucers or even wooden salad bowls with stick microphones. These crude parabolic mics were used to capture the "bat crack" sounds in baseball or player contact in football.

On to video switching

The production compartment has to keep pace with the other areas of the remote truck when it comes to change. The change in video switchers has been the continual increase in capability. Not only has the number of effects banks increased, but the functionality of each bank has increased. Past switchers only allowed one operation per effects bank, be it a dissolve, a wipe or a key. The ones in use today allow more than one of those operations to occur simultaneously on each bank. The use of "snapshots" allows the operator to store and recall switcher setup almost instantaneously. In its infancy, there might be half a dozen sources available on a remote. Today, sources have increased to a point where routers are needed to filter the amount of sources available at any instant at the switcher. Switchers now accept dozens of inputs and, in some cases, to keep the control panel a manageable size, have "shift" functions for crosspoint buttons so that each button can access more sources. Almost every truck now has a DVE/DME onboard; some even have still-stores.

The number of monitors found in the production compartment has exploded. The term "monitor wall" didn't exist early on. In fact, monitors used by the director and technical director were often the same ones used by the video operator to shade cameras. Many early trucks had a single compartment. All the operating positions in the truck would use the same set of monitors. Today's trailers usually have separate compartments for camera control, videotape, production and audio. Sometimes, transmission has a separate compartment, but it is usually associated with video.

The final area that has gained prominence on a truck is graphics which didn't exist on trucks until the mid-'70s. Graphics used to be a black-and-white camera, often just outside the truck, that shot art cards. Those graphics weren't keyed over video until the '60s. Early on, switchers could only "super" them. That meant superimposed by doing a partial dissolve to the graphics camera. In the '70s, NBC worried that multicolor graphics might make the scene too busy. Now, bumpers, replays, even regular play, use heavy graphics. FOX NFL coverage uses a separate truck for all the graphics layered over the game. Today, switchers need multiple downstream keying capability to handle all the sources that end up on the scene simultaneously. The era of the single "Chyron" operator is rapidly coming to a close.

Moving on

Trucks today would probably not recognize their ancestors. Early trucks resembled a bus or a book mobile. The driver could usually walk from the steering wheel to the back of the unit without going outside. The other truck architecture was the box and cab, much like many Ku trucks today. Unless you were putting tape machines on a vehicle, it was hard to fill up the space in a 40-foot trailer. Few tractor trailers were in use until the '70s. The Glenn-Armistead and the trailer WGN used for White Sox and Cubs baseball in the '60s were only a few examples. WGN's 40-foot trailer only carried four TK-41 cameras.

Today, trailers as long as 53 feet ply the interstates. Many are pushing the 80,000-pound maximum bridge weight limit. Many trailers separate their dual axles by a few feet so they can carry more weight over the trailer's wheels.

The remote business has captivated many of us. It offers what has drawn many of us into this business in the first place, adventure and a taste of show business. With the exception of news, it is the last bastion of live television. ■

Tractor and two trailers that comprise the Glenn-Armistead color TV production system. One unit contains control, switching and effects equipment; the other contains a film system and two color TV tape recorders.

Jim Boston is senior product support engineer, automation & transmission systems, Business and Professional Group, Sony Electronics, San Jose, CA.

Authors's note: The author wishes to thank Glenn Hill, senior support engineer for production systems, Sony Electronics, San Jose, CA, for his technical support in this article.

Make your daily interactions more satisfying

BY KARE ANDERSON


Kare Anderson

Suppose a colleague gives you a compliment as you meet her in the hallway and then another person accidentally bumps you in passing. You will respond more to being bumped than to being complimented, even if the person who knocked into you immediately apologizes. You have little control over those instinctual reactions. In fact, your mood will be altered longer from a bump than a compliment and you will remember it longer.

Why? Not because you are a negative person, but because your most primal instinct is for survival. That instinct is hardwired into your brain so that even in modern circumstances your swiftest, most pervasive reactions are to protect yourself from any sign of "danger." All of your angry feelings are the visible surface of an underlying negative feeling, such as hurt or irritation stemming from some early circumstance in your life where you felt in danger. The current source of your anger looks similar to that earlier time.

From negative to positive

When you react negatively, even with a briefly hardened face or a sharp tone in your voice, the other person instinctively escalates in a ping pong reaction. It is easier for an interaction to degenerate into a difficult time from one "bad" action than it is for the experience to rise from a positive action.

Because you can't rewire your brain to change your gut reactions, you can compensate by appearing "safe" when you meet people. First, move slower and speak slower, lower and less so the other person can become comfortable and familiar with you. Don't talk too loudly or too quickly or move too fast, especially with high, quick arm gestures. Such gestures can rob you of the appearance of power. If your voice is lower and slower, your sentences shorter and gestures spare, then the other person will accept you more quickly.

Second, because people instinctively like people who are like them, demonstrate the part of you which is most like them. Talk about common experiences, background or places. Adjust your voice level and rate and amount and kind of body motion to become more like theirs. Children do this instinctively. Only as we get older do we lose the instinct to adapt to another's behavioral style.

See the box below for other suggestions on gaining and holding people's attention. ■

Kare Anderson is a speaker and author. Visit her web site at www.sayitbetter.com. Also sign up for her free on-line monthly newsletter, by sending "SIB" to her at kareand@aol.com. To set up a speaking engagement, call 415-331-6336.

Attention getters

• ***Be vividly specific.*** A detail or example proves a general conclusion, not the reverse. A detail is memorable, while a statement is less credible and easily forgotten. When you want to be heard and remembered, characterize your information or request with a detail, example, story or contrasting options. Use words that relate to the senses. For example, "beautiful color" is not as vivid as "blue," which is not as vivid as "cobalt blue."

• ***Be "plainly clear."*** Don't wear patterned clothes or other detracting detail on your clothing, especially on the upper half of your body, because it will shorten the attention span of the person with whom you are speaking.

• ***Look for the underlying issue.*** When you are arguing for more than 10 minutes, you are probably not discussing the real conflict and are unlikely to resolve it in the discussion. Look for the underlying issue. Read Robert Bromson's book, *Dealing With Difficult People,* for ideas on recognizing difficult behaviors and adopt behaviors to protect yourself from them.

• ***Deepen their commitment before you ask for more.*** The more time, actions or effort someone has put into something, someone or course of action, the more deeply they believe in it, will defend it and will work on it some more. If you want more from the other person, wait until he or she has invested more time, energy, money or other resources to ask for it.

• ***Bring out their best side.*** When people like the way they act when they are around you, it's because they see qualities in you that they admire. The opposite is also true. Don't make suggestions or requests when they are acting in an unbecoming way; your efforts will only backfire. Praise the behavior you want to flourish.

• ***Move to motivate.*** Motion activates emotion and makes experiences more memorable. Motion attracts attention and causes people to remember more of what's happening and feel more strongly about it. Get others involved in motions with you that create goodwill. You are more likely to get "in sync," because your vital signs may become more similar, such as eye pupil dilation, skin temperature and heart beat. ■

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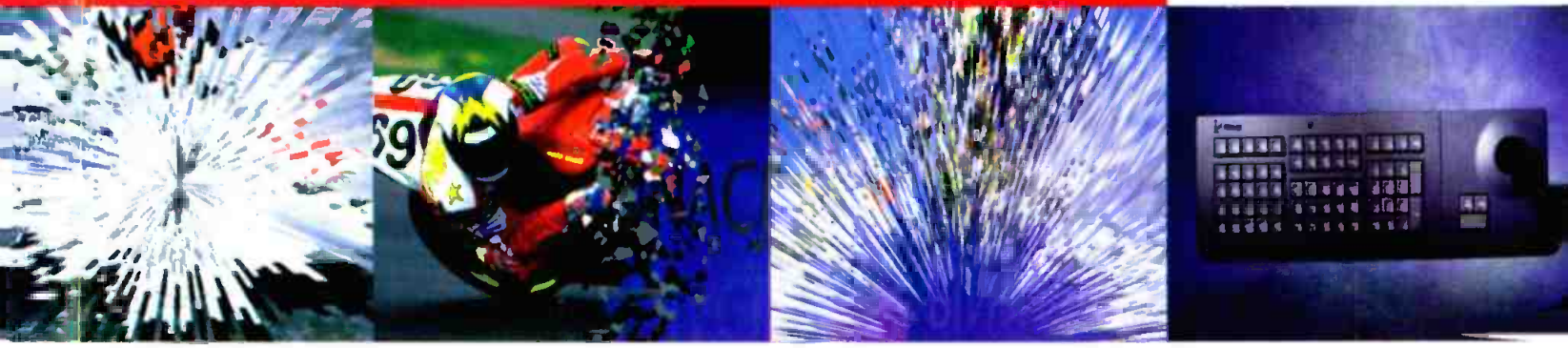

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Applied Technology

Editable MPEG-2: Today's dynamic video compression format

BY JAMES FETTEROLF AND MEINRAD ZELLER

Is MPEG-2 in your future? Chances are if you're in the broadcast or post-production community you will soon face some form of the MPEG-2 audio/video compression format, if you haven't already. In fact, as our industry accelerates into the new digital age, broadcasters have no alternative to the cost efficiency MPEG-2 provides their facilities, as well as the superior quality and frame-accurate editing MPEG-2 gives post-production studios.

However, confusion surrounds the dynamic compression format. MPEG-2 is not just one standard, it comprises different profiles and levels ranging from applications involving video CD to high-definition television. The broadcast community has embraced MPEG-2 MP@ML IPB frame as a format for transmission and distribution because of its low bandwidth and good quality. But many believe that frame-accurate editing with MPEG-2 is impossible. Recent developments challenge that viewpoint as the industry explores two forms of MPEG-2 editing schemes: 4:2:2P@ML and MP@ML 'IPB frame,' which is 4:2:0 color sampling. Both co-exist and yet have different and crucial roles in post-production and broadcast environments.

The FAST Electronics blue provides high-quality MPEG processing in a wide variety of I/O formats.

Formats

First, you should understand that MPEG-2 is optimized specifically for video. It has advantages over other compression formats such as traditional motion-JPEG. In particular, MJPEG suffers from an inflexible compression scheme that while adequate for post-production, will never win acceptance in the broadcast transmission community due to its lack of interframe compression resulting in an unacceptably high bandwidth. Second, due to a multitude of proprietary formats, MJPEG is not easily distributed. Even worse, to get to distribution, video must be re-compressed from MJPEG into MPEG-2 IPB frame. The result is substantial quality loss through concatenation (cascading compression) of formats.

This makes MJPEG an awkward compression format that offers few strengths in post-production and nothing in the broadcast transmission environment. However, uncompressed video, which is ideal for the post-production domain, is expensive and unsuited for the low-bandwidth broadcast transmission world. But going from uncompressed video to MPEG-2 IPB will suffer none of the concatenation issues that plague MJPEG. The result? For the highest-quality demands, uncompressed video will remain solidly entrenched in the post-production editing environment.

Major benefits

MPEG-2 is the only compression format that has global acceptance and is optimal for the post-production and broadcast environments. It features interframe encoding for high compression, which allows for reduced bandwidth for transmission. At the same time, the MPEG-2 algorithm also offers low compression with excellent audio and video quality for post-production. MPEG-2 also has interoperability through a clearly defined decoding spec becoming the universal compression medium. Furthermore, MPEG-2 has a rich tool set of flavors, depending upon chroma sampling, the resolution, bit rate, etc., all of which can be modified to reduce the risk of obsolescence. Only MPEG-2 offers flexibility to meet the low-bandwidth demands of broadcast and the high-quality requirements of post-production editing. Editable MPEG-2 consists of two major flavors of compression. I frame editing, targeting the post-production community and IPB frame editing, targeting the broadcast transmission markets.

MPEG-2 I frame editing for post-production

MPEG-2 I frame, 4:2:2P@ML is targeting the post-production editing community and is focused on quality. These environments typically require a system that can encode and decode in real time while maintaining the highest possible quality through multiple generations. Post-production editing systems also need to be able to use the same compression scheme as that of the final

program distribution format. In other words, you want to avoid cascading different compression formats. Transcoding from MJPEG to MPEG-2 is not only a recompression step, but also a compression format change. (See

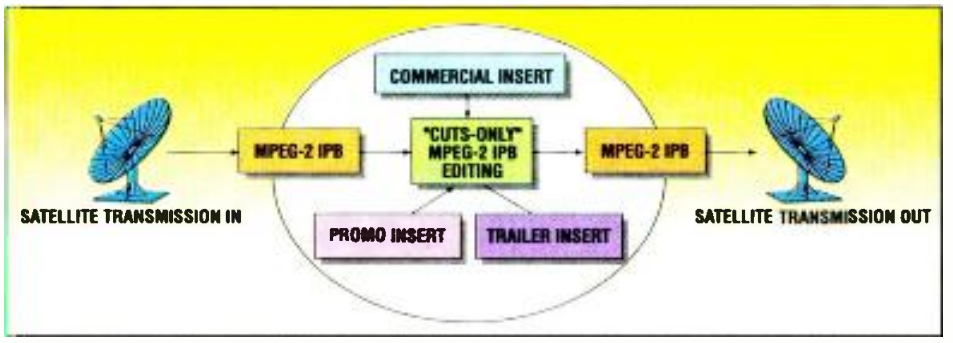

Figure 1. Typical signal path for satellite distribution.

Figure 1.) It is better to go from MPEG-2 I frame to IPB frame with minimal re-compression or data-reduction techniques. Most important, for post-production MPEG-2 must provide frame-accurate editing.

As independent research has shown, an MPEG-2 4:2:2P@ML I frame-only datastream at 50Mb is sufficient even for applications like video editing that demand high quality. Companies such as NEC and FAST, with its new blue native digital editor, have already been demonstrating systems using 4:2:2P@ML I frame editing.

A good way to remember MPEG-2 I frame is that it will be used for *editing* the content to be broadcast. An MPEG-2 I frame signal effectively addresses the needs of post-production editing by providing the following advantages:

- High quality, ITU-BT 601 720x480, 10-bit 4:2:2 chroma sampling and a 10-bit I/O ensures more video integrity through doing multiple generations. It is visually lossless up to eight generations.
- Frame accurate.
- Cost effective. MPEG-2 is approximately 15% to 20% more efficient than MJPEG, which means a savings in storage space requirements.
- Interoperable. Provides freedom to produce a program that can be distributed in its highest quality to any MPEG-2 system.
- Variable compression from 200 to 2:1. Gives the user flexibility to work off-line/on-line.
- Flexible MPEG-2 algorithm that can go from I frame for production to IPB frame for distribution without suffering from concatenation quality losses like MJPEG.

Frame editing for broadcast

On the other hand, MPEG-2 IPB frame signal provides satellite and transmission editing environments with low bandwidth and high quality. Broadcast applications typically require a signal that can be satellite distributed but still allows cut edits — all in real time. (See Figure 1.)

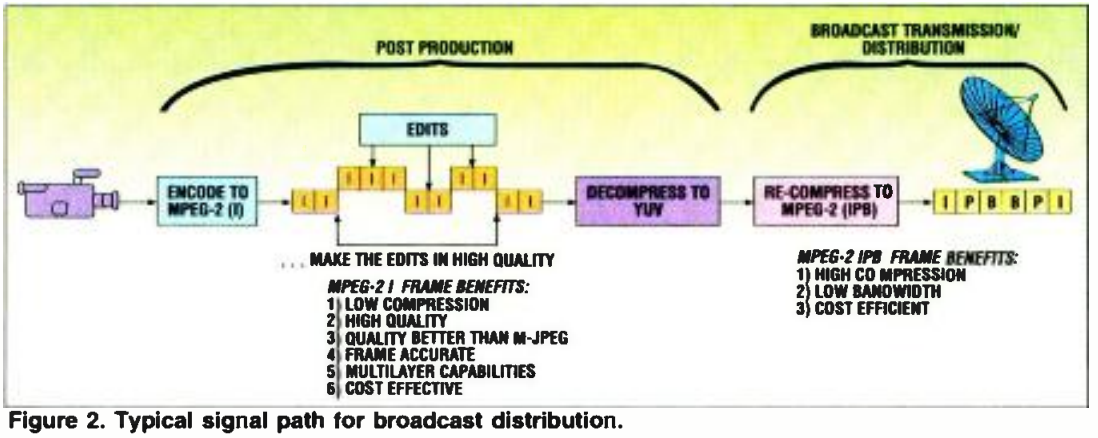

Figure 2. Typical signal path for broadcast distribution.

A good way to remember MPEG-2 IPB frame is it's used for *broadcasting* the content. MPEG-2 IPB frame-editing systems address the needs of the broadcast transmission environment by providing the following benefits:

- cost effective;
- low bit rate of 9Mb/s;
- 4:2:0 quality; and
- used for distribution onto DVD, VOD, DTV, DSS, etc.

Take it to the limit

MPEG-2 has become a hot topic and most people understand the IPB frame advantages. This is probably because IPB frame solutions have been adopted and implemented faster than other formats through its use with DVD, Direct TV and other distribution and transmission services. However, there are critical disadvantages that make it unusable in the production editing environment. Some disadvantages to IPB frame editing include:

- IPB frame is limited to cuts-only. This limits MPEG-2 IPB to a few edits and it won't work in a post environment.
- Frame accuracy.
- Quality loss. Quality must be reduced by compression to reach a low enough bandwidth to transmit.
- Extensive processor power is required to edit IPB, even for a cuts-only editor.
- Hw/Sw intensive. To edit with IPB frame, the entire architecture must be optimized to work specifically in that environment.
- Fixed data rates. IPB frame editing does not allow variable compression ratios. Broadcasting IPB is fixed at approximately 9Mb/s.

The benefits of both?

There are significant benefits to using a combination of I frame and IPB frame. In fact, this may be exactly how most production, distribution and transmission will operate in the near future. You may be creating content by editing video with real-time effects, animation, compositing and CG in low compression, high-quality MPEG-2 I frame. Then, output the final product through an IPB frame encoder. You now have an IPB frame signal, highly compressed, with good quality video for broadcast distribution or transmission. (See Figure 2.) The advantages to this technique are that you avoid harm-

ful concatenation and re-compression artifacts by not converting to another compression format. Also, you don't have to convert I frames again unless you want to re-compress to another compression ratio to save space.

The efficiency of MPEG-2

You need to understand the reasons why MPEG-2 is suitable to the post-production and broadcast transmission editing environments and why it holds core advantages over MJPEG. MPEG-2 is a dynamic and efficient video compression format. MPEG-2 MP@ML IPB frame for the post-production environment is focused on quality preservation, while using MPEG-2 MP@ML IPB frame in the broadcast transmission environment is focused on bandwidth. Chances are MPEG-2 is in your future! ■

James Fetterolf is the product manager of blue, and Meinrad Zeller is the vice president of research and development at FAST Electronic U.S., Inc. in Foster City, CA.

Applied Technology

A virtual eject button for virtual tape

BY HARRY AINE

Everyone knows the benefits of long-duration video disk recorders (VDRs). Greater storage means that you can enjoy non-linear random access to more material and preview longer programs without first committing them to videotape.

And everyone knows the disadvantages of current video disk storage. Besides the fact that storage space is limited, you cannot begin working on a new project until the data from the last project you were working on has been removed from the disk and off-loaded to tape. That process of off-loading media files consumes billable hours and often makes accommodating last-minute bookings impossible.

However, what if you could work continuously on a VDR without ever having to stop to make space for the next job? What if you could continue working with your storage, while someone else began digitizing new material onto available disk space without interfering with your work? What if your graphic artists could start compositing even as the VDR is acquiring the media? What if you could increase your VDR's flexibility, efficiency and productivity, while retaining its unique VTR-type functionality? By separating the VDR's controller from its storage component and by

MountainGate's CentraVision VDR interface.

taking advantage of the high-performance bandwidth of Fibre Channel, MountainGate has succeeded in making its CentraVision video disk recorder a next-generation solution.

A new concept

The innovative design of CentraVision's VDR incorporates traditional VTR functionality of DDRs. It is a new concept in that it treats VDR control and storage independently, allowing users to configure systems with the amount of storage they need, while permitting additional storage later without having to buy a new VDR. In keeping with the CentraVision philosophy of shared access, the VDR's recorded media can be shared among multiple users in a work group environment on a CentraVision Fibre Channel network. Standard VTR features include variable speed, slow-motion, four-channel digital audio and time code.

With the help of the new CentraVision file system and file system manager, the VDR now allows users to treat partitioned disk space like virtual tape. As a result, editors and artists have the ability to eject a vTAPE, or virtual tape, load another and begin working on the next project without delay. vTapes are disk partitions that are optimized for specific native video formats, such as eight- or 10-bit YUV (NTSC or PAL) or RGB. Other native formats are being developed, such as Quicktime, OMF and native support for DVD. Through the CentraVision implicit data-conversion facility, the native file formats are automatically converted to the file format expected by the applications.

Consider an example with two workstations, A and B, the CentraVision VDR and CentraVision Fibre Channel disk array. The CentraVision 72GB array is partitioned as vTAPE A and vTAPE B. Workstation A, workstation B and the CentraVision VDR can have simultaneous access to vTAPE A. Both workstations see the tape as YUV files, while the VDR sees vTAPE A as a 25-minute capacity partition on the disk array. Both workstations can render to files at the same time that the VDR can interface to an on-line suite and be operated through machine control.

When the vTAPE A project is completed, both workstations and the VDR can eject vTAPE A, as if ejecting a videotape and load vTAPE B. vTAPE A can then be off-loaded while work is being performed on vTAPE B.

The CentraVision VDR was designed to bridge the workstation and traditional video worlds, so the system's efficiency and flexibility extend to the on-line edit suites. For example, graphics created on one of the workstations and saved on a vTAPE can be immediately imported to an on-line suite via the CentraVision VDR.

The file system manager manages bandwidth on the system — assigning vTAPES to the varied work groups. It manages security issues in terms of read/write privileges and determines which vTAPEs are mounted on which real-time devices (i.e., CentraVision VDRs). The CentraVision file manager is first being released for SGI, with NT, Macintosh and Sun cross-platform support to follow. As the file system is ported to Mac and NT, vTAPEs will be accessible from all supported platforms simultaneously. For instance, rendering can be done on NT machines, while compositing is done on SGIU machines using the same media at the same time.

The CentraVision VDR offers a number of improvements over past VDR technology. Specifically, with CentraVision, VDR storage is now expandable because VDR control and storage are completely independent — the VDR storage becoming part of the overall storage of an entire CentraVision Fibre Channel network. Furthermore, with CentraVision, the VDR becomes a

shared resource as multiple users in a work group can simultaneously access the VDR's recorded media. Finally, not only does the CentraVision VDR integrate VTR capabilities directly into the workstation environment, it also brings true VTR functionality to VDRs with the addition of the eject button. The CentraVision VDR eject button allows vTAPEs to be ejected on completion of a job, so that new vTAPEs can be loaded, permitting a smooth and efficient workflow within a facility. ■

Harry Aine is business development manager for MountainGate, Reno, NV.

Applied Technology

ASC's RAIDsoft

BY FRED SCHULTZ

RAIDsoft is ASC's exclusive software implementation of RAID protection against drive failures and a keystone in ASC's larger design of system-wide redundancy.

RAIDsoft is an integral part of the software of every VR300 server, thereby allowing each server on the system

RAIDsoft in a VR300 server.

to perform independent RAID-protected reads and writes to a single common array of shared Fibre Channel disk storage.

RAIDsoft offers two critical advantages over traditional hardware-based RAID:

First and foremost, since RAIDsoft operates from the server software, there is no dedicated RAID controller hardware to be purchased or serve as a single point of catastrophic system failure.

Second, since RAIDsoft is part of the native software in each and every VR300, should one or more VR300s go off-line due to maintenance or failure, all remaining servers continue their activities unimpeded. Every remaining VR has full access to all material since each performs its own RAID-protected reads and writes.

But beyond the way RAIDsoft extends and streamlines existing RAID features, it also introduces a new level of protection — protection against multiple drive failures.

Conventional RAID-3 approach

Traditional implementations of RAID use a single parity drive that protects against failure of a single drive per RAID cluster. This is excellent as far as it goes, but it leaves the system vulnerable to total data loss should a second drive fail prior to rebuild of the first.

Because this conventional form of parity is satisfactory for many, ASC's RAIDsoft continues to make this configuration available. RAIDsoft even extends its economy by enabling a single parity drive to protect an unprecedented 32 drives instead of requiring one per group of four or seven drives as had previously been the industry's limits.

In conventional parity, data is organized into stripes of data pieces written onto data drives and a calculated parity piece onto a separate parity drive.

Hardware SCSI RAID controllers do not begin reading from the parity drive until failure of a data drive is under way, so program delivery is disrupted even if it ultimately recovers.

RAIDsoft, in contrast, continually reads and decodes the parity information. This improves the capability of error detection, as well as data performance during error correction. In the process, RAIDsoft also monitors and logs the performance of all drives, which now makes possible pre-failure replacement.

And finally, unlike SCSI RAID, which must rebuild whole drives, RAIDsoft rebuilds only the necessary drive sectors that can immensely speed restoration of full protection.

New level of redundancy

Over and above extensions and enhancements to conventional parity, RAIDsoft introduces a new multiple parity protection – ECC Parity.

For the cost of a few additional parity drives, ECC Parity provides the full

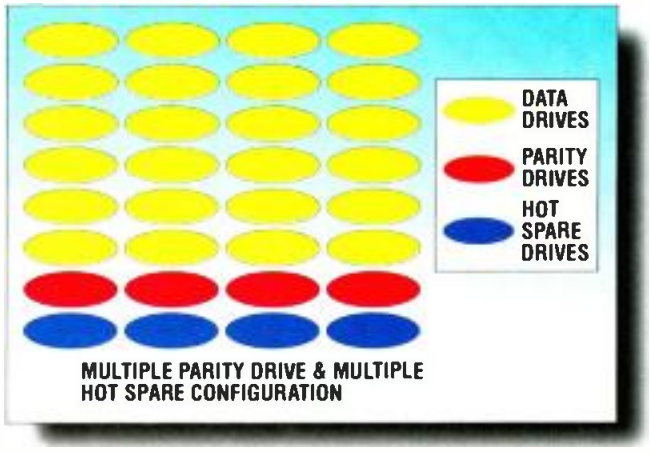

Figure 1. ASC's RAIDsoft implementation: ECC Parity's multiple parity drive and multiple hot spare configuration.

array with protection against not just one but two consecutive drive failures. With no separate hardware RAID con-

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troller that could serve as a single point of storage failure, the ECC Parity brings an unprecedented level of safety, redundancy and dependability to the storage of valuable content.

Implementation of ECC Parity is based on each server directly executing its own reads and writes to each of the individual drives, a capability available only in Fibre Channel disk drives. By advanced use of high-speed XOR processing and Hamming codes double data drive errors can be corrected, and single, unknown location data errors can be corrected.

For yet an extra level of redundancy, hot standby disk drives can be added to the array. (See Figure 1.)

In the event of a disk drive failure, the failed disk automatically goes off-line. An operator can then rebuild the RAID set using one of the hot spares by drag-and-dropping some very obvious, unambiguous icons. Rebuilding the RAID set takes place in the background with absolutely no impact on operations.

Tangible benefits

RAIDsoft eliminates the cost of a hardware RAID controller and the single-point vulnerability it brings. RAIDsoft tracks drive health and provides less on-air disruptions in the event of failure.

For users of conventional parity, RAIDsoft can save the purchase cost of multiple unwanted parity drives and minimize exposure by speeding rebuilds. And users of ECC Parity get a double safety net so that a failed drive can be removed and replaced by appropriate personnel at appropriate times rather than becoming a do-or-die task forced upon a night operator. ■

Fred Schultz is product manager at ASC Audio Video Corporation, Burbank, CA.

Technology in Transition

New high-tech transmitters

As stations enter the digital arena, the first order of business is typically the selection of a digital transmitter. As any RF engineer knows, the term digital transmitter is really a misnomer. Even for DTV, whether that be HDTV or multichannel operation, the transmitter is still analog. It's the modulation encoding that's digital. With that in mind, what's the big deal with regard to the new types of transmitters?

Tubes vs. solid-state

The battle over amplifier technology is nowhere more hotly debated than with transmitter companies. The opinions held by the various transmitter manufacturers are not only strongly set forth, they are stoutly defended at industry events like the recent *Broadcast Engineering* DTV conference in Chicago. Let's look at the basics.

Three basic types of amplifier technology are used in transmitters: solid-state, grid-based tubes — the UHF tetrode and Diacrode — and Klystron-based UHF devices. Each technology has its own set of advantages and limitations. The correct choice for your application may not be as clear as you'd like.

Many in the industry assumed that solid-state devices would quickly replace tubes in UHF transmitters. Well, that's happened to some degree in VHF transmitters, but not so with UHF transmitters. One problem for solid-state systems is their increased complexity — in other words, more parts. At least as of yet, there aren't any UHF 10,000W transistors so the only way to reach high power levels is to parallel a lot of smaller devices. Currently, three solid-state technologies are being closely followed: MOSFET, LDMOS and silicon carbide (SiC).

The Thomson Tubes Electroniques Diacrode is able to provide twice the output power of a similar-sized tetrode through the use of a unique output circuit.

The old standby technology, grid-based tubes, still provide reliable operation in cost-effective configurations. The newcomer here is the Diacrode. Developed by Thomson Tubes Electroniques, the Diacrode (see photo) is really a highly modified version of the UHF tetrode. The anode current is modulated by an RF drive voltage applied between the cathode and power grid. The difference between a standard tetrode and the Diacrode is that the latter provides an electrical extension of the output circuit to an external cavity. The output cavity is really a section of quarter-wave transmission line with a short at the top. This produces an open circuit (minimum current) at the vertical center of the tube and a maximum current at the base and the shorted section at the top of the tube. With two current maximums, the tube produces twice the power of an equivalent tetrode.

Klystron technology is well understood but, without additional circuits, it's not a terribly efficient RF solution. However, the addition of beam pulsing, multistage depressed collectors (MSDC) and the inductive output tube (IOT) (also known as the Klystrode by Varian) configurations have improved on the klystron's basic design.

When it's all considered, the key for digital applications in all these UHF

amplifier technologies is linear operation. The bottom line is that it doesn't matter how high the tube's AC-to-RF efficiency is, when it comes to DTV, the system won't work unless the tube is linear.

Selecting a transmitter

When faced with buying a new DTV transmitter, the engineer has a plethora of choices. After you've convinced yourself that one or more of the amplifier technologies will work in your application, what other points need to be considered?

- initial purchase price;
- on-going maintenance costs;
- AC-to-RF efficiency; and
- factory support.

Related factors that might need to be carefully considered could include:

- transmitter size;
- power consumption; and
- cooling requirements.

TRANSMITTER MANUFACTURER	PHONE NUMBER	RS#
Acrodyne	800-523-2596	235
Advanced Broadcast Systems	800-499-4554	236
Comark	413-569-0116	237
Electtronica Industriale	39-39-7398-1	238
EMCEE	717-443-9575	239
Harris	217-222-8200	240
Itelco	303-431-1699	241
Larcan-TTC	303-665-8000	242
Rohde & Schwarz	301-459-8800	243
Th omcast	33-1-3490-3100	244
AMPLIFIER DEVICES		
EEV	914-592-6050	245
CPI-Eimac	650-592-1221	246
Thomson Tubes Electroniques	201-812-9000	247
Litton Electron Devices	800-861-1843	248

Table 1. Here's a list of some transmitter and tube/device manufacturers to check out. Be sure you're comparing apples to apples when making evaluations. It's easy to get confused among the different ways companies spec their products. If you'd like some additional help, contact Dr. Digital via fax: 913-967-1905.

To help you better understand the options, a list of transmitter companies is presented on the left. Each can provide you with comprehensive information about their particular solution. Consider it along with what you can learn by talking to their other customers. Remember, if you have to buy a transmitter in the next year, you'll be among the first with a new technology. New designs often suffer from infant mortality, design changes and after-the-sale updates. Be prepared to work with the manufacturer over the long haul. And, be sure you understand how much support you have a right to expect — after you've turned over the check. ■

New Products

ENHANCED POSTBOX ELITE NON-LINEAR EDITING SYSTEM

Panasonic Postbox elite: the Postbox elite is enhanced with 40 innovative hardware and software improvements; the complete AV workstation integrates non-linear editing with on-line component video quality, more than 300 real-time transition effects, real-time video filters, a character generator with roll/crawl/transition effects, a powerful paint system, keying, graphics import and VTR control; Postbox elite runs dual streams of video, plus title key in real-time and renders unlimited layers; 201-392-6176; fax 201-392-6558; www.panasonic.com/pbds

Circle (252) on Free Info Card

SWITCHERS WITH WINDOWS NT

ECHOlab production version of 5000 series: the enhanced production version of the ECHOlab 5000 series is a digital video switcher with an integrated server running Windows NT; it combines the power of a large 33-input switcher with integrated control of the latest open architecture video devices such as a 3-D DVE using a Pinnacle Genie card, a clip-store using DP5 Perception cards, and a CG and still-store from Inscriber Technologies running on a Matrox DigiMix card; mixing enhancements make complex transitions easier and serviceability and modular growth flexibility have also been enhanced; 781-273-1512; fax 781-273-3275; www.echolab.com

Circle (275) on Free Info Card

MULTIROLE CAMERA SYSTEM

Philips LDK 100 series: this series of cameras offers the benefits of 12-bit A/D conversion, plus 24-bit, dynamically managed, digital processing; two digital signal processors combine all the camera functions in the digital domain, including knee, gamma, contour and matrix; the series also features unique dual skin contour circuits with automatic skin tone selection; continuous auto black provides perfect black levels and shading without the need for black balance and a specially adjusted matrix helps ensure excellent color reproduction when working under fluorescent lights; software upgrades can be downloaded from a PC via the standard serial RS-232 link by E-mail; 801-972-8000; fax 801-972-0837; www.philipsbts.com

Circle (255) on Free Info Card

INTERCOM SYSTEM

Telex Communications RTS Zeus 2400 DSP matrix intercom system: the Zeus is designed to deliver 24 channels of better-than-CD-quality audio in a two-rack unit package; the CD-quality sample rate of 44.1kHz is enhanced by 20 bits of resolution yielding superior audio clarity; the heart of the system is the DTM ASIC, which processes 45-bit word length, ensuring full performance regardless of the number of users on a given path; 612-884-4051; fax 612-884-0043.

Circle (251) on Free Info Card

VIDEO DISK ARRAY

Accom WSD/2Xtreme: this long-play digital video storage device is designed for the computer video and TV post-production markets; it offers five minutes of storage, features eight- and 10-bit recording standard and comes in 10- and 20-minute versions at prices lower than previous WSD models; it provides fast Ethernet and SCSI computer interfaces and optional audio storage; 415-328-3818; fax 415-327-2511; www.accom.com

Circle (258) on Free Info Card

HDTV DIGITAL SIGNAL GENERATOR

Leader LT 440D HDTV digital signal generator: a test signal generator that operates in the 1125/59.94 HDTV system and complies with BTA S-004A, S-005A, S-006A and SMPTE 229M, 291M and 292M; front-panel switching allows selection of 1,135 or 1,180 lines displayed, as well as 1,125/60 operation (an option), test tone level and frequency and remote-control baud rate; the generator incorporates serial digital outputs of conventional and dedicated test signals that include the pathological checkfield and includes embedded four-channel AE5/EBU audio-test tones; 800-645-5104 or 516-231-6900

Circle (263) on Free Info Card

COMPACT ROUTING MATRIX

Grass Valley SMS-DV series high-density serial digital video routing matrix: it is fully compatible with the series 7000 control system and includes two compact, high-density serial video matrices — 128x128 and 256x256; two optional control panels, the SCP simple and the MB4 multibus are also available; 800-426-2200 or 503-627-7111; fax 413-448-8033; www.tek.com

Circle (265) on Free Info Card

DIGITAL MIXING CONSOLE

Studer On-Air 2000: this digital audio mixing console is fully digital and can be supplied with six, 12, 18 or 24 input channels and easily interfaces with any type of TV broadcast environment; each input fader is assigned to a field on the console's multifunction LCD touchscreen that displays the channel status via touch-sensitive icons; the central screen allows parameters to be set and modified directly via accompanying rotary control interfaces; 615-399-2199; fax 615-367-9046

Circle (266) on Free Info Card

FOUR-CHANNEL MPEG-2 DECODER

Vela Research four-channel MPEG-2 SCSI decoder: this four-channel rack-mount decoder is designed for ad insertion and near video on demand; it features a SCSI-2 fast/wide (optional UltraSCSI) interface with NTSC or PAL video outputs, and each channel is independently configurable with separate gen-lock inputs to allow the locking of video outputs to external video sources; each video channel operates independently to allow playback of different stream types, video resolutions, compression types (MPEG-1 or MPEG-2) and start/stop time; 813-572-1230 (ext. 7186); fax 813-573-2508; www.vela.com

Circle (253) on Free Info Card

MICROWAVE SYSTEM PLANNING SOFTWARE

Andrew Microwave System Planner (AMSP) software: this software enables the rapid and accurate selection of the passive portions of a microwave system; it graphically facilitates system planning and equipment selection, such as choices of terrestrial microwave antennas, waveguide, flex twists, connectors, accessories and pressurization; a point-and-click interface guides you through the system selection; 708-349-3300; fax 708-349-5222; www.andrew.com

Circle (256) on Free Info Card

500MHZ ANALOG SCOPE

Iwatsu TS-8500 ultrahigh writing speed analog oscilloscope: this oscilloscope features time base dual delay function, NTSC video output connection, wide bandwidth of DC to 500MHz and high-speed automatic setup; along with visual writing speed of 5div/ns and the ability to update displays to one million times per second, it also features an exclusive scan converter tube for the highest level of brightness in the history of analog scopes; high-speed storage capacity allows immediate storage of high-speed single-shot phenomena; 201-935-8486; 201-935-8533; www.iwatsu.com

Circle (260) on Free Info Card

PRODUCTS NOW SHIPPING

NON-LINEAR EDITING SYSTEM

Pixel Power Collage edit system: a non-compressed, non-linear editing system with Collage functionality that provides real-time text and graphics layer; a standard ED Mediapack gives 36 minutes of non-compressed 4:2:2 video; includes dedicated operator control panel with assignable controls; +44 (0)1223 721000; fax +44 (0)1223 721111

Circle (279) on Free Info Card

ANIMATION ADD-ON MODULE

Inscriber CG/Xtreme: an animation add-on module that works with the open system character generator Inscriber CG/Supreme allowing users to fly key-frame based multiple layer animations consisting of text, logos and to draw objects over spline-based flight paths; in the on-line mode, the animations play back in real time, complete with a full traveling linear key channel; 519-570-9111; fax 519-570-9140; www.inscriber.com

Circle (280) on Free Info Card

ADD FUR TO SURFACES IN STUDIO MAX

Digimation Shag: Fur is an environment plug-in that allows you to add fur to an object's surface inside Studio MAX quickly and easily (even long hair can be added to a small degree); no real geometry is generated, but the fur can cast and receive shadows and highlights; you control where the fur is applied, as well as the density, color, thickness, direction and leaning and bending of the hairs; texture maps can be used for most options for even more control; 504-468-7898; fax 504-468-5494; www.digimation.com

Circle (281) on Free Info Card

HDTV UPCONVERTERS

Tekniche Juno range: a range of high-quality HDTV upconverters for the transition from SDTV to HDTV; these upconverters offer aspect ratio conversion and comprehensive noise reduction in a 2RU frame; other features include analog and digital outputs, full 10-bit resolution with 16-bit internal processing, multilevel noise reduction and built-in standards conversion capability; a flexible architecture allows a wide range of input and output standards; 201-784-2288; fax 201-784-3860; www.tekniche.com

Circle (282) on Free Info Card

VIDEO and PRO AUDIO

TO INQUIRE ABOUT YOUR ORDER:
800 221-5743 • 212 239-7765
OR **FAX** 24 HOURS:
800 947-2215 • 212 239-7549

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New York, N.Y. 10001

B&H
PHOTO - VIDEO - PRO AUDIO

QUICK DIAL 71

NRG

POWER VEST SYSTEM

The Power Vest combines the comfort and convenience of a photo-journalist style vest with the power of NRG's high-est capacity power belt. Available in two styles: the **Field** model is designed for use in a field production environment, while the **Event** model is for shooting events where style is everything. The Field model is ruggedly constructed from black high density weatherized ballistic nylon and has an open-cut style that makes it comfortable to wear in a variety of climates. Also has a highly adjustable design to fit almost any physical proportion.

- Internal and external pockets for blank tapes and accessories, a clear divert window for a press pass or business card, D-rings for cables and microphones, and an integral padded camera rest on the right shoulder
- Cleverly concealed inside the vest is your choice of 12 volt 86 watt hour or 13.2 volt 95 watt hour nicad cell packs
- A control box on the front features dual power outputs (dual cigarette and XLR or mixed)
- 7-stage "fuel-guage" charge status indication and auto-reset short/overload protection

The **Event** model is very similar to the **Field** except in place of rugged fabrics and pockets it features shoulder to sternum black satin fabric. Worn under a suit coat, the **Event** model is indistinguishable from a formal dress vest and it still retains interior and low exterior pockets. Both vests include 300-series charger (2 hrs.) and can be used with the optional Intelliquick Fast Charger (1 hr.).

POWER CAN SERIES

For powering single or multiple pieces of 12v DC equipment for extended periods of time. Nothing beats the power and convenience of NRG's Power-Can Series. It integrates an ultra-high capacity, high-discharge-capable UPS type lead acid power cell, a world-wide fast charger, and computer-controlled monitoring system with display -- in a single rugged package. Connect up to four pieces of equipment simultaneously. From a midnight emergency scene to a wedding reception in the park, the Power-Can delivers ample power for extended running time.

- Recharges in 8-10 hours by simply plugging the Power-Can into any source of AC power (90-250v AC)
- LCD display shows discharge/charge status, voltage etc.
- An optional "Power Dolly" allows the Power-Can to be rolled for easy transport.
- Available in 18, 28 and 40 amp versions, each Power-Can has either 6 or 8 cigarette lighter connectors, four 4-pin XLR connectors or one of each.

HORITA

BSG-50
Blackburst/Sync/Tone Generator

The BSG-50 provides an economical means for generating the most common RS-170A video timing signals used to operate various video switchers, effects generators, TBCs, VCRs, cameras and video editing controllers.

- 6 BNC video/pulse outputs
- Now available 6 blackburst, 4 sync, 2 subcarrier
- Each sync output individually settable for composite sync, composite blanking, H-drive or V-drive
- Separate buffer for each output--maximum signal isolation
- 1KHz 0dB sinewave audio tone output, locked to video
- Outputs can easily be configured to meet specific user and equipment needs

$269

CSG-50
Color Bar/Sync/ Tone Generator

- Generates full/SMPTE color bars, blackburst and composite sync signals
- Built-in timer can automatically switch video output from color bars to color black after 30 or 60 seconds. Easy and convenient for producing tape leaders and striping tapes with color bars and black
- Front panel selection of full-field or SMPTE color bar patterns or color black (blackburst) video output.
- Includes crystal-controlled, 1KHz 0dB audio tone output.
- Output has video sync, ref frame, 1 KHz, 0dB
- Audio tone switches to silence and color bars change to black when timing 30/60 second timer.
- Fully RS-170A SC/H phased and always correct. No adjustment required.

$349

WE STOCK THE FULL LINE OF HORITA PRODUCTS INCLUDING:

WG-50	Window Dub Inserter
TG-50	Generator/Inserter
TRG-80	Generator/Inserter/Search Speed Reader
TRG-80PC	Has all of the above plus RS-232 control.
VG-50	VITC Generator, LTC-VITC Translator
VLT-50	VITC-To-LTC Translator
VLT-50PC	VITC-To-LTC Translator / RS-232 Control
RLT-50	Hi8 (EVO-9800/9850)TC to LTC Translator
TSG-80	NTSC Test Signal Generator
SCT-80	Serial Control Titler "Industrial" CG. Time-Date Stamp, Time Code Captioning
SAG-85	Safe Area, Convergence Pattern and Oscilloscope Line Trigger and Generator

QUICK DIAL 72

GLIDECAM INDUSTRIES

V-16 AND V-20
Professional Camera Stabilization Systems

The GLIDECAM V-16 and V-20 Camera Stabilization Systems allow you to walk, run, go up and down stairs, shoot from moving vehicles and travel over uneven terrain without any camera instability or shake. Designed primarily for professional video and 16mm motion picture cameras, the Glidecam V-16 stabilizes cameras weighing from 10 to 20 pounds and the V-20 from 15 to 26 pounds. They are both perfect for shooting the type of ultra-smooth tracking shots that take your audience's and client's breath away -- instantly adding high production value to every scene. With either of the "V" series stabilizers you'll be able to offer the type of professional shooting techniques that were previously available only to clients with full budgets. Whether you are shooting commercials, industrials, documentaries, music videos, news, or full length motion pictures, the Glidecam "V" series will take you where few others have traveled.

The Glidecam Support Vest

The lightweight and comfortable Support Vest can be adjusted to fit a wide range of operators. High endurance, closed cell EVA foam padding and integral 16 aluminum alloy create a vest which can hold and evenly distribute the weight of the Glidecam V-16 and V-20 systems across the operator's shoulders, back, and hips. For safety, quick release, high impact buckles allow the vest to be removed quickly.

The Three Axis Gimble

A free floating, precision Gimble incorporating Integrally Shielded Bearings creates the super-smooth and pivotal connections between the front end of the Dyna-Elastic Arm and the Camera Mounting Assembly. The Three Axis Gimble provides the operator with finger tip control over fluid tilting, panning and rolling. A locking mechanism allows the Gimble to be placed at varying positions on the Central Support Post. Moving the Gimble effectively adjusts the Systems Center of Gravity. The upper portion of the Sled's central support post includes guide markings. These markings allow for accurate gimble positioning.

The Dyna-Elastic Arm

The Exoskeletal Dyna Elastic Support Arm is designed to counteract the weight of the combined camera and Camera Mounting Assembly by employing high carbon alloy springs. The arm may be boomed up and down, as well as pivoted in and out, and side to side. It is the combined boom ing and pivoting action of the arm which creates the shock absorption necessary for ultra-smooth camera movement and mobility. The spring force is held adjustable to allow for varying camera weights. For safety, a Dual-Spring design is employed to reduce spring failure damage.

QUICK DIAL 74

lowel

ViP Video Lighting System

Designed for video. ViP systems provide 55 to 500 watt capabilities powered by AC or DC. Mount one on camera, on stand, or hand hold it. Some ViPs feature adjustable beam angles. All are light weight and convention cooled.

V-light

Efficient enough to light a small room yet small enough to fit in a large pocket, the V-light provides a broad, key light, back light or fill light (with umbrella or gel).

- Extreme wide angle multi-use halogen source
- Mounts on stand, clamps, boom, wall, window, door-top
- 500 watt, AC powered (lamps not included)

i-light

Battery powered light provides excellent fill light, eye-light, or high-lights, with good contrast control for news and documentary shooting.

- Small and lightweight (18 oz.) for on camera use
- Multi-use 6:1 focusing range with 100 lamp (lamps not included)
- 55 or 100 watt (12/14 volts DC)
- Includes cig. lighter connector or optional 4-pin XLR

Pro-light

Can be used as a low-level key or accent light, fill light (w/diffusion), backlight or background light.

- Multi-use halogen, focusing/tilting controlled with one hand.
- 125 or 250 watt AC, 100 watt 12 volt, or 200 watt 30 volt DC
- Optional cigarette, 4-pin and 5-pin XLR connectors
- Lamps not included.

Tota-Light

Provides a base or bounce light, backlight, or background light. Use it with an umbrella or gel frame with a diffusion kit. It is an ideal fill light or small soft key or illumination for copy work.

- Multi-use halogen source with 360° no-yoke tilting
- Choice of 300, 500, 650, or 750 watt AC lamps (not included)
- Gull-wing reflectors close compactly for storage and travel

Omni-Light

Produces the ideal key or back-light and with diffusion or an umbrella it becomes a great soft fill source. With accessories, hand-hold the Omni, camera mount it, or choose from a wide variety of mounting systems.

- Multi-use halogen source provides a non-crossover beam
- Choice of optional quick-change Super-Spot Reflector for exceptionally long throws at all voltages
- Choice of lamps: 420 or 500 watt 120v AC, 650 watt 220/240v AC, 250 watt 30 volt DC, 100 watt 12 volt DC (lamps not included)

DP System

Only 3.9 pounds the DP Light offers a very powerful key, backlight or background light with or without diffusion. When used with its umbrella or diffusion it provides a soft key, fill, or side light. It includes a #1 reflector for an 8:1 focusing range and a large cool operating hand grip and knobs.

- Multi-use halogen source with 170° no-yoke tilting
- Choice of 500, 750, or 1000 watts 120 volts, 650 or 1000 watts 220/240 volts (Lamps not included)

Complete line of Lowel lights, lighting kits and accessories in stock...Call

anton bauer

Logic Series DIGITAL Gold Mount Batteries

The Logic Series DIGITAL batteries are acknowledged to be the most advanced in the recharge-able battery industry. In addition to the comprehensive sensors integral to all Logic Series batteries, each DIGITAL battery has a built-in microprocessor that communicates directly with Anton/Bauer InterActive chargers, creating significant new benchmarks for reliability, performance, and life. They also complete the communications network between battery, charger and camera. With the network in place, DIGITAL batteries deliver the feature most requested by cameramen: a reliable and accurate indication of remaining battery power.

DIGITAL PRO PACS

The ultimate professional video battery and recommended for all applications. The premium heavy duty Digital Pro Pac cell is designed to deliver long life and high performance even under high current loads and adverse conditions. Its size and weight creates perfect shoulder balance with all camcorders.

- **DIGITAL PRO PAC 14 LOGIC SERIES NICAD BATTERY**
  14.4v 60 Watt Hours, 5 1/8 lbs. Run time: 2 hours @ 27 watts, 3 hrs. @ 18 watts
- **DIGITAL PRO PAC 13 LOGIC SERIES NICAD BATTERY**
  13.2v 55 Watt Hours, 4 3/4 lbs. Run time: 2 hours @ 25 watts, 3 hours @ 17 watts

DIGITAL TRIMPAC

Extremely small and light weight, the Digital Trimpac still has more effective energy than two NP style slide-in batteries. High voltage design and Logic Series technology eliminate the problems that cripple conventional 12 volt slide-in type batteries. The professional choice for applications drawing less than 24 watts.

- **DIGITAL TRIMPAC 14 LOGIC SERIES NICAD BATTERY**
  14.4 v 43 Watt Hours, 2 3/4 lbs.
  Run time: 2 hours @ 20 watts, 3 hours @ 13 watts

InterActive 2000 Power/Chargers

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, all 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 bundles all Power/Charger features in the ultimate professional power system.

Dual 2702/2401
Two-Position Power/Chargers

The DUAL 2701 (70 watt) and 2401 (40 watt) are sleek, rugged and economical two position Power Chargers that have all the features of InterActive 2000 technology including DC camera output and LCD display. The DUAL 2701 will charge any Gold Mount battery in one hour, the DUAL 2401 charges ProPac batteries in two hours and Trimpacs in one. Their compact, lightweight package design makes them the ultimate travel Power/Chargers. They can also be upgraded with the Diagnostic/Discharge Module and/or with the Expansion Charge Modules to charge up to six batteries of any type.

PROFESSIONAL VIDEO TAPES

QUICK DIAL 71

fuji

Professional Grade VHS					
PG-30	2.39	PG-60	2.59	PG-120	2.79
Superior Grade Double Coated VHS					
SG-30	3.39	SG-60	3.99	SG-120	4.49
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	4.99		E630HME		8.39
P660HMP	6.49		E660HME		10.49
P6120HMP	8.49		E6120HME		13.99
M321SP Metal Betacam (Box)					
05S	17.95	10S	18.49	20S	19.95
30S	22.95	60L	31.95	90L	49.95
DP121 OVC PRO					
12M (Med.)	8.29	23M	9.99	33M	12.99
63M	22.49	64L (Lg.)	23.99	94L	33.99
123L					43.99

maxell

Hi8 Metal Particle (XRM)					
P6-120 XRM					6.59
Broadcast Duality 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	5.49	T-60 BQ	6.19	T-120 BQ	7.39
BQ Professional S-VHS (In Box)					
ST-31 BQ		7.19	ST-62 BQ		7.99
ST-126 BQ		8.39	ST-182 BQ		17.49
Betacam SP					
B5MSP	15.75	B10MSP	17.75	B20MSP	19.75
B30MSP	20.75	B60MLSP	29.75	B90MLSP	46.45

Panasonic

Mini DV Tape					
AY DVM-30	9.99	AY DVM-60			11.99
DVCPRO					
AJ-P12M (Medium)	8.49	AJ-P23M			9.99
AJ-P33M	13.49	AJ-P63M			22.99
AJ-P64L (Large)	24.99	AJ-P94L			34.99
AJ-P123L					44.99

SONY

Hi-8 Professional Metal Video Cassettes					
P6-30 HMPX	4.59	P6-30 HMEX			7.99
P6-60 HMPX	6.59	P6-60 HMEX			11.49
P6-120HMPX	8.89	P6-120HMEX			15.49
Hi-8 Metal Evaporated Editor (HMEAD)					
E6-30 HMEAD	10.49	E6-60 HMEAD			14.89
E6-120 HMEAD					20.19
PR Series Professional Grade VHS					
T-30PR	2.39	T-60PR	2.59	T-120PR	2.79
PM Series Premier Grade Professional VHS					
T-30PM	3.49	T-60PM	3.99	T-120PM	4.79
BA Series Premier Hi-Grade Broadcast VHS (In Box)					
T-30BA	3.59	T-60BA	3.99	T-120BA	4.79
MQ Master Quality S-VHS (In Box)					
MQST-30	7.49	MQST-60	7.99	MQST-120	8.39
BRS 3/4" U-matic Broadcast Standard (In Box)					
KCS-10 BRS (mini)	8.29	KCS-20 BRS (mini)			8.99
KCA-10 BRS	8.19	KCA-20 BRS			8.69
KCA-30 BRS	9.69	KCA-60 BRS			13.39
XBR 3/4" U-matic Broadcast Master (In Box)					
KCS-10 XBR (mini)	8.79	KCS-20 XBR (mini)			10.19
KCA-10 XBR	9.29	KCA-20 XBR			10.69
KCA-30 XBR	11.99	KCA-60 XBR			15.69
KSP 3/4" U-matic SP Broadcast (In Box)					
KSP-S10 (mini)	9.59	KSP-S20 (mini)			11.09
KSP-10	10.09	KSP-20			11.59
KSP-30	12.99	KSP-60			16.99
BCT Metal Betacam SP Broadcast Master (Box)					
BCT-5M (small)	14.99	BCT-10M (small)			15.99
BCT-20M (small)	17.99	BCT-30M (small)			18.99
BCT-30ML 21.49		BCT-60ML 27.99		BCT-90ML	41.99
Mini DV Tape					
DVM-30EXM w/Chip	15.99	DVM-60EXM w/Chip			19.95
DVM-30EX "No Chip"	12.99	DVM-60EX "No Chip"			14.99
DVM-30PR "No Chip"	9.99	DVM 60PR "No Chip"			12.99
Full Size DV Tape with Memory Chip					
DV-120MEM	29.95	DV 180MEM			34.95
PVD Series Professional DVCAM Tape					
PDVM-12ME (Mini)	24.95	PDVM-22ME (Mini)			26.95
PDVM-32ME (Mini)	29.95	PDVM-40ME (Mini)			31.95
PDV-64ME (Standard)	39.95	PDV 94ME (Standard)			44.95
PDV-124ME (Standard)	49.95	PDV-184ME (Standard)			59.95

SEVEN DAY CUSTOMER SATISFACTION GUARANTEE

Circle (47) on Free Info Card

VIDEO and PRO AUDIO

QUICK DIAL 72

KNOX VIDEO

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

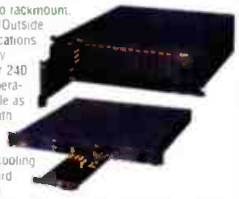
Knox's family of high performance, 3-channel routing switchers are extremely versatile easy-to-use and very affordable. Housed in an ultra-thin rackmount chassis they accept and route (on the vertical interval) virtually any video signal, including over-the-air and non-timebase corrected video. They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

- Accepts any one-volt NTSC or PAL video signal input including off-the-air and non-timebase corrected –to any or all video outputs.
- Accepts route two-volt mono or stereo unbalanced audio inputs to any or all audio outputs.
- Video and audio inputs can be routed independently (breakaway stereo a... too), they don't need to have the same destination.
- Can store and recall preset cross-point patterns. (Not available on RS12 ...)
- Front panel key-pad operation allows easy manual operation
- Can also be controlled via RS-232 interface with optional RS Remote Controller or Remote Keypad.
- Internal timer allows manual or automatic timed sequence of patterns. Ideal for surveillance applications.
- Front panel LED indicators display the present routing patterns at all times.
- An internal battery remembers and restores the current pattern in case of power failure.
- Internal vertical interval switching firmware allows on-air switching.
- Housed in a thin profile rackmount 1 chassis.
- Also except the RS12x2 are available in S-Video versions with/without audio.
- Models RS16x8 and RS16x16 are also available in RGB/component version.
- With optional Remote Video Readout, the RS16x8 and RS16x16 can display active routes on a monitor at remote locations, via a composite signal from a BNC connector on the rear panel.
- The RS4x4, RS8x8 and RS16x16 are also available with balanced stereo audio. They operate at 660 ohms and handle the full range of balanced audio up to +4 dB with professional quick-connect, self-locking, bare-wire connectors.

nova SYSTEMS, INC.

StudioFrame
Modular Video Processing System

The Nova StudioFrame Series is a modular, flexible, digital analog signal processing system. It is designed to efficiently and effectively combine a wide variety of individual function (or processor) boards such as A-D and D-A converters, video signal encoders and decoders, audio and video distribution amplifiers and frame synchronizers into more complex function groups, all in one equipment mainframe. The scalable nature of the StudioFrame design allows it to be easily reconfigured and/or upgraded as today's video standards and requirements continue to evolve. The system is housed on two rackmount frame models (the SF-3 and SF-1) allowing up to thirteen front loading processor boards and thirteen rear mounted passive interface cards to be accommodated in a single chassis. Both the StudioFrame SF-1 and SF-3 chassis are designed to meet the most stringent broadcast requirements. The SF-3 is a thirteen slot 3RU chassis while the SF-1 is a 4 slot, 1R... chassis. All studio cards as well as the two chassis are backed by a two year warranty on parts and labor with guaranteed 24-hour turnaround service. The units are ruggedly constructed to endure studio rackmount, production van and OB (Outside Broadcast) mobile applications. A universal power supply operates at either 110 or 240 VAC, 50/60 cycle. OC operation is optionally available as is a redundant supply with automatic switchover. Dual exhaust fans maintain proper airflow and cooling. "Hot swappable" front card loading allows power-on removal/insertion of individual processing modules without disturbing others in the system. All cabling can remain in place while you service any module. An intelligent "centerplane" provides power, sync, timing and data distribution, facilitating expansion to more complex, more cost-effective signal processing functions.



NovaASD/NovaSDA
Analog to Serial Digital & Serial Digital to Analog Converters

Components of the Nova StudioFrame series, the NovaASD and the NovaSDA incorporate the latest digital video processing techniques for high speed A-D and D-A signal conversion. They are designed to meet the most stringent broadcast requirements and their "hot swappable" front card loading facilitates servicing without disturbing other cards in the system. The NovaASD is ideal for for interfacing analog signals with digital video formats and the NovaSDA for interfacing serial digital signals with

SDA-1 Serial Digital Component to Analog Component Converter
- SMPTE 259M 4:2:2 Serial Digital Component (D1) input.
- Equalized and reclocked serial digital component output
- Analog component video (Y, R-Y, B-Y/YUV) and RGB/S outputs
- 10-bit D/A converters
- Output level control
- NTSC and PAL compatible

SDA-2 Serial Digital Component to Composite and S-Video Converter
- SMPTE 259M 4:2:2 Serial Digital Component (D1) input
- Equalized and reclocked serial digital component output
- Dual composite & dual S-Video outputs
- Color bar output selectable
- 10-bit D/A converters
- Output level control
- NTSC and PAL compatible

SDA-3 Serial Digital Composite to Analog Video Converter
- SMPTE 259M Serial Digital Composite (D2/D3) input
- Equalized and reclocked serial digital composite output
- Four analog composite video outputs
- Color bar output selectable • 10-bit D/A converters

ASD-1 Analog Component to Serial Digital Component Converter
- Analog component video (Y, R-Y, B-Y/YUV) and RGB/S input
- Dual SMPTE 259M 4:2:2 Serial Digital Component (D1) outputs
- 10-bit D/A converters
- Picture positioning control
- NTSC and PAL compatible

ASD-2 Analog Composite and S-Video to Serial Digital Component Converter
- Analog composite and S-Video input
- Dual SMPTE 259M 4:2:2 Serial Digital Component (D1) outputs
- 10-bit D/A converters
- NTSC and PAL compatible

ASD-3 Analog Composite to Serial Digital Composite Converter
- Analog composite video input
- Dual SMPTE 259M 4:2:2 Serial Digital Composite (D2/D3) outputs
- 10-bit D/A converters
- Input gain adjustment

NovaMNR Median Noise Reducer

The NovaMNR is a StudioFrame card that eliminates impulse and transmission noise, cleans up satellite, microwave and fiber feeds and fills in CODEC and time-based corrected videotape drop-outs. It features full bandwidth, uncompressed 10-bit digital processing for ultimate video transparency as well as analog composite inputs and outputs.

- Eliminates "sparkles" those black and white dots that sometimes appear on remote video feeds. The NovaMNR incorporates a proprietary adaptive three-dimensional median filter that analyzes pixels from several fields of video and replaces the impulse noise with unilluminated, clean video.
- Controls are accessible locally or remotely. A three position threshold switch (off/low/high) adjusts system noise sensitivity while a bypass/operate switch is also included. Both switches are remoteable via RJ-11 jack.
- Also available in PAL and PAL-M versions
- Universal drop-out compensation replaces missing video information, whether it is from a time-base-corrected VCR source or the decoded output of a CODEC feed. The NovaMNR effectively fills in drop-outs with replacement video from the surrounding pixels at previous video field.

NC-8 RGB/Component to Composite/S-Video Encoder

- 10-bit processing, 8-bit D/A conversion
- Zero insertion delay, frame of memory
- Two composite and one S-video output
- Analog RGB (Sync on Green or all three), RGB/Sync and YUV (Betacam) inputs. Also available with looping inputs.
- Variable luminance notch filter
- Y and C adaptive comb filtering for maximum encoding performance
- Remote serial control • Output level control
- Color bar output selectable
- Designed to meet the most stringent broadcast requirements.
- Hot swappable front card loading facilitates servicing without disturbing other cards.
- Available in PAL and PAL-M versions

VIDEONICS POWER™ Script

Animated Postscript Character and Graphics Generator

QUICK DIAL 74

The most advanced character generator ever designed for video production, multimedia and industrial applications. PowerScript delivers the huge range of titles and graphics supported by PostScript display technology, plus animation, effects, transparency and color keying. It features two GPI inputs, anti-aliased, 17.5 ns (nanosecond) pixel resolution and 4:2:2 broadcast-quality video. It also offers high-speed RISC processing to provide real-time Level 2 PostScript imaging and fast rendering—even with the most complex images. The PowerScript works stand-alone or with a computer, has a built-in TBC, offers a powerful and intuitive interface, and is suitable for the desktop or can be rackmounted.

Powerful Character Generator
- Choose from 35 built-in fonts or download PostScript fonts from your PC. PowerScript's high speed RISC processor provides real-time PostScript imaging.
- Characters can be rotated at any angle, scaled to any size, stretched horizontally or vertically.
- Styles include variable bold and italic, underline and shadow (drop shadow, variable displacement and opacity). Each character can be adjusted separately.
- Text can be positioned anywhere on the screen or automatically centered vertically or horizontally. Left, right, top, bottom and center justification is also provided.
- Characters are automatically kerned, using the font's standard kerning information. Spacing is highly flexible with variable word and letter spacing and line spacing (leading).

Intuitive User Interface
- Built-in real-time object-based drawing tool and text editor—no computer or software required. Design can be done ahead of time and displayed later, or can be done on the fly.
- Supplied keyboard and mouse are used with easy on-screen menus to place and modify graphics and text.
- Change fonts, colors, and other characters instantly.

Transparency and Colors
- Characters can be made transparent (0-100%) over video. Other characters and graphics with 64 levels of transparency.
- Opaque characters can use over 4,000,000 colors. Transparent characters can use over 8,000.
- Different colors can be used for fill and outline (variable width) as well as each letter and each graphic.

Roll, Scrawl, Animation, Effects
- Variable speed roll, crawl and push (slide) in all directions.
- Every text object, graphic and logo can be animated. Complex animations include having elements fly, bounce, etc.
- Elements can change outline and/or fill color, transparency, position as they move and results are displayed in real time.
- Move individual characters in different directions; make colors change; flash words; make letters and words bounce, spin a letter across the screen. Use fades and wipes to transition between titles and video or between two pages of titles.

Backgrounds and Graphics
- Titles can be placed on solid color, patterned or graduated backgrounds, or they can be genlocked to incoming video.
- Lines, squares, rectangles, ovals and circles can be created and placed anywhere on the screen. Each graphic object can use a different color, transparency, rotation, size, fill and outline.

Imported Logos and Graphics
- Accepts most PostScript or PCX format graphics without modification. Imported images can be any size and can be scaled, skewed, and rotated when placed on screen. Transparency and anti-aliasing can be defined when graphic is generated.

Expansion Capabilities

Although PowerScript operates on its own, you can still add peripherals and connect to a computer or network. Two PC-card slots allow the addition of non-volatile flash-RAM and Ethernet cards. RS-232 port allows connection to desktop computers for added storage and downloading of fonts or graphics from a PC.

QUICK DIAL 72

LEADER

Manufacturing test and measurement equipment for over 40 years, Leader Instruments is the standard which others are measured against for reliability, performance, and most important—cost effectiveness. Before a product is brought to market, an exceptional degree of energy and effort go into its design. Prototypes are built and tested to withstand environmental and other factors far exceeding actual operating conditions. These include high humidity, extremes of heat, cold, shock and vibration. Manufacturing quality is built in every step of the way and only the finest parts are used. At each production run, subassemblies are separately tested before they are integrated into the finished product. then each product is tested again. This is why less than half of 1% of all Leader products are ever returned for warranty repair or adjustment.

5860C WAVEFORM MONITOR

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

5850C VECTORSCOPE

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

5100 4-Channel Component / Composite WAVEFORM

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

5100D Digital Waveform/Vectorscope

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

5870 Waveform/Vectorscope w/SCH and Line Select

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

5872A Combination Waveform/Vectorscope

Models 5872A offers all the operating advantages of the 5870, except for the following: SCH is deleted from the 5872A (line select retained), making it ideal for satellite work.

5864A Waveform Monitor

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

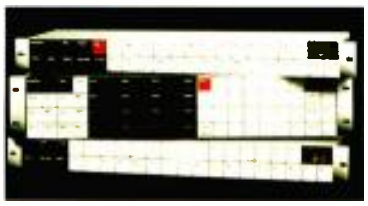
5854 Vectorscope

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

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

ROUTING CONTROL SYSTEM

Utah Scientific SC-3 routing control system: the production release of SC-3 is designed to provide the most advanced routing system when used in conjunction with the Utah-300 router for use in broadcast, post-production, cable television, fiber-optic transmission switching and satellite uplink facilities; the SC-3 provides an Ethernet control port for connection to industry-standard LANs for network control; the system maintains compatibility with all previous Utah Scientific routers and offers the functionality to control new and older routers from other manufacturers; 508-303-8200; fax 508-303-8197; www.artel.com



Circle (261) on Free Info Card

VHF TV TRANSMITTERS

Thomcast OPTIMUM line: based on a new concept design that combines state-of-the-art technologies, this line of VHF TV transmitters provides the highest level of performance and operational capabilities; the comprehensive line, from 500W up to 60kW, features a compact foot print, wireless transmitter structure, broadband amplifier, MOSFET technology, ability to upgrade with digital standards and a common module policy with CRYSTAL (DAB) and ULTIMATE (UHF); +33 (0) 1 34 90 30 01; fax +33 (0) 1 34 90 30 11

Circle (277) on Free Info Card

VIDEO CODEC

RE 2700 DCT video codec: this video codec provides lossless transmission of SMPTE 259M video over 155Mb/s OC-3 SONET networks in real time; designed for studio transmissions, it features true 10-bit resolution and interfaces to D-1, D-5, DCT and other serial digital tape formats; the codec also provides up to six side channels of associated audio and data; the RE 2700 supports remote machine control so that users on the remote end can have complete control over VTRs and other equipment at the studio; 440-871-7617 (ext. 200); fax 440-871-4303; www.re.dk

Circle (270) on Free Info Card

PLENUM-RATED MULTIPAIR AUDIO CABLE

Gepco plenum-rated multipair audio cable: this series of cables is available in pair counts of four (6604HS), eight (6608HS) and 12 (6612HS); the cables are 22-gauge with tinned copper conductors and drains; each pair is individually shielded and color-coded with Halar insulation; other features include an overall white polymer alloy jacket, a characteristic impedance of 70 ohms and a mutual capacitance of 25pf/ft; 312-733-9555; fax 312-733-6416

Circle (273) on Free Info Card

Business Wire

Business

Canon announced that NBC-TV will use more than 14 Canon Digi-Super 70s to cover Super Bowl XXXII. The Digi-Super provides high performance without regard to object distances. IFplus technologies reduce chromatic aberrations beyond conventional IF lenses, and in addition to its optical advantages, with IFplus, the heaviest group of elements remain stationary in the focusing section of the lens, so that the camera's center of gravity never changes.

Digital System Technology, Inc., in conjunction with Argyle/Hearst, announced that it is in the process of completing the installation of a digital TV system for the ABC affiliate KITV in Honolulu. DST designed, built and installed the first FCC-licensed digital TV station.

TCI announced the installation of two AMEK Recall automated mixing consoles into its National Digital Television

Center remote production truck. The main Recall console is configured with 44 microphone and 12 stereo line inputs. The truck is designed to handle audio for entertainment events such as concerts, talk shows and award shows.

RE announced plans to develop and market encoding and decoding products for the transport of DTV signals over satellite, microwave and terrestrial networks. In addition to these plans, RE was awarded a contract from AT&T to provide RE 4500 component digital video codecs for use in its International Video Services that will carry CBS's broadcast feeds from the 1998 Nagano Winter Olympics' International Broadcast Center. RE was also awarded a contract to supply RE 4500 codecs to Ohio Educational Telecommunications Network Commission, for the digital upgrade of OET's statewide video distribution network.

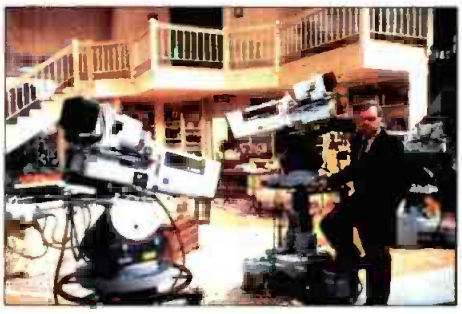
FAST recently presented the beta version of blue., the Native Digital Editor and has also announced the coordinated worldwide launch of blue. beta testing. blue. allows video to be edited in its original format, Native Digital, and features 10-bit uncompressed, MPEG-two and DV codecs. Combined with

The GALLERY

Every In - Any Out multiformat freedom, blue. supports all professional audio and video devices.

COMARK Communications' parent company, Thomcast, announced the acquisition of the department image from Matra Communication, a French telecommunications manufacturer. The new business unit, Multimedia and Digital Systems, will cover all activities in R&D, software and hardware products and systems aimed at providing the world market with innovative MPEG-2 products.

WCBS-TV, New York, installed a Hitachi Eagle System with two HV-D3 color cameras on top of the World Trade Center for its daily newscasts.



The installation of the system marks the highest resolution camera at the highest vantage point in the United States. Hitachi also announced that QVC home shopping network purchased 12 SK-2600 digital studio cameras with digital triax transmission for its new all-digital studio.

Harris Corporation was awarded a contract to provide a VHF DTV transmitter to ABC affiliate, WFAA-TV in Dallas. The PlatinumCD 20kW VHF DTV transmitter combines a reliable solid-state architecture with Harris' CD 1, the world's first commercial ATSC exciter.

SeaChange International announced that it is developing an interface between its Broadcast MediaCluster video server and OmniBus Systems' broadcast network operation system. The interface will allow the Broadcast MediaCluster to be efficiently used in TV transmission systems that have selected OmniBus Systems as their broadcast automation vendor.

KHQ-TV, an NBC affiliate, and Cowles Publishing have chosen to upgrade the station's field acquisition and editing with Panasonic DVCPRO equipment. The purchase includes 13 AJ-D700 camcorders, 14 AJ-D650 studio editing VTRs, six AJ-D750 studio editing VTRs, seven AJ-D230 desktop VTRs, seven AG-A850 edit controllers and a Postbox elite non-linear editing system. Also investing in the DVCPRO equipment, is the Tribune Company's ChicagoLand Television (CLTV) news. The sale includes 16 AJ-D700 camcorders, 18 AJ-D640 player/recorders and four AJ-D230 desktop VTRs.

Pioneer announced that NBC-TV's "The Tonight Show Starring Jay Leno," has installed a 3X3 IDT/Pioneer mul-

lion-less video wall as an addition to the show's set. The new multiscreen projection system replaces the old scenery between Leno's desk and the Late Night band, and stands as a centerpiece in the TV studio.

Black Entertainment Television (BET) has purchased four Canon Digi-Super70X lenses for entertainment productions. This is one of the first reports of the lens being used for entertainment purposes, rather than its standard use in sports production. The Digi-Super70X provides a long telephoto and wide-angle combination and is engineered to incorporate Canon's internal focusing and IF+ technologies for long-range telephoto applications.

Odetics Broadcast announced that NBC affiliate, KNOP-TV purchased an Odetics SpotBank commercial insertion and automation system for use in its station. The SpotBank will work in conjunction with an ASC video server to replace its hands-on manual system.

Tribune Broadcast in agreement with Sony will install Sony Betacam SX digital broadcasting equipment over the next few years. The purchase will primarily include the Betacam SX hybrid recorder and the DNW-A30 player, as well as the DNE-50 and the DNE-700 non-linear editors. ■

People

On Dec. 1, Julius Barnathan, former president of ABC Broadcast Operations and Engineering, passed away at 70 years of age of lung cancer.

He joined ABC in 1954 as supervisor of ratings. He held a range of jobs at ABC, including VP in charge of TV research, VP for affiliated stations, president of the owned TV stations and VP and GM of the TV network.

Barnathan's contributions to broadcasting were significant. He guided the technical production of six presidential campaigns and nine Olympic broadcasts (for which he received Emmy Awards for the Summer Games in 1976 and 1984, and the Winter Games in 1980 and 1988). He made television more accessible to the hearing impaired by guiding the development for closed-captioning. He was also honored with NAB's Engineering Award for his contributions to broadcasting. In 1985, he received the Trustees Award from the National Academy of Television Arts and Sciences. He also received the Presidential Proclamation Award from SMPTE in 1991. This year, he was elected as an honorary member of SMPTE for his lifetime contribution to the advancement of TV technology.

He retired from ABC in 1992, and remained as a consultant on technology and important technical issues. ■

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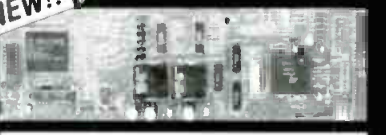

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Minimum of 5 years maintenance experience including significant experience in an ITU-R 601 digital environment. Requires knowledge of Sony VTR's inc., DBETA, BETA SP, GVG digital switchers and routing switchers and DVE, Hitachi digital cameras, Avid, and various digital and analog audio consoles. Requires a high level of PC and Macintosh literacy and networking skills.

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POSITION: Immediate opening for a highly motivated experienced broadcast engineer with a solid background in analog and digital video, audio, computer, transmitter, and satellite equipment. Knowledge of the ATSC television standard is required. SBE TV Certification or FCC General Class license preferred. Must be able to present demonstrations and technical training material to broadcasters.

Duties will include hands-on digital television system implementation, testing, and trouble-shooting, management of on-site technical staff and maintenance programs, DTV demonstrations and presentations, coordination of set-up and tear-down of road show.

TRAVEL: Based initially in Alexandria, VA, extensive travel will be required.

DURATION: This will be an 18-24 month contract position.

URGENCY: Review of resumes will begin immediately.

RESPONSE: If you are interested, please submit your resume and salary requirement to:

Internet: modlum@pbs.com
Fax: 703-739-8444
Mail: PBS
1320 Braddock Place
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Duties will include hands-on digital television system implementation, testing, and trouble-shooting, management of on-site technical staff and maintenance programs, DTV demonstrations and presentations, coordination of set-up and tear-down of road show, and management of budget expenditures.

TRAVEL: Based initially in Alexandria, VA, extensive travel will be required.

DURATION: This will be an 18-24 month contract position.

URGENCY: Review of resumes will begin immediately.

RESPONSE: If you are interested, please submit your resume and salary requirements to:

Internet: hdunton@harris.com
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Time Warner Communications
Mid-South Division
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6555 Quince Road, Suite 400,
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MAINTENANCE ENGINEER: WTVY-TV4 (CBS for Dothan and the Gulf Coast) a Benedek Broadcasting station seeks a television broadcast maintenance engineer. The candidate is expected to install and repair television equipment to the component level. Knowledge of VHF transmitters, microwaves, and computer systems is a plus. Must be able to work as a team member as well as independently. Must be able to work all shifts, including early morning, nights, and weekends. This is a hands-on position. NO CALLS PLEASE. Send resume, salary history, and references to Clyde Walker, Engineering Manager, WTVY-TV, P.O. Box 1089, Dothan, AL 36302. Fax 334-793-3947, e-mail clyde@wtvy.com. Benedek Broadcasting/WTVY-TV is an Equal Opportunity Employer.

ASSISTANT CHIEF ENGINEER Supervise engineering maintenance staff, assure compliance with regulatory agencies, routine equipment maintenance and repairs to the component level, assist in training of operation personnel, and responsible for the overall technical quality of the on air product. A minimum of five years experience in television broadcast maintenance is required, along with good supervisory skills. Experience in VHF transmitter maintenance and operation is preferred, along with SBE certification or equivalent. To request an application for employment and a job description contact: Dennis Lowe, Chief Engineer, KMVT Broadcasting, Inc., 1100 Blue Lakes Blvd. North, Twin Falls, ID 83301, or FAX your request to 208-733-4649. KMVT is an equal opportunity employer. Women and minorities are encouraged to apply.

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MAINTENANCE ENGINEER KPTM FOX 42 is currently accepting applications for a full-time Maintenance Engineer. The successful candidate should have an educational background in Electronics. Duties include maintaining and trouble shooting News and studio equipment. This includes proprietary broadcast equipment and building equipment. Live news cast support is required. The ability to work across departmental lines as well as working with minimal supervision is a must. The candidates schedule will include some weekend work but is an excellent opportunity to get a start in a progressive broadcast station. Please send applications or apply in person to: KPTM FOX 42, Attention: Personnel, 4625 Farnam Street, Omaha, Nebraska 68132. No phone calls please. KPTM FOX 42 is an equal opportunity employer. M/F/H

CHIEF ENGINEER Shockley Communications Corporation is seeking qualified candidates for the position of Chief Engineer for its station in Rochester, MN. Candidates should have experience in UHF transmission systems, microwave STL/TSL, digital storage and routing and station operations, including master control, production, traffic and news. The successful candidate will be responsible for building a high power UHF station, NTSC AND DTV from scratch and grow it to be the news, programming and community service leader in this market. Qualified candidates looking for a challenge in a #1 city should send resume to: Terry Kelly, Executive VP/TV, 5725 Tokay Boulevard, Madison, WI 53719. SBE certification preferred. Shockley Communications is an equal opportunity employer.

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MANAGER, TECHNICAL SERVICES An NBC O&O station in Miami has an opening for a Manager of Technical Services reporting to the Director of Engineering. The incumbent will participate in our transition to Digital TV, actively contribute input to the capital, business and operating plans and will be accountable for engineering performance. Responsible for special projects as assigned. Solid broadcast technical knowledge. Significant experience in major market production/operations/technical management. Bachelors degree in technical area or equivalent experience. Computer proficiency (Microsoft Word, Excel). Excellent leadership, team building, communications and general management skills. If interested in the above position, please send resume to: Director Employee Relations, WTVJ/NBC, Inc., 316 North Miami Avenue, Miami, FL 33128. Fax: (305) 789-4399 We are an Equal Opportunity Employer. M/F/V/H

MAINTENANCE TECHNICIAN: WHLT seeks a motivated individual for the position of Maintenance Technician. Qualified candidates must have a formal education equivalent of Associate of Arts Degree in electronics, military training, or trade school certificate preferred. Ten years of broadcast maintenance experience preferred. Must be capable to trouble shoot broadcast equipment to the component level in a timely matter under deadlines. Must be physically capable of working occasionally in hot, cold, wet, cramped, noisy or dirty places. Qualified applicants should send resume, salary history, and cover letter to Human Resources Dept., WHLT Maintenance Tech., WJTV, 1820 T.V. Road, Jackson, MS 39204, WHLT is an Equal Opportunity Employer M/F. Pre-Employment Drug Test Required.

ANCHOR/REPORTER KDNL-TV, the ABC Station for St. Louis, has an immediate opening for a weekend Anchor/Reporter. Qualified candidates must have 3-5 years experience. And possess dynamic communication, enterprise reporting, creative storytelling, and superb live remote skills. Send resumes and videotapes to: Personnel Department, KDNL TV 30, 1215 Cole Street, St. Louis, MO 63106. Pre-employment drug screening required. Minorities are encouraged to apply. KDNL is an Equal Opportunity Employer. No phone calls please. Resume deadline is January 5, 1998.

KPTS IS SEEKING A BROADCAST MAINTENANCE Engineer with demonstrated skills in troubleshooting, repair, and operation of equipment. Requires formal electronic training, two years of experience, FCC license, TV Broadcast Engineer SBE Certification or willing to obtain. Flexible schedule. Salary commensurate with experience. Please send resume to: KPTS Television, Human Resource Dept., 320 W. 21st Street North, Wichita, KS 67203. EOE

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EOM

The end of local broadcasting?

BY PAUL MCGOLDRICK

Paul McGoldrick

If you attended the *Broadcast Engineering* Digital TV '97 conference last month, you heard me make an assertion that local TV broadcasting may disappear in the digital age. I was asked by a couple of attendees to expand on that thinking:

The fact, as I noted last month, that every single TV broadcaster in the United States has committed to DTV broadcasting and has been allocated a new (mostly UHF) channel is astounding. I don't see a problem for the top 30 markets; each one of those stations either has, or can obtain, the resources necessary to build the essential RF and production infrastructure to go ahead. They will then be able to sell the additional space beyond their DTV broadcast(s) and recoup their investment. If they had to broadcast HDTV over the whole channel — as lawmakers probably thought they had agreed to — stations probably wouldn't make money for a long time. If stations had to pay for the channel allocation, the same may have been true. (Selling the empty VHF frequency spectrum in nine or more years should be the biggest money auction in history.)

For markets 31 to around 120, increasingly close attention to budgets will be needed. I suspect many will overspend. Fallout effects from those will increase the dramas played out in the lowest markets. In television, *lowest* directly equates to *poorest*. If anybody thinks that a station in a DMA of around 200 has a license to print money, I can direct you to a few buys!

Monopoly

How will those stations implement DTV? What has been happening in radio is probably a good example. In a word, *aggregation*.

Aggregation is the cover-up word for what has been described as a game of Monopoly. When you play Monopoly, you grab every property that you can. As the game proceeds, you start amalgamating to get the right, complete, groups of properties so you can take maximum advantage of visitors. As you start to improve properties with houses and hotels, cash flow is perilous, but the risks are worth the income potential. Then a massive tax or other levy hits you and you are in trouble. You mortgage off properties that are less important to you; you do deals; you survive (hopefully).

. . . local TV broadcasting may disappear in the digital age.

The minimum outlay to get into DTV has got to be a DTV transmitter and antennas (probably plus a tower), STL, NTSC/525-component analog-to-DTV converter, as well as monitoring, test and DTV input equipment. With that collection you could input satellite DTV signals and add locally converted 525-line signals, probably only in 480P and broadcast. Doing all that for less than $750,000 is unlikely.

Enter the Monopoly player who agrees to fund the project in exchange for most, or all, of the station. The buyer provides 99% of your signal by satellite, complete with advertising and you provide station IDs and a couple of local car dealer commercials. Then, the buyer brings in the supplementary services to make money from the remainder of the bandwidth.

And then the race for aggregation is on. The megagroups in radio haven't finished the feeding frenzy as they try to solve the problems of controlling the acquired properties; and they just seem to get bigger, but more focused.

What if the small guy refuses the overtures? Local funding will probably not be available for what is inherently a bad investment, so in the end it will be either a fire sale or a bankruptcy. What is the time scale? Take the FCC's timetable for conversion, basically nine years and add another three years for the inevitable waivers to complete the process. Is this good or bad? It is not for me to say, but it does go against the stated purposes of local broadcasting.

Public broadcasting

I don't see this affecting PBS' ability to convert to DTV — and with probably more HDTV broadcasting than anyone else! One way or another, the majority of PBS stations will find the money and resources to do it. Some systems are in a better position and condition than others. It is also a great opportunity to undo some really crazy PBS things and get the system into the 21st century.

For example, in the San Francisco Bay area, there are what amounts to five PBS stations trying to get the same dollars from a relatively small percentage of the viewing population. Although the money is certainly there, it would be nice if a little imagination were used to combine those five into two UHF channel allocations. The stations could get done all the things they individually want to do without the ridiculous competition. That won't happen, unfortunately, and I for one will not be watching when the pledge drives turn audience guilt levels to a new high. ■

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

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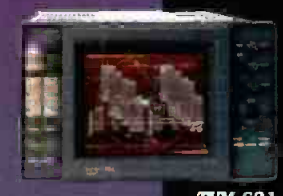
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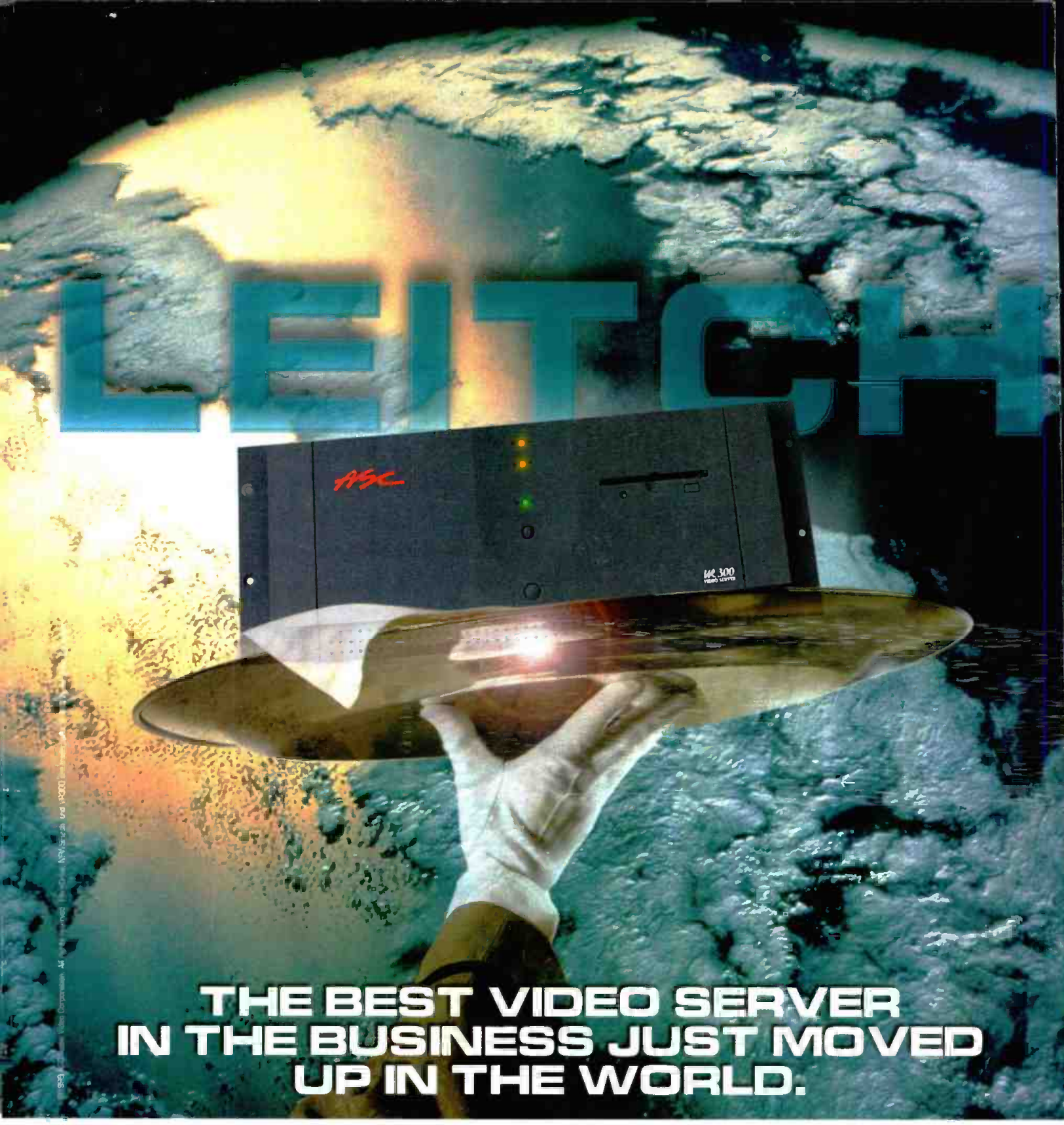

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