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AUGUST 1998

Broadcast ENGINEERING®

THE JOURNAL OF DIGITAL TELEVISION™

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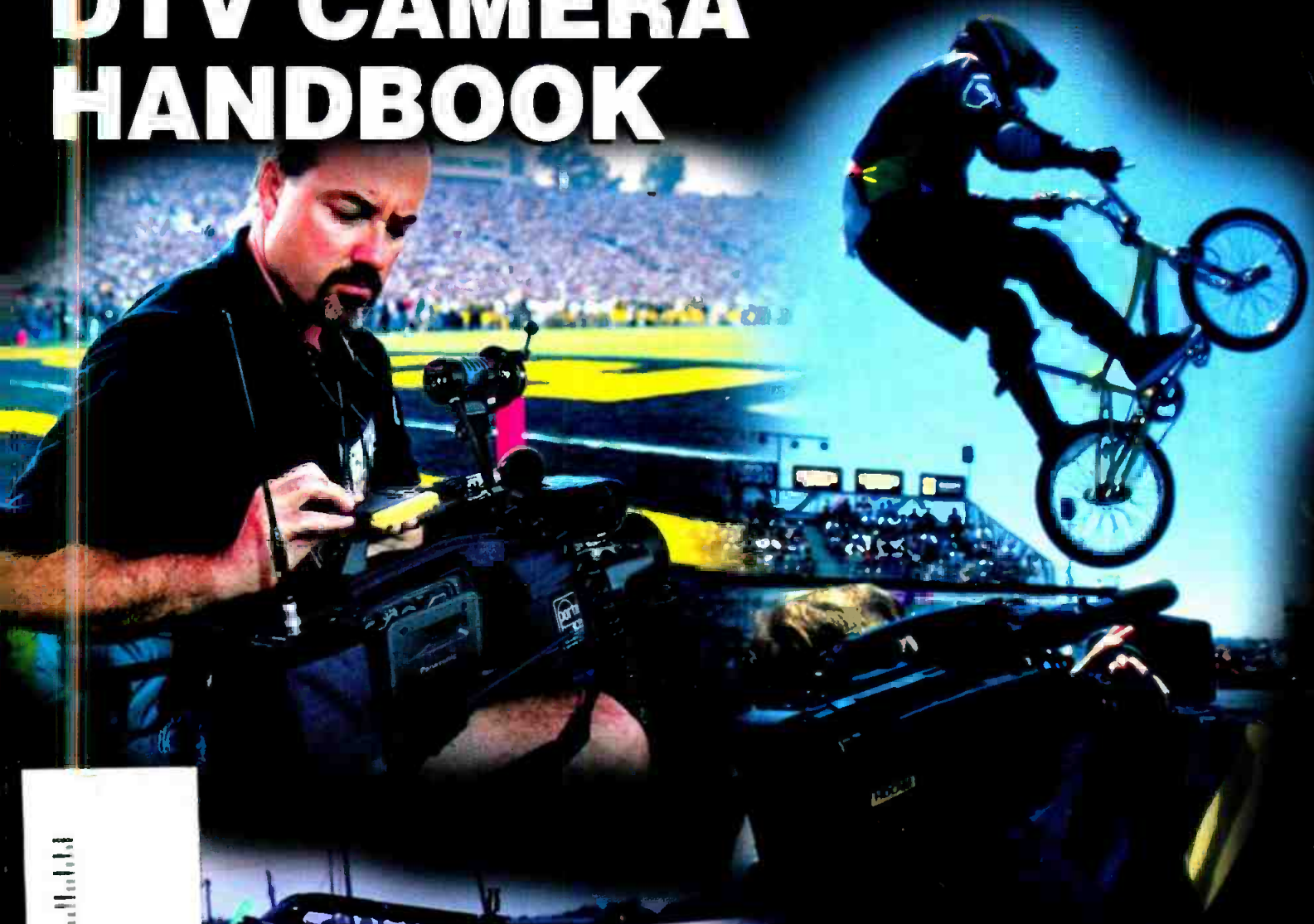

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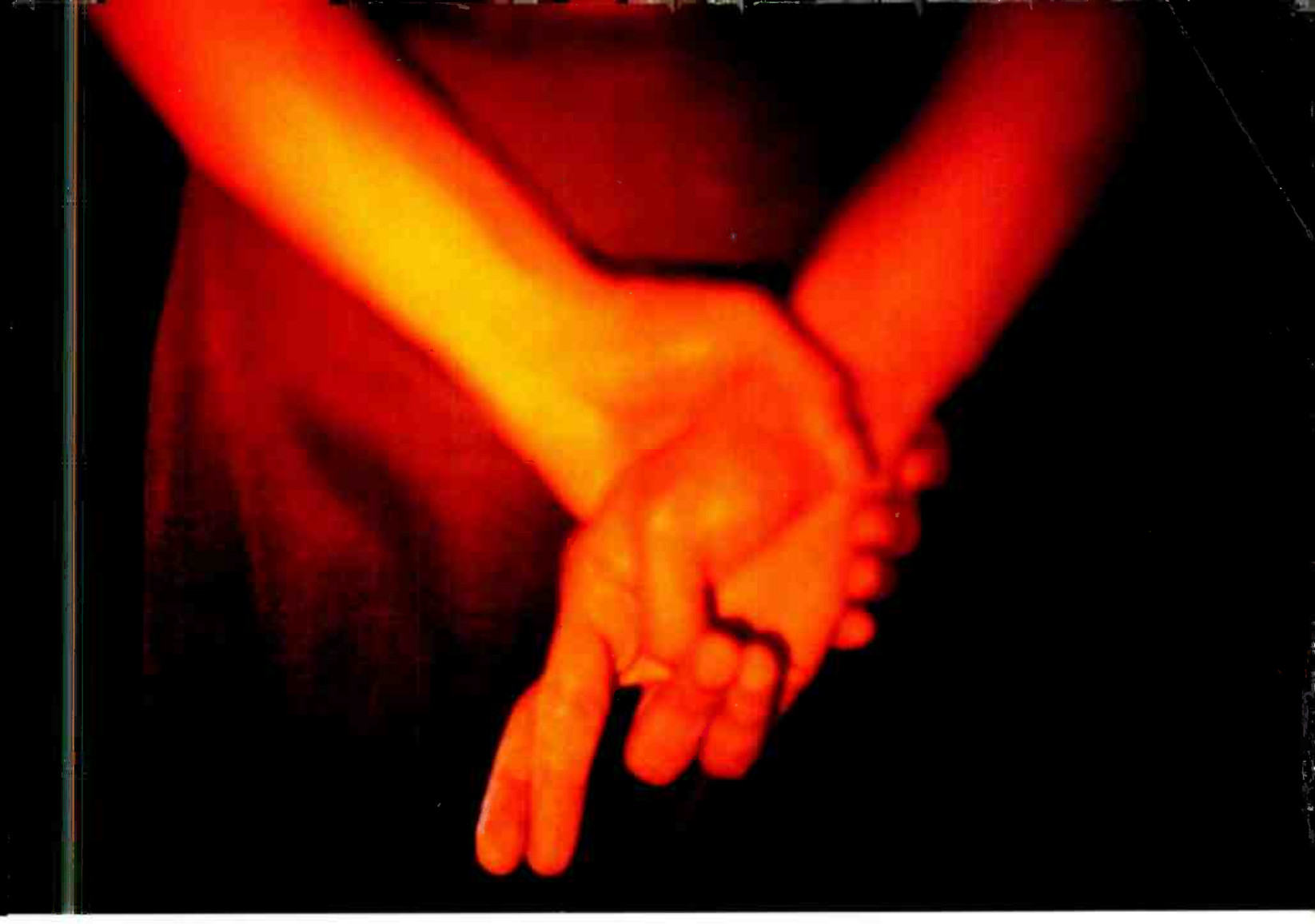

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August 1998
Volume 40
Number 9

Broadcast ENGINEERING
THE JOURNAL OF DIGITAL TELEVISION

IN THIS ISSUE

Features

Beyond the Headlines

NEWS

FCC UPDATE

DTV UPDATE

EXPERT'S CORNER/VENDOR VIEWS

Digital Handbook

TRANSITION TO DIGITAL

COMPUTERS AND NETWORKS

ASK DR. DIGITAL

(continued on page 8)

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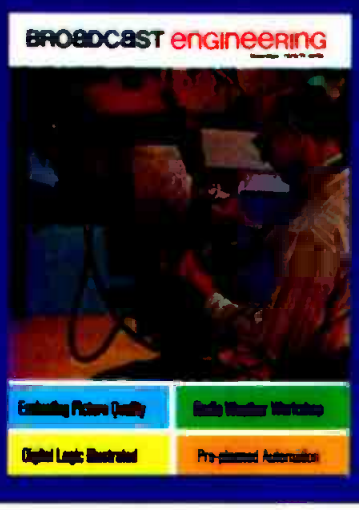

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Editorial

Letter from camp

"Hello mudda, hello fadda. Here I am at Camp Granada." Anyone out there besides me recall that song? It sort of reminded me that it's mid-summer, and no single issue is burning within my computer. So, I thought I'd share a couple of things that have crossed my desk in the last couple of weeks.

The first thing that piqued my interest is the continued arrogance of the computer industry. Because many broadcast systems have billed themselves as "NT systems," we follow it closely here at *BE*. I was scanning stories about Windows NT 5.0 and came across one headline that read "NT 5.0 continues to slip." Reading further, I discovered that not only was NT 5.0 slipping, but it was in its "second" beta. What? Wait a minute. A "second" beta? I thought a beta was already a second version. But, hold on, it gets better. In case you're wondering how stable NT may really be, the story says that NT 5.0 apparently wasn't working quite right so Microsoft plans to release a "third" beta. Not to worry, Microsoft officials are calling the third beta merely a "refresh." Unfortunately, for those planning on 5.0, the second beta won't be "feature complete" — sort of like a new car that only comes with three wheels. You just have to laugh.

Seems at least one satellite company may have hired the same computer PR type to write its press releases. DirecTV played word games when describing its recent satellite failure. The company issued a press release confirming that a spacecraft control processor had failed on July 4. However, the word failure was never used. Instead, the release's headline noted an "anomaly" on their DBS-1. So what do you call it when the satellite falls out of the sky, a temporary minor outage?

Finally, I wanted to mention cable's digital dogfight. It seems that cable (see last month's editorial on AT&T buying TCI) doesn't want to carry all these new signals broadcasters are being forced by the government to generate. The cable industry is crying foul saying they can't be expected to carry all these new channels because they are out of spectrum. If you're the cable guy with a typical 50-channel system, you can see the problem. In Kansas City, for example, that would amount to finding a place for as many as 48 new channels of off-air programming. Whoops, there go your 50 channels.

Once these cable systems go digital, it won't be as much of an issue. However, the cable industry isn't going to add these new broadcast channels without something in return. And they've made it clear that they want to negotiate those agreements without any FCC regulations binding their collective hands. TCI's number two guy Leo Hindery said that mandatory carriage of the new digital TV signals "would be one of the greatest displacements of high-quality (cable) programming — one of the rudest things I can ever, ever imagine."

Yep, I sure hate to see cable drop those *high-quality* programs like the spittoon channel or the cat channel. And, oh yes, there's also the mud-wrestling channel. No, Leo, the rudest thing imaginable is your arrogant refusal to implement digital technology on the same schedule that broadcasters have to follow.

Brad Dick

Brad Dick, editor

direct: brad_dick@compuserve.com
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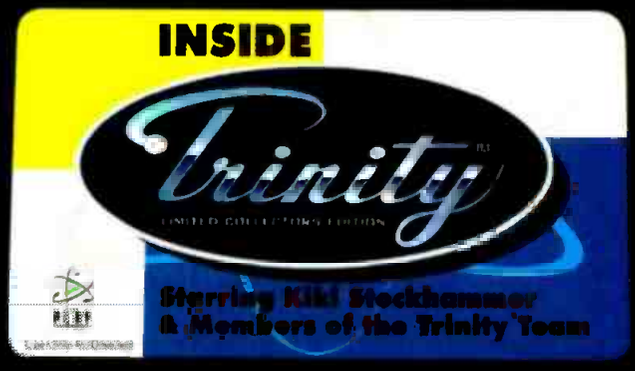

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Reader Feedback

Handling 5.1 audio

I found Ken Hunold's article (see "Handling 5.1 audio in production," *Broadcast Engineering*, May 1998, p. 64) on handling multiple channels of audio interesting. I am trying to gain consensus in the TV audio industry for a particular delivery system. I don't represent any manufacturers; I'm just an LA-based production mixer trying to get the industry to talk about how we're going to ship six channels of audio around (without AC-3 encoding) until it's broadcast. Any suggestions?

PETER BAIRD
LOS ANGELES

Author Ken Hunold responds:

Consensus in the broadcast industry is often elusive because of the many forces at work. These vary from paranoia (the program producers want to be in complete control of their product through the creative and distribution processes) to the mundane (the track assignments of any multitrack media must be unambiguously identified).

Broadcasters are not very comfortable with dual system operation (separate audio and video storage formats, for example) in their integration and distribution systems. Network delivery systems often have lots of issues, other than audio, that must be addressed. Therefore, their infrastructures are more complex (and thus more resistant to change) than audio-only, or even audio-for-video facilities. Post-production facilities, including the post facilities at the networks, are more accustomed to dealing with separate audio and video elements and formats. At the networks, these elements are almost always conformed to a single physical piece of media for distribution.

As mentioned, six channels of audio exceed the capabilities of most of today's VTRs. All of the networks are currently working out how they will be handling this issue, so some agreement may be forthcoming. You may want to lobby the networks to which you intend to deliver your product. Try to sell them on a simple, efficient and consistent system that addresses their concerns for a reliable, repeatable and straightforward delivery system. Bear in mind that network delivery formats often have some historical significance and that the consensus solutions may not always be the best solutions.

A product that needs designing

In Paul McGoldrick's EOM column (see "A product that needs designing, *Broadcast Engineering*, June 1998, p. 212), he cries out for a video equivalent to the ubiquitous seven-second delay of talk radio and hopes for one to be available by NAB '99. The good news is that one such product appears as a *BE* pick hit in the same issue. Based on the page 95 description of Accom's APR Attaché DDR, it should be able to deliver as much as two minutes of audio, video, and even key delay.

STEVE BEURET

Paul McGoldrick, in his EOM column, June 1998, speaks of the need for a video delay device. The product available as he described is already available from Prime Image; it's called the Pipeline Delay. It provides up to 10 seconds of audio and video delay. I've used the unit, and it works quite well.

JERRY FOREMAN
GREENCASTLE, PA

It's a Heathkit world

Greetings from the cable-TV trenches. I just wanted to say that I enjoy reading *Broadcast Engineering*, and I got a real kick out of your Heathkit editorial (see "It's a Heathkit world," *Broadcast Engineering*, June 1998, p. 8). I also used to build Heathkit stuff. I still have my first Heathkit transistorized voltmeter (one of the first replacements for the old VTVM) and my Heathkit color-bar generator, built from trusty old Motorola MC78x series RTL logic (slow, runs warm, has that weird 3.6V power requirement). And it was great fun rolling my own, just like you have with your 14-watt-per-channel tube amp! What a sense of satisfaction one gets from this hobby. Anyway, keep up the good work and thanks for tickling some fond memories.

JOANNE BANDLOW
CABLEVISION SYSTEMS

I really enjoyed your editorial "It's A Heathkit World" in the June issue of *Broadcast Engineering*. It brought back memories of building my first kit (an Allied Radio Knight Kit) when I was 12 years old and subsequent Heathkits, all of which still work. Ironically, as I write this, I am listening to a vintage Marantz receiver in my office.

ROBERT LEFTWICH
PRESIDENT
LEFTWICH CORPORATION
ROANOKE, VA

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News

What's wrong with an antenna on your roof?

BY LARRY BLOOMFIELD

Field tests conducted by independent engineers concerned about DTV reception indicate we may have to go back to a tradition in television as old as the industry itself. Drive into almost any neighborhood, and you can tell where the amateur radio operators live.

Remember in the early days of television when the same was true of who had a TV set and who didn't? As TV receivers' front-ends improved, stations increased their effective radiated power, and many of us subscribed to a new thing called cable and those classic rooftop protrusions began to vanish. Some of us got taken in by a device that looked like a poor attempt at coat-hanger art and was named for Peter Cottontail's listen apparatus: the rabbit-ear antenna. Can you recall ever encountering rabbit-ear antennas that even remotely performed with any degree of satisfaction without more ghosts than a Halloween party at Vincent Prices' house? And then there was the proximity effect: If you walked anywhere near the twisted bit of junk, the picture would fade, jump and do all kinds of gyrations the producer of the show never intended for it to do.

The outdoor antenna did a fine job. Why did we ever abandon it? There are many reasons, and it would be impossible to list them all here. The two that are probably the most bothersome are poor initial installation and the neighbors wanting to "dress up" the neighborhood. Remember, the FCC has recently taken the bite out of the prohibitions that so many neighborhood covenants waved in the face of any would-be antenna erector.

The outdoor antenna may make a reappearance. Some folks with a vested interest have been looking into reception issues with the new DTV service that will be offered to the unsuspecting public beginning this November. The results they came up with are other than promising. It appears that we'd better get used to the rooftop antenna once again if the information from Nat Ostroff of the Sinclair Broadcast Group and others is even remotely true.

Ostroff pointed to a report presented by Dennis Wallace at NAB this year. Wallace's firm was hired by MSTV to evaluate DTV reception in the Washington, DC area from WHD and WETA. The fact that MSTV sponsored this project is significant to what is presented here.

Ostroff recently stated, "The results of these tests confirm our worst fears about the viability of 8VSB and the DTV standard as an indoor antenna service. Even outdoor reception was discouraging." Ostroff said that according to tests in which a log-periodic antenna on a 30-foot mast was used, 44% of the outdoor sites tested for WETA produced unacceptable results, as did 29% of the sites tested for WHD. Ostroff said, "Even at sites where signal strength was not a problem, reception was not acceptable." He speculated that this problem was probably caused by dynamic multipath problems in the path to the receive antenna.

Ostroff is rightly concerned. His company owns 57 TV stations. According to Ostroff, the cost to make the transition to digital delivery of his various signals is more than $300 million. Not being able to get a viewable signal into viewers' homes "is very disturbing since these results are the first from an old-line eastern city and may be more representative of what might be expected from cities like Boston, Philadelphia, Baltimore, etc."

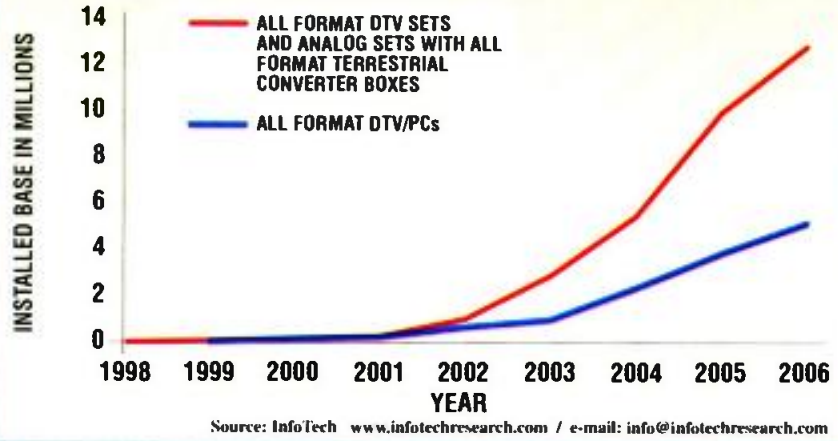
Remember, these test results are about outdoor antennas. As you can imagine, indoor reception results were far worse.

FRAME GRAB

A look at the issues driving today's technology.

Slow start for digital reception, faster growth later.

Penetration for all format digital TVs (and analog sets with all format terrestrial converter boxes). By 2006, approximately 13% of American households will be equipped to receive off-air digital signals. All format DTV/PCs are also shown.



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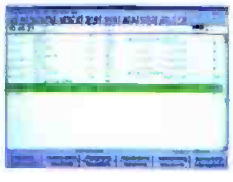

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Ostroff said, "For WHD, the sites that were above the required signal strength, but did not produce acceptable results, represented more than 50% of the total. That is, 28 out of 52 sites did not produce pictures with a bow-tie/reflector antenna. With just a bow-tie antenna, the results were even worse. That is, for sites with enough signal level, only 16 out of 46 sites produced pictures indoors!"

Multipath is only one of a number of problems that the receiving antenna system — indoor or outdoor — and receiver itself must handle. Keep in mind that the farther away the transmitter site is from the heart of town, the less multipath tends to be a problem. The multipath issue was a concern mentioned recently by Roy Trumble, assistant chief at KRON. Trumble noted that the multipath signal strength that KRON will experience in San Francisco, with Mt. Sutro being so close, will be nearly as strong as the direct signal itself.

One other concern should come from those unsuspecting souls who live in areas where they get signals from several different transmitter sites. In San Diego, for example, major network station affiliates, including the NBC O&O, are located from downtown San Diego to the north (ABC & CBS), east (NBC) and south (FOX). Probably the only reason nothing is located to the west is because of the Pacific Ocean, or there'd be a transmitter site out that way.

With Ostroff's experience in both the broadcast business and at the engineering helm of several major TV transmitter-manufacturing companies, we should listen to him. According to Ostroff, "The real secret of digital success may well be in the ability and willingness of the receiver manufacturers to face up to the need to make adaptive equalizers for their receivers that can deal with the true nature of the dynamic multipath found in both outdoor and indoor environments." So far we have not seen that the consumer industry understands or is prepared to make such an effort.

Ostroff added, "It is up to the broadcasters to make . . . robust off-air reception a requirement for every DTV set sold into the market. Anything less could leave us with only cable as a means to reach our digital audience." Ostroff has invited anyone interested in getting consumer set manufacturers to listen to these problems to e-mail him at Nostroff@sbgnet.com.

Ostroff has taken his case to the Consumer Electronics Manufacturers Association (CEMA). This national organization, which represents most TV set manufacturers, does swing some influence in these areas. After several snail-mail exchanges between Ostroff and Gary Shapiro, president of CEMA, Shapiro assured Ostroff in a letter dated May 5, 1998 that CEMA, in addition to participating in the public policy debate on mandatory cable carriage of DTV, is also "pursuing a pro-antenna, pro-over-the-air policy." Shapiro continued, "I would think Sinclair would support both cable 'must carry' and our (CEMA's) antenna promotion campaign.

"As to whether TV sets will get off-the-air reception under multipath conditions, set makers I have spoken to indicate this is not a problem or one that will be resolved shortly. To me, this means that some set makers have proprietary solutions (algorithms)."

Holding out an olive branch, Shapiro said, "I think we share a desire for robust over-the-air service. I will oppose efforts to slow down DTV service . . . or put mandates on set makers." This is not the strongest reassurance that could have been given to someone representing a company that will be spending as much as Sinclair.

Engineers at CEMA have said they are making every effort to insure that the retailers have a handle on the antenna problem. If you see someone in your neighborhood taking field-strength measurements, it's probably someone from CEMA mapping the countryside. Granted, that's going to be kind of hard to do meaningfully because there is not much in the way of regularly transmitted DTV signals these days, but these maps will be out to the retailers so everyone will know where the reception problem areas are. Until there is more definite proof from the receiver manufacturers that they have the issues of multipath and more robust receivers well under control, Ostroff has some valid concerns. Want to know what CEMA is up to? Go to www.cemacity.org.

Upgrading surround sound to AC-3

It wasn't long ago that DirecTV announced it would air AC-3 5.1 surround sound. Many broadcasters will be airing AC-3 with their new HDTV this fall. This is all well and good, but there is one problem: AC-3 is not backward compatible. What about Pro-Logic and all the folks who have invested big bucks in that kind of surround-sound equipment in the past?

AC-3 is Dolby's third and next generation of surround sound. If you're not familiar with it, look through the back issues of this magazine, where much has been printed about the subject matter. You're going to see it almost everywhere. In addition to its application in HDTV, AC-3 is also the Dolby digital film format and is used on the audio tracks of the latest generation digital video disc (DVD) here in the United States. That's not all. With the recent changes to the PAL DVD specification, the Dolby Digital AC-3 encoders are used in most parts of the world, including Europe,

DIGITAL HEADACHE?

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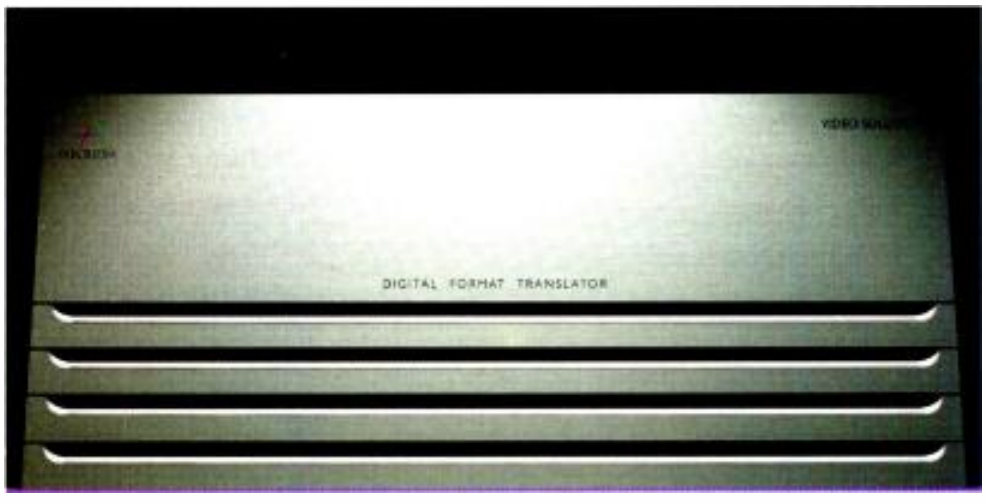

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making it, for the most part, the worldwide format on audio tracks. This makes the techniques for encoding/decoding the same for DTV, DVD, HDTV and the rest of the alphabet soup.

Surround sound sounds great. However, it seems that the majority of the more than 29,000,000 Dolby surround systems sold to date cannot play back the 5.1 channels of Dolby Digital AC-3. Dolby Digital is a universal standard found on DVD, laser-disc and PC multimedia. It will soon be available on other DSS, HDTV and digital cable services.

What's the point? Create a need and someone will step up and fill it. That's just what Vantas, out of Redondo Beach, CA, has done, demonstrating the first digital surround processor/amplifier that will allow users to play back Dolby Digital (AC-3) with any receiver.

Elliot Rubin, Vantas' director of marketing, said that their new products "simplify the user interface and eliminate the need for a remote control. Source detection and switching are automatic. Real-time VTRACK (digital volume tracking) matches the surround channels to a receiver's main volume level." The automatic features, however, can also be set manually.

The company offers two devices that will enable all Pro Logic and stereo home theater systems to play back the 5.1 channels of the Dolby Digital encoded sources (AC-3). The main difference between the two models is that the DPA-S50 accepts both analog and digital audio and the DPA-P87 takes only digital signals. The DPA-P87 installs between the receiver's speaker outputs and the speakers and is designed as an upgrade for Pro Logic receivers. The DPA-S50 is designed as an upgrade for receivers (and stereos) that do not decode Pro Logic.

For further information contact Vantas via e-mail at rubin@vantas.com. ■

Thank you FCC

Ever go to someone's home and see a cable box that performs better, looks better and has more features than your cable box? Ever try to buy one? It's been nearly impossible, unless you found one bootlegged or on the black market.

Now, thanks to the Telecommunications Act and the Federal Communications Commission, the FCC has recently adopted pro-competitive, pro-consumer rules allowing consumer cable devices to be sold at retail. Maybe with the consumer allowed to buy his own set-top box off the shelf, the hidden costs of cable will cause the monthly bill to go down and the service to improve; or maybe this is wishful thinking. There is no doubt that the cable companies will scream the way the phone companies did when you were first permitted to buy your own telephone. Well, the world didn't come to an end then, and it probably won't over this decision either.

One lone voice does speak in favor. According to Gary Shapiro, president of the Consumer Electronics Manufacturers Association (CEMA), which is part of the Electronic Industries Association (EIA), "This decision will benefit consumers because it will foster innovation and competition. Consumer electronics manufacturers can move forward to develop a wide range of products and features, increasing consumer choice and driving down consumer costs." For more information, see CEMA's web page at **www.cemacity.org**. ■

Interactive TV lives

Almost sounds like a movie title. Just when the industry is recovering from the voice of John Malone (CEO of TCI) in the wilderness stating what his company is going to carry in the wonderful world of DTV/HDTV and then TCI's tawdry affair with AT&T, it is refreshing to see that someone at TCI is far enough away from the corporate card cutting and shuffling to have time for some new technology. What's really interesting is this is about the Dallas-area cable system owned by none other than TCI.

ACTV has announced that they have successfully delivered the first digital individualized TV programming to a limited number of digital cable homes within the Dallas-area cable system of TeleCommunications Inc. (TCI). Working with TCI and FOX Sports Southwest, the company has already produced and digitally delivered more than

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50 live, ACTV-enhanced professional sporting events. The company announced that it has successfully completed satellite delivery of its signal to other cable operators, demonstrating its ability to deliver ACTV-enhanced programming to digital homes throughout FOX Sports Southwest's entire viewing region; this region consists of approximately 5,000,000 homes.

The company has built a multimillion-dollar production facility outside of Dallas that delivers an MPEG-2 digital program feed to TCI Dallas through a direct fiber-optic connection. The signal is received by TCI using General Instrument headend reception equipment and is then delivered as an integrated part of the TCI digital-programming package to digital cable homes.

The ACTV's patented technologies allow viewers to direct the programming they are watching. For example, with sporting events, ACTV's individualized television technology permits the viewer to select more than 60 viewing options, such as Star Cam, which focuses on a featured player; Instant Replay-on-demand; in-depth statistics; scoring summaries and relevant feature stories and interviews. At the touch of a button, a viewer can seamlessly switch between game action and a multitude of options. The company's programming technology can similarly enhance a variety of TV genres including, but not limited to, news, game shows, educational programs and even advertising.

ACTV is making final preparations for launching this technology on a broader scale. They are working closely with the FOX Sports Southwest on fine-tuning all aspects of the live digital production and delivery. ACTV has relationships with many of the dominant players in the digital TV and Internet fields, including two companies that hold an equity interest: General Instrument Corporation and The Washington Post Company. General Instrument is integrating ACTV's patented software into all of its current and future digital set-top boxes. ■

Larry Bloomfield, a former chief engineer, is an industry consultant and author, located in San Jose, CA.

SKY-LA

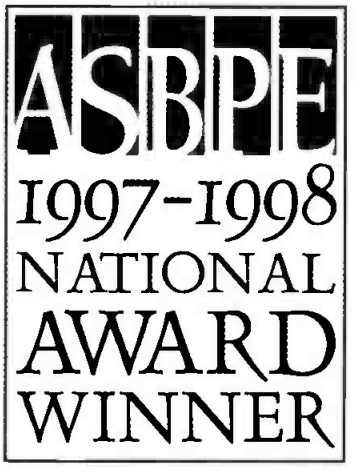
By now, most everyone has heard of companies such as DirecTV, PrimeStar and EchoStar. These companies provide most of North America with direct-to-home TV service via satellite. In this day and age, with all the talk about digital television, these folks have been and are doing it. No, it's not high scan rate, high definition, but remember, digital television is the method of delivery, not the quality; quality comes with the technique. It just so happens that with digital delivery, what you put in is literally what you get out with little or no degradation of the program technical quality. In other words, these folks take studio quality NTSC, or one of the other color formats for other countries, and deliver the pristine analog signal, digitally, to a small dish and its associated IRD.

You may not have heard about a few new players on the direct-to-home scene. One is American Sky Broadcasting, better known as A-Sky-B, a 700-channel operation in Arizona. There has been some press lately about it being sold. We'll talk about A-SKY-B at a later date. When they get closer to going on-line, you'll see it here. The other is Sky Latin America, better known as SKY-LA, which is home based in Miami Lakes, FL.

SKY-LA is unique in that it is bilingual (Spanish and Portuguese) and has uplinks from three different locations in three different countries and two continents. In addition to Miami Lakes, up-linking also takes place from Rio de la Loza Mexico City and Rio de Janeiro, Brazil. The Florida facility up-links both Spanish and Portuguese programming, which is delivered from Tektronix Profile servers or Odetics Cart Machines; the carts are Digi-beta. The automation system is provided by Louth; the encoders, conditional access, subscriber management system and IRDs are provided by NDS. SunUp Design Systems Inc. provides the control system that keeps the other systems in step and working together. ■

Broadcast Engineering magazine wins awards

Broadcast Engineering magazine recently won two prestigious awards from the American Society of Business Press Editors (ASBPE). *BE* won second place in the national competition for the May, 1997 "Granny Factor" editorial and second place in the Midwest region competition for the same editorial. Editor, Brad Dick, accepted the award at ceremonies in the nation's capitol in June.



Based in Washington, DC, ASBPE members are editors of many of the country's major business trade publications. Member publications include: *Electronic Engineering Times*, *CFO Magazine*, *Computer World*, *Internet Week*, *PC World* and *Windows Magazine*.

Broadcast Engineering magazine has won a total of three ASBPE awards in two years in addition to previously winning two nationally-recognized Neal awards from the American Business Press. ■

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FCC Update

DTV must-carry considered

BY HARRY MARTIN

The FCC is seeking comment on rules that would require the carriage of DTV signals by cable TV systems. The rulemaking notice addresses the need for compatibility between digital systems, seeks comment on possible changes to the mandatory carriage rules and explores the impact carriage of digital TV signals will have on other commission rules.

The commission believes the Communications Act and its legislative history have given it the discretion to manage carriage issues during the DTV transition period. Highlights of the FCC's rulemaking notice include:

- Comment is sought on digital equipment compatibility issues.
- Problems associated with the carriage of a broadcaster's HDTV signal are of particular concern.
- Several possible must-carry alternatives for DTV signals during the transition will be considered, ranging from full must-carry to no must-carry requirements.
- Carriage of DTV signals by small cable operators will be given special consideration.
- The FCC will consider what cable operator actions affecting the picture quality of DTV signals would be considered material degradation, which is prohibited for analog signals under the Communications Act.
- The commission asks how it should define signal duplication in the context of the transition period. (Duplicated signals are not subject to the analog must-carry rule.)
- For must-carry purposes, the FCC will seek to define ancillary and supplementary DTV services.
- The FCC is seeking comment on which tier of service DTV stations should be placed, and on channel positioning.
- The FCC also will consider how the use of antennas and A/B switches might factor into DTV must-carry.

Comments will be due in October.

FCC sets regulatory fees

In June, the commission released its Report and Order on annual regulatory fees (see Table 1). The total amount that the commission will collect is $162,523,000, a 7% increase compared to 1997. The fee amount for TV stations will be a function of market size and the fees must be remitted during the period beginning Sept. 14 and ending Sept. 18. The amount will be calculated based on data effective as of Oct. 1, 1997. If a station was sold in the previous year, the commission will look for payment to the entity that is the licensee of the station on the date that the fee is due.

VHF		UHF	
Markets 1-10	$37,575	Markets 1-10	$14,175
Markets 11-25	$31,275	Markets 11-25	$10,725
Markets 26-50	$21,400	Markets 26-50	$ 6,650
Markets 51-100	$11,975	Markets 51-100	$ 3,975
Remaining Markets	$ 3,000	Remaining Markets	$ 1,075
CPs		**LPTVs/TV Translators**	
All Markets	$ 2,650	All Markets	$ 265

Table 1. 1998 regulatory fees for TV.

Regulatory fees must be paid for construction permits, broadcast auxiliary stations, and translator and booster stations. Stations with a negative cash flow may be eligible for a hardship waiver.

FCC seeks to reverse EEO decision

The FCC has requested the U.S. Appeals Court for the D.C. Circuit to reconsider its decision overturning the commission's broadcast EEO rules. In April, the affirmative action provisions of the FCC's EEO rules were declared unconstitutional by a three-judge panel of the court. Although the commission claimed that its EEO rules benefit the public by promoting minority employment and encouraging program diversity, the court found no evidence that low-level minority employees have an impact on station programming. The court concluded that the FCC's EEO rules constitute a quota system because they create a "strong incentive" to meet numerical minority employment goals. On May 29, the FCC filed an appeal requesting that the entire court reconsider the decision by the three-judge panel. The commission said that instead of dealing with the applicant's argument that the FCC's enforcement violated laws protecting religious freedoms, the panel "decided the case on the broadest constitutional ground available."

In an unusual move, the court asked the appellant to submit comments in response to the FCC's request for rehearing en banc. Many observers believe the court's request for comments from the party victorious in the first decision is an indication that the court is giving the commission's request serious consideration and may grant the request for rehearing.

In the meantime, the FCC's EEO branch will continue to enforce the existing EEO rules. Thus, stations with reporting conditions attached to their renewals must continue to file such reports annually. Also, FCC Forms 395-B (Annual Employment Report) must be filed by Sept. 30. ■

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

Dateline

Commercial TV stations in Florida, Puerto Rico, the Virgin Islands, Iowa, Missouri, Alaska, Oregon, Hawaii and Washington must file their annual ownership reports on or before Oct. 1. TV stations in Alaska, Hawaii, Oregon, Washington and the Pacific Islands must file their 1998 renewal applications on or before Oct. 1. LPTV stations in the same states and territories, as well as in Iowa and South Dakota, also must file their renewals by Oct. 1. Annual employment reports for all stations are due on or before Sept. 30.

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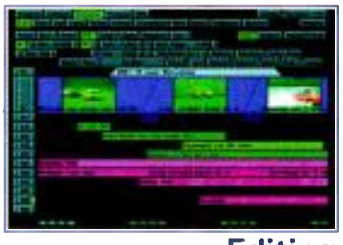

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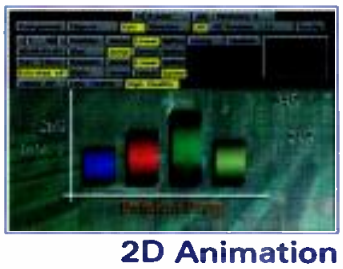

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DTV Update

Washington gets the jitters

BY LOUIS LIBIN

The future of digital television (DTV) portends consumer confusion, expensive equipment, reception problems and cable incompatibility. That was the message that emerged from a Senate committee that investigated the broadcasting and cable industries' transition from analog to digital technology.

According to committee members, these problems should have been anticipated, and preventive measures should have been taken. Now the complex issues threaten to delay the nation's DTV system. Officials from the broadcast, cable and consumer electronics industries told Congress that a variety of technical issues threaten to slow the adoption of high-definition television. Interface problems continue between the new high-definition TV sets, cable boxes and other equipment. The slow development of technical standards could also make some early equipment obsolete. In addition, the most recent over-the-air tests of the new technology have raised serious doubt as to the robustness of the DTV signal.

The fight for must-carry

A Senate committee is now investigating the broadcasting and cable industries' implementation of DTV. Committee chairman, Senator John McCain, said, "It hardly qualifies as a success story in the making." The committee is concerned that various problems could delay the transition from current analog broadcasting to new digital technologies, a process that, by FCC mandate, is to be completed by 2006. McCain said, "It is long past time for the American public to hear about the problems they will experience in the rollout of digital TV." Greg Schmidt, testifying on behalf of the NAB said, "The cable carriage of digital TV is uncertain and consumers' purchase of digital TV sets will be frustrated by uncertainty about these sets working with cable and about their ability to receive and display DTV signals, both via cable and over-the-air." Regulators at the committee hearing doubted that broadcasters would complete the switch to digital by 2006.

The second part of the hearing focused on the need for a special law requiring cable systems to carry stations' digital programming. Small-market stations that will have to spend millions of dollars to go digital are worried that no one will watch their new signals unless they are distributed by local cable systems. Large-market TV stations have more leverage and worry less about initial costs of implementation.

In spite of that, the National Association of Broadcasters wants the Federal Communications Commission to require cable systems to carry digital signals as they now carry broadcasters' analog ones. Under existing "must-carry" rules, cable systems must carry all analog broadcast channels. But digital broadcasts will be phased in over time, so for many years, stations will air programs in both formats. Cable operators are fighting this saying that if they are forced to carry both types of programs simultaneously, they will run out of channel space and will have to drop many cable-only channels. Broadcasters argue that they cannot build an audience for digital TV without the cable's help.

Consumer confusion

Consumers don't now that those expensive, new digital TV receivers going on sale this fall aren't compatible with digital set-top boxes (STBs) and other electronics equipment. A consumer using these devices will receive both HD and SD signals, but the pictures will only be displayed as regular NTSC images. A new interface device is now being developed that will allow the new receivers to communicate with STBs to properly display cable HD images.

Pricing will certainly be another issue that adds to the confusion. One manufacturer is now offering a 56-inch, HD-compatible projection-TV/monitor, with an NTSC-to-480p scan converter, that costs more than $5,000. A 36-inch 4:3 TV/multiscan monitor is about half that price and an all-format set-top decoder is about $1,700.

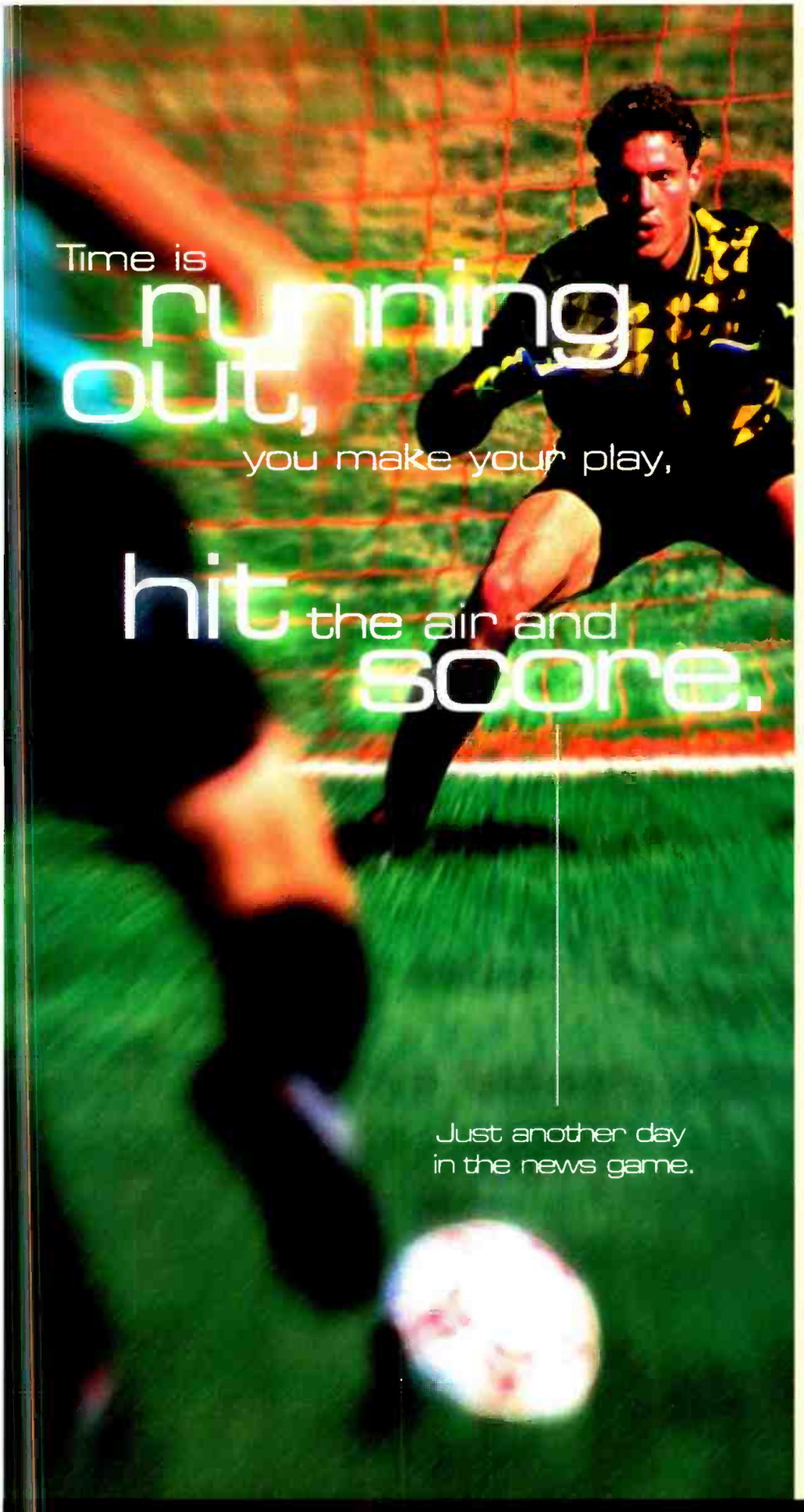
FCC forms Strike Force

The FCC, under Commissioner Susan Ness's chairmanship has formed a strike force to help broadcasters having trouble obtaining local permission to erect towers. Ness will lead a group of FCC staffers, who will field questions about DTV implementation and what stations and the communities need to do to work together. The commission has the authority to preempt local regulations on tower issues. ■

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

The government's plan

Affiliates of the four networks in the 10 largest markets will begin digital broadcasts by May 1, 1999, and in the top 30 markets by Nov. 1999. All other commercial stations will begin digital broadcasting no later than May 1, 2002, with all non-commercial stations going digital by May 1, 2003. Until 2006, broadcasters are allowed to also broadcast analog signals. ■



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Your legal right to mount an antenna

Can my viewers install their own outside antennas to pick up my new DTV transmissions even if there are local zoning ordinances against such antennas?

EXPERT

Of all the ink that has been spilt over HDTV, hardly a drop has been spent on the fact that it's dependent on outdoor receiving antennas. Rabbit ears won't work and cable won't be carrying HDTV signals anytime soon. The need for outdoor antennas is troublesome because many communities and homeowner's associations have tried to outlaw them.

Roy Trumbull is assistant chief engineer at KRON-TV, San Francisco, CA.

Following the enactment of the Telecommunications Act of 1996 (section 207), the FCC adopted 47 C.F.R 1.4000, which pre-empts local ordinances and homeowners agreements with regard to prohibitions on the mounting of antennas on dwellings. The person putting up the antenna must have exclusive use and control of the site. No fees or permits may be required. The only local prohibitions permitted are those involving health and safety and historic preservation. Thus, mounting an antenna on a fire escape or placing it too close to a power line could be prohibited by ordinance. Rules based on esthetics aren't permitted. But, if a signal can be received equally well from two different locations, a homeowners association might specify one over the other. Most of the case law that has developed with regard to this rule has come from the mounting of DSS dishes. There is still scant case experience with regard to conventional TV antennas.

The Satellite Broadcasting and Communications Association (SBCA) was one of the groups which lobbied for this rule. Many of the retailers selling DSS equipment belong to SBCA. Because the various satellite services lack local TV channels, retailers have a vested interest in installing combinations of DSS dishes and TV antennas. Thus, the case law on TV antennas should develop.

When confronted with homeowner association rules or a local ordinance, a petition must be filed with the FCC along with copies of the rule or ordinance. Once that petition is on public notice, it's unlikely that a fine or other action can be levied against you. However, if a court has already ruled against you, the FCC won't take the case away from the court. A consultation with an attorney who specializes in communications law is advised. Of particular interest is the Meade, KS preemption order, which is available on the FCC web site at www.fcc.gov/Bureaus/Cable/WWW/meadeks.txt. ■

EXPERT

Roy Trumbull is on point in his summary of the state of the law governing FCC pre-emption of local government and homeowners' association restrictions on the installation of outdoor video antennas. The rules apply to outdoor broadcast TV antennas, as well as satellite receive dishes.

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

The Meade, KS decision Trumbull refers to dealt with city ordinances which required that satellite antennas of one meter or less in diameter (larger TVRO dishes are not covered by the rule) be installed on the side or rear of a building, the roof or in a side or rear yard. A building permit, which required a $5 fee, had to be obtained before installation. The FCC said the prior permit requirement unduly impeded and delayed access to video signals. Similarly, the dish placement restrictions in the ordinance were found to unduly impede access because to get a permit, homeowners had to demonstrate to a building inspector that they could not receive an acceptable signal from an allowed site, such as a backyard.

In a later case applying the same rules, the FCC invalidated a Potomac, MD homeowners' association covenant which prohibited the installation of outdoor TV antennas. While FCC chairman Bill Kennard has said these rules will not be used to make the agency a "national zoning board," they will go a long way to block local restrictions on installation of outdoor DTV antennas. ■

READER FEEDBACK

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Transition to Digital

Monitoring video in a digital environment

BY MICHAEL ROBIN

Historically, signal monitoring facilities have been made available to operational personnel to allow for the adjustment of video signals to meet specific operational limits of performance or to simply watch the picture. Analog NTSC signals are sensitive to signal distribution impairments, and continuous monitoring is required in areas such as master control and studio control rooms. Of special interest are camera control units (CCUs) where critical and painstaking adjustments of cameras are carried out.

The advent of component digital video distribution using bit-serial signals requires several new areas of understanding, including component analog video concepts, component digital video concepts and bit-serial signal distribution. Complicating matters further is the fact that analog equipment and composite video signal sources and equipment will coexist with full digital equipment and a full digital bit-serial distribution complex for some time to come. All of these considerations dictate a review of existing monitoring concepts.

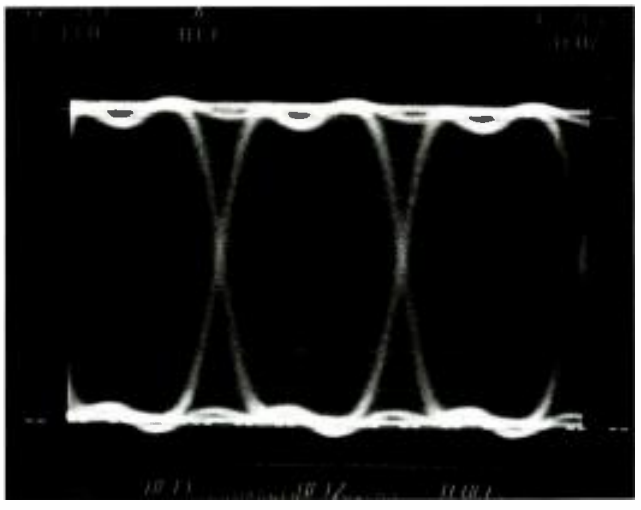


Figure 1. Typical eye-pattern at a generator output.

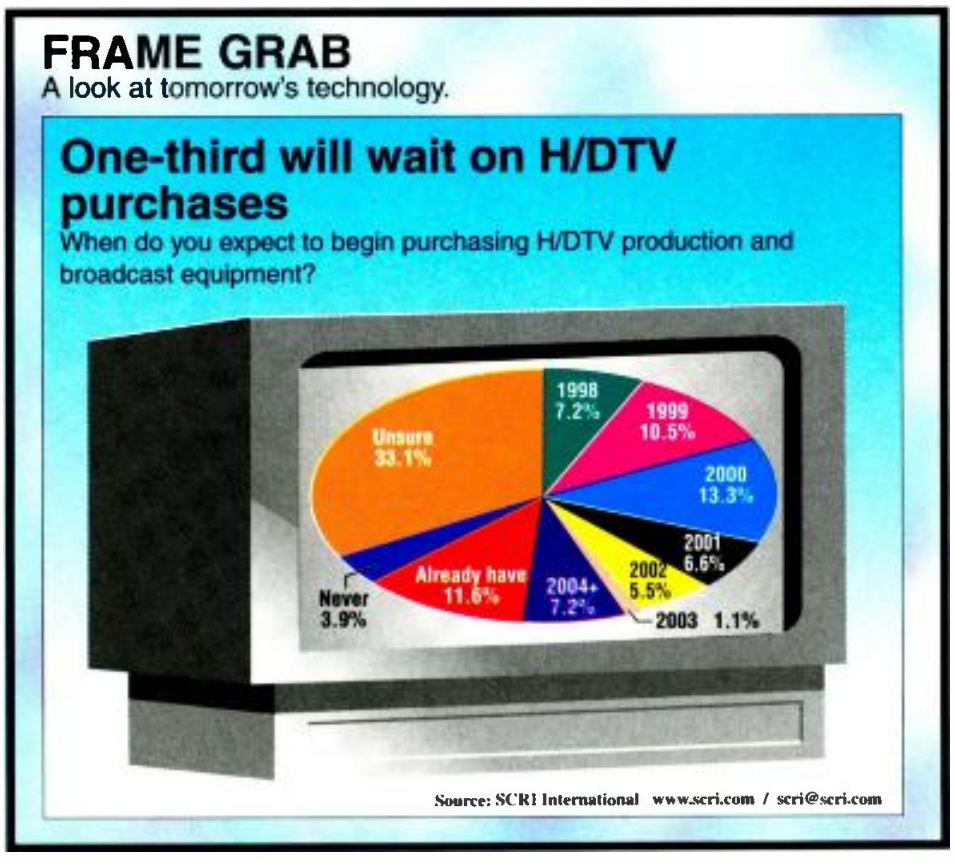
Monitoring the bit-serial transport layer

There are two approaches to monitoring the bit-serial transport layer, monitoring the bit-serial signal characteristics and/or monitoring the error rate. Waveform monitors capable of carrying out such tests are readily available, but are engineering and maintenance oriented, rather than operator tools.

When monitoring the bit-serial digital signal characteristics, there are several signal parameters that affect the integrity of the signal, and consequently, the ability of the receiver to recover error-free information. These are: launch amplitude, rise and fall times and jitter.

Monitoring the bit-serial digital signal eye-pattern at the output of a generator (camera, production switcher, VTR, etc.) ensures the signal characteristics are adequate. Figure 1 shows the shape of the signal at the output of a generator.

Monitoring the bit-serial digital signal shape at the input of the receiver (digital DA, routing switcher, VTR, etc.) at the output of a long coaxial cable is misleading. Figure 2 shows the signal available at the output of a 200-meter Belden 8281 coaxial cable. The signal is buried in noise, and the display provides no meaningful information. This signal, if properly equalized and reclocked, can provide an excellent reconstruction of the original information. Figure 3 shows the effect of the high-frequency loss equal-



ization on the bit-serial signal prior to reclocking. As shown, this waveform does not resemble the original waveform, and hence, no quality assessments can be made.

When measuring the error rate, error detection and handling (EDH) is used. EDH, as per SMPTE 165, can be used as an in-service test to alert users to any distribution system failures. Typical errors are presented as errored seconds over a period of time and as the time since the last errored second. Specialized waveform monitors, such as those belonging to the Tektronix WFM601 family, are available for the verification of individual bit-serial signal distribution links. Currently, EDH is not universally implemented, so monitoring does not always yield results. Using a waveform monitor with EDH monitoring capabilities to verify every router input and output, as well as all production switcher inputs, is a tedious exercise. An ideal situation for large bit-serial digital installations would be incorporating readily available EDH co-processors into every routing switcher input and output circuit. This would allow the integrity of all inputs and outputs to be quickly verified. Errors could be reported locally by lighting an LED or sent to a central diagnostic computer, simplifying the identification of the faulty link or signal source.

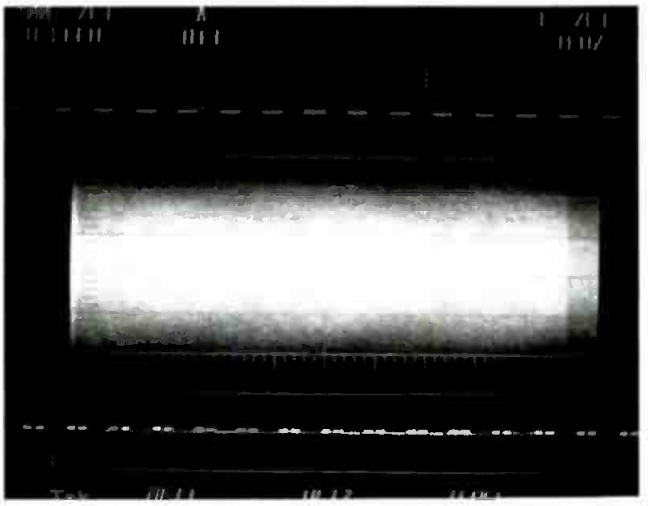


Figure 2. Eye-pattern, or lack thereof, at the end of a 200-meter coaxial cable (Belden 8281).

Monitoring packages

Monitoring in a digital environment means displaying demodulated component signals. To this effect, it is desirable to define a monitoring package. A suitable monitoring package consists of a waveform monitor and an associated picture monitor.

Waveform monitors should have the following characteristics:

- Active loop-through bit-serial input(s) conforming to SMPTE 259M.
- EDH alarm capability.
- Display of the component analog signals in Y, Pb, Pr form or derived (by

matrixing) G, B, R in sequential or individual display.

- Vector display of Pb/Pr color-difference signals.
- Gamut analysis and alert capability using the Diamond concept for GBR validity and the more recent arrowhead concept for derived composite analog NTSC validity. The waveform monitor should be programmable to display an alert for GBR and/or composite analog NTSC validity on the waveform monitor screen, as well as a picture flashing on an associated monitor.
- Provide a decoded analog component signal set in either GBR or Y, Pb, Pr (EBU N10) format for connection to a component analog picture monitor.

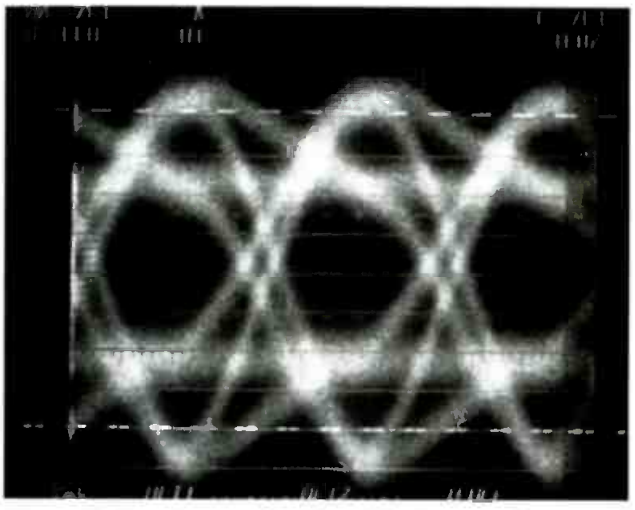


Figure 3. Signal shown in Figure 2 after high-frequency loss equalization. After reclocking, the signal can now be properly decided.

The picture monitor should have component analog GBR inputs with sync on green as per SMPTE 253M. It is preferable to use GBR component signals because some component picture monitors are designed for Betacam-type component analog signals and may display incorrect luminance and chrominance values when supplied with EBU N10 component analog signals.

The monitoring package used by the author in several installations consists of a Tektronix WFM601A waveform monitor and a component analog picture monitor of a size suitable for the intended use. The chosen waveform monitor has no eye-pattern display capability. ■

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

Coming next month. . .

We will look at several examples of proper signal monitoring in digital environments and some guidelines for their implementation.

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ATM and broadcasters

BY BRAD GILMER

There are few people who understand ATM better than Al Kovalick. For the last six years Kovalick has concentrated on digital video for broadcast, post-production and video-on-demand applications. Currently, he is the principal architect for Hewlett-Packard's Video Communications Division. The following is a summary of a discussion with Kovalick relative to ATM and its application for broadcasters.

There are two primary uses for ATM in broadcast applications. The first use is streaming real-time, isochronous video from point A to point B. The second use is file transfer. Some networks support both, while others support only one or the other. Streaming connectivity costs more than file transfer connectivity, because streaming connectivity requires tight timing. Unlike file transfer, streaming applications are always *best effort* because bad packets cannot be re-sent. File-transfer applications use two-way communications and streaming applications are one-way.

One critical factor used to determine the quality of an ATM link is *quality of service* (QOS). QOS is specified by four items: bandwidth (rate), loss, delay and jitter. Because packets can be re-sent in file transfer applications, it may appear that QOS is unimportant, however, both rate and delay must be considered. Rate is important because it affects file transfer time. (If you have plenty of time, ask for unspecified rate, it is the least expensive.) Delay is important because the mechanisms that work in file transfer work best if the delay is short. With long delays, file guaranteed reliability mechanisms might not work well, and could result in corrupt data or failed transfers.

With regard to streaming, all four items mentioned above must be considered. Delay is vital in situations that require interacting with live talent. The receiver's buffer must be able to correct for jitter, as uncorrected jitter can easily turn into frame slip. For rate and loss, every bit that is lost has to be concealed on the receiving end.

There are four ways to describe rate in ATM: constant bit rate (CBR), variable bit rate (VBR), unspecified bit rate (UBR) and available bit rate (ABR). The only one that guarantees a lossless connection is CBR. (For more information, see "The ins and outs of ATM," *Broadcast Engineering*, July 1997, p. 16.)

ATM criticisms

ATM has been criticized in that the overhead is excessive, and that the set-up delays are unacceptable or that ATM loses packets, and so on. Based on these criticisms, it has been said that ATM is unacceptable for use in the broadcast environment. Much of this criticism stems from a difference in perspective between the video and networking worlds. Broadcasters typically approach things from a "frame-based" perspective. When switching video, the expectation is that the switch will take place during the next vertical interval. ATM operates differently; it is not aware of frame boundaries in the video sense, and because of this, cannot switch during the next vertical interval. However, within a studio environment, most ATM switches can do a setup in about three milliseconds, which is generally a lot sooner than the next vertical interval. An ATM infrastructure is not a router equivalent in the sense of one-for-one functionality; instead, it is a packet switch or a cell switch.

With HD coming along, possibly bringing with it even more sophisticated routing mechanisms, video routers will be around for a long time.

ATM's biggest advantage is self-routing. When an ATM switch sees a cell destination, it knows how to route it there. With video routers, every connection must be set up by external control – you cannot route by address. ATM systems are networks. Video routers are not networks, they are just space division switches. Another advantage is that ATM switches can be connected directly to the outside world.

Nevertheless, with HD coming along, possibly bringing with it even more sophisticated routing mechanisms, video routers are going to be around for a long time – especially with the advent of 1.5Gb routers. To route HD using ATM requires OC-48 (2.488Gb/s), and that is not going to happen any time soon.

As mentioned, among ATMs criticisms is the problem of lost packets. Packet loss is a function of the QOS. Properly specified links do not lose packets; and, unlike IP networks, ATM guarantees that all cells arrive in the order they were sent. That does not mean that ATM cells could not become corrupted — corruption is a different issue. However, within properly specified connections, these issues should not be a problem.

Another criticism is that ATM connectivity is costly. ATM's costs depend on speed. Bear in mind that there are two kinds of networks. One is where you own the network (the fiber), and you put ATM over it – between buildings or cities, for example. In this case, ATM may be quite economical. However, if you have to buy it all from a vendor, a point-to-point connection across the United States can cost millions of dollars.

Although ATM may be costly, it is about the only way to stream high bandwidth video over public networks. It is difficult to get anything greater

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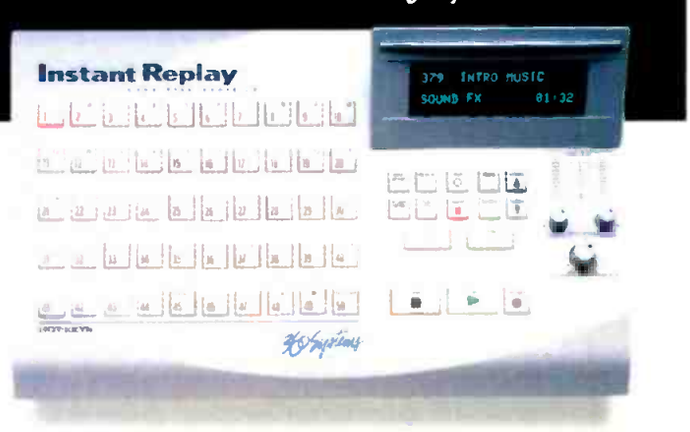

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Ask Dr. Digital

Who's your customer?

BY STEVE EPSTEIN, TECHNICAL EDITOR

Whether we realize it or not, within the broadcast industry, we enjoy a level of customer service that is apparently rare in today's world. Because we operate in an industry that runs 24 hours a day, seven days a week, many times we take overnight — and even same-day — parts delivery for granted.

As the facility technical guru, you're in the customer service business. Your customers are not only the station's listeners/viewers, but also the production/promotion/news people. How you respond to their needs will help determine your success as an engineer. If you rant and rave, and blame them every time they alert you to a broken piece of equipment, soon they won't bother telling you about little problems. Those little problems will grow, and before you know it, major fires will be breaking out all over. Soon, the GM will be breathing down your neck or searching for your replacement.

If, on the other hand, you quickly address small problems, and make it known that you expect normal wear and tear, your co-workers will realize that bringing minor items to your attention is in everybody's best interest. Not only will everything last longer, but everyone's job, including yours, will be easier.

Years ago, I worked with an engineer whose job was to maintain the station's ENG equipment. When he started, the equipment consisted of poorly maintained TK-76s and BVU-110s. Over time, he restored each and every unit. He made sure each was fully functional, and even went so far as to obtain the tan-and-blue touch-up paint from RCA to repaint the TK-76s. Most of the news photographers quickly realized what was going on and became conscientious about caring for their gear. Because of the engineer's concern about the details, his job slowly changed from putting out fires, to routine fire prevention, and the news department missed fewer stories because of technical problems.

From the beginning, the management at Southwest Airlines realized that airplanes don't make money when they are on the ground. Likewise, as station engineers, we need to constantly remember that equipment doesn't make money when it's on the bench. Catching problems while they are small is the best way to avoid downtime. A lot more small problems can be caught if everyone is looking and listening.

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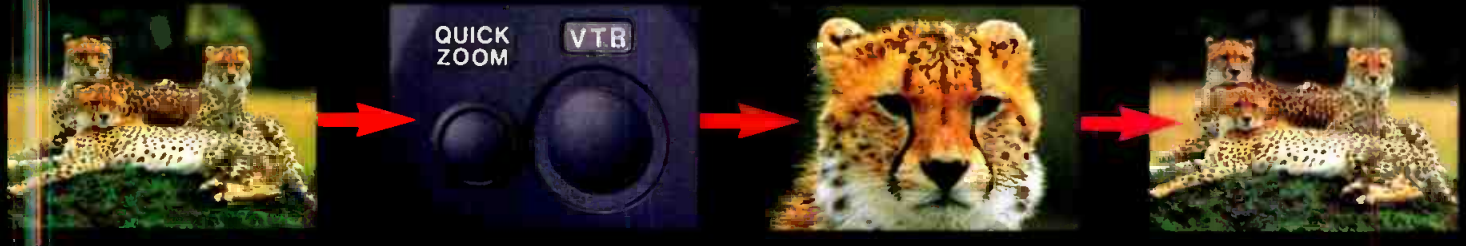

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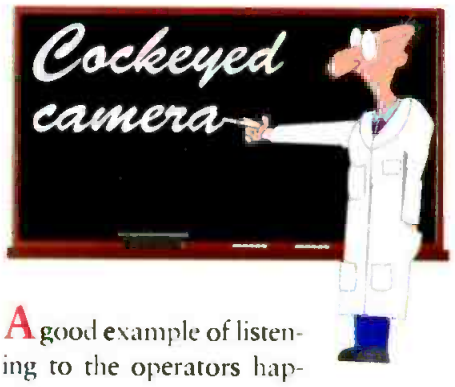

A good example of listening to the operators happened to me several years ago. About once a month, one of the studio camera operators would complain that camera three was crooked. At first, these complaints were simply dismissed. (Wrong.) After several complaints, I took a level out to the studio and verified that the camera pedestal was indeed level and that the camera was mounted squarely on the pedestal. Despite this, the occasional complaint still surfaced.

Finally, one day it was obvious the picture coming from camera three was crooked. I set up and carefully leveled a chart and then verified the camera was level and square with the chart. Sure enough, the picture was off by about 5°.

This particular camera was a TK-47 and the auto registration sequence used a reference slide that was mounted under the lens. Normally, the slide was illuminated with the lens capped, but by illuminating the slide with the lens cap open, it became obvious the slide was the problem. Beyond that, the slide mount was loose, which caused the slide to routinely rotate slightly right or left. That, combined with regular auto-set-ups, explained the random complaints. As the camera was rolled around the studio, the reference slide would shift position. Most of the time, it was close enough, but occasionally it would be far enough off axis to be noticeable. Tightening up and verifying that the mount was level solved that problem for good.

Now for some housekeeping. You've probably noticed I have a new e-mail address. The old one wasn't reliable — messages kept disappearing into the ether. If you sent an e-mail and have not received a response, please send it again. I'll do my best to get back to you within the next working day.

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Transmission & Distribution

Transmission-line maintenance

BY DON MARKLEY

The subject of rigid transmission-line maintenance has been covered before in this column. However, the care and feeding of semi-flexible transmission lines deserves more attention.

Semi-flexible cables are not completely rigid and are designed to bend during installation and, to a limited degree, in normal use. The largest manufacturers of these cables in the United States are Andrew with its "Heliax" line and RFS Cablewave with its "Flexwell" cables. Semi-flexible cables are generally intended for gentle bending, but not for continued flexing over a large range. For example, such cables would be used on a tower up to an antenna; however, if the antenna will be repeatedly moved, such as an ENG system where azimuth and elevation are adjusted several times per day, a more flexible cable must be used for the final connection between the long line run and the antenna. There are some small cable sizes similar to the semi-flexible types that will stand the repetitive bending, but something on the order of RG-216 is commonly used as the last link.

Semi-flexible cables are available in a wide variety of types and sizes. Sizes range from ¼- to nine-inch nominal diameter with dielectric materials of various foams, air and special materials for higher than normal temperatures. Cable impedance is normally 50Ω or 75Ω, and specific cable types are available for use in severe operating conditions and also to meet restrictive fire-prevention regulations. Regardless of the type of cable used, some general rules apply.

Installation and support

The most delicate time in a cable's life is during installation. While semi-flexible line can be bent, such bending must be done within limits. The minimum bending radius for each cable type is clearly specified by the manufacturer. For example, Andrew 1⅝-inch air dielectric cable has a minimum bending radius of 20 inches, while RFS nine-inch has a minimum radius of 118 inches (nearly 10 feet). However, you probably won't be running nine-inch cable into the control room. Observing the minimum bending radius prevents the cable wall on the inside of the bend from collapsing inwardly. If, in a burst of over-exuberance, that does happen, the affected portion of the cable must be replaced. If a short radius bend is necessary, the simple solution, although expensive, is a couple of connectors and an elbow.

When installing these cables, it is a good idea to pulse the cable before and after installation with a time domain reflectometer (TDR). This serves several purposes. First, it ensures that the cable has arrived from the manufacturer in good condition. It is rare, but not unheard of, to find water in a cable when it arrives on the site. Second, while not common, even the best protection can fail when a large reel of cable is rolled off a truck onto a big rock or when attacked by an overly eager forklift operator. To facilitate the testing of a new cable, it is advisable to order the cable loaded onto the reel with both ends accessible.

Next, be sure that the cable is treated gently as it is removed from the reel and hoisted onto the tower. This is where the proper hoisting grips must be used at the intervals recommended by the manufacturer. After the installation — including all hangers and grounding assemblies — pulse the cable again to make sure it has not been damaged. If properly installed without damage, the cable will normally be trouble-free for many years with little maintenance.

With the possible exception of the smallest sizes, semi-flexible cables must be supported on towers with proper hangers and hoisting grips. For ½-inch and smaller cables, nylon cable ties can be used. Metal banding for tower runs

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is generally considered unacceptable. Over time, normal cable movement can cause the bands to cut into the cable. Larger cable sizes *must* be supported by proper hangers from the cable manufacturers. In addition, the cables *must* be hoisted onto towers with hoisting grips. Although some may claim that the cables can be hoisted by carefully tying on a hoisting line, don't allow it. The cable can be permanently deformed or crimped.

Several types of hoisting grips are designed to be left on the tower as permanent support. They are used with hangers that do not prevent the cable from slipping. In the past, hangers were intended solely to prevent the cables from flopping around in the wind. All load support was accomplished by the hoisting grips that were left on the tower and usually fastened to a turnbuckle. If the hoisting grips were removed, all of the cable's weight was supported solely by the end connector — which eventually came apart. Under these circumstances, the connection to the connector can develop severe gas leaks. Some newer hangers now grip the cables sufficiently to provide support if used at the recommended intervals. This eliminates the need for a permanently mounted support. However, in the "belt-and-suspenders" mode, it isn't a bad idea to use both.

On older installations, after years of being subjected to severe electromagnetic fields and hot center conductors, dielectric material used to support the inner conductor sometimes hardens. In some cases, movement of the center conductor between ambient temperature and operating temperature can cause the dielectric material to break. The center conductor could then touch the outer conductor with the obvious results. The more severe the bend in the cable, the more common these problems are. Although newer cables use improved materials which have reduced that problem, it is still a good idea to make cable bends as gentle as possible. Just because you can bend a cable to a certain radius doesn't mean that you have to do so. Remember, as you are bending the cable, if you bend it too much — just once — the fix will be costly.

When using semi-flexible transmission line, care must be taken to support the line and observe the minimum bending radius.

Care and feeding

Primarily, the care and feeding of semi-flexible cables involves two things. First, when the tower is inspected, have the riggers check all the hangers. Any broken hangers should be replaced with the proper units. A few replacement hangers should be maintained in the station's spare-parts inventory. Second, for air dielectric cables, keep pressure on the cables at all times. It doesn't matter how tight the seals may be. If positive pressure is not maintained with either dry nitrogen or dry air, water vapor will get into the cable. The vapor will condense and work its way into a puddle at the bottom, eventually shorting out the cable. If you are lucky, a small hole can be made on the bottom of the cable, and the water can be drained out. The hole can be plugged with a sheet-metal screw, some sealing compound and tape. The line should then still hold gas and be usable. One minor point: file off the sharp tip on the sheet-metal screw before using it. Otherwise, you will greatly reduce the peak power handling capability of the cable.

Just because you can bend a cable to a certain radius doesn't mean that you have to do so.

One problem with semi-flexible cables is their repair following damage. A common problem in rural installations is bullet holes, usually caused by a frustrated hunter who decides to replace the deer he never saw with one of those big, red lights or strobes. The best way to handle the problem is to carefully cut out the damaged portion and re-connect with a male and a female flange or with the splice connector available from the manufacturer.

Most currently manufactured transmitters will shut down quickly on VSWR faults. However, older transmitters have a tendency to keep pumping RF for awhile. If a fault occurred in the antenna, the result was often the destruction of several feet of the transmission line before everything finally shut down. If that happens, replace all of the cable. The problem is that the residue of the arcing at the top of the cable falls down inside of the cable until it builds up sufficiently to cause another burnout. Trying to avoid cable replacement by cutting off the cable at a lower point will simply result in more down time at a later date. If you have a burnout, replace the entire cable. To avoid that catastrophe, keep the transmitter VSWR trip circuitry operating properly or install one of the available sensing systems, such as the Bird Watcher. ■

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

DVD authoring tips

BY RON BURDETT AND GARRET MAKI

Authoring a DVD differs significantly from preparing a title for VHS video release. With tape, the project typically requires making a telecine master of the film, preparing the trailers and other material, and then dubbing these elements into the studio's preferred format. In authoring a DVD, the role is more like that of a producer; in addition to preparing the master, we assisted the studio in determining how material would be organized on the disc, what features it would have, and the look and structure of its menu system.

A DVD project also differs from a conventional video project in that the capacity of a DVD is measured in bits rather than minutes. The amount of information that can be stored on a disc is less dependent on the running time of the film, than on the quality and the compression rate used to encode the film. As a result, a DVD needs to be carefully budgeted, and there is no analogy in video production for this.

Hardware and source material

DVD production requires a variety of hardware and software tools that are not typically used in video production. However, as in video production, the quality of the end product is related directly to the quality of the tools used. With *Fargo*, we compared several encoding systems, before choosing Nuko Powered by C-Cube. After carefully evaluating different authoring systems, we chose the Daiken system.

Another requirement of DVD production is enormous hard-drive capacity. In fact, the hard-drive capacity of the production system needs to be three times as great as the capacity of the disc being mastered. This is because it needs to be able to simultaneously hold the elemental files, the multiplexed files and the final files, each set equal to the size of the DVD disk. Needless to say, the system also requires a fast network.

Although virtually any type of source material can be used to produce a disc, the quality of the end product depends on the quality of the source material. The type of video source used also has a bearing on the compression ratio that will ultimately be used to encode it. Because DVD is a component medium, component video formats such as D-1 or digital Betacam produce the best results.

Garret Maki (standing) and Mark Dimambro work on the facility's latest DVD offering.

Menus and monitors

In laying out a menu system, small details can make a big difference in consumer satisfaction. For example, we had to decide whether to lay out the film's 17 chapter stops on a single menu page or on a series of pages. Ultimately, Polygram chose the multipage approach, as this allowed us to include relatively large key frames and titles for each chapter. It also meant that the choices on each page would appear in a single column, rather than in a grid, making navigation easier.

We also learned that it was important to consider how the menu screens would appear on a typical consumer's home television. A menu that looks great on a $20,000 monitor in a darkened edit bay may look significantly worse to a consumer viewing it at home. To ensure that this did not happen, we purchased a 20-inch consumer TV set of average quality and hooked it up to our PhotoShop workstation. It became our benchmark and allowed us to be sure the choices we made worked as well on the home television as they did on the professional monitor. For example, we found that we could only go down to a certain point size for things such as the actors' biographies before the words became illegible. It also helped in selecting colors for menus and highlights, because certain colors do not display as well on a television as they do on a computer monitor.

In authoring a DVD, the role is more like that of a producer.

Bit budget

Armed with the DVD's assets, it was

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time to prepare a bit budget. A bit budget was used to allocate space on the disc for each of the various elements. *Fargo* was to be encoded onto a double-sided, single-layered DVD disc, which gave us 4.7GB of disc space per side. Thus, creating the budget was a straightforward math problem of dividing up this space. (It is important to note that the "GB" used to measure space on a DVD means "billions of bytes" and is not equivalent to "gigabytes," the binary unit used in computer applications and signifying 2^{30} or ~1.07 billion bytes.)

In creating the bit budget, we began with the fixed items, the largest of which were the audio tracks. As DVD audio tracks are encoded at a fixed rate, determining the space we required was merely a matter of multiplying the bit rate by the total length of the audio tracks. For *Fargo*, the audio tracks were done in two-channel Dolby Prologic surround sound and AC-3 encoded at 192kb/s. The other fixed items included the subtitles, menus, closed captions and navigation data.

DVD production requires a variety of hardware and software tools that are not typically used in video production.

Encoding process

Once the fixed items were accounted for, the remaining space was available for the video. By dividing the remaining space by the total time length of the video (which again included the pan-and-scan and letterbox versions of the film and the trailers), we arrived at the maximum average bit rate that could be used in compressing the video. In this case, the value was 4.9Mb/s. But, rather than use all the available space, we chose to encode the video at an average rate of 4.8Mb/s. Doing so left a little extra space to correct any problems that might be found after the video was encoded. While an average rate of 4.8Mb/s was more than adequate for *Fargo*, keep in mind that there is no one bit rate that is ideal for all films; much depends on the source material.

The actual encoding of the video was done in a three-step process. The first pass produced a log of the 3:2 pull down. This essentially reversed the telecine process, eliminating the duplicate fields that were produced when the film was transferred to video. The second pass was used to evaluate the film from a compression standpoint. The encoder evaluated each scene for its relative complexity and determined whether it required compression at a rate greater or lower than the average. It then produced a file of the bit-rate graph. The actual encoding of the video was then done according to this graph in the third pass.

A compressionist monitored this process and looked for any visible compression artifacts. Scenes containing such artifacts were then encoded again at a higher bit rate, using the extra disc space we had set aside for this purpose.

Quality-control checking a DVD presents an interesting challenge. There are significant time-to-market challenges requiring fast turnaround and, unlike the software industry, we didn't have the luxury of sending beta copies to several thousand home users. Even though strict QC procedures can be built into each project, it is impossible to test a disc on every available player to uncover possible hardware conflicts.

It doesn't require special technical mastery to manage any of these issues. What is needed is a strong sense of design and the ability to view the final product from the consumer's perspective. Authoring a DVD involves hundreds of small choices and giving careful thought to each is essential to producing a great DVD disc. ■

Ron Burdett is president of Sunset Post, and Garret Maki is senior vice president of the firm's DVD division in Glendale, CA.

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CONVERTING THE WORLD

SYSTEMS DESIGN SHOWCASE

KGO moved into the digital newsroom era in June with a fully-integrated digital storage and editing package.

KGO goes tapeless

By Stuart Allan

Broadcasters have been talking about the "newsroom of the future" for years now. In this digital and predominantly tapeless environment, news producers, journalists and editors have unlimited access to material stored on central servers. Browsing today's headlines — or those of 30 years ago — happens right on the desktop. Editing is performed entirely on disk, while data of all types is whisked around the facility via Fibre Channel. Meanwhile, an intuitive automation system manages the entire operation, from ingest to archive, from scripting to air. The recent upgrade at KGO-TV, in San Francisco, makes this station one of the world's first fully automated tapeless newsrooms. The renovation also prepares the station for meeting the FCC's November deadline for broadcasting an HDTV signal.

The key to successfully migrating to a fully digital facility using both existing and newly purchased products and applications is that everything must function well as a *system*. The station's plan to rebuild the news operation incorporates a migration process based on the Tektronix Digital Media Foundation (DMF).

Video server-based design

KGO's director of engineering Jim Casabella began by researching methods for transitioning the station's entire news operation to a server-based solution. At that time, the station was producing 25 hours of live news each week and using Beta SP machines. These tape decks were approaching the end of their life span. As head of an ABC workgroup focusing on video server technology, Casabella felt disk-based systems had matured to a level where they were extremely reliable and more

KGO goes tapeless

cost-effective than tape machines. They would also facilitate the creation of an environment employing near-line storage and a completely automated library. While this new technology was not inexpensive, his research showed that cost savings would actually be realized through reduced staffing and lower maintenance.

Casabella turned to the Tektronix Systems Management Group, which had recently completed facility rebuilds at TV4 Sweden and Norway's national broadcaster, NRK. Just over a year later, KGO went on-line last June with its fully automated, server-based newsroom. The station is now a proving ground for the power of digital technology in a live news environment.

Integrated control and storage

The new facility is built around 12 Profile PDR200 video file servers linked to dual Silicon Graphics Origin 2000 servers with a combined 1.44TB of Fibre Channel RAID storage. NewStar for Windows automation systems manage the newsroom, with editing performed on 12 EditStar and six Lightworks V.I.P4500 workstations. For archiving, a massive StorageTek Powderhorn 9310, capable of storing 300TB of data, is linked via Fibre Channel to the SGI servers.

The entire facility is managed by an Omnibus Columbus automation system from AVS Graphics. Integrated into all aspects of the plant, the system provides control over every machine, including a 256x256 Grass Valley SMS7000DV serial digital router and 384x384 NVISION NV3512 digital audio router. The automation system can manage assets on each server from a single terminal and administer Fibre Channel file transfer throughout the facility.

Four Profile servers are dedicated to recording satellite and microwave feeds in the station's ingest department. These devices are connected to the SGI RAID arrays via Fibre Channel, as well as the EditStar editing systems and two playout Profiles. Two of the four channels on each Profile are assigned to recording and playout, the other two are appropriated to the Omnibus for automated file dubbing. Incoming material does not reside on the Profiles, but streams automatically to the SGI servers at near real time.

The Origin servers can store up to 60 hours of material at a resolution of 40MB/s, or enough raw news footage for several days' worth of broadcasts. Each server is outfitted with six Fibre Channel cards for communicating with the Profiles and four RAID-3 interface cards, each of which can talk to two fiber RAID controllers. In all, there are eight volumes of fiber RAID storage, with double redundancy virtually guaranteeing that material will never be lost. In addition, whichever Origin is functioning as the backup also facilitates browsing from the EditStar workstations. If one server goes down, FailSafe software automatically switches all in-progress activities to the other server.

StorageTek's Powderhorn library system is equally impressive. The station had previously installed a StorageTek Wolfcreek system to handle the commercial archive; it feeds the Philips MediaPool servers and is controlled with Avalon Librarian software. The Powderhorn also runs on Avalon Librarian, but the similarities end there. The new archive system is massive, holding up to 6,000 50GB data tapes — equaling around 15,000 hours of material. Plans are for it to eventually hold every news story KGO has run since hitting the air in 1963.

While people and machines were previously packed tight at KGO, the rebuild opened up a good deal of space previously dedicated to equipment and

Digital storage is centered around 12 Profile PDR200 video file servers, linked to dual Silicon Graphics Origin 2000 servers. Total capacity is 1.44TB.

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library storage. Seven racks hold all of the Profile, V.I.P and Omnibus machines. The SGI gear resides in four racks. Digitizing the commercial tape library and housing it in the Wolfcreek system opened up approximately 2,000 square feet of space. The station's two news libraries, one containing film and the other three-quarter-inch and Beta videocassettes, have not been fully digitized yet. When that task has been completed, an additional 4,000 square feet of space will be freed. So operations that used to be spread out over 6,500 square feet are now fully contained in just 500 square feet.

A transitional approach

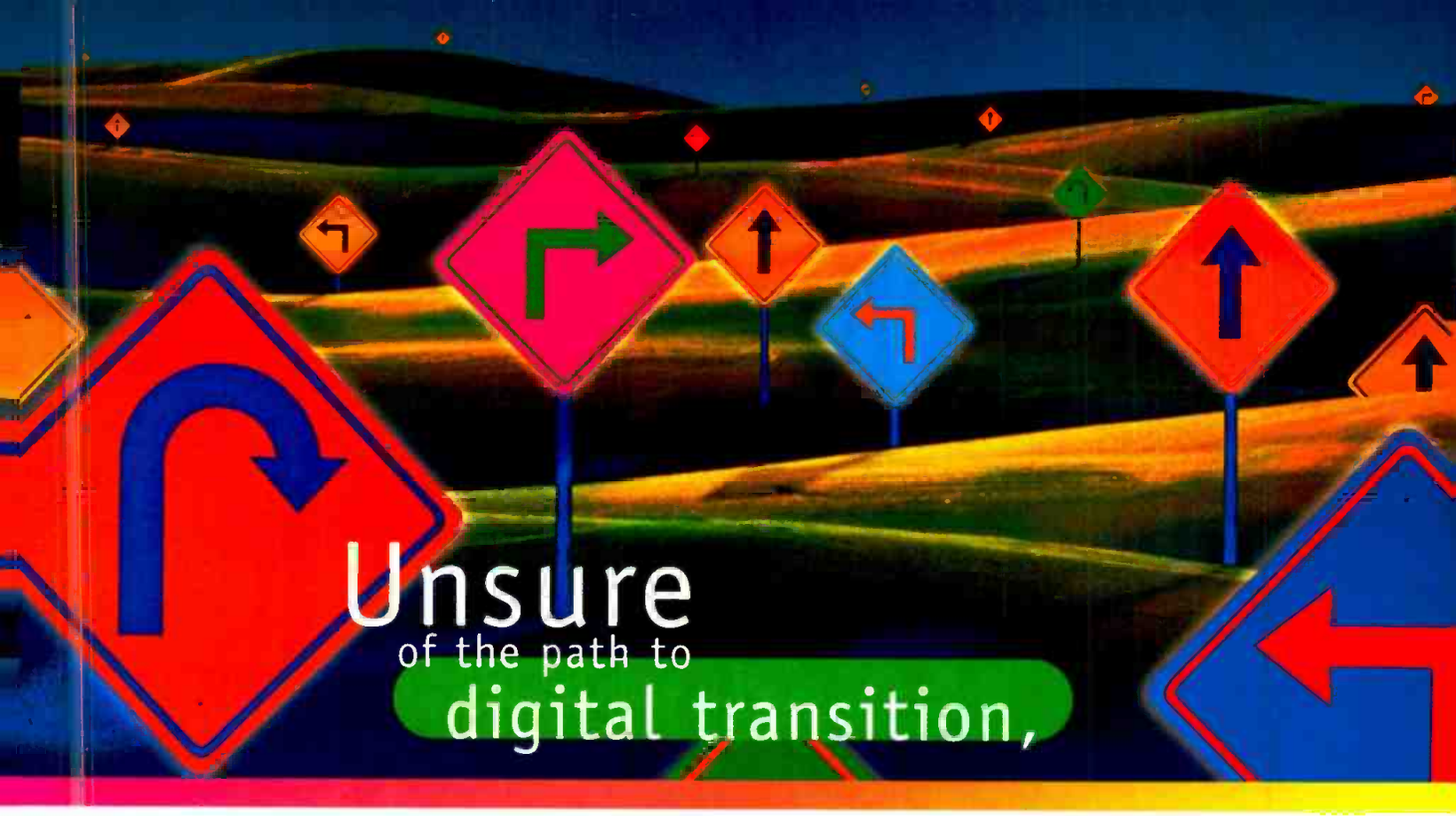
The rebuild was performed in two stages. Phase I, which began in October 1997, saw the implementation of the serial digital 601 environment, with the first all-digital newscast occurring in March 1998. Phase II activities revolved around Fibre Channel interconnectivity and bringing the ingest and archive components of the facility on-line. While Tektronix Systems Management Group provided consulting, engineering and integration services for the project, Great Circle Systems in Sebastopol, CA was contracted through Tektronix to handle plant design and engineering, systems installation, testing and commissioning, E&M and HVAC interface and training.

Every aspect of the station's news operation has been transformed by the upgrade. There are now 90 NewStar for Windows workstations in place of the NewStar 1 the staff had been using since 1987. The NewStar system is used for story assignment, script production and archive retrieval. Key personnel with dedicated terminals include the editing supervisor, executive producer, director and technical director.

Two Omnibus workstations are assigned to ingest and transmission operations. Approximately 30 hours of raw material arrives at the newsroom on weekdays, and 24 hours of material comes in over the weekend.

The station's system managers direct the incoming feeds to one of several cache areas: daily, two-week and hold for archive (HFA). Daily material not used that day is automatically moved into day-two and day-three caches, after which it moves into the two-week cache. Material marked for the two-week cache but not used within 14 days is presented back to the system manager, who will have the option to delete it or extend the time it spends in archive. An HFA tag automatically moves the material from the two-week cache into deep archive until a date specified by the system manager, at which point Omnibus notifies the operator. The material can then be deleted or held until a later date.

The entire KGO facility is managed by an AVS Graphics Omnibus Columbus automation system.



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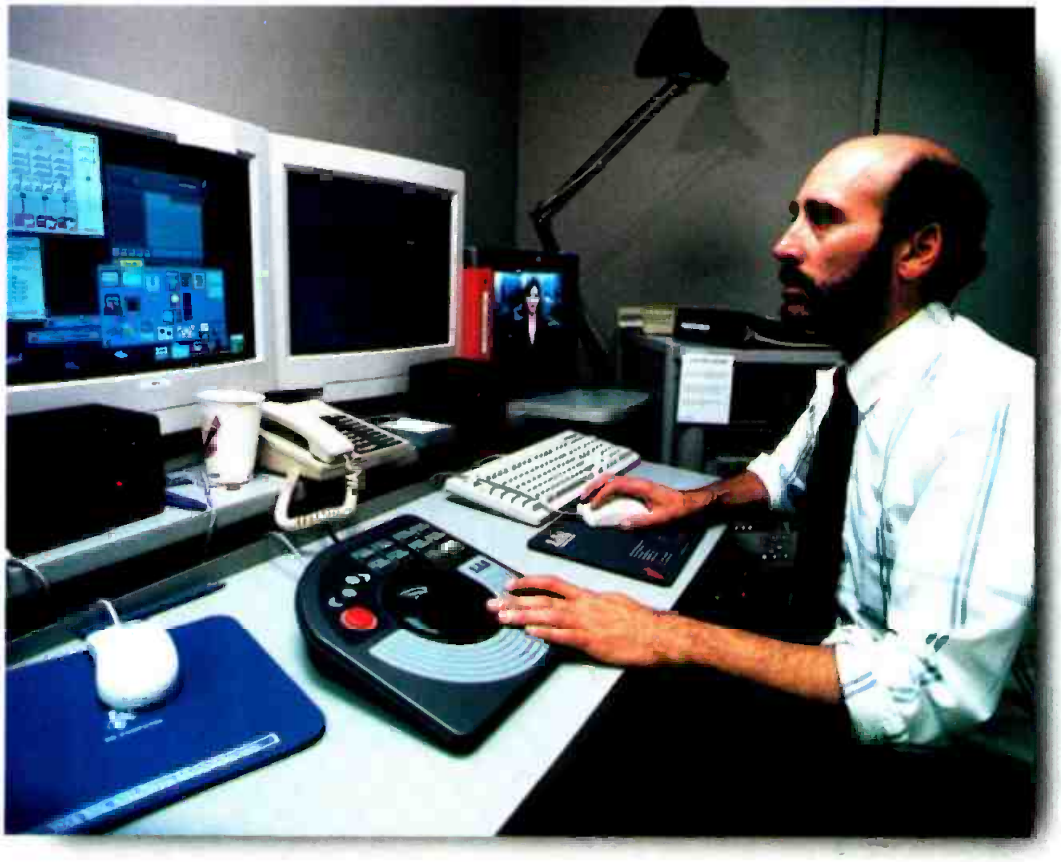
If the SGI servers reach a predefined disk usage level, the system alerts the system manager. Material can then be offloaded from the one-, two- and three-day cache areas into the two-week cache.

All tape-based linear editing systems have been replaced by the EditStar and V.I.P 4500 systems. The cuts-only EditStars, supported by six Profiles with PDX208 expansion modules, are used to edit simple packages and most sports segments. Four are located in dedicated edit rooms, the other eight are on desktops in the newsroom. The V.I.P workstations, two of which include Pinnacle Aladdin DVEs, are used primarily by full-time editors cutting packages, including promos and investigative pieces. Located in dedicated edit suites, all of the editing systems are capable of performing wipes and dissolves internally and supporting 16 channels of digital audio.

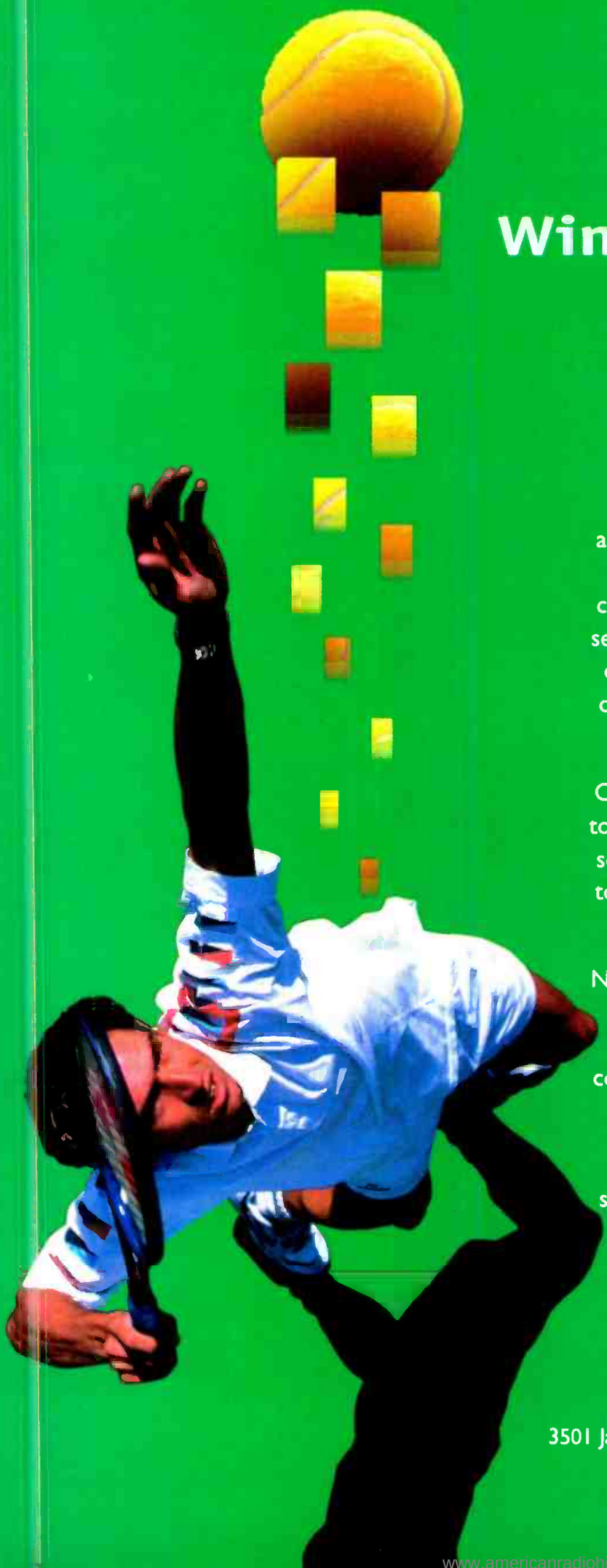


The Lightworks V.I.P4500 edit stations are used primarily by full-time editors cutting packages, including promos and investigative pieces. Two of the six V.I.P workstations include Pinnacle Aladdin DVEs.

Material can be brought into any edit system via digital tape or 601 router. Upon completion of a package, the editor sends the material to a playout Profile via 601 router. Omnibus then automatically dubs a copy to the SGI server via Fibre Channel for deep archive. If the package does not run within two weeks, the executive producer or system manager can choose to hold it for another show or delete it from the playout server. Once a story has run, it is removed from the SGI server and committed to deep archive on the Powderhorn library system.

A learning process

Incorporating so much new technology into a functioning facility required a coordinated, methodical approach between the staffs of the station and the system integrators. The first step was installation of the NewStar workstations, the Omnibus facility manager, and the video and audio routing systems. Then came the EditStar and V.I.P



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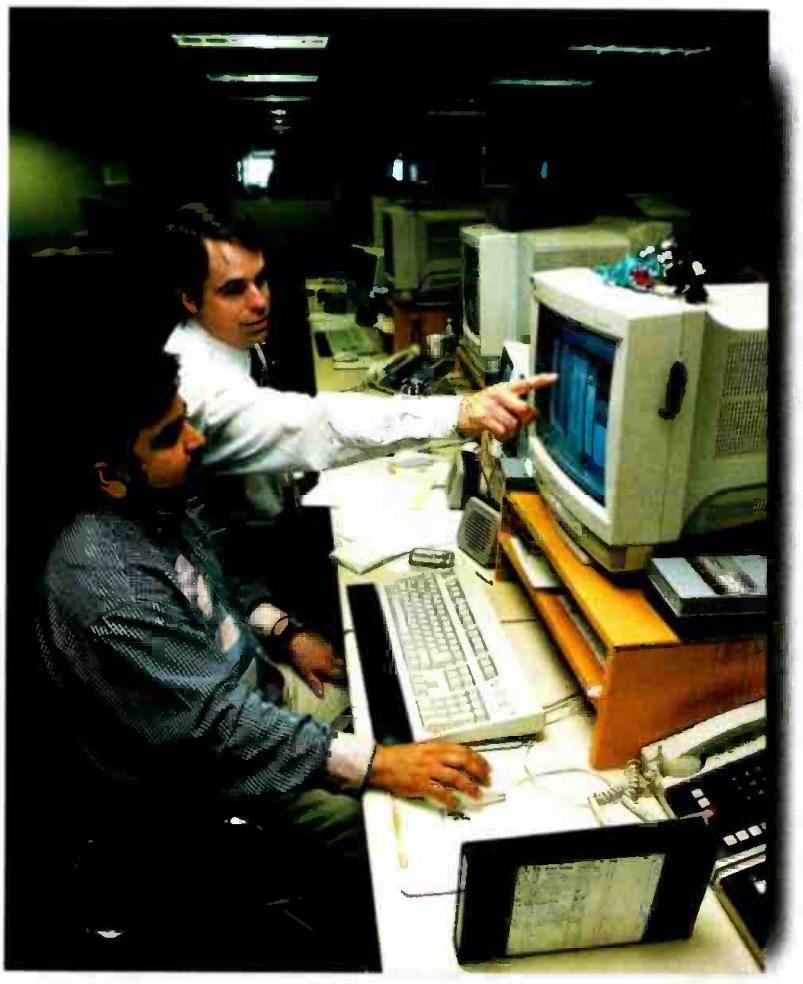
workstations. As editors became proficient on their new tools, the station's tape-based editing systems were gradually phased out. The ingest component was brought on-line in June 1998. Archiving material onto the Powderhorn, which is ongoing, completes the process.

The past several months have seen the operation working out kinks and refining new procedures. Throughout the installation process, the noon newscast served as a pilot program for testing systems and analyzing workflow issues. No other U.S. TV station had ever broadcast a major newscast directly off servers in such an automated fashion, so it was learn as you go for the KGO team.

The staff soon learned that working in a digital environment makes quality control more important than ever. The person digitizing material into the system has to closely monitor levels and also create the correct metadata so that Omnibus knows where to cue shots up and where to play them out. All of the information for controlling newscasts is now written directly into the program scripts.



The KGO station has 12 EditStar workstations. The cuts-only EditStars are used to edit simple packages and most sports segments.

Video segments for the news show are automatically loaded into the playout Profiles when the editors commit to their finished material. Completed packages from the archive are also loaded. Each of the two playout servers has two channels dedicated to playing stories to air. The rundown list controls these servers cueing each story and displaying the first frame of the video on a preview monitor. Should the need arise, the TD can freeze, re-cue and abort events manually with controls located near his console.

Both the director and the TD have the ability to dub material directly from tape to the playout servers via the clip manager. This capability is essential for inserting breaking news stories in which the material has neither been digitized into the system nor entered into the rundown list.

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The benefits of digital

One of the most striking features of the design is that every newsperson now has immediate access to an unprecedented amount of material. A producer, for instance, can browse high-quality video from the archive while seated at the desktop or in an edit bay. He or she can even grab a piece of material being edited at the other end of the newsroom. In fact, virtually any number of users can access the same piece of material simultaneously.

Eventually, KGO hopes to link its operation to other ABC stations via T-3 ATM lines. Intersite access will allow users at these networked stations to browse each other's active and archive databases, then efficiently download any desired material. This type of powerful networking will provide an unprecedented capability for affiliate stations.

Profile rack showing the PDX208 expansion module, which supports the cuts-only EditStar and the expansion PAC200 audio chassis.

KGO's upgraded facility was built to adapt and change as video standards and compression schemes evolve, so new HDTV gear will fit right into the existing infrastructure. The station has already ordered key elements of its HD package from Tektronix, including a Grass Valley HD2100 master control switcher and another Omnibus automation package. Once again KGO looks to be setting a pace that other stations around the country will attempt to follow. ■

Stuart Allan is a technical writer based in southern California.

Design team:

Client: KGO-TV
Project supervision: Tektronix Systems Management Group
Engineering/KGO: Jim Casabella, director of engineering; Lee McPherson, technical facilities manager; David Graham, information systems; Rich Tom, information systems; Gary Jevitt, systems manager/trainer
Engineering/Tektronix: Mark Wagner project manager/systems engineer; John Liron, Omnibus development group
Designers: John Cvetko, system architect, Tektronix; Bob Marinelli, engineering manager, SGI
Integration/Great Circle Systems: Sam Spooner, president
Jason O'Dell, systems engineer

Equipment list:

12 Tektronix Profile PDR200 video file servers with PDX208 expansion modules and PAC208 A/D audio chassis; two SGI Origin 2000 video servers; AVS Graphics Omnibus Columbus facility management system; Tektronix PVH100 Fibre Channel hub; 90 NewStar for Windows workstations; 12 EditStar editing systems; six Lightworks V.I.P 4500 editing systems; one StorageTek Powderhorn 9310 tape library; one Grass Valley SMS7000DV serial digital router; one NVISION NV3512 digital audio router; Avalon Librarian software; FailSafe software.

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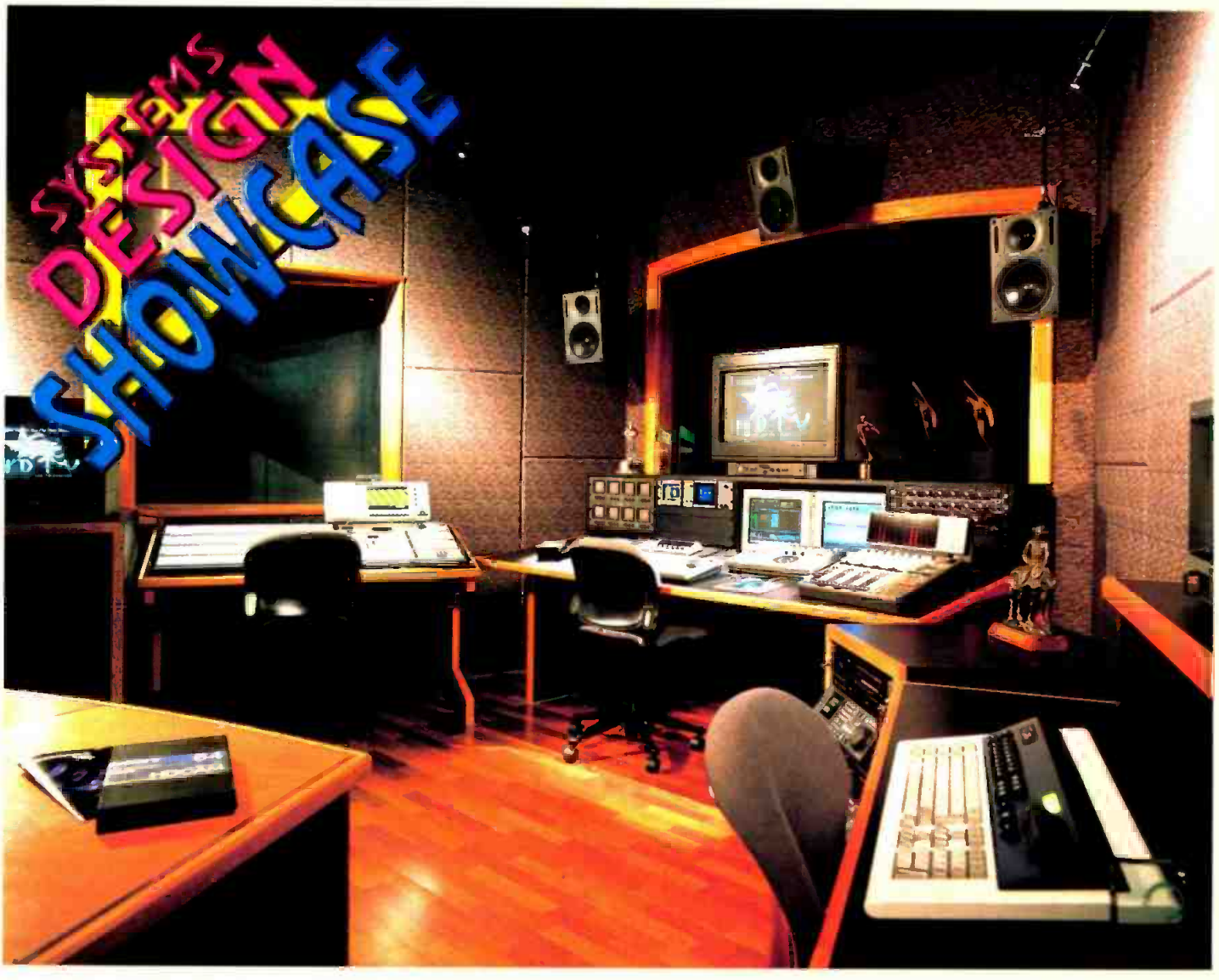

Winning the HDTV gamble at American Production Services

By Conrad Denke

I started our company along with my wife and partner Laura back in 1978 as American Motion Pictures. The company started with a 16mm camera and some rudimentary film editing equipment and won several national awards for corporate productions in the early stages. Around 1980, the video revolution was coming, so the company acquired a video camera and a few ¾-inch U-matic decks to meet customers' evolving requirements. As the video equipment progressively grew in size, we graduated to the Betacam and

Photo: Seattle's American Production Services' new high-definition post-production suite. (Photographs by Concept: Benson & Rice.)

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Winning the HDTV gamble at American Production Services

one-inch type-C production formats, then expanded into digital by adding D-2, D-1 and Digital Betacam.

As business grew, the company soon became American Production Services, enlarging the plant's facilities and adding staff. Along the way, we watched other production companies in the Seattle area go out of business due to unexpected maintenance costs and unanticipated financing expenses, as equipment became obsolete before it could generate enough income to amortize the required capital expenditures. We were determined to learn from our competitors' mistakes and not bet our future on video equipment that the market would not support.

By the late '80s, there were several edit suites in our new building, each based on systems from different manufacturers. That's when the decision was made to standardize on one brand so our editors and technicians could move easily from one bay to another. Sony had always been supportive, so when the company released its line of BVE edit controllers and DVS switchers, we decided to standardize with Sony. The result has been a seamless integration with fewer configuration conflicts.

Moving to HD

Last year, we started contemplating how HDTV would affect our plans but thought that it would be many years away. There were concerns about the proliferation of competing formats, the challenge of integrating a new technology with the existing facility, the size of the required investment and finding customers for high-definition production capabilities once we decided to go ahead. At first, these considerations seemed daunting, and we began to wonder if waiting until someone else tested the unknown dangers of being the first with HD would be the best move.

But then the local PBS station, KCTS-TV, came with a guarantee of a dependable amount of business if we could put together a digital HDTV post-production facility. KCTS had been involved with high-definition production since they began shooting their own analog HDTV shows such as *Over Washington* and *Over America*, and last fall they purchased Sony's digital HDC-750 field camera and the breakthrough HDW-700 one-piece HD camcorder for the station's upcoming HDTV production schedule. They were already planning to create a major production for the 1998 World Expo in Lisbon and an aerial program to coincide with the 2000 Summer Games in Australia. So here was a ready customer if we could provide the necessary HDTV digital post capabilities. The FCC's insistence that broadcasters migrate into digital broadcasting was an opportunity to broaden our market and get American Production Services onto the national stage.

Geoff Dunlap shooting an HD production with Sony's HDW-700 camcorder, as shown on the 20-inch HDM-20E1U high-definition monitor.

Having learned the benefits of staying within a single manufacturer's family of systems, the first decision was to choose which of the competing approaches to HDTV should be selected as

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the foundation of the proposed upgrade. Our experience with Sony's equipment had already demonstrated its proven reliability and production performance, but the crucial deciding point came when Sony demonstrated the new HDW-700 camcorder. It was the first all-in-one digital HDTV remote production solution.

Sony has been making analog HDTV production systems since its HDV-1000 recorder way back in 1984. The equipment received eager acceptance in both Japan and Europe. For that matter, HD Vision, in Dallas, and David Niles, in New York, are still using their HDV-1000 decks — fourteen years later. Then in 1988, Sony introduced the world's first all-digital HD recording with its 1.2Gb/s HDD-1000 recorder. By 1994, SMPTE had specified the 1080i format for HDTV, and this year Sony released a battery-operated HDW-700 HDCAM system for mobile field production.

Integrating HD

But how well would Sony's HD technology integrate with our existing post-production infrastructure? Larry Thorpe, vice president of Acquisition Systems for Sony Electronics' Broadcast and Professional Company, assured me that all their new HDCAM equipment was based on existing Digital Betacam hardware in which we already had gained considerable experience.

HDCAM uses the same size cassette as Digital Betacam. It also uses the same transports and chassis of Digital Betacam camcorders and recording decks. Even the heads and drums are as close to Sony's Digital Betacam forerunners as the HDTV specifications would allow.

The HDCAM recording format uses a two-step process: signal pre-filtering followed by a modest 4.4:1 compression using an adaptive field frame DCT-based algorithm. The result is a video data rate of 140Mb/s, which provides a 40-minute recording time in the small format camcorder "S" cassette, one hour in the mid-sized version and two hours of storage on the larger studio cassette. The HDW-500 editing VTR emulates the original Digital Betacam and retains all the operational capabilities users

Compared to the adjustments we had to make when upgrading to CCIR-601 production capabilities back in 1991, adding HDTV post-production capabilities was relatively uncomplicated.

American Production Services' HD edit suite includes a Sony three M/E HDS-7000 production switcher, a two-channel HDME-7000 for creating 2-D and 3-D effects and Sony HDCAM HDW-500 VTRs in foreground.

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Geoff Dunlap, American Production Services, shooting in the field with the HDCAM camcorder.

expect — pre-read, scrubbable jog audio and high-quality slo motion.

The HDW-700 camcorder outputs a 1920x1080i baseband 1.5Gb/s signal as specified in the SMPTE 274M HD production standard. However, because different standard-definition digital productions will have their own requirements, the camcorder can also simultaneously deliver ITU-601-based 4:2:2 format — popularly referred to as the 480i format — via a SMPTE 259M SDI interface, or as an option, an alternate 480p version of the same signal. Both of these SDTV alternatives are downconverted from the "super-sampled" digital HDTV signal.

Of course, we'd also have to move the digital HDTV signal around our facility. The baseband 1.5Gb HDCAM signal can be routed via any of several manufacturers' routing systems. But for dubbing purposes, the compressed 140Mb/s signal can be wrapped inside the SMPTE SDTI (serial data transfer interface) protocol which makes it a 270Mb signal that can be sent over standard coaxial cables and through standard routers.

We also have four HDW-500 VTRs with their own independent TBC controllers and access to a wide spectrum of decks handling anything from Digital Betacam, Beta SP, ¾-inch U-matic, S-VHS or Hi-8. The edit controller is a BVE-9100 system with the BKE-9402 programmable control panel to let it talk to any peripheral equipment that understands RS-422 instructions. We always have to consider the bottom line, but the current prices on Sony's HDCAM line are similar to last year's prices on the Digital Betacam equipment.

The production switcher, a Sony three M/E HDS-7000, has two keyers per row providing a total of six keyers and 10-bit processing. Digital effects can be created on our two-channel HDME-7000 containing a full compliment of 2-D and 3-D effects. Because sound is becoming increasingly important in digital production, we were glad to see that

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Sony's HDCAM format provides four editable channels of 16-bit AES/EBU audio, and the editing VTR is 20-bit capable.

Audio will be run through the same mixing board we have in our other edit suites, the DMX-E3000, with Dolby Laboratory's AC-3/AES ProLogic decoder to feed five Genelec speakers, plus a sub woofer. The editor's monitor is a 16:9 high-resolution 28-inch HDM-2830 display, and the clients can watch the images on a 20-inch HDM-20E1U screen.

This HD project would never have been launched unless we were confident that we could provide the full spectrum of services customers expect from a high-end post-production facility. After all, the process of creating finished HD video for today's demanding clientele must meet the challenge of incorporating 3-D and computer-generated images from a growing variety of graphics sources into a production. To complete this process, we purchased a Sierra Design Labs high-definition disk recorder, the HD 1.5 Plus. The recorder provides 14 minutes of uncompressed HD storage with eight channels of audio.

The DDR is used not only for caching, but most importantly, as a graphics bridge to pull computer-generated graphics files off almost any workstation, whether over a network connection or on disk. Because clients may bring graphics from any number of third-party software applications, from After Effects to LightWave 3-D to whatever might be developed tomorrow, this HD disk recorder is crucial to allowing us to import those images into our high-definition edit suite. For those clients with hard-copy graphics, we use a Sony DXC-H10 HD camera mounted on a graphics stand.

To complete the interconnectivity circuit, the switcher's eight AUX are used as a mini router. ADC high-definition patch panels were installed to route signals anywhere within the suite. We've also installed a Snell & Wilcox HD 5100 upconverter with key channels to take any serial digital 525 signal and change it into the HD format. We will soon have the new model of Chyron's Duet-HD character generator to keep even our fonts in the high-definition domain. With this compliment of equipment, we'll be able to meet the needs of even our most demanding clients.

Compared to the adjustments we had to make when upgrading to CCIR-601 production capabilities back in 1991, adding HDTV post-production capabilities was relatively uncomplicated. Originally, the installation was actually pre-configured with the same prototype equipment that Sony displayed at this year's NAB. We swapped all of it out with new equipment when it was delivered just days before our new high-definition editing suite, which we call "Edit Suite Z," was opened. Once the decision to go with the HDCAM format had been approved, I can honestly say it was the smoothest installation of new technology we had ever experienced at American Production Services. Our director of engineering, Barry Ballanger, began construction at the end of May by converting an existing audio sweetening room.

Because the edit suite would need HD programs, we decided to purchase two Sony HDCAM HDW-700 camcorders to compliment our camera/audio/lighting/grip rental capabilities. To make the cameras especially desirable to rental clients, two Canon HJ 18X7.8 BIAS special high-definition zoom lenses were also purchased.

Interest in our new high-definition editing suite blossomed even before our June open house. Current HDTV projects range from the *National Desk* series produced by Whidbey Island Films for PBS, production of on-air news promos for San Francisco's KTVU-TV, station KGW-TV's ongoing HD news reel highlighting events in Portland and Harris Corporation's creation of an HD advertising display destined to be presented in the front window of Macy's New York department store.

We are confident that this new HDTV installation will help American Production Services on the crest of the new digital production wave. An investment as significant as this can be a crucial gamble for a company like ours and market considerations must be calculated into every purchase decision. By combining our own production experience with Sony's HD technology, the result is a video production environment that will allow us to succeed both business-wise and creatively. ■

Conrad Denke is owner of American Production Services, Seattle.

Equipment list:

Tape machines: Sony HDW-500 editing VTR, HDW-700 camcorders
Edit controller: Sony BVE-9100 with BKE-9402 programmable control panel
Production switcher: Sony HDS-7000, 3-M/E
Digital effects: Sony HDME-7000
Audio console: Sony DMX-E3000
Monitor speakers: Genelec
AC-3 encoding: Dolby
Video monitoring: Sony HDM-2830, HDM-20E1U
HD disk recorder: Sierra Design Labs HD 1.5 Plus
Camera: Sony DXC-H10 HD
Lenses: Canon HJ 18 X 7.8 BIAS high-definition zoom
Patch bays: ADC
HD upconverter: Snell & Wilcox HD 5100
Character generator: Chyron Duet-HD

Granny factor editorial is a winner

In addition to being popular with you readers, "The Granny Factor" editorial (see *Broadcast Engineering*, May 1997, p. 6) won second place in the national American Society of Business Press Editors competition and second place in the Midwest region competition.

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Digital tape ACQUISITION

Footage from the field has never been better.

By Steve Epstein, technical editor

In the early days, it was film. In the '70s, film gave way to analog tape. As we approach the millennium, analog tape is giving way to digital formats. They are so widespread that digital formats are now available in the consumer markets. Today's videotape acquisition equipment is capable of incredible image quality using a vast array of sophisticated cameras and lenses. However, unlike years past, compressed recordings are the norm. Despite image compression, the digital images produced by today's equipment are better than ever. Because of the wide range of recording formats available, this article will concentrate on 4:2:2 and HD-based digital tape recording systems for acquisition, although the chart on p. 78 covers a more comprehensive range.

The primary use for tape today is in acquisition, which also requires at least one camera. As we move forward, many of the parameters associated with cameras are changing. Aspect ratios, scanning methods and line/frame rates are some of the more obvious. All of these things effect tape recorders because, rather than simply recording digital data, videotape decks require that data be formatted as video. Unlike data, video has a specific line/frame rate structure, and it is those structures that are changing. One fundamental change is the move toward component video. All of today's digital formats are based on component video. Also, with the exception of HD D-5, which only offers a stand-alone field recorder, all these formats offer camcorders and/or dockable decks.

Many of the manufacturers are offering small, lightweight systems that are easy to get into tight spaces. However, one problem with these lightweight systems is that they lack much of the structural integrity of older, bulkier units. This is both good and bad; it's easier on the camera operator, but if these units are dropped or suffer major shock, it is more likely that they will suffer damage. Sometimes the damage can be extensive, making replacement more viable than repair. Luckily, many of these small units cost less than the larger systems, so their replacement is far easier to swallow.

Fundamentals

Tape offers the lowest cost per unit measure of any storage format today. Its cost effectiveness is one of the reasons why tape is still in widespread use. Most of today's formats record video using compression. Although the compression methods vary, DCT-based intraframe compression is the

Photo: Much of today's studio equipment is rugged enough to take on the road. Tim Culbertson, WCYB videographer, sets up a tape in WCYB's Livestar II news van.

Digital tape formats for ACQUISITION

most common. Today, there are only two HD formats available that offer digital field recording capability, Panasonic's D-5 HD and Sony's HDCAM. Two other formats, JVC's Digital-S 100 and Panasonic's DVCPRO 100 were announced at NAB '98. Much of the information regarding these last two formats is preliminary, but both are expected to be based on the 50Mb/s recorders currently offered by the companies.

For 4:2:2 digital acquisition in standard definition, there are several choices: Sony's Digital Betacam and Betacam SX, JVC's Digital-S and Panasonic's DVCPRO 50. Each of these formats offers compressed recording of component video using decks designed to go into the field. Depending on the format, camcorders, dockable recorders and even stand-alone field recorders are available. With that said, let's take a look at each of these digital acquisition formats in detail — first the HD formats, and then those for standard-definition recording.

Sony's HDCAM

Not surprisingly, the newest format for HD recording is also the most versatile. The HDW-700 is the only HD digital camcorder; a studio deck, the HDW-500 is also available. The HDCAM recording format uses ½-inch metal particle tape and offers field recording times up to 124 minutes. Much of the technology, including the tape transport, used for HDCAM is based on Sony's Digital Betacam. This allowed the format to be deployed quickly and keeps the equipment costs low. HDCAM uses a 15:5:5 sampling structure (see "Playing the numbers game," p. 81) and records only eight bits. This, combined with a 4.4:1 adaptive compression system results in a recorded data rate of 140Mb/s, nearly 8% more than Digital Betacam.

On the audio side, the HDCAM format offers four channels of 20-bit audio sampled at 48kHz. A cue track is also part of the format as is the ability to preread. Despite HDCAM's similarity with Digital Betacam, it is unable to playback Digital Betacam recordings and there are apparently no plans for this. At the time of this writing, the HDCAM footprint was unavailable, but many of the relevant specifications can be found in Table 1. However, it is safe to assume it is quite similar to the Digital Betacam footprint shown in Figure 2.

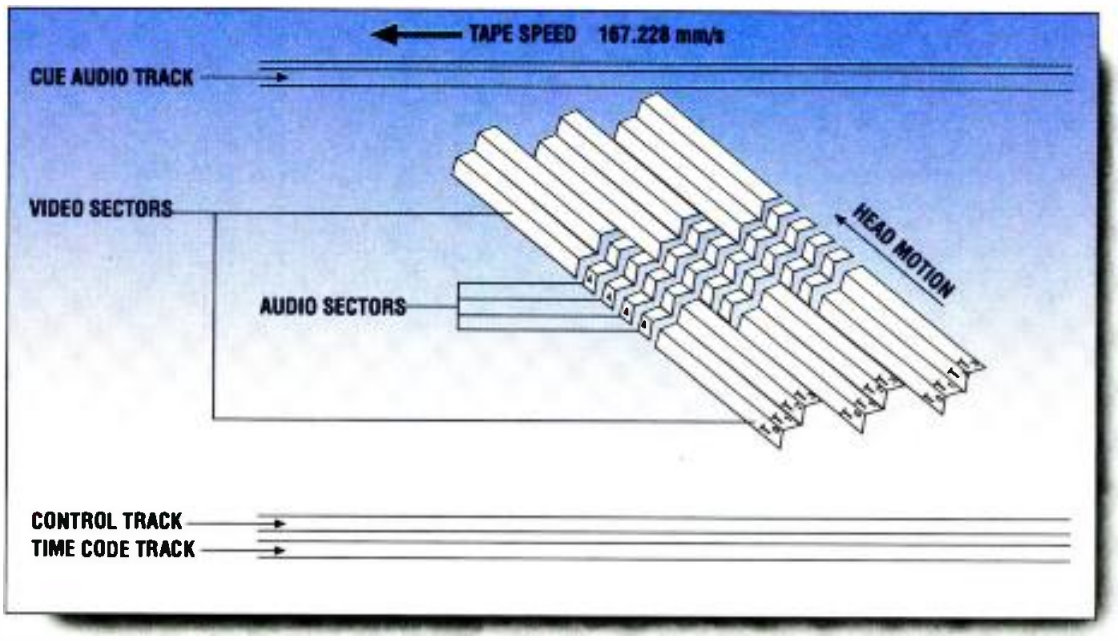


Figure 1. Track footprint used for D-5 and HD D-5 recordings.

Panasonic's HD D-5

HD D-5 is obviously based on Panasonic's D-5 format. D-5 is the only format which provides 10-bit, uncompressed, standard-definition component recordings. Taking advantage of that fact, Panasonic developed a 4:1 intrafield compression system that reduced the 22:11:11

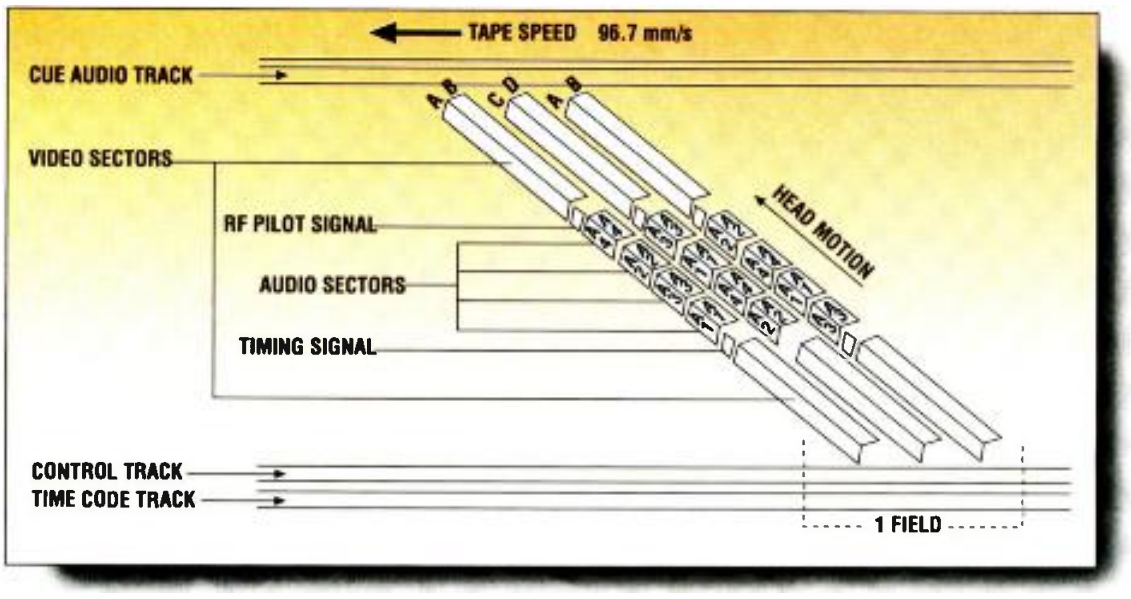


Figure 2. Digital Betacam's track footprint.

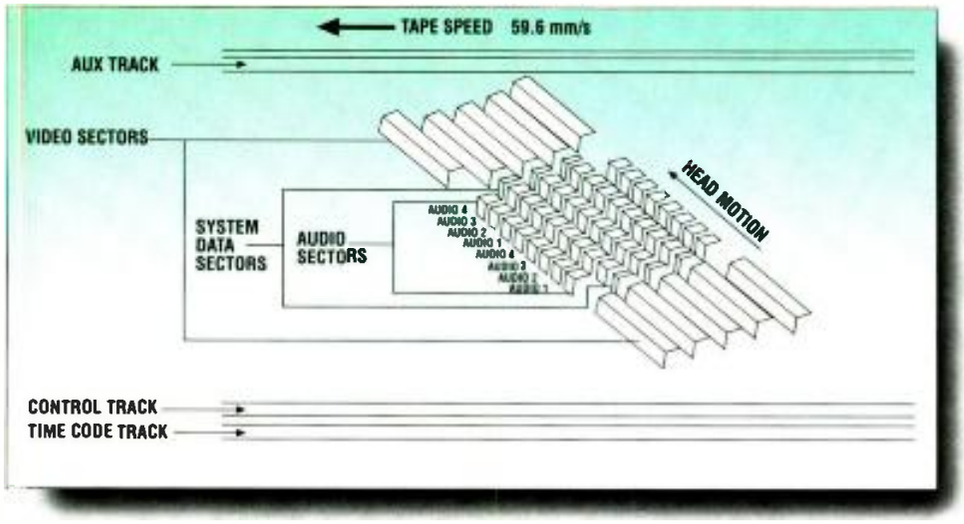


Figure 3. Tape layout used for Betacam SX.

of a higher sample rate (18MHz) D-5 decks can also be used to record eight-bit widescreen images.

Digital Betacam, Betacam SX

As its name implies, this is a digital version of Sony's highly successful Betacam format. Digital Betacam records a 4:2:2/10-bit component video signal with only 2.34:1 compression. Depending on the model, some Digital Betacam decks are capable of playing back analog Betacam (SP) recordings. Digital Betacam offers four channels of 20-bit/48kHz audio, a cue track, preread and record times up to 124 minutes on metal particle tape. For field recording, the camcorders can only handle the small cassette which offers 40 minutes of record time, but a stand-alone recorder, the DVW-250 can handle both cassette sizes. This allows more than two hours of continuous record time in the field. The Digital Betacam footprint is shown in Figure 2.

Although Digital Betacam was designed to provide high-quality recordings for production, Betacam SX is geared toward the demands of news operations. Betacam SX's footprint is shown in Figure 3. Also based on analog Betacam, Betacam SX provides 4:2:2 eight-bit recordings that are compressed approximately 10:1 using MPEG-2 4:2:2P@ML

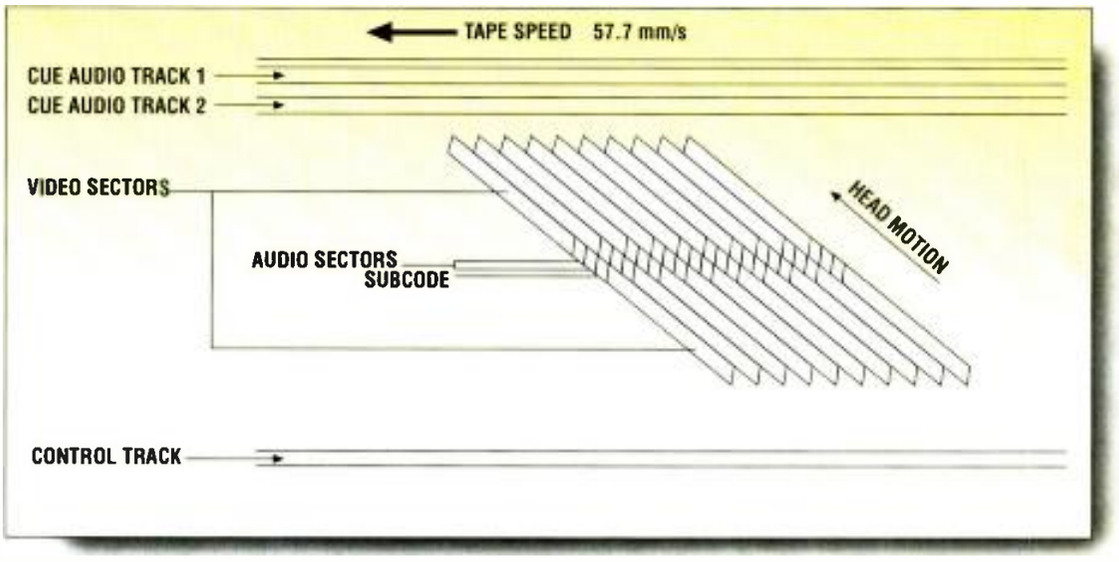


Figure 4. Recording track layout used for Digital-S.

10-bit data rate (see "Playing the numbers game," p. 81), and allowed it to be recorded on unmodified D-5 decks. Recently, models have been introduced that integrate the compression systems within the standard size deck. For the most part, these newer decks do not have standard-definition inputs and therefore cannot record the standard-definition signals. This year at NAB, Panasonic introduced an HD D-5 field recorder, the AJ-HD2200, as well as the AJ-D2700 studio deck, which provides 1080i/720p switchable recording.

Other features of the HD D-5 format include recording four channels of 20-bit audio sampled at 48kHz, preread, up to 124 minutes of recording time on a single cassette and an analog cue track. For field use, only 63 minutes of record time is available, as the recorder cannot accommodate the large cassettes. The D-5/HD D-5 recording footprint is shown in Figure 1.

Technically, you can't acquire standard-definition video on D-5 — there is no field recorder. But because it is the basis of HD D-5, let's take a quick look at the video side of the standard definition format. D-5 records at a data rate of 288Mb/s. When recording standard definition signals, a 4:2:2 sampling structure is used, and the samples are quantized using 10 bits. One additional feature of some D-5 decks is the ability to playback D-3 recordings. This is a nice trick considering D-3 records eight-bit composite video and D-5 is a 10-bit component system. One additional feature of the D-5 format is through the use

Tape offers the lowest cost per unit measure of any storage format today.

Digital tape formats for ACQUISITION

(GOP=2, I, B). Using this level of compression allows recordings to be made at the low data rate of 18Mb/s. That data rate allows two channels of video to be sent simultaneously on a standard microwave channel, or a single video channel can be sent back at faster than real time (2x). Other features offered on the Betacam SX format include four channels of 16-bit/48kHz audio, preread and an auxiliary channel. Record times for the format top out at 184 minutes, while up to 60 minutes can be recorded in the field decks. Like Digital Betacam, some Betacam SX models can playback analog Betacam tapes.

Betacam SX also offers some unique features. One is the integration of a hard disk drive into the studio decks. Among other things, this allows editing to be performed using a single deck. Tape-to-

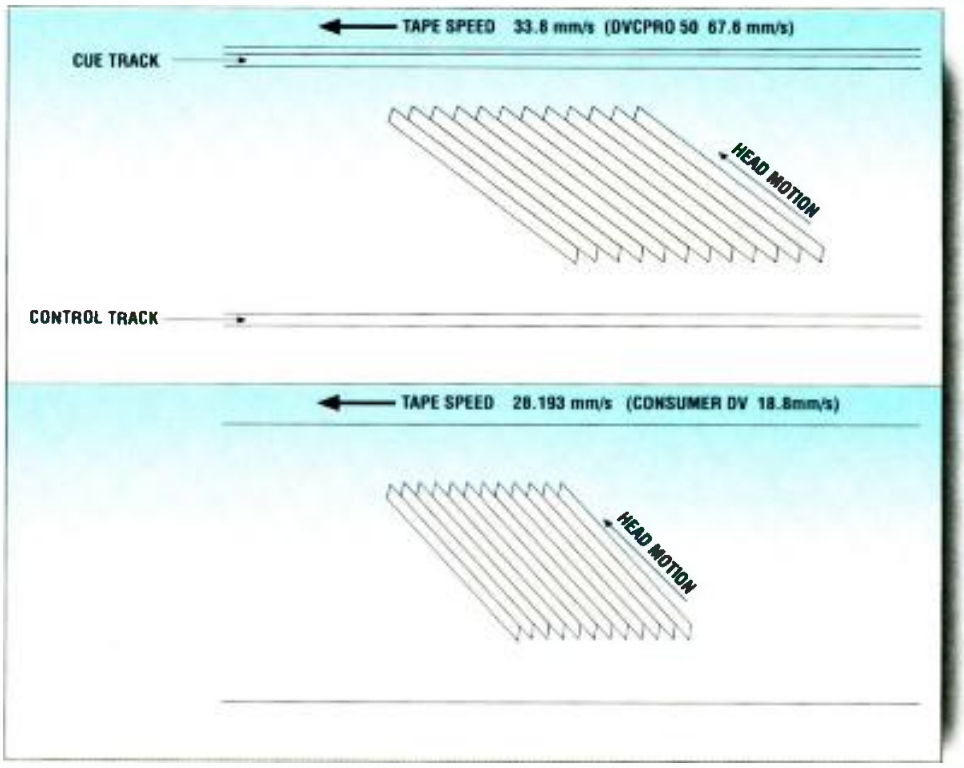


Figure 5. Track layouts for 6.35mm DV-recordings. DVCPRO (top) uses an 18-micron track pitch. DVCAM (bottom) uses a 15-micron track pitch, with the consumer DV format using a 10-micron track pitch in the standard mode. All three formats record audio, video and subcode information digitally on the helical scan tracks.

	Mfgr.	Format	Tape Width	Maximum Tape Length (minutes)	Tape Speed (mm/s)	Track Pitch (microns)	Playback faster than real time	Plays back other formats	Video Record Format (see note 1)	Recording data rate (Mb/s)	Compression	Preread	Uncompressed Lines	Audio channels	Cue tracks
High Definition formats	Panasonic	D-5 HD	1/2"	L-124 minutes M-63 minutes S-23 minutes	167.228	20	No	No	22:11:11 10-bit	288	4:1 Intrafield	Yes	None	4-48kHz/20-bit	1 Analog Cue Track
	Sony	HDCAM	1/2" MP	L-124 minutes M-64 minutes S-40 minutes	96.7	21.7	No	No	15.5.5 8-bit	140	4.4:1 Adaptive Frame/field	Yes	None	4-48kHz/20-bit	1 Cue track
	JVC	Digital-S 100	1/2"	See Note 2	115.5	See Note 2	See Note 2	Digital-S (D-9)	See Note 2	100	6.6.1 DV based	See Note 2	See Note 2	See Note 2	See Note 2
	Panasonic	DVCPRO 100	6.35mm	See Note 2	See Note 2	See Note 2	See Note 2	See Note 2	See Note 2	100	See Note 2	See Note 2	See Note 2	See Note 2	See Note 2
1/2- inch standard definition formats	Panasonic	D-5	1/2"	L-124 minutes M-63 minutes S-23 minutes	167.228	20	No	D-3 optional	4:2:2 10-bit	288	None	Yes	All	4-48kHz/20-bit	1 Analog Cue Track
	Sony	Digital Betacam	1/2" MP	L-124 minutes S-40 minutes	96.7	21.7	No	Betacam (SP) optional	4:2:2 10-bit	127.76	2.34.1 Intraframe DCT	Yes	None	4-48kHz/20-bit	1 Cue track
	JVC	Digital-S (D-9)	1/2"	124 minutes	57.737	20	2X	S-VHS	4:2:2 8-bit	50	3.3.1 Intraframe Dual DV	Yes	2	4-48kHz/16-bit	2
	Sony	Betacam-SX	1/2" MP	L-184 minutes S-60 minutes	59.6	32	4X	Betacam (SP) optional	4:2:2 8-bit (preferred)	18	10:1 Interframe MPEG-2 4:2:2P@ML	Yes	None	4.48kHz/16-bit	1 Aux Channel
6.35mm DV-based formats	Panasonic	DVCPRO 50	6.35mm Thin Layer MP	L-94 minutes M-33 minutes	67.6	18	2X	DVCPRO	4:2:2 8-bit	50	3.3:1 Intraframe Dual DV	No	2	4-48kHz/20-bit	1 Analog Cue Track
	Panasonic	DVCPRO	6.35mm Thin Layer MP	L-123 minutes M-63 minutes	33.8	18	4X	DVCAM DV	4:1:1 8-bit	25	5:1 Intraframe DV	No	None	2-48kHz/16-bit	1 Cue track
	Sony	DVCAM	6.35mm ME	Standard-184minutes Mini-40minutes	28.2	15	4X	DV	4:1:1 8-bit	25	5:1 Intraframe DV	No	None	4-32kHz/12-bit or 2-48kHz/16-bit	None
	Various	DV	6.35mm ME	Standard-184minutes Mini-40minutes	18.8	SP-10 LP-7.7	No	None	4:1:1 8-bit	25	5:1 Intraframe DV	No	None	4-32kHz/12-bit or 2-48kHz/16-bit	None
Consumer data format	JVC	D-VHS	1/2"	HS mode 3.5hours STD mode 7 hours LS mode 49 hours	33.35 16.67 2.38	29	No	VHS (record and play)	N/A Bitstream recording	28.2 14.1 2.0	N/A Bitstream recording	No	None	N/A	N/A

Notes
1 The 4.2.2 nomenclature is based on multiples of a standardized sampling frequency 13.5MHz.4 The 4 in the nomenclature denotes the sampling frequency (4 x 13.5MHz/4 = 13.5MHz) The 22:11:11 designation specifies the following sampling frequencies 22 x 13.5MHz/4 = 74.25MHz for luminance and 11 x 13.5MHz/4 = 37.125MHz for each of the color difference signals The sampling rates used for HDCAM are approximately 56MHz for luminance and 14MHz for each of the color difference signals For more information see the "Playing the numbers game" sidebar on p81
2 Not yet released

Table 1. Specifications for various digital-tape formats in use today. (Information obtained from manufacturer-provided sources.)

A variety of HD formats are found within HD production facilities, such as COLOSSALVISION in New York, which has HDCAM, D-5 and HD analog one-inch machines.

disk transfers can be done at 4x real-time and transfers from the disk to an external server can be done at speeds up to 4x real time. Another unique feature is the design of the laptop editor. Rather than a one-piece field editor, the Betacam SX field editor consists of two identical portable recorders, each with a built-in LCD screen. When mated together, the units provide cuts-only editing of Betacam SX and Betacam (SP) tapes. A similar unit offers playback of only Betacam (SP) tapes.

Digital-S

The last of the ½-inch formats we will cover in this article is Digital-S. Based on JVC's S-VHS format, Digital-S offers eight-bit 4:2:2 recording. Originally capable of recording two audio channels, current units feature four 16-bit/48kHz audio channels, as well as two audio cue tracks (see Figure 4). Digital-S decks are capable of preread and playback at up to 2x real time. The Digital-S compression system uses intraframe compression and is based on the consumer DV compression system. The DV system uses a single chip to compress 4:1:1 video 5:1. JVC chose to use a pair of DV chips, which results in a 4:2:2/eight-bit sampling structure, a compression ratio of 3.3:1 and an overall bitrate of 50Mb/s. Maximum record time on Digital-S has recently been extended to 124 minutes on a single tape. Other features of the Digital-S format include preread, the ability to playback S-VHS tapes and 2x playback. As mentioned earlier, a 100Mb/s version of Digital-S has been announced.

Not surprisingly, the newest format for HD recording is also the most versatile.

DVCPRO 50

Panasonic's DVCPRO 50 is the only digital component, eight-bit 4:2:2 recording format that uses 6.35mm (¼-inch) tape. Based on DVCPRO, DVCPRO 50 uses an 18-micron track pitch and a dual DV chipset for compression. By doubling the tape speed, Panasonic doubled the recordable data rate. The compression system used for DVCPRO 50 is the same as that used for Digital-S. Demonstrations have shown that with the proper hardware, switching between the compressed 50Mb/s bitstreams used for DVCPRO 50 and Digital-S is relatively simple. It is also possible to switch from/to the 25Mb/s bitstream used for DVCPRO.

Digital tape formats for ACQUISITION

The DVCPRO 50 format provides maximum record times of 94 minutes on the L-cassette and 33 minutes on the M-cassette. Four channels of 48kHz/20-bit audio, as well as a single analog cue track, are available. DVCPRO 50 does not provide preread capabilities, but 2x playback speeds are available on some models. Like Digital-S, a 100Mb/s version has been announced. Laptop editors are available for field editing, but unlike the Sony units, the DVCPRO (50) laptops are a single piece.

DV and its derivatives: DVCAM and DVCPRO

These formats, like D-5, don't quite fit the criteria for this article — they are 4:1:1 based — but an understanding is helpful because they form the basis for DVCPRO 50, Digital-S and their 100Mb/s versions. The DV format is a consumer digital recording format that uses 6.35mm metal evaporated tape. Video is sampled using a 4:1:1 structure and quantized to eight-bit resolution. All of the video and audio information is recorded on the helical scan tracks and no longitudinal tracks are used. Track pitch for the consumer format is 10 microns with a 25Mb/s data rate.

Both Sony and Panasonic have built professional versions of the DV consumer format (see Figure 5). Sony's DVCAM uses a 15-micron track pitch, metal evaporated tape and no longitudinal tracks. Longitudinal tracks cannot be recorded on metal evaporated tape. Panasonic's version of DV, DVCPRO, uses metal particle tape and therefore can record longitudinal tracks. DVCPRO has a control track and a cue track and uses an 18-micron track pitch. Limited interchange is possible within these formats. DVCPRO can play back both of the other two. DVCAM can only playback consumer DV.

Making the choice

With all the variables, choosing a single acquisition format can be difficult. Applications, as well as facilities, vary.

Acquiring footage is one thing, but once it is acquired, the footage has to be run through some form of production. It is no secret that the production paradigm is changing. Linear editors are giving way to server/network-based non-linear systems. Once the footage is dubbed off the acquisition tape, it may spend the rest of its life on disks.

With all the variables, choosing a single acquisition format can be difficult.

Facilities must consider their entire process when considering an acquisition format. Determine how far up the chain acquisition tapes will be used. Will they be dubbed to a server immediately? Will cuts only editing be done on tape with more complex production on disk? Will the tapes go to air? Also consider how the signals from tapes will get to their destination. Will they be composite, component, analog or digital? Will you be able/required to handle compressed bitstreams?

Although moving digital signals though a facility does not result in signal damage equivalent to analog generation loss, it is not entirely transparent either. Signal compression and decompression along with composite/component encoding/decoding operations all take their toll. Signal paths are also important. Moving 10-bit images in and out of equipment designed for eight-bit video results in increased noise in the final product. Care must be taken to ensure that the signal path from the camera lens to the transmitter is as straightforward as possible. Eliminating unnecessary signal format translations is an important first step. As important as this is now, the future holds even more potential for dealing with a myriad of formats, whether they are SD, HD, progressive, interlace or even old monochrome.

These issues are part of a much larger picture than simply acquisition. Making the best decision regarding an acquisition format requires some consideration of the larger picture. Choose wisely, tape acquisition is likely to be around for some time. ■

Speak out

The issue of tape formats has always been controversial. Anyone recall the battles between Type C and Type B? How about M vs. Beta?

With the complexities that digital brings to the table, selecting a house or acquisition tape format carries both financial risks and production rewards. What is your station going to do? Or do you need help?

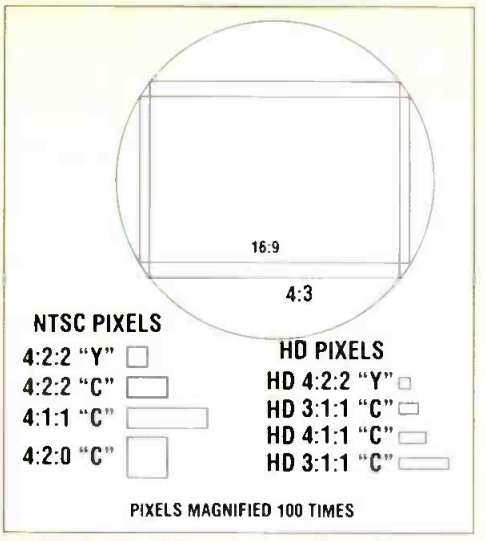
Send your opinions or questions on tape formats to Dr. Digital at: drdigital@compuserve.com. We'll contact those with responses that are selected for future use in the magazine. Let your voice be heard.

Playing the numbers game

By Steve Epstein, technical editor

While researching the "Digital tape acquisition" article, I ran across some strong opinions about how to "state the facts" and think it's time to clear the air. *Specmanship* is nothing new. It went on during the days of analog video, and it will continue throughout the transition to digital and HD. Manufacturers quote numbers and show graphs, and in the end, their products always look better than everyone else's. After enough presentations, it's all too confusing. In an effort to be fair and cut through the confusion, I calculated some effective pixel dimensions based on today's common sampling structures.

The first problem is how to relate the two different aspect ratios. Fitting one inside the other always places the smaller of the two at a disadvantage. Therefore, because lenses and tube faces are round, I chose a circle, and placed the largest possible rectangle of each aspect ratio inside (see Figure 1). Based on those dimensions I divided the image widths by the number of pixels per line, and the image heights by the number of active lines. The resulting pixels are shown magnified 100 times. In all cases, the "Y" or luminance pixel is represented by the first number in the sequence, and the "C" or color difference signal is represented by the second and third numbers in the sequence. Most formats that have originated in the video world use the same sampling structure for each of the color-difference signals. However, other formats, such as MPEG, use a sampling structure that is based on an array of pixels rather than across a line. Therefore, the sampling structure can vary from line to line. MPEG-2's 4:2:0 sampling is an example of this, rather than associating two chrominance samples (R-Y & B-Y) to every other luminance sample on *every* line (SDTV 4:2:2), MPEG 4:2:0 associates every other luminance sample, on *every other* line, with a chrominance sample. Because of this, each of the pixels shown below are a single line high except the 4:2:0 "C" pixel, which has an effective height of two lines.



Relative effective pixel sizes based on sampling structure and the raster sizes shown.

For NTSC, a luminance bandwidth of about 5MHz is used, with chrominance bandwidth about half that. Based on SMPTE 259M, there are 486 active lines. The "4" in the 4:2:2 nomenclature refers to the sampling of 720 pixels using a sampling frequency of 13.5MHz (about 2.5 times the luminance bandwidth). The "4" refers to multiples of a standardized sample rate: 13.5MHz/4 (4 x 13.5MHz/4 = 13.5 MHz). A "2" refers to sampling 360 pixels at an effective frequency of 6.75MHz (half of the 4), and therefore a "1" refers to sampling 180 pixels at an effective rate of 3.375MHz (half of the 2). When video is sampled using 4:2:2, each line contains 720 luminance pixels and 360 (x2) color difference pixels. With 4:1:1 the number of color difference pixels drops to 180 (x2). When sampled using 4:2:0, there are 360 (x2) color difference pixels per line, but instead of sampling 486 lines, only half (243) the lines are sampled. However, because MPEG samples in groups of 8x8 pixels, the number of sampled lines needs to be divisible by eight and therefore 243 is reduced to 240.

For high-definition (HD), higher system bandwidths are used, and therefore, higher sampling rates are needed. The HD luminance bandwidth is about 30MHz, with half that (15MHz) being used for chrominance. The chosen luminance sampling frequency is 74.25MHz, 5.5 times higher than the 13.5MHz used for SDTV. The number of active luminance samples per line has been specified at 1920.

The question of how to denote this higher sampling frequency arises. Should the nomenclature remain based on the 13.5MHz/4 used to denote a "1" in SDTV? If so, 22:11:11 becomes the new standard for high-definition (22 x 13.5MHz/4 = 74.25MHz). Or, conversely, should the accepted sampling structure of 4:2:2 be updated to reflect the higher sampling rates used for HD? I think the 4:2:2 nomenclature should continue. It loosely reflects sampling rates based on Nyquist sample theory and bandwidth, whereas using the 22:11:11 nomenclature does not. To avoid confusion, sampling structures used for HD should reference that fact.

There are a number of ways to do this, one would be noting the actual sampling frequency as a subscript. Another method would be to add an HD prefix or suffix designation to the three number nomenclature. The subscript method can get tedious, and is difficult to convey on some media, such as the web. Therefore, I will use HD X:Y:Z to refer to sampling structures used for HD. In this case, HD 4:2:2 refers to a sampling structure whereby each line contains 1920 luminance pixels sampled at 74.25MHz and two sets of 960 color difference pixels sampled at 37.125MHz.

In this nomenclature, a "4" refers to the sampling of 1920 pixels using an effective sampling frequency of 74.25MHz. Consequently, a "3" refers to 1440 pixels sampled at 55.7MHz (3/4 of the 4), a "2" refers to 960 pixels sampled at 37.125MHz (half of the 4) and "1" is the equivalent of 480 pixels sampled at just over 18.56MHz (half of the 2).

Shown in the figure are relative effective pixel sizes for the various sampling structures. Each is magnified 100 times. To provide some scale, if the length of the 16:9 rectangle were the 100 yards of a football field, the HD 4:2:2 "Y" pixel is just under 2"x2." Carrying that same example one step further, on a wide shot that had one goal-post as the left edge and the other goal-post as the right edge of the screen, approximately 12 (3 rows of 4) HD 4:2:2 luminance pixels, overlaid with two sets of 6 (3 rows of 2) color difference pixels would be used for a rectangular object about the size of a football.

The HD X:Y:Z designation is strictly my opinion. The question boils down to this: Should the 13.5/4 quotient be the basis of *all* sampling structures, or should high-definition sampling structures substitute 74.25/4? If so, how do we tell the difference? What do you think? E-mail me at **drdigital@compuserve.com**. ■

LENSES: More than glass

By Don Garbera

The rush to DTV is resulting in a plethora of new features and options for broadcast lenses.

If you're in the market for a new broadcast lens, there are plenty of models to choose from. Stations in the top 10 markets are gearing up for digital capabilities, as well as high-definition (HD) television — which has several scan rates to choose from, such as 480p, 720p, 1080i and 1080p. All this makes for a mad scramble to produce both SD and HD programs. And, if that's not enough, many stations need (and want) to begin archiving programs in 16:9.

When you look at all this technology virtually happening at the same time, it's no wonder that many broadcast engineers are scratching their heads wondering which end is up. With all this confusion that *must* eventually lead to some solid decisions, engineers have little time left to devote to lens selection for new or existing cameras. Unfortunately, devoting little or no time to lens selection can make the difference between the success or the failure of a program or production. Keeping this thought in mind, let's take a look at where lens technology is today in relation to where the industry is headed.

With Nikon no longer in the picture, the three major lens manufacturers are Fujinon, Canon and Angenieux — and all three have introduced new 16:9 lenses for HD applications. Prior to this year, HD lenses were considered specialty items and pretty much mimicked 16:9 NTSC models, barring minor focal length differences. According to lens makers, it's the networks and their O&O's and production companies that are buying 16:9 HD lenses. The little guys are still

Photos: Today's lenses provide superior optical imaging with a wide range of features and prices. Lenses pictured from the top: Angenieux's 15X8.3 high-resolution ENG lens, Canon's Digi-Super 21 and Fujinon's HA36X ENG HD.

buying NTSC lenses. However, 16:9 lenses are making up a larger portion of that NTSC market.

Switchable cameras

To accommodate the new 16:9 format, camera manufacturers developed the *switchable* 2/3-inch camera. The prime mission of switchable cameras is to help stations transition to 16:9 by providing both aspect ratios in one camera. This allows stations to continue shooting most programming in 4:3, and yet be able to use 16:9 for those special productions that need to be archived. As much as 30% of broadcast lens sales are for use on switchable cameras.

However, the need for switchable (4:3 and 16:9) operation creates a problem for camera manufacturers. When a 4:3 lens is mounted on a switchable camera, 20% of the viewing area is lost (see Figure 1). When using a switchable 16:9 camera in the 4:3 mode, only 9mm of the 11mm diagonal chip is utilized. This means that the lens appears more telephoto because a 2/3-inch lens is designed to image on an 11mm (diagonal) CCD. A 4:3 chip and a 16:9 chip are both 11mm diagonal. However, on every switchable camera, with the exception of Philips' cameras, when you switch the chip to the 4:3 mode, the diagonal of the image becomes 9mm. This is where the 20% loss occurs. Philips switchable cameras incorporate what they call *dynamic pixel management*, which eliminates the lost area.

To more clearly illustrate this, picture a rectangle within a circle (see Figure 1). When in the 4:3 mode, 10% of the rectangle (CCD surface area) on each side of the circle is lost. For example, an 8mm lens used on a switchable camera in the 4:3 mode effectively becomes 9.6mm.

To combat this problem, lens manufacturers developed an 0.8 ratio converter (called a crossover unit by Canon) that, in effect, corrects the focal length bringing it back to where it should be. The converter, available as an integral part of the lens or as an attachment, adds between $4,000 and $5,000 to the cost of the lens. Unfortunately, many engineers aren't aware that they need this feature in order to avoid the image loss.

According to some lens manufacturers, smaller stations are still purchasing the least expensive (fixed NTSC 4:3) lenses. According to Fujinon, 80% to 85% of lenses sold do not incorporate 0.8 converters. Angenieux reports a slightly lower percentage of lens sales without converters as opposed to converters; and Canon wouldn't put a percentage on it, but says lenses

with converters are a segment of sales that has grown dramatically in the past several months.

However, some stations are choosing to try 16:9 operation, while still recording in NTSC. This allows them to gain experience with widescreen without the accompanying cost of recording in HD. This also provides the advantage of being ready for widescreen operation, even with SD broadcasts and an easy conversion path to HD at a later date.

Enter HD lenses

For many first-time-buyers, the differences between a 16:9 lens and an HD version of a similar lens get lost in the numbers. Things like edge-to-edge sharpness and evenness of illumination across the frame are characteristics that sometimes get dropped from order specifications, especially when dollar signs are attached.

When looking at HD lenses, performance requirements jump by magnitudes. For zoom lenses, chromatic aberration has been a persistent problem. (*Editor's note:* For a complete discussion of this and other lens performance factors, see "Camera lenses," *Broadcast Engineering*, Oct. 1994, p. 48.) Chromatic aberration is caused by a lens's refractive index, which varies by color. The result is that different colors focus at different points on the CCD. Manufacturers attempt to correct for the problem by using a combination of optical glasses in the lens.

A key difference between 16:9 NTSC and 16:9 HD lenses is that HD lenses use more elements (individual lenses) and require advanced electron-beam lens coatings. An HD lens also

LENSES:
More than glass

requires more precision in the grinding, polishing, coating and assembly stages, along with more extensive testing. The result is an HD lens with 50% fewer aberrations and one that can "see" in the 2,000,000-pixel range, as opposed to the 520,000- to 640,000-pixel range of NTSC lenses. The penalty is a 25%-to-30% higher purchase price — but then, nothing comes without a price. Today's HD lenses are still far less expensive than those of only a few years ago when we were talking in the $250,000 range.

Features

Lenses come with a plethora of features, most based on individual models, not "options." One standard feature is internal focus. With internal focus, the focus lens(s) is placed behind the front lens element. This eliminates the rotation of the lens's front external ring as the focusing ring is turned. The advantage is that rectangular sun shades and matte boxes can be used because the front of the lens does not turn. With an external focus lens, only round sun shades can be used. Another advantage to internal focus lenses is with polarizer or graduated filters. Now, the filter does not have to be repositioned as the lens is re-focused. The majority of broadcast lenses provide internal focus.

Another important development, especially with ENG lenses, is image stabilization. While helicopters used to be about the only place to get stabilized lenses, Canon has developed a miniature system which does about the same thing, but at a lower price and smaller package. The feature is available as a part of the lens or as adapter that fits over the front of their other ENG lenses.

The system, called a *Vari-Angle Prism*, is a variable-angle liquid prism consisting of a silicon liquid sandwiched between two pieces of glass surrounded by a bellows. (See Figure 2.) This allows the two pieces of glass to be bent in relationship to each other. Sensors in the lens pick up mechanical vibration and send the information to a microprocessor. The data is analyzed and correction voltages are generated and applied to miniature motors that surround the vari-angle prism. These motors then move the glass in an equal but opposite direction of the vibration. The result is a correction of any vibration or lens movement.

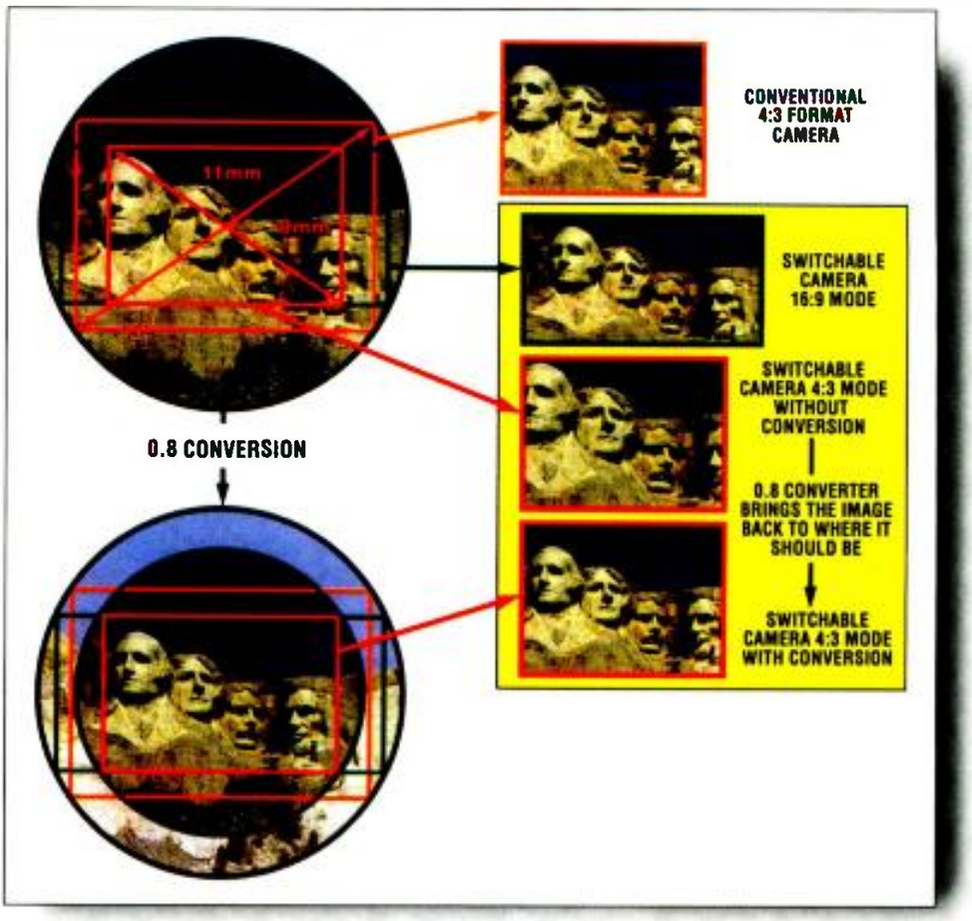


Figure 1. In order to maintain the same size image area on the CDD when switching between 4:3 and 16:9, a ratio converter or crossover must be inserted between the lens and the CDD. Otherwise, 20% of the CCD image area is lost. (Figure courtesy of Fujinon.)

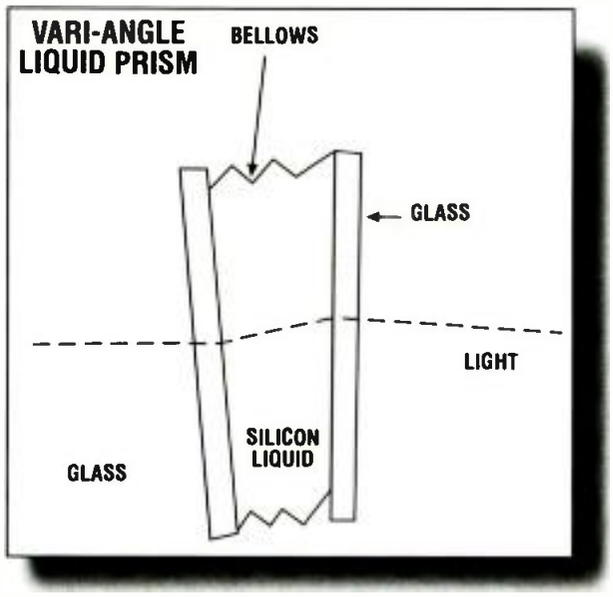


Figure 2. Canon uses a *vari-angle prism* to correct for lens vibration and motion. Light is bent to corrective angles with microprocessor-controlled miniature motors.

Making a lens greater than 30mm in diameter is extremely difficult. The molding, grinding and polishing processes, even with computer control, are problematic. Such large lenses can develop what's called *spherical aberration*. The result is a blurred image, one with reduced contrast and resolution. The cause is that light passing through the outer periphery of a spherical lens is focused at a different point from light passing through the center of the lens. (See Figures 3a and 3b.)

Fujinon's solution is *aspheric technology*. Starting out as a preformed shape, the glass is first softened by heating, then pressed and cooled into the desired precise shape. The result is a lens element that is lighter and more accurate. This technology allows zoom lenses to be made with fewer elements, making for a lighter and smaller lens assembly.

Lens maintenance

Despite their complexity and fragile appearance, lenses can stand a lot of abuse. For example, ENG lenses are thrown in and out of cars, used in dusty environments and, in general, not treated to lots of TLC. Sometimes they are even on the receiving end of an errant out-of-bounds football player. All these factors make it important to ensure that lenses receive regular maintenance. However, lens maintenance is not a "do-it-yourself" project.

Fogging can be an issue, especially for sports lenses. To help combat the problem, Fujinon incorporates a compartment in the casting of its ENG lenses that provides for placement of a desiccant pack. When the focus group is moved, air is pulled through the desiccant pack removing moisture from the lens. Angenieux does much the same things, while Canon takes a different approach claiming that because their lenses are sealed, it's not needed.

No matter how careful your shooters are, dirt and grime eventually coat the lens and eventually find a way into the mechanical mechanisms. A lens, whether it's sealed or not, should be returned for service on a regular basis to maintain maximum image quality and performance. For HD lenses, this is even more important. All these (and other) factors make it important to return even the most cared for lenses for a thorough checkup every two years.

Buying a lens

It's surprising how much time engineers spend on choosing a camera, and how little time these same people spend on selecting a lens for that camera. Whether new or used, a good lens on a mediocre camera will look better than a bad lens on a good camera.

It's okay to buy a used lens. In fact, there are plenty of bargains, especially if all you want is a 4:3 lens. But, keep the following considerations in mind.

- Purchase a lens according to the camera's format requirement. It's surprising how many people will buy a ½-inch lens, and then wonder why it doesn't fit a ⅔-inch camera.
- Make sure that the lens is mount-compatible with the camera. It will save a lot of headaches because most older lenses cannot be modified.
- Ask if the lens has been discontinued in the last five years. If it has, it may be difficult to get repair parts.
- Once you're sure this is the ideal lens, have it checked out by a competent lens service technician. If it receives a clean bill of health, chances are it was properly maintained and, in terms of its ability to function properly, its age really won't matter.

> A good lens on a mediocre camera will look better than a bad lens on a good camera.

If you're in the market for a new lens, some additional rules apply.

- Buy from a reputable manufacturer that provides service and will provide a loaner lens when your lens is in for maintenance or repair.
- Make sure the lens is the right focal length for the intended job. Size and weight are less important than focal length. If you're shooting wildlife, you need to determine how much telephoto is needed, and consider the lens' portability. If you are primarily shooting news, a general-purpose lens is best. Don't lock your shooter into a long telephoto or wide-angle lens.
- Buy a lens that is comparable in quality to the camera. Mounting a $4,000 lens on an $80,000 camera is like putting a discount, no-name lens on a Hasselblad. Don't be penny-wise and pound-foolish.
- Look for added features and functions, such as digital electronics, internal focusing or maintenance features. However, buy only those features that will enhance the lens' performance or make your shooter's life easier.
- Make sure accessories, such as remote zoom and focus controls and desired filters, are available.
- Develop a good relationship with the manufacturer's representative. This can come in handy when you need information or just some advice on an imaging problem.

Never forget, the lens is what forms the image. Nothing goes to air or tape that doesn't first go through the lens. If the lens isn't good, it doesn't matter how good the camera or recording media is, the image is gone forever. You seldom get a second chance for that perfect shot. Don't blow it with the wrong lens. ■

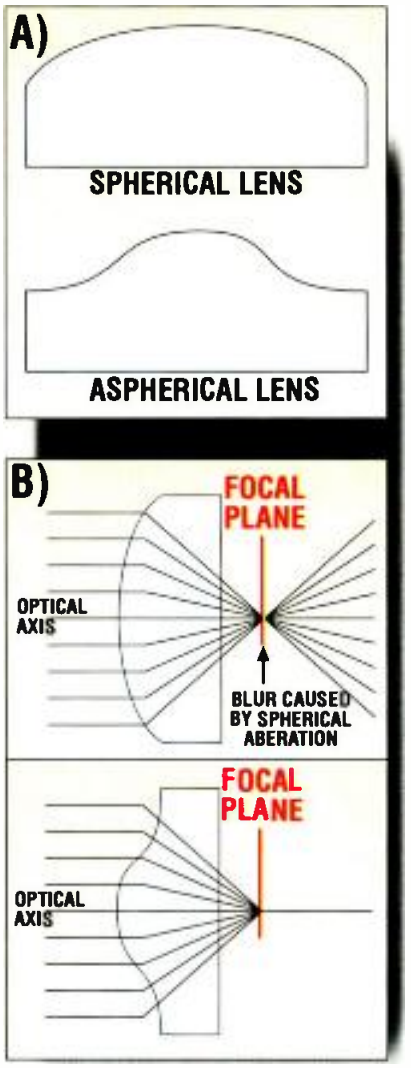


Figure 3. Light passing through the outer area of a lens focuses at a different point than light passing through its center. Fujinon uses an aspheric-shaped lens to correct for the distortion.

Don Garbera is a writer and photographer located in Stamford, CT.

Acknowledgments: The author would like to thank David Walton, national sales manager, Fujinon, and Gordon Tubbs, regional sales manager, Canon, for their help with this article.

Today's cameras are lightweight and reliable, making it possible to take them to remote locations. Above, Bill Carrier III, API Photographers, is shown on location in Peru with a Betacam SX.

Digital camera technology

By Philip Hejtmanek

The techniques have changed, but the purpose — to capture live images and convert them to an electronic signal — remains the same.

As broadcasters rush headlong into the digital age, there are changes throughout the technical facility. The relative merits of compression algorithms and DTV scan formats continue to be debated, but one thing remains constant: Capturing live images to video has been an ongoing task throughout television's 50+ year history. Operators still point the camera lens in the direction of the desired scene, focus the image and allow the image sensor and electronics of the camera to convert the incoming light into an electronic signal. While the task remains basically the same, the conversion process has evolved significantly since those first iconoscope and image orthicon cameras of the '40s and '50s.

One significant change has been the evolution from tubes to solid-state imagers, which has resulted in improved gain and signal-to-noise (S/N) performance. It has also allowed the addition of sophisticated digital signal processing (DSP) technology. Digital processing has made specialized features, such as individual color correctors and custom configurations, possible. Today's cameras are easy to set up, easy to operate and easy to maintain. They are also energy-efficient, compact, versatile and inexpensive. Perhaps best of all — based on personal experience — camera cables for studio and remote use have shrunken from backbreaking TV-81 to lightweight, super-flexible triax or fiber-optic cable.

CCD basics

Eliminating tubes has simplified camera design and maintenance. CCDs are virtually indestructible, have a wide dynamic range, use minimal power and need virtually no setup. Typical broadcast-quality color CCD image systems consist of three CCD sensor array chips, an optical prism to separate light into the three primary colors and an optical low-pass filter. The sensors are precisely aligned and fixed to the optical block at the factory. No field adjustment is needed or possible.

A fundamental difference between tube and solid-state imagers is the nature of the sampling mechanisms used. In tubes, a continuous photosensitive target is scanned by an electron beam. The output is a signal proportional to the amount of light incident on the target. The horizontal component of the signal is a continuous sweep across the

target, while the vertical component is sampled at a rate based on the number of active lines in the raster.

In CCDs, the horizontal and vertical dimensions are sampled based on the number of active picture elements in the CCD array. A typical 2/3-inch 520,000-pixel, 4:3 CCD uses over 1,000 pixels horizontally and 500 pixels vertically, while an HD 16:9 CCD with 2,200,000 pixels contains approximately 2,200 pixels horizontally and 1,000 vertically. Although the camera's resolution is limited by the number of pixels used, how those pixels are processed also determines, to a great extent, the camera's final output resolution.

Within the CCD array, each individual photosensitive element (pixel) develops and stores a charge proportional to incident light. These charges (analog voltages) are transferred from the photosensitive array to a storage array and then shifted serially from the imager, forming an output signal proportional to the incident image. Interline transfer (IT) and frame interline transfer (FIT) chips have an individual storage register located adjacent to each photosensitive pixel, with the more expensive FIT chip having a separate, light-isolated storage array from which the final output is shifted. This results in less vertical smear on highlights than is typical with IT sensors. IT and FIT CCDs are most commonly used in today's cameras, however, some proprietary variations also exist.

Contrary to popular belief, not all of the image area of a CCD is light sensitive. Much of this surface area is taken up by elements such as registers and transfer gates that are not light-sensitive. Because of this, an array of miniature lenses are positioned over the pixel array to concentrate the light on the light-sensitive areas. Manufacturers have found a way to take advantage of the space between the photosensitive sensors through the use of a technique known as *spatial offset*. It can increase the camera's luminance resolution by effectively doubling the number of luminance samples. In this technique, the CCDs used in the red and blue channels are offset on the optical assembly by 1/2 pixel horizontally relative to the CCD used for the green channel.

Another technique used to increase resolution is the use of an optical low-pass filter. The optical low-pass filter reduces the amount of high-frequency energy that reaches the imagers. Because CCDs discretely sample the image, Nyquist theory applies. Any incoming frequency higher than one-half the sample rate will cause aliasing. Reducing the incoming high-frequency (detail) information results in improved resolution due to the decreased alias components. Some optical low-pass filters filter only in the horizontal and vertical directions, while others filter diagonally as well.

Portable camcorders are used for a variety of tasks in studio and field applications. Fritz Roland of Roland House, Arlington, VA, on location with a Sony HDW-700 camcorder. (Photo by Forrest MacCormack.)

Formats in flux

The industry's evolution toward DTV has generated the need to handle 4:3 and 16:9 aspect ratios within the same camera. Many of today's CCDs are capable of switching aspect ratios by changing the way individual pixel signals are clocked off of the chip. Others are constructed with a building-block approach, that allows users to replace the optical assembly to accommodate scanning format or aspect ratio changes.

The debate over progressive vs. interlaced scanning directly affects TV camera design. Scanning formats represent the third or temporal dimension of sampling within cameras, and determine camera performance relative to motion capture and motion-related artifacts. An interesting difference between tubes and CCD imagers is that in a tube system, each horizontal line on the target is scanned in sequence. This means that some amount of time has elapsed between the scanning of the top line in a raster and the bottom line. If the televised object is moving, the image may appear to be blurred. A CCD sensor, on the other hand, can capture the full field (in an interlaced system) or frame (in a progressive system) at the same instant in time, and then clock out the picture signal in sequence. However, when the sequence is displayed on a CRT-based monitor, the delay in displaying the top and bottom scan lines matches the scanning delay of the tube imager, but does not match the snapshot-like capture of the CCD. As

display technology moves toward solid-state devices capable of displaying the entire image simultaneously, this problem will be resolved.

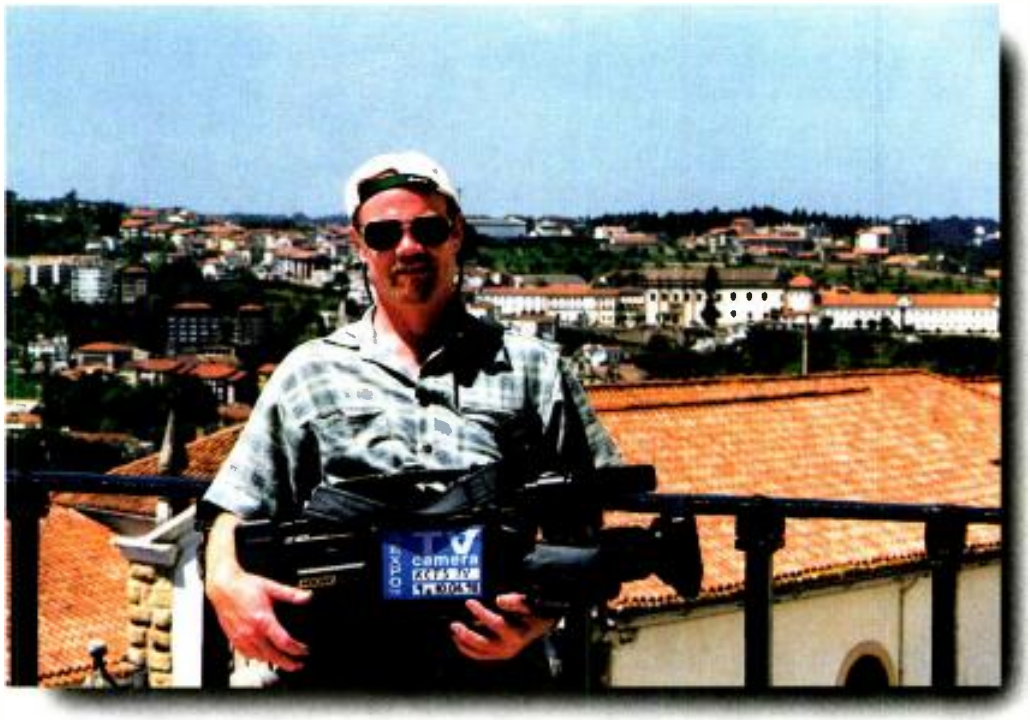
The jury is still out in the debate over the relative benefits of progressive scan vs. interlace, but many agree that progressive scan offers several advantages in terms of vertical resolution and less potential for motion artifacts. Progressive scan cameras may suffer some disadvantage in noise and sensitivity due to the shorter sampling times. The progressive scan camera must also be capable of twice the system bandwidth of the interlaced scan camera assuming an equal number of scan lines and double the frame rate. This requires higher performance DSP circuitry.

Some camera manufacturers are addressing this debate by developing cameras that can be switched between interlace and progressive scanning modes. Through innovative pixel clocking techniques, progressive outputs can be obtained at 30fps that require bandwidths comparable to 60 interlaced fields/s. This reduces much of the added cost and allows broadcasters to invest in equipment today and work with both formats at the cost of some additional circuit complexity. As a side note, high-speed cameras have been announced for capturing increased detail for slow-motion sequences. These cameras capture images at three times the normal CCD rate and provide greatly improved slow-motion image capture.

True HDTV digital cameras are becoming available. Most are using 1035i sensors that have been adapted for use with 1080i outputs. True 1080i sensors are expected to be out by the end of the year. Up until now, most of the cameras used for HDTV have been older analog models adapted for use with today's systems. There has also been increased interest in the development of native 720p sensors, and at least one manufacturer has declared its intention to develop a full line of progressive scan products.

Today's digital offerings

The advent of digital signal processing is responsible for much of the improvement in camera performance. In a typical digital camera, the signal from each of the three CCD image sensors is preamplified and then applied to A/D converters. Quantization resolutions of up to 12 bits are found in the latest cameras, with sample frequencies in excess of 60MHz. This translates to extremely high dynamic range and signal-to-noise specs well above 62dB. Camera manufacturers have developed DSP ASICs with internal processing resolutions up to 30 bits that are optimized for processing video. These sophisticated chipsets are making a number of valuable new features possible.



Marc Pingry, producer/director of photography for KCTS, Seattle, on location in Portugal with a Sony HDW-700.

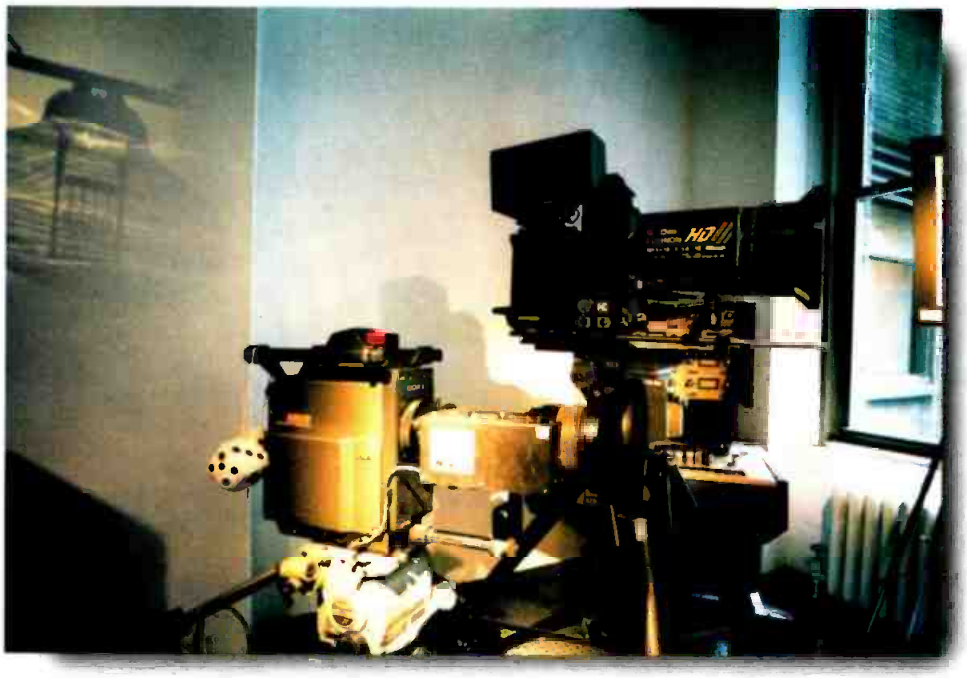
One of these features is the ability to precisely store color balance, shading and detail parameters and then recall those settings at a later time. Many of today's cameras can store setups on a disk or memory card for later recall. These settings can also be quickly transferred to another camera. Precise camera matching and preservation of color balance with different lenses or extenders is also simpler with digital control. In addition, highlight compression and black stretch can be dynamically controlled on a pixel-by-pixel basis to overcome problems with detail and noise in high contrast scenes. Similarly, true color information can be preserved in highlights, which, in older camera designs, would have been clipped as white.

Digital processing has the most striking effect on detail enhancement. Whereas older cameras developed a single detail signal from the green channel, today's digital cameras process detail information on all three channels. Video from CCD imagers is inherently quite sharp and precise control over detail enhancement is necessary to prevent "edgy"-looking pictures. DSPs can derive edge signals based not only on vertical and horizontal features, but also on diagonal features. Detail enhancement, properly employed, helps to create a natural-looking picture.

Conversely, detail processing can achieve a "soft focus" effect on the entire picture or just selected areas. Flesh-tone detail processing allows video operators to selectively enhance or soften a particular hue or set of hues — a feature useful for covering up skin defects in talent or for the specialized requirements of commercial production. DSPs are even used to correct minor flaws in the CCD image sensors themselves, making the cost of the overall product less dependent on the quality of the CCD semiconductors. This also increases the useful life of the sensors themselves and reduces maintenance costs.

Another useful DSP function is noise reduction, resulting in greatly improved noise specs. One thing to remember

about noise reduction is that signal processors can find it difficult to differentiate between noise and high-frequency picture detail. Designers, and to some extent, operators, must compromise between the amount of noise reduction applied and the overall resolution of the video. Some noise, especially in the darker areas of the picture, originates in the CCD itself. This type of noise can be reduced by using larger pixels (to gather more light) or techniques such as Peltier cooling of the CCD chip (which reduces random electron movement).



COLOSSALVISION, located in New York, maintains a small museum of older, high-definition equipment. The first commercially available high-definition camera, the Sony HDC-100, can be seen in the foreground. The Ikegami EC-1125, shown in the background, uses three 1¼-inch Plumbicons.

Real-world features

Today's cameras offer a full range of accessories, making them truly versatile. Studio and hand-held viewfinders present an impressive amount of information to the operator. Some even feature a picture-in-picture function for viewing return video without losing the current camera image. Variable rate shutters are standard equipment in CCD cameras, making it easy to tune out artifacts in the video caused by rotating objects or computer monitors. These shutters can also be used to reduce motion blur in sports broadcasts.

David Niles, a high-definition pioneer and president of COLOSSALVISION, with a recent acquisition, a Sony HDW-700 outfitted with a Fujinon lens.

Cameras can be connected to their base stations using coax, triax or fiber-optic cable. Fiber connections can be used at distances in excess of 2,000 meters. Some cameras offer six or more different control-panel configurations, allowing the system designer to tailor the camera-control functions precisely to the application. CCUs offer a variety of video outputs, including analog composite and serial digital component. Some of the latest portable camcorders include built-in MPEG encoders to support the new generation of digital ENG tape and transmission equipment.

Now, more than ever before, camera manufacturers are offering versatile solutions to the problems of electronic imaging. In these times of DTV uncertainty, potential camera buyers need to carefully examine their own requirements, especially as they apply to DTV scan formats. Many of today's products have been future-proofed by virtue of the ability to change circuit boards or optical blocks. An alternate solution may be to buy a camera that can switch scan rates or line count at the flick of a switch. Although the cost for this will likely be higher, it may be offset by the ability to respond faster to the changing digital environment.

In general, camera technology has matured, however, manufacturers continue to squeeze additional performance from CCD imagers. DSP has added more capabilities to the camera designer's, as well as the video operator's, bag of tricks. It has helped produce the best pictures the art of video has ever seen. All that now remains is for the TV industry to converge on a scanning format that everyone can agree on. Fat chance. ■

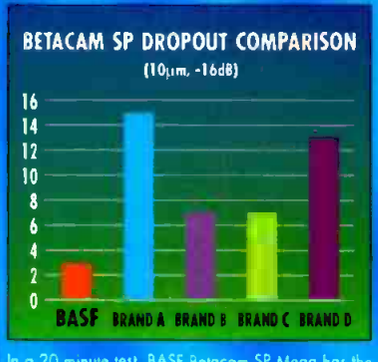
Philip Hejtmanek is the director of technical operations at WWJ-TV, Detroit, MI.

Why are more video professionals switching to BASF Betacam tape?

Ask Michael Alexander, producer for CableTime, the country's largest third-party turnkey cable advertising company

"In the cable business, we have to shoot commercials efficiently. That means that the people, the equipment and the media have to get it right the first time. That's why we're very picky about the tape we use."

"Honestly, the first thing that attracted us to BASF was the recommendation of another producer. So we tested BASF. I shot several hours' worth of footage in Mexico City. When I watched the tapes, I couldn't find any dropouts. I brought in my boss. We stared and stared at the footage, and we just couldn't spot any dropouts. BASF's lack of dropouts is what got us to switch. Our old brand practically guaranteed two dropouts a minute!"



In a 20 minute test, BASF Betacam SP Mega has the lowest dropout rate of any brand.

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Circle (43) on Free Info Card

Your two faces

BY KARE ANDERSON

We are all literally and unwittingly two-faced. To learn more about how you present yourself to the world and your underlying feelings, you only have to look at your face in a mirror. You constantly present two aspects of yourself on the two sides of your face.

Recent research on the different functions of the left and right sides of the brain helps to explain why this is so. The two vertical halves of the face are each affected by the nerves of the opposite side of the brain and show the world different parts of how you feel. In fact, the two sides of your face, like the left and right sides of your body — are usually asymmetrical and unequal in proportion.

Look at yourself in the mirror to see the differences. The left side is your more "private" part of your personality, and your right side is the more "public" side. The left side often looks less happy than the right. Most subjects who have been analyzed projected their wish images upon the left side of their face, and their right side related more to their real or basic self-image and attitude toward the world. The right side of a person's face often appears more pleasant, sensitive, vulnerable and/or open in expression. The left side is less expressive than the right and tends to reflect the hidden, severe, stern or depressed aspects that someone usually intends to keep private from the world. The left side is more likely to register negative emotions, while the right side tends to reflect the more positive and optimistic, but not necessarily phony, part of a person's personality.

It stands to reason that research on how the brain is organized, left and right, can give us insights into how we literally face the world, and how we can better understand others. The left brain — reflected more in the right side of the face — relates to logic, pragmatic thinking, practicality and language. In turn, the right part of the brain, relates more to intuition, imagination and other more creative leanings.

The basic gut feelings, including your attitude toward yourself and your life, emanate from your right brain. You express them more in the left side of your face. The more controlled or conscious responses — the social mask you put on for the world — may be processed more by the pragmatic left brain and appear more readily on the right side of the face.

What your face says

Now, you may be getting lost in the "lefts" and "rights" of all this, but let's continue with some experiments you can conduct to learn more about yourself and others for whom you have strong feelings (like or dislike) in your life.

Ironically, the right brain is more actively involved in observing the world — which it does predominantly through your left eye; and, when you face someone, your left eye is across from their right side. Therefore, you are more aware of their right side. What you notice most is more connected with their left (logical) and less revealing side. Thus, you miss facing the part of their face that is most likely to show their "true" feelings.

Here is an exercise that you can do with someone. Sit facing each other and look at the left and right sides of the other person's face. Does the right side show a more open, less tense presence? Does the left side look more reserved or more serious? Remember, the left side (that is, their left side) is their more private face, and the right side is their more public face. In fact, the left side is likely to show their basic disposition.

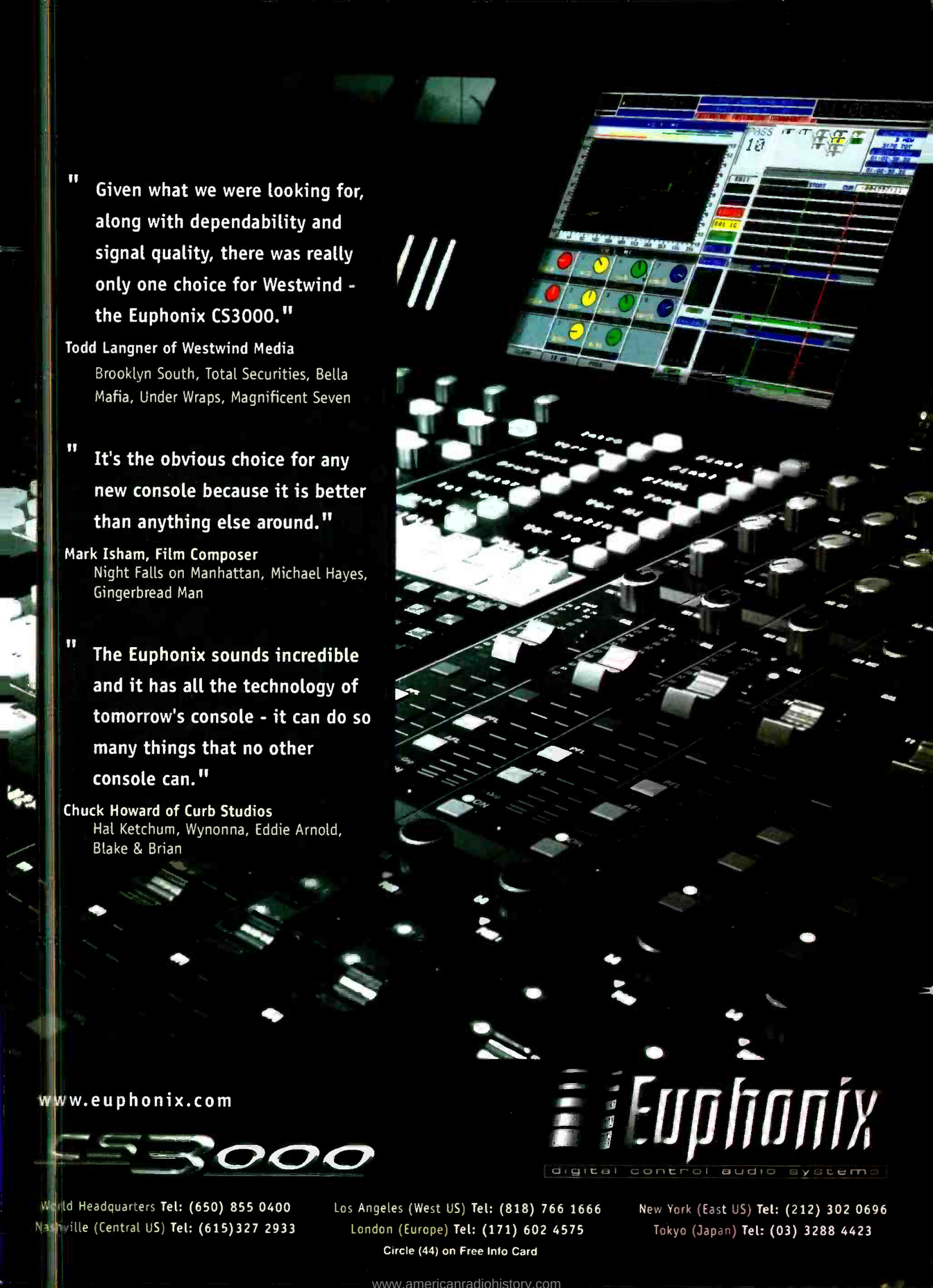
See yourself clearly

To gain an even more revealing view of yourself, find two photographic negatives of "head and shoulders," close-up pictures of yourself. If you don't have any handy, ask someone to take two pictures of you. Cut both negatives of yourself in half vertically down the center of your face. Flip over one side of each negative. Take a glossy-coated side and a dull-coated side of the left side of your face from the two negatives, and ask your camera shop to print it to create a "left-left" photo. Take a glossy and a dull-sided half of your face and also get a "right-right" print made. Thus, instead of the normal right-left photo of your actual face, the joined half negatives become right-right and left-left faces. You will then see exaggerated versions of both aspects of yourself — and will probably be able to see each more clearly. ■

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

Coming up next month . . .

Find out how to increase the chances of knowing if someone is not being candid with you.



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Circle (44) on Free Info Card

Applied Technology

Encoders: The building blocks of DTV

BY BARRY HOBBS

When major-market stations begin DTV operation, broadcast TV will undergo the biggest transformation since the advent of color. Under the provisions of the FCC-mandated ATSC digital TV standard, broadcasters will have unprecedented technical and creative latitude.

Instead of broadcasting one NTSC signal, broadcasters may use their 6MHz channel allotment to transmit one high-definition TV (HDTV) signal, one HDTV signal and one standard-definition TV (SDTV) signal, or they can transmit multiple SDTV signals. As many as six broadcast-quality SDTV signals may be transmitted in this 19.39Mb/s transport stream. Additionally, as bandwidth permits, they can also squeeze in subscriber-based data services or interactive programming, such as Internet access, paging or interactive advertising. A likely scenario will be a hybrid approach — broadcasting SDTV signals during the daytime, then shifting to HDTV fare in prime time.

As one of the most critical links in the DTV chain, encoders handle the compression of video signals into MPEG-2 4:2:2 and 4:2:0 bitstreams, including the 19.39Mb/s (4:2:0) ATSC bitstream that DTV transmitters will deliver to the home. Broadcasters now have the option of investing in the NDS Series 5000, E5810 encoder system, designed to handle HDTV and SDTV formats.

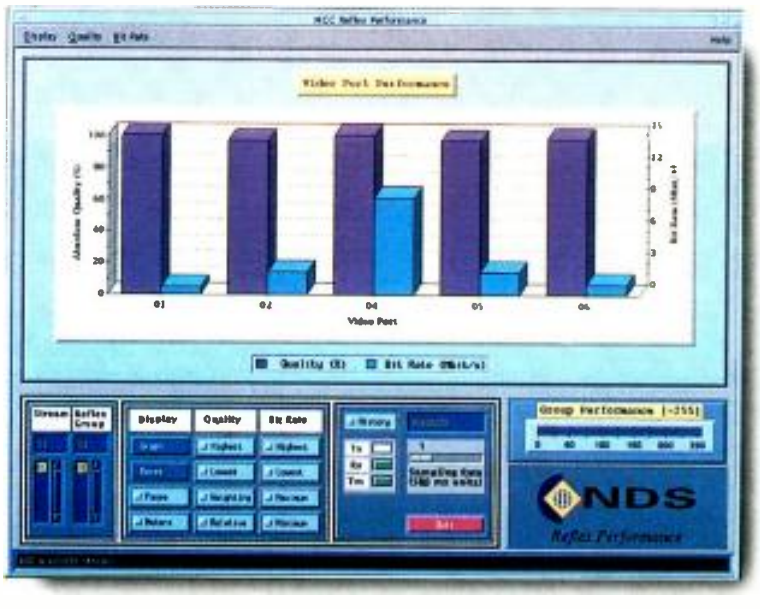
Dedicated HDTV encoders can become expensive. If broadcasters carry HDTV programming only in prime time, that device will sit idle all day until it's needed. And when a backup unit is kept on hand in the event of failure, that figure doubles. Because most stations will carry a minimum of one SDTV signal, they must also purchase at least one SDTV quality encoder. Multicasting multiple SDTV channels further compounds the financial burden.

The NDS E5810 HDTV encoding system uses a modular design incorporating up to seven E5610 standard-definition encoders to offer broadcasters greater flexibility and investment protection.

With the NDS encoders, stations are able to scale the system as needed. The encoder's architecture consists of six next-generation (SDTV) E5610 units, a multiplexer and a high-definition processor that can be configured in a building-block fashion. For example, one unit is needed to encode a 480p/30 signal; two units are needed to encode a 480p/60 signal and all six units are required for 720p/60 and 1080i. When configured for SDTV, the E5810 has the capacity to handle six separate channels.

The device can handle SDTV and HDTV signal encoding within the same system, eliminating the need to buy additional SDTV encoders. Switching between SDTV and HDTV encoding is an automated process that is fully configurable and schedulable.

Additionally, a seventh SDTV encoder can provide redundancy and can be brought on-line in the event that one of the first six units fails. In times of non-use, this seventh encoder can be used to broadcast a second SDTV channel in HDTV prime time. WXYZ-TV in Detroit has configured seven of the units together in preparation for HDTV broadcasting this fall.



The NDS system allows station engineers to easily monitor key parameters and performance with PC-compatible software.

Considering that the MPEG-2 compression scheme is a well-defined universal standard, it is fair to ask what distinguishes one manufacturer's encoder from another's. The answer is the engineering behind the product. NDS employs proven motion estimation and psycho-visual algorithms, as well as adaptive spatio-temporal

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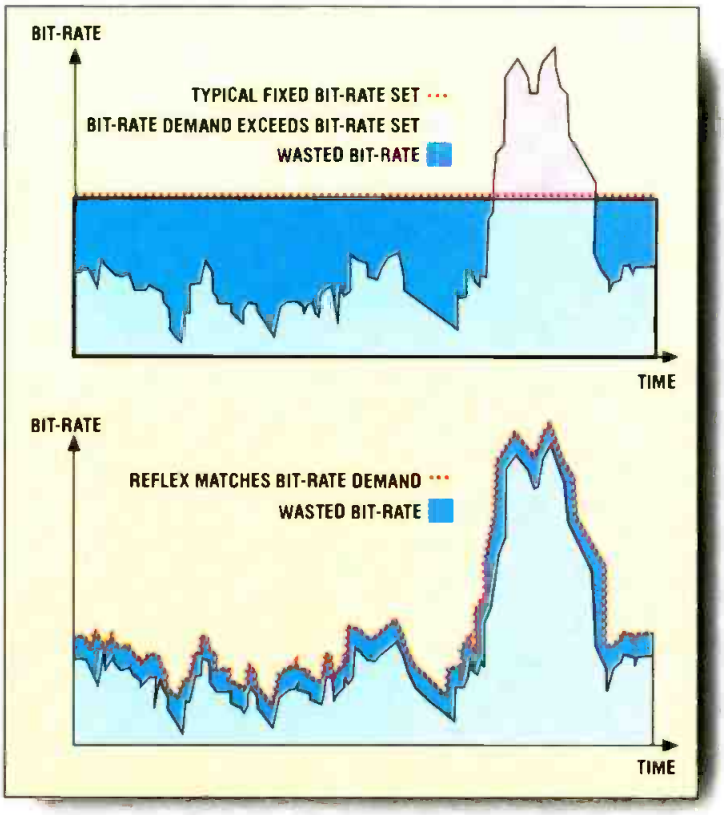
noise reduction for high-quality encoding.

Like time and money, bandwidth is a limited valuable resource and should not be wasted. The more signals that broadcasters pack into their channels, the greater the risk of an error or a quality hit. The encoders employ Reflex, a statistical multiplex management system that looks ahead at the bitstream, and compensates for changes in the picture content. A real-time, dynamic process, the statistical multiplexing uses framestores to analyze motion vectors and resolution levels in each scene. It then seamlessly appropriates the bits as required to maintain minimum and maximum quality standards for each signal in the multiplex. By optimizing the picture quality, broadcasters can maximize bandwidth by transmitting more revenue-generating signals, without sacrificing quality.



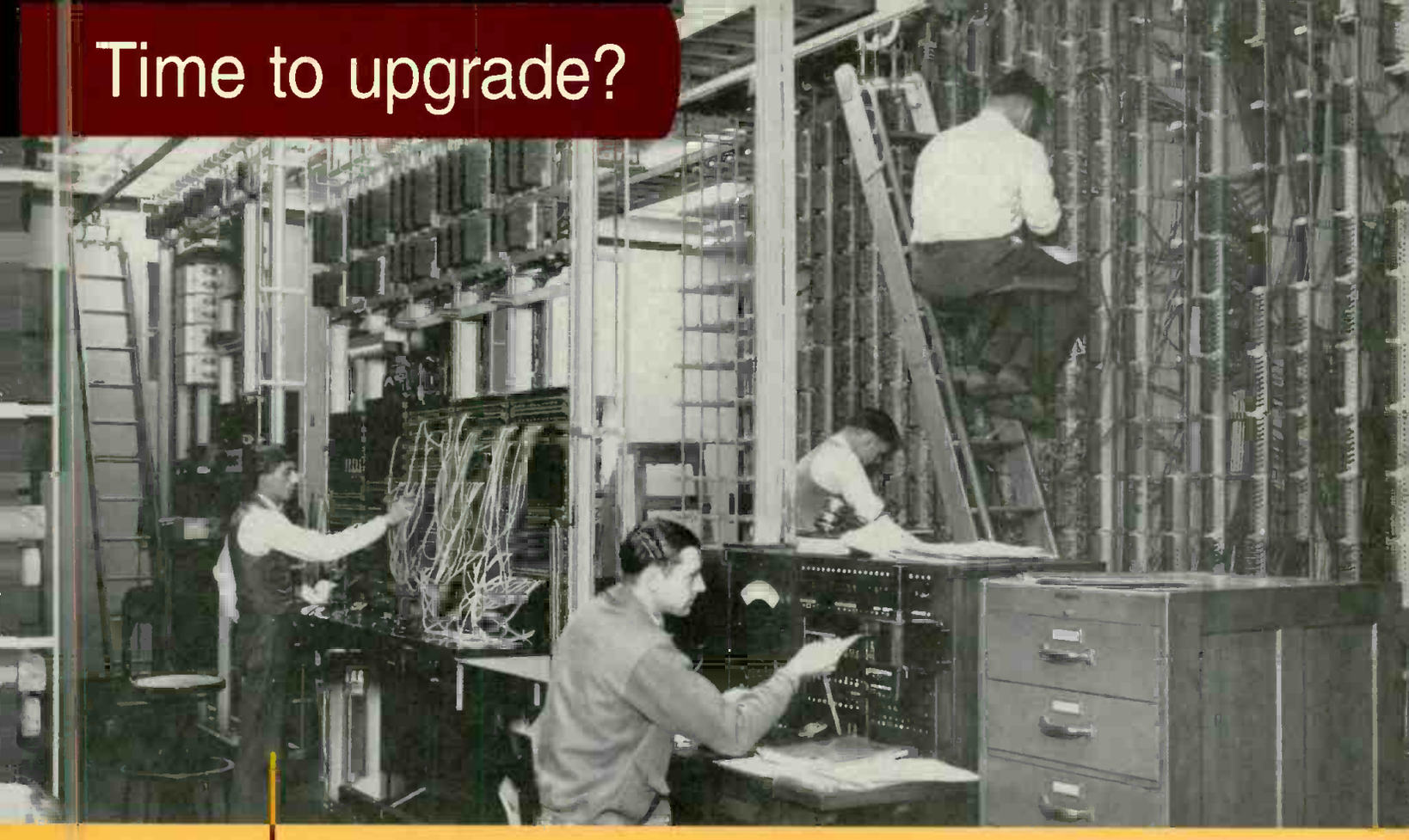
With fixed-bitrate encoding, either wasted space occurs or peaks exceed channel allocation. NDS Reflex matches the needed bitrate-to-channel-space allocation.

Data integrity and quality control is also assured by StreamServer PC-Pro, a multiplex management system that generates, analyzes and optimizes multiple SDTV and HDTV signal being fed to the encoder.

The Series 5000 encoders, based on the System 3000 series, will be field-upgradeable via modem, or other mediums, as advancements are made to its design.

Barry Hobbs is director of Engineering and Systems Support, NDS America.

Time to upgrade?



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Circle (40) on Free Info Card

Production switchers

BY THE *BE* STAFF

One of the most powerful pieces of equipment in any TV station or post house is the production switcher. From simple cuts to complex transitions involving digital effects and the integration of live video into those effects, these devices are crucial to creative programming. However, finding one that best fits your needs can be time-consuming.

To help you along, the *BE* editors have assembled a list of key manufacturers that make production switchers. In addition, we've asked them the tough questions to help you sort through the decision process.

Armed with the answers to these questions, you'll be able to narrow your search to those few models that meet your needs. For additional information, use the reader service number (RS#) shown in column one and the Free Information card on page 123. You also may contact the *BE* editors with additional questions or locate other vendors by visiting our web site at www.broadcastengineering.com. ■

Company	Product name/Model number	Product type	Number and type of inputs	How many M/Es	How many and what type of keyers	Outputs available	Output signal formats	Type of external control provided/supported	Internal DVE	Number of DVE channels provided	Modularity (upgradeable) construction	Special features
For-A Corporation 281-894-2668 RS# 450	VPS-400D	Component Digital Mixer	8 standard serial digital component, SMPTE, 259M, BNC	1	2	2 program, 2 preview	Serial digital component, SMPTE, 259M, BNC	Editor, RS-232, API, Tally Out	Yes	1	Yes	Upgradeable, all-in-one design
Philips Digital Video Systems Company 800-962-4287 info@mail.philipsdvs.com RS# 451	DD 35 Digital Production Switcher	Digital	Up to 48 SDV inputs and two panel versions: 24 source button and 32 source button	3.5 M/E architecture	9 + 3; 2 fully functional digital keyers per M/E, 3 fully functional downstream keyers and 3 optional external DSKs	Many	Serial digital CIR 601	10 x 422 serial data ports for interface to many different machine controls, DVE control, router control	Yes	2	Yes	MaKe-Memo Macro control. Macros can be made with name display on the macro panel. These controls can perform functions such as DVE effects recall with name, VTR cue and play, Intercom on/off
PSP Digital +44 1625 522 534 www.psp-digital.co.uk RS# 452	DVS-4	4:4:4:4 Digital Switcher	2-16 SDI	1	2 keyers: chroma and linear	program, preview, auxiliary	All outputs SDI	RS-422, GVG protocols, GPIs, timelines, control panel	No	N/A	Complete modularity for features and I/Os	Capable of true 4:4:4:4 switching and keying
RS# 453	DVS-2	Compact digital switcher	2-32 SDI	1	2 assignable keyers: chroma and linear	program, preview, auxiliary	All outputs SDI	RS-422, GVG protocols, GPIs, timelines, control panel	No	N/A	Complete modularity for features and I/Os	The power for the size
Ross Video 613-652-4425 www.rossvideo.com RS# 454	210A 216A	Analog	10/16 composite analog	1	2: 1MLE keyer, 1DSK	2 program, 2 preview	Composite analog	GPI inputs and outputs; RS-232 or RS-422 for editors (GVG100); Tally	No	N/A	No	True multilevel effects for big switcher performance
RS# 455	RVS 316	Analog	16 composite analog	1.5	3: 2 MLE keyers, 1 six-input DSK	2 program, 2 preview; 1 MLE program; 1 MLE preview; 1 clean feed; 1 mix preview; 2 each aux busses 1 to 4	Composite analog	GPI inputs and outputs; RS 232/RS 422 (editors, VTR machines); Tally; GVG 100 or 200 protocol	Can have external control of all popular DVEs	N/A	No	Designed for live production
RS# 456	RVS 416 RVS 424 RVS 630	Analog composite	16/24/30 composite analog	2	4 + 1 to 8; 4 MLE keyers, 1 to 8 downstream multikeyer	3 program; 2 preview; 2 MLE 1 program; 1 MLE 1 preview; 2 MLE 2 program; 1 MLE 2 preview; 1 DSK preview; 2 each AUX busses 1 to 4	Composite analog	GPI inputs/outputs; Tally; RS 422; GVG 100 or 200 protocol	No	N/A	No	Downstream multikeyer allows for 8 linear keys on air at one time with independent or combined controls for settings and transitions
RS# 457	Synergy 2	Component digital	16 to 64 component digital	2	4	1 MLE 1 program; 1 MLE 1 preview; 2 MLE 2 program; 1 MLE 2 preview; 1 main preview without overlay; 1 main preview with overlay; 1 clean feed; 4 expansion; 12 Aux bus 1 to 12 (one per bus)	Component digital	Tally; RS-422; GPI inputs; GPI outputs	Yes, Squeeze and Tease	4 2D DVEs	N/A	Squeeze and Tease
RS# 458	Synergy 3	Component digital	24 to 64 component digital	3	6	1 MLE 1 program; 1 MLE 1 preview; 1 MLE 2 program; 1 MLE 2 preview; 2 MLE 3 program; 1 MLE 3 preview; 1 main preview without overlay; 1 main preview with overlay; 1 clean feed; 4 expansion; 12 aux bus 1 to 12 (one per bus)	Component digital	Tally; RS-422; GPI inputs; GPI outputs	Yes, Squeeze and Tease	6 2D DVEs	N/A	Sqeeze and Tease

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RS# 459	Synergy 4	Component digital	32 to 64 component digital	4	8	1 MLE 1 program; 1 MLE 1 preview; 1 MLE 2 program; 1 MLE 2 preview; 1 MLE 3 program; 1 MLE 3 preview; 2 MLE 4 program (main program); 1 MLE 4 preview; 1 main preview without overlay; 1 main preview with overlay; 1 clean feed; 4 expansion; 12 aux bus 1 to 12	Component digital	Tally, RS-422, GPI inputs, GPI outputs	Yes, Sqeeze and Tease	6 2D DVEs	N/A	Squeeze and Tease
Scitex Digital Video 650-369-5111 www.scitexdv.com RS# 460	Abekas 8150 digital switcher	Digital	16 component serial digital, parallel component digital, component analog, composite	1 plus PGM/PST	3 linear luminance, dual-patch chroma keyer	Program, preview, monitor (confidence test), 4 aux., aux. ref.	601, Component analog	RS-422, RS-232, GPI, GPO, Tally, LINC	Yes, option	Twin channel	Yes	Internal Abekas Dveous DVE
Sony Electronics 800-686-SONY www.sony.com/professional RS# 461	HDS-7000 high-definition video production switcher	High definition, standard definition digital	30 HD-SDI inputs; all inputs accept industry standard SMPTE 292M HD serial digital interface	2.5 M/E with program present and dual downstream keyer, or 3 M/E in extended or cut-down models	2 keyers per M/E; optional chroma keyer available	15 HD-SDI outputs, M/E 1, M/E 2, PGM, PVW, output clean and 10 aux buses provide feed for DME, monitoring and recording	SMPTE 292M HD serial digital interface	RS-422A, DME, GPI, serial Tally	No	N/A		The DME-LINK function enables the keyframe effects of the HDME-7000 to be run with the fader bar or transition button or each M/E, just like a wipe transition
Snell & Wilcox UK: +44 (0) 1730 82 1188 US: 408-260-1000 UK: info@snellwilcox.com; US: info@snellusa.com RS#462	Magic DaVE 4A Magic DaVE 8A	All digital DVE and switcher, standard definition	4x total from: 4x Y/C and 4x composite, NTSC or PAL; 8x total from: 8x component YPbPr plus; 8x composite, NTSC or PAL	1x	1x chroma; 1x DSK; 1x DSK chroma keyer; 2x chroma	2x component YPbPr, Y/C; 2x composite, NTSC or PAL; 1x preview RGB or YPbPr (switchable); 1x key; 4x blackburst	Component YPbPr, Y/C; composite NTSC or PAL, component YPbPr	RollCall control network; RS-422, RS-232, GPI/O (and Tally)	Yes	Two channel effects from a single DVE channel	Options card adds extra effects/wipes additional chroma keyer, 2x additional inputs (frame store)	Compact switcher with fully-integrated DVE
RS# 463	Magic DaVE 4D	All-digital DVE and switcher, standard definition	4x serial digital to Rec. 656	1x	1x chroma; 1x DSK; 1x DSK chroma	2x SDI program; 1x SDI preview; 1x RGB/YPbPr preview (switchable); 2x SDI key; 4	SDI: 270Mb/s to CCIR Rec. 656	RollCall control network; RS-422, RS-232, GPI/O, Tally	Yes	Two channel effects from a single DVE channel	Options card adds extra effects/wipes additional chroma keyer, 2x additional inputs (frame store)	Compact switcher with fully integrated DVE
RS# 464	Magic DaVE 8D	All-digital DVE and switcher, standard definition	8x serial digital to Rec. 656; 2x key	1x	2x chroma	2x program, 2x key, 1x SDI preview, 1x analog preview, 4x blackburst	Program/key 270Mb/s to Rec 656; analog preview RGB/YPbPr	RollCall control network, RS-232, GPI/O, Tally	Yes	Two channel effects from a single DVE channel	Analog I/O option (separate unit)	Compact switcher with fully integrated DVE
RS# 465	HD1012 HD1024	10-bit, all-digital high-definition switcher	12x 1.485GHz digital, assignable as program or key; 24x when used with external 32x32 router	1 1/2 x M/E	3x chroma	2x program, 2x clean program (preset), 2x preview in 10-bit serial format	1.485GHz program, 1080i or 720p	RollCall control network, RS-232, Ethernet, GPI/O, Tally	Option available Q1 1999	1 or 2 option	DVE future option	HDTV switcher with fully integrated DVE
RS# 466	DVS1000 DVS800	Standard-definition switcher with integral router	8x M/E and router, 10-bit SDI to Rec. 656, plus 11x4 router switch; 8x 10-bit SDI to Rec. 656	1x	Luma, linear	2x program (M/E), 2x DSK (optional)	270Mb/s, 10-bit to Rec. 656/SMPTE PT125	Industry standard remote control, Tally, GPI/O	No	N/A	DSK option, 16:9 aspect ratio option	Small panel size, ideal for telecine applications
RS# 467	DVS500	Standard-definition switcher with integral router	2x 10-bit SDI to Rec. 656	1x	Luma, linear	2x program (M/E), 2x DSK (optional)	270Mb/s 10-bit to Rec. 656/SMPTE PT125	Industry standard remote control, Tally, GPI/O	No	N/A	DSK option, 16:9 aspect ratio option (field service)	Small panel size, ideal for master control room applications
Tektronix 800-547-8949 www.tek.com/VNDI RS# 468	1200		16 component analog, serial digital, parallel digital	1	3 linear, luminance auto-chroma	dual PGM/PVW, 2-Aux	Component analog, serial digital, parallel digital	RS-422, RS-485/P-Bus II, GPI/O, Tally	No	N/A	Inputs by 25	Auto-Chroma key
RS# 469	2200		32 component serial digital	2	4 linear, luminance auto-chroma	PGM, PVW, 10-Aux switched preview, framestore, cleanfeeds	Component analog, serial digital	RS-422, RS-485/P-Bus II, GPI/O, Tally, Diagnostic	Optional integraed Krystal control panel	2: video and key	Inputs by 8	6 matte generators per M/E with two color wash
RS# 470	4000-2 4000-3		64 component analog & looping serial digital	2 plus PGM/PST, 3 plus PGM/PST	6; 12 in Lamina layering mode linear, luminance, auto-chroma	PGM, PVW, 18-Aux, switched preview, framestore, cleanfeeds	Component analog, serial digital	RS-422, RS-485/P-Bus II, GPI/O, Tally, Diagnostic	No	N/A	Inputs by 8	Up to 10 distinct key layers in Lamina mode
Video GainesVille 352-372-0270 www.vgv.com RS# 471	MightyMix	Component digital/analog mixer	4 component analog; 4 serial digital	1	1 chroma, luminance, linear	Program, 2 aux., preview	Composite, component, serial digital	RS-422, GPI/O, Tally	Yes	1	Upgrade to aux. or DVE	Compact, one-piece construction

Table 1. From simple cuts to complex transitions, production switchers play a significant role in creative programming. Above is a key list of production switcher manufacturers. The production information was supplied by respective vendors in response to a questionnaire furnished by the *BE* staff editors. For more information, circle the appropriate RS# numbers (see column 1) on the Free Info Card on page 123.

Ace Server

The V1 Video Server from Doremi Labs offers an elegant solution to the challenge of instant access to huge libraries of recorded video for multiple users. As a central server containing the complete library, the V1 Server is networked to every workstation and provides complete software control and monitoring capabilities. If your facility needs a video server, check out these features and see why the V1 Server from Doremi Labs is the ace of the pack.

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Tel: (213) 874 3411, Fax: (213) 874 3401 • www.doremilabs.com

Circle (46) on Free Info Card

TEST PRODUCTS

DSC Laboratories Wide product line: this product line includes two Combi test targets and an Ambi illuminator for use with 16:9 and 4:3 format cameras in engineering/maintenance and studio/production; the Combi targets combine multiple test elements on two shatterproof CCD-friendly transparencies; the Combi-1W OSG features EIA greyscales, vector colors, flesh and opaque patches; the Combi-2W OSG features multibursts, resolution wedges, zone plates, linear ramp, back focus and streak test; the Combi OSGs are held by the portable Ambi Wide, and lit evenly with any illuminant; the targets may also be used with other manufacturer's lightboxes or spheres; 905-673-3211; fax 905-673-0929; www.dsclabs.com; dsc@dcslabs.com

Circle (379) on Free Info Card

HIGH-POWER UHF TRANSMITTER

ITS Corporation Visionary series: a high-power UHF transmitter solution that is capable of analog or digital broadcasting; the series is available for broadcasting NTSC peak power levels up to 280kW and DTV coverage average power levels to 100kW; solid-state feedforward driver amplifiers provide exceptional performance with low power consumption; the IOT final amplifier (available from multiple vendors) provides long life and high efficiency; 800-366-3891 (ext. 3223); www.adc.com

Circle (380) on Free Info Card

TV PRODUCTS CATALOG

Tektronix 1998 Television Products Catalog: a full-color, soft-cover catalog that spotlights more than 150 products, including products for digital TV and cable TV applications; extensive indexes list products by name and function, as well as in categories such as signal monitors, MPEG test sets and picture-quality analysis systems; 800-426-2200 (press 3, code 1087); fax 603-222-1542; www.analog2digital.com or www.tek.com

Circle (381) on Free Info Card

DIGITAL MIXER

Panasonic DA7: a full-featured eight-bus digital mixer that brings affordable, professional digital mixing within reach; some of its features include 32 inputs, 24-bit I/O capability, surround-sound mixing capabilities, dynamic and snapshot automation and one-function/one-step screen layer operation; an easy-to-read screen display is placed in the upper right-hand corner of the mixer, and the display of channel settings and parameters are quickly accessible via a touch of assignable control buttons; three expansion card slots allow connection of recorders with ADAT Lightpipe, Tascam TDIF and AES/EBU (switchable to S/PDIF) interfaces; 714-373-7277; fax 714-373-7277

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The Next Generation

Introducing the VSC 300 Scan Converter

Extron introduces the VSC 300 Scan Converter
The VSC 300 is a broadcast quality, computer-to-video scan converter that sets a new standard for price and performance. The VSC 300 is autoscanning and will automatically recognize and accept all resolutions up to 1600 x 1280 with horizontal scan rates of up to 100 kHz and vertical rates up to 120 Hz. It is compatible with NTSC and PAL video formats.

The VSC 300 provides a broadcast quality image output that complies with the RS-170A standard for NTSC. The VSC 300 also provides a scalable output. Workstation resolutions are scaled down to computer-video resolutions of 640 x 480, 800 x 600, 832 x 624, 832 x 480 and 1024 x 768. Now you can run high resolution computer-video on lower resolution digital displays such as LCD, DLP and Plasma.

The VSC 300 has a list price of $6,745.

VSC 300 Features:
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- 10 bit digital encoder
- NTSC and PAL compatibility
- Genlock capability
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- Intuitive front panel LCD control
- Rack mountable
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DVCPRO50 PRODUCTS

Panasonic DVCPRO50 product line: this product line includes a 525 progressive digital camcorder and VTR, and a dockable VTR that is switchable between 50/25Mb/s; as the compatible extension of the DVCPRO, this new line offers a 4:2:2 signal processing platform, a digital video data rate of 50Mb/s, 3.31 DV-based intraframe compression and four 16-bit 48kHz sampled channels of uncompressed digital audio suitable for high-end acquisition and post-production applications; 201-392-6176; fax 201-392-6558; www.panasonic.com/pbds

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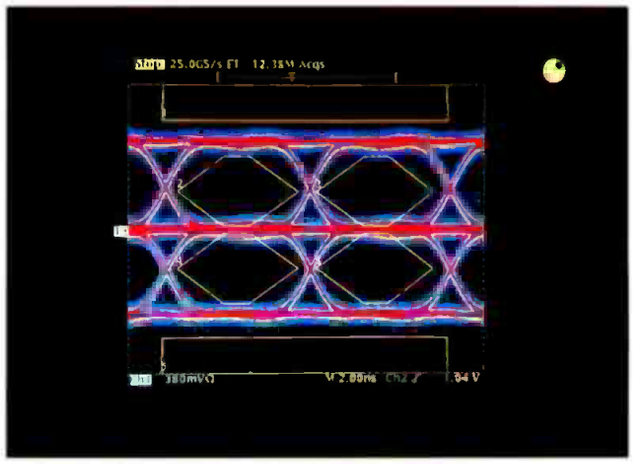

DIGITAL OSCILLOSCOPE

Tektronix digital phosphor oscilloscopes (DPOs): a class of instruments that provides the performance and information necessary for working with complex electronic signals; unlike analog real-time oscilloscopes and digital storage oscilloscopes, DPOs display, store and analyze in real time, using three dimensions of signal information — amplitude, time and the distribution of amplitude over time; the benefit of this new third dimension is an interpretation of the signal dynamics, including instantaneous changes in the signal and the frequency of occurrence; 503-627-2654; fax 503-627-5593; www.tek.com

Circle (351) on Free Info Card

SYSTEM FOR PLAY-BACK IN MULTIPLE, SEPARATE LOCATIONS

Digital Video Products Group of Mercury RemotePlay: a hardware and software solution that allows the playback of digital media content in multiple separate locations under the control of a single central computer; it allows media programmers to customized information for individual locations and download it for seamless playback within other program materials, using Windows NT-based computer systems; some applications include localizing national commercials with the name and address of local distributors, adding a local look and feel to narrowcasts or distributing local tourist information to hotels in a national chain; 978-256-1300; fax 978-256-3599; www.mc.com

Circle (352) on Free Info Card

ANALOG? DIGITAL? HYBRID?

Whatever The Future Holds, You'll Be Ready!

The DPS-470 Serial Digital AV Synchronizer

The DPS-470 serial digital component AV synchronizer is the ideal choice for broadcasters transitioning to DTV. Available in video and audio/video configurations, the DPS-470 bridges the gap between analog and digital production facilities. 10 bit ITU-R 601 component processing and adaptive comb filter decoding provide maximum signal transparency. A built-in auto sense TBC and digital test pattern generator round out the features.

For combined video and dual stereo audio synchronization, add the DPS AS-470 internal digital audio synchronizer option. Because all outputs are active, analog and digital devices can be connected at the same time.

As you move to DTV, the DPS-470 is your insurance against obsolescence. And you won't pay a premium!

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Y/C
Component

AUDIO:
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AES/EBU Digital
Analog Balanced

DPS

www.dps.com
800-775-3314

Circle (47) on Free Info Card

DTV STILLSTORE

Avica Technology Corporation Vecta: a DTV stillstore for broadcast, post-production and telecine operations; Vecta incorporates new DTV standards, high-resolution video and HDTV formats and allows acquisition of an image in any video format and conversion of the image to any other format for immediate display; based on a Windows NT platform, it performs as a stand-alone or networked workstation; its powerful search engine accesses images from centralized and distributed storage, and the Vecta asset management system server features workload distribution capabilities for multiroom projects; 818-846-0589; fax 818-846-0175

Circle (353) on Free Info Card

NEWS PRODUCTION FACILITY

Quantel news production facility: this news production facility is capable of handling every aspect of news operations in a totally integrated system; based on the Clipbox editing video server, the system integrates the AP ENPS newsroom with journalist video browse and edit capability via the Imis/Odetics Bowser shadow server; complete control of loading, playout and asset management is provided by the Omnibus Columbus automation system; 203-656-3100; www.quantel.com

Circle (361) on Free Info Card

FIBRE-CHANNEL DISK ARRAYS

Discreet Logic Discreet Fibre Storage: this high-performance storage technology provides real-time HDTV, film-resolution playback and RAID-3 data protection; only two disk arrays are required to sustain a real-time stream of non-compressed RGB HDTV video and real-time playback of 2K film-resolution images; partitionless multiresolution storage provides the ability to store formats concurrently (NTSC, PAL, TV, film) without the creation of hard partitions; upon retrieval, material can be transparently scaled to a higher working resolution; 514-393-1616; fax 514-393-0110

Circle (354) on Free Info Card

LARGE-FORMAT, DIGITAL MIXING SYSTEM

Otari Advanta: a state-of-the-art, large format digital mixing system that is offered in application-specific configurations for the music recording, on-air broadcast, film and post-production industries; it accommodates up to 256 full-function channel paths; three operator positions are available for film and video-post applications; users can select a combination of dedicated or mapped control elements for the assignable control surface; 650-341-5900; fax 650-341-7200

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It's a tough RF world out there – and it's getting tougher. Fewer open TV channels. More wireless everywhere. And advanced digital television will soon be coming to a city near you.

Vega's EMP (Embedded Micro-Processor) Series takes these challenges in stride, while giving you the Emmy award winning audio quality you've come to expect from Vega.

EMP technology in the transmitters offers "intelligent" frequency agility and audio control, allowing you to reprogram UHF frequencies as often as needed, along with precise digital control of mic gain.

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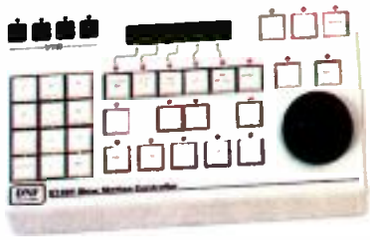

PRODUCTION SWITCHER CONTROL OVER VIDEO SERVERS

DNF Industries peripheral bus interface: a peripheral bus interface that gives production switchers control of video clip load and play from digital disk recorders and video servers; the interface is a software option for use with DNF's ST300 VTR controller and creates a bridge between the production switcher and stored video, allowing technical directors to load and play stored video as part of a pre-programmed sequence; by returning control to the production switcher, the peripheral bus interface eliminates the discontinuity that existed between stored video and other production elements; 818-252-0198; fax 818-252-0199

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RIGID TRANSMISSION LINE

MYAT Series 7077: $7\frac{3}{16}$-inch 75Ω rigid transmission line that is ideal for DTV and NTSC applications through Channel 69; this new line provides significantly less windloading than $8\frac{3}{16}$-inch line and waveguide, and also provides better attenuation and more power than $6\frac{1}{8}$-inch line; the Series 7077 includes a range of $7\frac{3}{16}$-inch accessories and components in addition to the rigid line sections; 201-767-5380; fax 201-767-4147; www.myat.com

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MODIFICATION FOR SONY'S DVW-A500P & DVW-500P

Quad 1 Technologies will modify and upgrade your PAL Digital Betacam tape machines to record, edit and playback a 24-frame, 625-line video signal using the SDI connections; complete video, time code and audio accuracy is maintained in either mode; the resulting tape can be played back on any standard 625/50 Digital Betacam or on the modified Digital Betacam in the 625/50 mode; what is recorded at 24fps plays like a normal recording when played in a 25fps Betacam; a 25fps master is played perfectly at 24fps in the machine which has been modified; there is no loss in either direction and the modified machine is switchable to play in either mode; 213-993-4271; fax 818-831-6900

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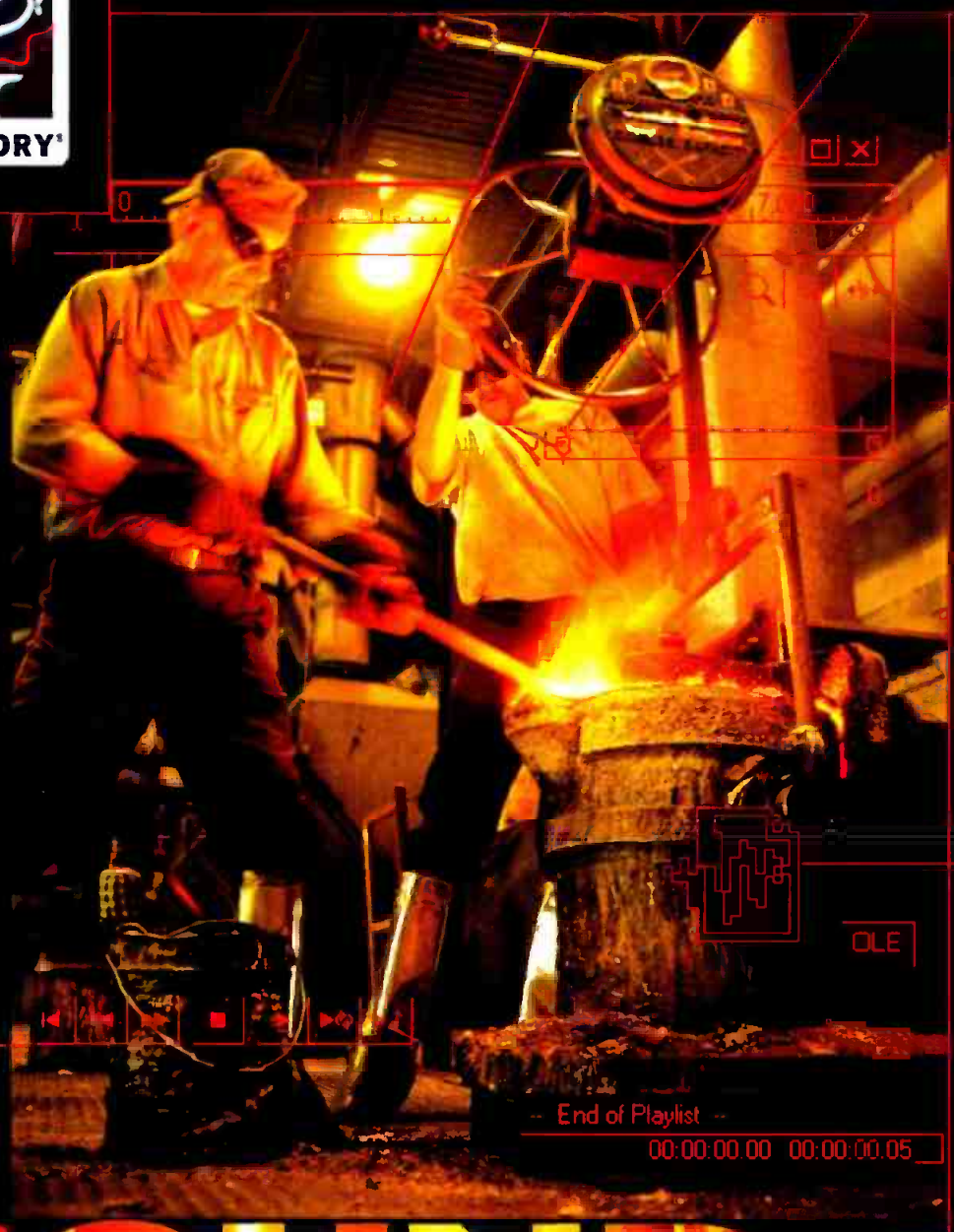
SONIC FOUNDRY



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DIGITAL EDITING SOLUTION

Pinnacle Systems miroVIDEO DC50: a Windows NT/95-compatible, non-linear editing system for the professional digital video editing market; it includes a professional-style breakout box that supports high-quality vide and audio connection to equipment such as Betacam decks and other component video sources; DC50 provides input and output connections to component, composite and S-video sources, as well as providing balanced and unbalanced audio I/O; other features include gen-lock I/O for easy integration into any production environment; DC50 also features a capture rate of up to 7MB/s; 650-526-1600; www.pinnaclesys.com

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LIGHTING PRODUCTS

Frezzi Energy Systems Full-Spectrum Sun Gun: a 50-watt HMI light that is color balanced at 5,500 degrees K providing true daylight color balance light without the need for a corrective filter; it delivers the equivalent light output of a 200-watt tungsten quartz daylight corrected output which can be mounted on-camera, stand-mounted or hand-held; the bulb lifetime is 4,000 hours and is 400% more efficient than a quartz light; accessories include barndoor with filter holder and a flip-up/down 3,200 degree K correction filter that converts it to a tungsten balanced indoor light, providing the HMI advantage of low power consumption and high light output; 800-345-1030; www.frezzi.com

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LONG-FRAME PATCHBAYS

Rean LF Series: a ¼-inch long frame series of patchbays that feature 48 or 52 jacks; the assembly is mounted in a heavy-duty machine aluminum extrusion that delivers complete rigidity; in addition, each unit incorporates a unique strain relief bar on the back of the unit to help preserver solder points; the LF Series patchbays are available in red, blue, silver and black; 888-817-8827; fax 608-274-5820

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ATSC DIGITAL TV AUDIO MONITORS

Harris Corporation ATSC-1, ATSC-2 & ATSC-3: a series of audio monitors designed specifically to meet the new ATSC DTV requirements; developed by Wohler Technologies, the monitors are ideal for machine rooms and edit bays where on-the-spot monitoring of six Dolby 5.1 channels is required; featuring a compact design that requires only two rack units, the monitors are available in three separate models to access six-channel analog, three-channel AES or encoded ATSC datastream input; the units provide simultaneous visual monitoring of all six audio channels; standard features include high-resolution, wide-range LED bargraphs, left/right and front/surround phase LED indicators and an adjustable-duration display of the peak PPM value; 800-622-0022

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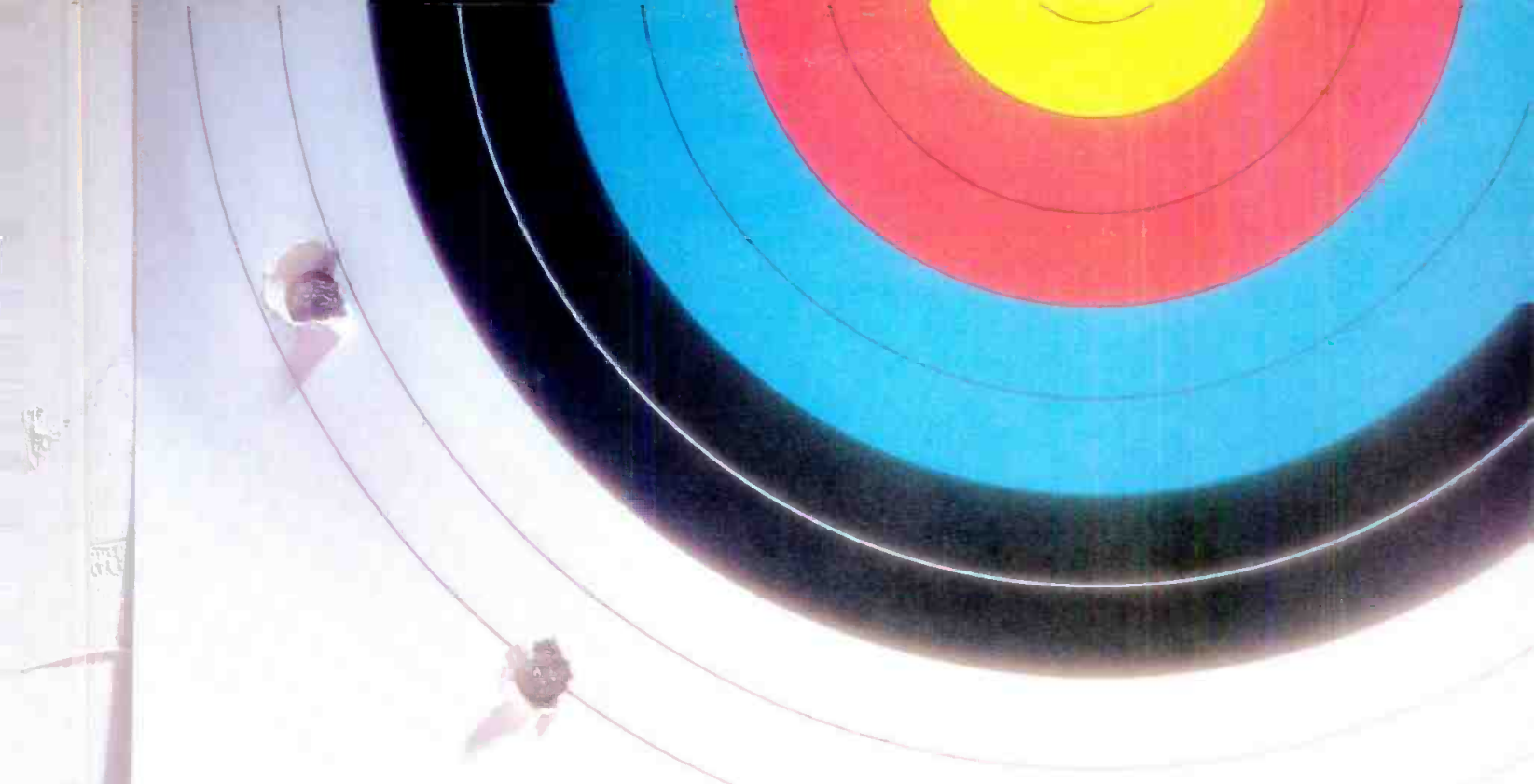

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DUAL-CHANNEL PROTOCOL TEST SYSTEM

Xyratex Fibre Channel Protocol Analyzer Plus (PA+): a dual-channel protocol test system specifically targeting the Fibre Channel development arena within broadcast and video post-production-based markets; the PA+ provides sophisticated functions for real-time capture and monitor, off-line viewing and analysis of traffic at gigabit speeds for arbitrated loop, point-to-point and fabric topologies; in addition, it offers high-speed capture, decoding of standard protocols like IP, TCP, SCSI-2 and 3 and analysis of complex datastreams; the PA+ is comprised of a full-sized PCI card, two DB-9 electrical interfaces and Windows 95-based XyraVIEW Pro software; the DB-9 interface easily converts to optical using a standard media interface adapter; 714-476-1016; fax 714-476-1916; www.xyratex.com

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ALL-DIGITAL HDTV UPCONVERTER

Snell & Wilcox HD5050: a powerful studio-quality HDTV production tool designed to deliver a wide range of features, including a fully specified digital HDTV synchronizer, as well as providing high-quality aspect ratio conversion; the HD5050 accepts 10-bit serial digital standard-definition inputs and delivers full studio-quality 1.5Gb/s true HD serial digital output with full specified 744.25MHz sampling clock rate resulting in the equivalent of 30MHz analog bandwidth; the system offers complete control of all output picture parameters including size, shape and position, as well as digital horizontal and vertical enhancement; 408-260-1000; fax 408-260-2800; www.snellwilcox.com

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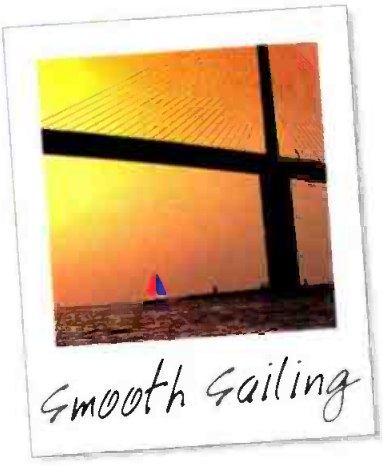
[Argus]

Bridge Over Troubled Waters.



The switch from analog to compressed digital will continue to make waves well into the millennium.

Smooth sailing into the world of digital can be accomplished if the equipment you choose is ready for digital and conforms to all compliance requirements. Our Argus™ encoder is DVB compliant (ETR-154, ETR-211, ETS-300468) and has helped Vela remain at the forefront in developing products that support MPEG-2 MP@ML and the MPEG-2 4:2:2 Profile@ML.

The voyage into 4:2:2 digital video continues as we introduce products like CineView Pro.™ CineView Pro is Vela's MPEG-2 4:2:2 Profile@ML decoder which supports SDI and genlock. There's a sea of information on making the switch from analog to digital. To stay on course, check out our website, or call and ask for a product brochure.

We'll help you bridge the gap between analog and digital...and when you get to the other side...it's going to be smooth sailing.

Vela Research

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DVB Digital Video Broadcasting

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COMPREHENSIVE DIGITAL CONVERSION SYSTEM

Telect VersaFrame II: a comprehensive range of conversion tools for A/D, D/A, component, composite and other applications; it features a modular architecture that is simple to use and easily expanded for future growth; individual modules dock in a chassis, allowing users to customize a conversion system to meet specific needs; each frame handles up to four modules and features power supply redundancy by interconnecting two frames through a rear panel patch; if one power supply fails, the other frame can pick up the load; 800-551-4567; www.telect.com

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ROUTING SWITCHERS

Knox Video ProPatch Series: a series of high-performance single or dual output switchers in thin profile 3RU rackmount chassis; the switchers consist of five series of routing switchers with an additional channel of video: Alpha (one channel), Beta (two channels), Gamma (three channels), Delta (four channels) and Epsilon (five channels); they are configured for 16, 12, 8 or 4 sources to one or two destinations; the ProPatch routers are active, 200MHz switchers that accept and route almost any 1V NTSC/PAL, Y/C, RGB, RGBS or RGBHV video source on the vertical interval; 301-840-5805; fax 301-840-2946; www.knoxvideo.com

Circle (369) on Free Info Card

COMPONENT DIGITAL/ ANALOG WAVEFORM MONITOR

Leader Model LV 5100DE: an improved version of the LV 5100D, a combination digital-analog waveform vector, picture and stereo monitor; the new version includes EYE pattern display with level and time cursor to facilitate full evaluation of the digital datastream; other features include full EDH facilities with readout of the time of detected errors, and the status of ANC, embedded audio, TRS, EAV, SAV, APCRC, FFCRC and EDH flags; internal and external alarms may be assigned to any or all of the status readouts; a unique rating of serial data quality is given in terms of equivalent length of coax from an ideal source; 800-645-5104 or 516-231-6900

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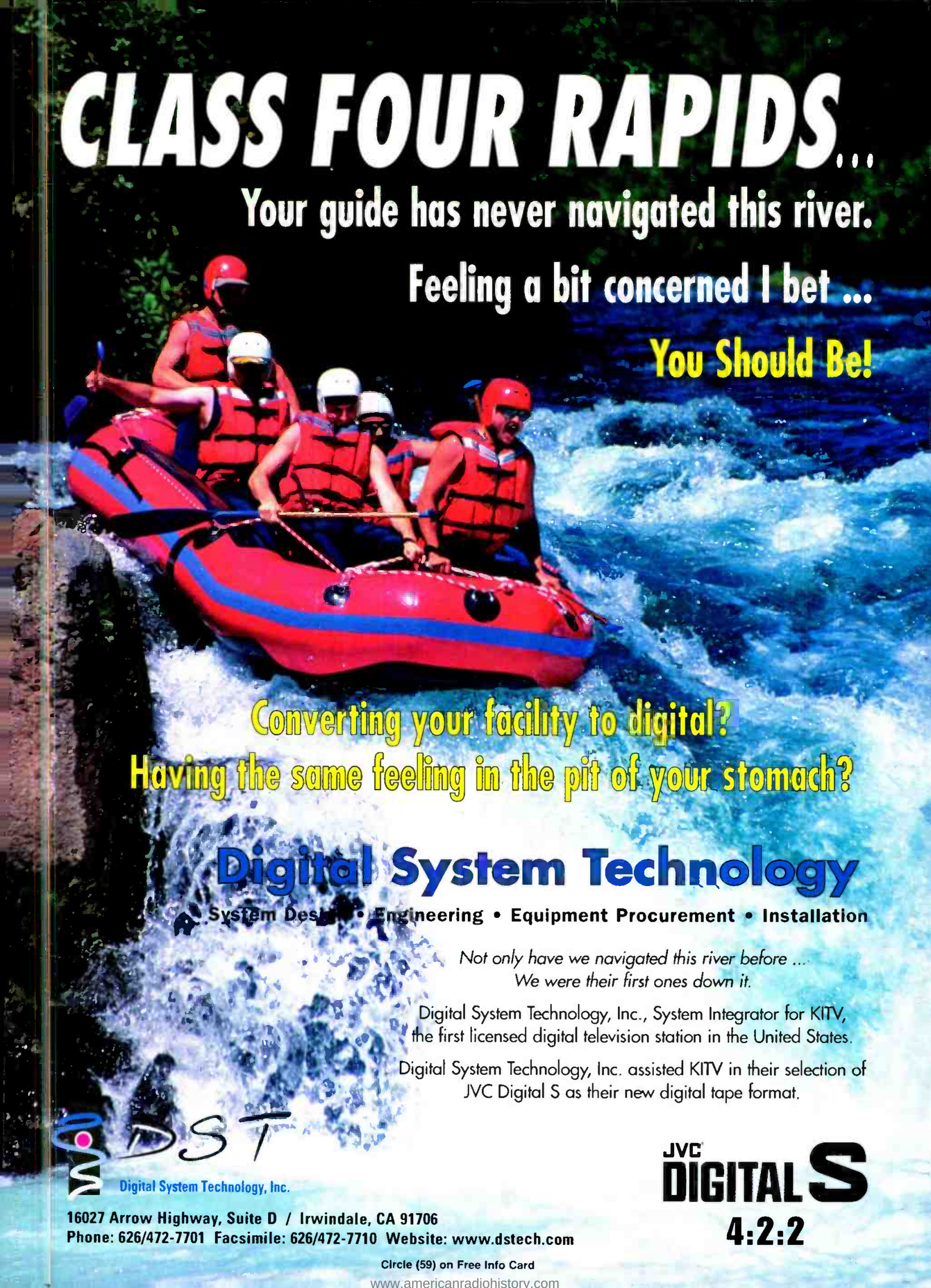
CLASS FOUR RAPIDS...

Your guide has never navigated this river.

Feeling a bit concerned I bet ...

You Should Be!



Converting your facility to digital?

Having the same feeling in the pit of your stomach?

Digital System Technology

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Not only have we navigated this river before ...
We were their first ones down it.

Digital System Technology, Inc., System Integrator for KITV, the first licensed digital television station in the United States.

Digital System Technology, Inc. assisted KITV in their selection of JVC Digital S as their new digital tape format.

DST

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JVC DIGITAL S 4:2:2

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PRODUCTS NOW SHIPPING

HOUSING FRAME

Miranda *Symphonie*: this 16-slot 4RU frame is the latest addition to Miranda's line of housing frames designed to accommodate the company's *imaging* Series family of broad-level digital video/audio encoders, decoders, converters and systems integration modules; this highly flexible unit can accommodate a mix of up to 16 digital video and/or audio *imaging* Series modules; Symphonie offers full power redundancy by adding a second power supply; all power supplies are hot-swappable for easy maintenance; for optimal security, Symphonie allows the status of each *imaging* module and power supply to be monitored through a series of front-panel LEDs, while complete control of every parameter of all 16 modules can be remotely accessed via Miranda's ICP-S remote control software (for Windows NT environments); 514-33-1772; fax 514-333-9828; www.miranda.com

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DIGITAL VIDEO EFFECTS SYSTEM

Pinnacle Systems AlladinPro: a high-quality single or dual-channel 3-D digital video effects system; AlladinPro is the ideal complement to the new broadcast digital video formats such as Digital-S, DVCPRO and DV; this open system is based on the Windows NT platform and is BroadNeT compliant; with AlladinPro's studio tools option, a character generator and a paint system are added, turning the basic version of AlladinPro into a fully integrated stand-alone system; 650-526-1600; www.pinnaclesys.com

Circle (371) on Free Info Card

EFFECTS PLUG-IN CARD FOR YAMAHA O2R

TC Electronic TC Unity: an effects plug-in card for the Yamaha O2R digital recording console; the O2R automatically senses the card when it is plugged into any one of it's four I/O expansion slots. This activates complete display and fader access to all of the preset and editing screens designed specifically for the TC Unity; the TC Unity features two independent 24-bit mono in/stereo out signal processing engines, with a wide variety of TC quality effects onboard including reverb, chorus, delay, pitch shifter and more; 805-373-1828; fax 805-379-2648; www.tcelectronic.com

Circle (372) on Free Info Card

PLUG-IN FOR PRO TOOLS TDM SYSTEMS

TC Electronic MasterX: a TC multiband dynamics processing plug-in for Pro Tools TDM systems; MasterX provides integrated multiband expansion, compression and limiting, all optimized for mastering applications; an intuitive user interface provides a streamlined approach to dynamics processing featuring many new ideas to make this critical process faster and easier; 805-373-1828; fax 805-379-2648; www.tcelectronic.com

Circle (373) on Free Info Card

CHARACTER GENERATORS

Videonics PowerScript Studio 4000: this character generator provides the capabilities of larger, more expensive CGs at a fraction of the price; with 10-bit 4:2:2 digital video quality at 5.5MHz bandwidth, version 4.0 software and PowerScript Communicator software, PowerScript Studio meets the demands of CG operators who need the high quality, power and flexibility of a stand-alone solution that can be used in the studio or on location; 800-338-3348; fax 408-866-4859; www.videonics.com

Circle (374) on Free Info Card

PCI DVB INTERFACE CARD

GENROCO DVP-2732: the newest member of GENROCO's TURBOfibre family of high-bandwidth, low host overhead controller products; the single PCI card uses a powerful 32-bit 100MHz Java engine from Patriot Scientific which enables it to merge as many as 70 3Mb MPEG- program streams over a single DVB channel with single packet granularity in real time; 414-644-8700; fax 414-644-6667; www.genroco.com

Circle (375) on Free Info Card

MPEG-2 VIDEO EDGE DEVICE

Tektronix M2 series: this MPEG-2 video edge device moves digital video material between facilities with higher quality at lower bandwidth; more than a codec, it is suitable for transmitting contribution-quality video at MPEG-2 4:2:0 or 4:2:2 from a studio to a satellite transmitter, from an event venue to a studio, and from one post-production house to another; the M2 Series offers real-time video streaming over standard networks, including the MPEG- 4:2:2P @ ML and is optimized to maintain video and audio quality even through multiple generations for encoding and decoding; 503-627-7111; fax 413-448-8033

Circle (376) on Free Info Card

PRODUCTS NOW SHIPPING

Character generators

AVS Graphics ManuScript family: character generators designed to meet the needs of the typical broadcast suite; the latest in the series includes Cadet (composite and Y/C outputs, 20 typefaces, 18ns resolution, Graduate (composite/YC or component RGB/YUV outputs, 200+ typefaces, 9ns resolution, LogoComposer and full foreign language capabilities) and SDI Dictator (digital I/Os and processing); +44 1990 003220; fax +44 1990 003203

Circle (377) on Free Info Card

Digital terrestrial product range expanded

NDS DVB-T digital terrestrial modulator and professional integrated receiver decoder (IRD): both products now feature 2K and 8K carrier functionality; the range of the NDS DVB-T digital terrestrial modulator has also been extended from the initial 8MHz bandwidth version to include 7MHz bandwidth, with 6MHz versions due to follow in the near future; 714-725-2500; fax 714-725-2505

Circle (378) on Free Info Card

Business

JVC Professional Products Company has created a new division, the Digital Broadcast Systems Group, which will be charged with coordinating large-scale purchases by broadcasters and post-production users. The new division began operation June 1. The division will be led by S. Scott Spector and will spearhead sales and marketing nationwide, creating a faster path for product delivery and service.

Communications Engineering Inc. (CEI) will design, engineer and implement a sophisticated MPEG-2 server solution for the Public Broadcasting Service (PBS). The integrated server system, using eight Hewlett-Packard MediaStream Broadcast Servers, will encompass a fault-tolerant, automated design that will originate 24 programming feeds to PBS member TV stations from its national Technical Operations Center in Alexandria, VA.

The WHYY organization is commencing a comprehensive facility upgrade with the help of Communications Engineering Inc. (CEI), which will provide turnkey broadcast design and implementation services. CEI is collaborating with the WHYY team to design and equip WHYY's new corporate headquarters, broadcast and production facility on Independence Mall in Philadelphia. The present analog technical plant will be replaced with a hybrid analog/digital solution that will enable WHYY to expand services on additional DTV channels and other media managed through automation and centralized storage techniques to reduce operating costs. WHYY chose CEI because of the company's DTV and HDTV broadcast expertise and digital project experience.

Canon announces that the HDTV post-production service provider, HD Vision of Texas, has added the new HJ18x7B and HJ9x5.5B high definition ENG lenses to its existing Canon products. HD Vision is responsible for such projects as Texas Rangers and Baltimore Oriole broadcasts to high profile features, commercials and corporate projects.

Post Effects will use Cyberset by Orad to produce A&E's *Documentaries with Bill Kurtis*. The show will include wrap-arounds shot on virtual sets at Post Effects. All opens, closes and bumpers are shot using Cyberset by Orad to composite the host with computer generated sets. John Edel, virtual studio designer at Post Effects, used Infinite Reality software on Silicon Graphics hardware. The Cyberset system allows for camera moves including hand-held and dramatic booms. It matches talent and camera position with the background and is simultaneously digitally videotaped.

A&E's *Documentaries with Bill Kurtis.*

Comark Digital Service (CDS) and dtvision have formed a strategic alliance to provide a comprehensive range of strategic and technical services to commercial and non-commercial stations in the transition from analog to digital television. The companies will offer transition plans for DTV conversion, financial models and technical and business strategies.

The Nashville Network (TNN) has equipped its audio remote truck with a 48-track AMS Neve Capricorn full-digital recording and mixing console. The truck has been used for concerts by Alan Jackson and for a series of live call-in request concerts by Faith Hill, Willie Nelson, Johnny Mathis and Michael Bolton. When not on the road, the truck is used for remixing and sound production at TNN's studios. The Capricorn was chosen because it is built in layers, allowing many inputs to fit in the confines of the truck. The board in the TNN truck has 96 mic inputs and full automation.

Amway Corporation has added JVC's 4:2:2 component Digital-S format to its production studio. Amway's goal was to begin shifting away from one-inch tape to a digital format offering comparable record time, but with higher-quality video and no generation loss in dubbing. Digital-S allows two hours of record time and eliminates worries over submastering and generational loss. Amway's long-term goal is to purchase four JVC BR-D92 recorders that feature four-channel independent audio.

The first Solid State Logic Axiom-MT digital console will be installed in National Mobile Television's (NMT) all-digital HDTV mobile truck, one of the first vehicles of its kind in North America. The system will service broadcast audio for the Madison Square Garden Network (MSG) over the next five years, covering Knicks basketball and Rangers hockey games. The system was selected because it offers maximum power and functionality, while fitting into a small space.

Energy Film Library has purchased a Quantel Editbox Magnum, which will be used to reorganize and consolidate the company's existing inventory and to select the best of the constant influx of new material. The painting and multi-layer compositing techniques of Editbox will allow Energy to generate original imagery as well as creative custom packages, offering its clients an end-to-end

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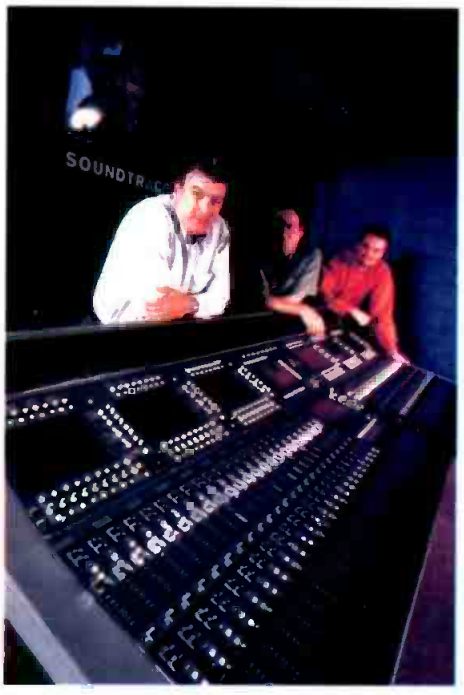
archiving, editing, layering and presentation solution.

Sky Latin America, LLC, chose Louth Automation for its on-air automation system, including advanced multichannel programming, interstitial playout and media preparation components for its new direct-to-home satellite broadcast center at Miami Lakes, FL. The system architecture includes 68 video file servers, 10 cart machines, five serial digital video routers, as well as VTRs, external GPI units, keyers, video switches and facility management communication connections. Engineering, design and integration was provided by A.F. Associates.

National Teleconsultants (NTC) has been selected by DIRECTV of El Segundo, CA, to provide baseband system design and integration services for the new, all-digital DIRECTV Los Angeles Broadcast Center (LABC) in the Marina del Rey section of Los Angeles. The center will initially encompass more than 100,000 square feet, mostly committed to technical space. The facility is based extensively on planned use of video server technology that provides digital program recording and playback functions. The center contacts one of the largest TV routing switchers ever assembled as a single integrated system and more than 700 broadcast equipment racks, more than 1,000 monitors and a score of broadcast devices.

Soundtracs plc has sold DPC-II digital consoles to the Soho-based sound/post-



production facility Magmasters Sound Studios Ltd. The two 160-channel, 64-fader consoles, which are to be installed in August, will be used principally for TV and feature film projects.

A.F. Associates Inc. (AFA) has been awarded a contract to relocate the Shop At Home network from Knoxville, TN to Nashville and facilitate a major expansion. The new facility will include three studios, two control rooms, one on-line edit room that doubles as another control room, two non-linear edit rooms, a central equipment/master control room and a high-end digital graphics system, which will be networked throughout the facility. AFA will also install a multichannel file server for

Windows

www.stortek.com

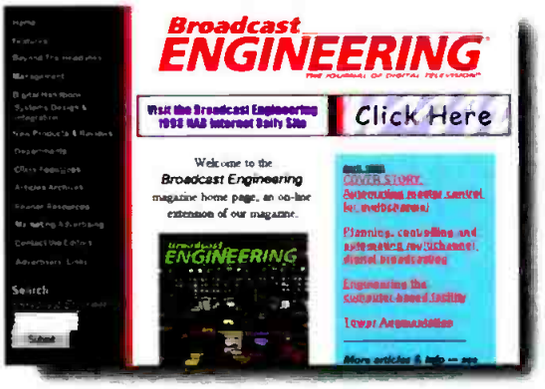
StorageTek: StorageTek's MediaVault is a complete storage management system for broadcasters migrating to digital systems. It combines ultra-fast automated tape libraries, ultra-high capacity SD-3 helical-scan cartridge drives and applications-enabling software.

www.pinnaclesys.com

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

www.e-trim.com

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



www.broadcastengineering.com

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

www.nova-sys.com

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

SONY

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

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

- Variable servo 10X optical power zoom lens goes from 5.9 to 59mm in 1.7 to 24 seconds. The manual zoom rocker is continuously variable right up to where the digital 20X zoom kicks in.
- Sony's Super Steady Shot reduces high frequency camera shake without compromising image quality. SteadyShot uses horizontal and vertical motion sensors that allow it to work accurately while zooming, moving (even shooting from a car), and shooting in low light conditions.
- Has digital effects including audio and video fade, overlap and Slow Shutter.
- Automatic and manual focus, iris, shutter, gain and white balance. Iris is adjustable in 12 levels from F1.6 to F11, shutter from 1/4 to 1/10,000 of a second in 12 steps. Gain from -3dB to +18dB in 8 steps.
- Zebra pattern indicator, built-in ND filter.
- Custom Preset function lets you preset, store and recall custom settings for color intensity, white balance (blush or reddish), sharpness and brightness.
- Stores Photo, Date/Time, Shutter Speed, Iris, Gain and F-stop for easy recall. So if you have to re-shoot, you know your original settings for every scene and frame.
- Records Drop/Non-Drop Frame time code. Time code can be read either as RC time code or as SMPTE time code.
- Has a large 1-inch B&W viewfinder with 550 lines of resolution for easy focusing even in low contrast lighting situations. Separate information sub panel displays time code, battery time, tape remaining and other camcorder functions without cluttering up the viewfinder.
- Records 16-bit/48kHz audio on one stereo track or 12-bit/32kHz with two pairs of stereo tracks (L1/R 1, L2/R2), so you can add stereo music or narration.
- One-point stereo electret condenser mic for clear stereo separation. Directivity can be selected from 0°, 90° & 120°.
- Automatic & manual (20-step) audio level record controls. Monitor audio with headphones or from the LCD panel which has an active VU meter.
- XLR input connectors for mics and audio equipment.

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

DSR-30 DVCAM Digital VCR

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

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

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

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

They Feature:
- 500 lines of horizontal resolution
- They handle NTSC, NTSC 4.43, PAL, and SECAM

- Picture (chrome, phase, contrast, brightness) and setup adjustments (volume, aspect ratio) are displayed as easy-to-read on screen menus.
- Closed captioning is available with the optional BKM-104 Caption Vision Board.

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

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

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

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

SONY UVW-100B

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

- Three 1/2-inch IT Power HAD CCDs with 380,000 pixels attain sensitivity of F11 at 2000 lux (low light is 4 lux). S/N ratio of 60dB and 700 lines of resolution.
- Gain-up can be preset in 1dB steps from 1dB to 18dB.
- Auto Iris detects the lighting conditions and adjusts for the proper exposure.
- Clear Scan records computer monitors without horizontal bands across the screen. Shutter speed can be set from 60.4 to 200.3 Hz in 1Β3 steps. Also has a variable high speed shutter from 1/100 to 1/2000 of a second.
- SMPTE LTC time code and UB generator/reader. Rec Run/Free Run, Preset/Regen are easily set. For multi-camera operation, genlock to an external time code is provided.
- Genlock input and built-in color bar generator.
- 26-pin VTR interface for feeding component, composite and S-Video signals to another VTR for simultaneous recording. Start/stop are controlled and external VTR status such as Rec and Tally are shown in the viewfinder.
- Diecast aluminum, 1.5-inch DXF-601 viewfinder is rugged yet comfortable while providing 600 lines of resolution.
- Large diameter eye cup reduces eye strain and simplifies focusing. Diopter adjustments (-3 to 0) compensates for differences in eye sight.
- Zebra level indicators, safety zone and center marker generator. Shows tape remaining and audio levels.
- 8-digit LCD display indicates time data, warning indications and video status. Battery status audio level are also shown in a bar graph meter.
- With Anton/Bauer Digital Batteries remaining battery power is displayed on the LCD panel and through the viewfinder.
- Weighs 15lb. with viewfinder, battery, tape and lens. Shoulder pad is adjustable, so you maintain optimum balance when using different lenses and batteries.

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

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

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

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

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

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

PVW-2600/PVW-2650/PVW-2800
BETACAM SP 2000 PRO SERIES

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

- Built-in TBC's and digital dropout compensation assure consistent picture performance. Remote TBC adjustment can be done using the optional BVR-50 TBC Remote Control.
- The PVW-2600, PVW-2650 and PVW-2800 (generates as well) read VITC/ LTC time code as well as User Bits. Ext/Int time code, Regen/Preset, or Rec-Run/ Free-Run selections.
- Built-in character generator displays time code or CTL data.
- Set-up menu for presetting many functional parameters.

PVW-2650 Only
- Dynamic Tracking (DT) playback from -1 to +3 times normal speed.

- Two longitudinal audio channels with Dolby C- type NR.
- Recognizable monochrome pictures at up to 24X normal speed in forward and reverse. Color at speeds up to 10X.
- Two types of component connection; three BNC connectors or a Betacam 12-pin dub connector. They have composite and S-Video signals as well.

PVW-2800 Only
- Built-in comprehensive editing facilities.
- Dynamic Motion Control with memory provides slow motion editing capability.

UHF WIRELESS MICROPHONE SYSTEMS

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

VIDEO and PRO AUDIO

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PHOTO - VIDEO - PRO AUDIO

NewTek

Calibar 3-Oz. Pocket-Sized Test Generator

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

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

CHYRON PC-CODI & PC Scribe

Text and Graphics Generator and Video Titling Software

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

PC-CODI Hardware:

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

PC-Scribe Software:

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

PC-CODI and PC-Scribe Bundle 2995.00

TRUEVISION / AVID

TARGA 1000/MCXpress NT

Professional Video Production Workstation

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

TARGA 1000 Features:

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

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

MCXpress Features:

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

TARGA 1000/MCXpress Turnkey Systems:

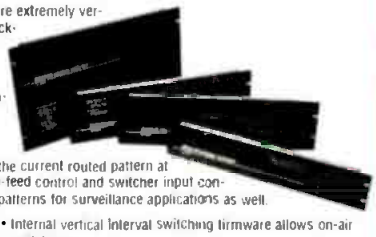
- 300-watt, 6-Bay Full Tower ATX Chassis
- Pentium ATX Motherboard with 512K Cache
- Pentium II- 300 MHz Processor
- Matrox Millenium II AGP 4MB WRAM Display Card
- 64MB 10ns 168-Pin (DIMM) S-DRAM
- Quantum Fireball 6.4GB IDE System Drive
- Seagate Barracuda External 9.1GB SCSI-3 Ultra Wide Capture Drive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

With TARGA 1000 .....$7495.00
With TARGA 1000 Pro (component input/output) $7995.00

KNOX VIDEO

RS4x4/8x8/16x16/16x8/12x2

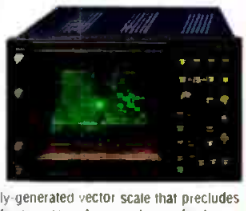
Video/Audio Matrix Routing Switchers



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

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

LEADER



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

5860C WAVEFORM MONITOR

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

5850C VECTORSCOPE

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

5100 4-Channel Component / Composite WAVEFORM

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

5100D Digital Waveform/Vectorscope

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

5870 Waveform/Vectorscope w/SCH and Line Select

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

5872A Combination Waveform/Vectorscope

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

5864A Waveform Monitor

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

5854 Vectorscope

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

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

CORPORATE ACCOUNTS WELCOME

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The GALLERY

commercial insertion and product shot storage. An 11-unit robotic camera system will include a 70-foot ceiling track for unusual aerial shots. AFA has also completed turnkey systems integration services for Bay News 9 — Tampa Bay, Florida's only 24-hour news channel, using state-of-the-art automation and file server technology. The facility comprises a master control room, a network operations/signal acquisition area, studio production control rooms, a multifunctional newsroom, a non-linear edit suite, off-line edit suites and a graphics room.

The CNBC Network has selected Avid's AvidNews NRCS as its newsroom computer system. CNBC will install 166 seats of AvidNews NRCS in its Fort Lee, NJ newsroom. CNBC has already installed 50 NRCS Windows-based systems. The network is currently using NRCS with more than 100 DOS and VT workstations and the recently installed AvidNews NRCS Windows seats. The CNBC plans to upgrade an additional 50 DOS and VT terminals by this summer and will upgrade the remainder of the terminals in a phased implementation throughout the rest of 1998. The NRCS system will support CNBC's installed base of DOS and VT terminals during the migration.

Hamlet Video International Ltd. has supplied 15 503AR stereo scopes to Bloomberg L.P. The sale was made as part of the Team 4 system solution for use in Bloomberg's London-based business TV operation. Team 4 has supplied equipment and engineering services to Bloomberg since 1995 for use in its digital European TV channels. The Hamlet 503ARs will be used for monitoring audio levels and post-production systems at the Bloomberg European headquarters, the production center for five different language business channels.

Tape House Editorial has purchased a DVS Digital Video ProntoVision uncompressed real-time HD digital disk recorder, which will be installed in Tape House's all-digital HD edit suite. ProntoVision will provide HD I/O and disk cache capabilities for the Axial 3000 editor in the company's HD edit suite and HD I/O for the Onyx workstation running HD Fire and Amazon software in the company's graphics suite. The system will deliver 22 minutes of uncompressed HD storage and is configured with both SCSI bus and Ethernet networking options. Editors will be able to load and dump HD frames from any networked workstation in the facility, working in 1080i or 720p.

DVS Digital Video has also sold a MovieVideo SCS HD still and clip-store system to Post Logic Studios of Hollywood. The system will be installed in the studio's HD telecine facility. The system was chosen for its I/O speed for up and down loading of HD frames and for its ability to handle compressed and uncompressed files at the same time.

Pacific Research & Engineering Corp. (PR&E) has signed a letter of intent to acquire Graham-Patten Systems, a manufacturer of digital audio mixers for the video editing environment. Terms at the time of signing were not disclosed.

NDS Americas Inc. has been awarded the ATSC encoder contract for use by WSB-Atlanta. The station will take delivery of the NDS E5810 HDTV encoding system, along with the StreamServer PCpro control management system.

People


Jim Wilson

George J. (Jim) Nelson Wilson, 64, died of cancer on June 25. Wilson had served as president of LARCAN-TTC since 1996 and as president of LDL Communications since 1984. He was also a member of the board of directors for LeBLANC & Royle Enterprises. During his career he held management positions with Andrew Antenna, Raytheon Canada, Microwave Associates and Bayly Engineering.

Mark Borton has rejoined Trompeter Electronics, Westlake Village, CA, as marketing analyst.

Don Thompson

Don Thompson has been appointed to lead the global marketing team for Leitch Technology, Chesapeake, VA.

Leitch Technology, Chesapeake, VA, promoted **Bob Combs** to director of network sales, responsible for all sales and account management for the New York-based broadcast TV networks.

Bob Combs

Jerry Chase was appointed president and CEO of Comark, Southwick, MA.

Telemundo/KSTS-TV48 has appointed **Robert Amoroso** as director of engineering and operations.

Videotek, Pottstown, PA, has promoted **Robert van Zyl** to senior vice president, John D. Terrey director of sales and **Jerry Williamson** as senior regional sales manager.

Dr. Joseph A. Flaherty, senior vice-president of technology at CBS and chair of the North American National Broadcasters Association (NANBA) Technical Committee, has been elected the new chair of the World Broadcasting Unions (WBU) Technical Committee.

Dielectric Communications, Raymond, ME, announced the appointment of **Kerry Cozad** as vice president of the Advanced Broadcast Operations. Cozad has been a featured speaker at NAB, SBE and IEE Broadcast Symposiums, and has presented papers and published articles around the world. He previously worked with Andrew Corp and Harris.

Howard Elovitz

Howard Elovitz was appointed manager of international satellite and broadcast communications sales at Andrew Corp., Orland Park, IL.

Ken Michel was promoted to vice president, network engineering, at ABC Broadcast Operations & Engineering

MountainGate, Reno, NV, appointed **Dan Mancinelli** as its new vice president of sales.

Michael Oliveri was appointed vice president of U.S. sales and marketing within the Measurement Business Division at Tektronix, Beaverton, OR. ■

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Help Wanted

BROADCAST MAINTENANCE ENGINEERS

Professional Communications Systems has career opportunities in Tampa, FL for maintenance engineers experienced in the repair of analog and digital equipment. PCS is a dealer for Sony, Panasonic and many of the top broadcast equipment manufacturers. We are looking for top quality people interested in servicing and growing our customer base. Send resume and cover letter to:

Pat Wolf, Personnel
PCS
5426 Beaumont Ctr. Blvd., Suite 350
Tampa, FL 33634
Internet: www.pcomsys.com
FAX: 813/886-9477
Drug Test Required, EOE, M/F

ENGINEER IN CHARGE Mountain Mobile Television (part of Colorado Studios) in Denver has an opening for a qualified Engineer-In-Charge. Mountain Mobile has three production units - two expandos and one 50' straight truck. Each of the production units does well in excess of 150 events a year. Events are principally sports: NBA (Utah Jazz & Denver Nuggets); NHL (Colorado Avalanche); MLB (Colorado Rockies & Kansas City Royals) and regional college events. Qualified applicants will have several years of engineering experience in a comparable remote broadcast environment, excellent people skills, a team player, a willingness to travel and, the ability to make things go right. Contact Doug Clark, Director of Operations of Mountain Mobile Television Phone: 303/331-8584 Fax: 303/388-3773. www.ColoradoStudios.com

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WJTV-TV JOB POSTING ADVERTISEMENT WJTV seeks RF Maintenance Engineer to perform the repair, replacement, modification, installation, removal, adjustment, and integration of all RF and related equipment that is essential for the operation for WJTV and WHLT. A Degree in electronics, military training, or trade school is necessary: related experience will be evaluated. Five yrs maint. of audio, video, and RF exper. perferred. Must have commercial operators license or permit. Send resume, sal his, cover letter to HR Dept., WJTV, 1820 T.V. Rd, Jackson, MS 39204. WJTV is an EOE. Pre-Emp Drug Test Req.

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BROADCAST MAINTENANCE ENGINEER The Mississippi State University Television Center seeks an energetic and resourceful broadcast maintenance engineer to help support the Television Center and WMSV Radio. A two year degree or technical school certificate and five years of experience in electronics repair and maintenance are required. Five years of experience in broadcast maintenance engineering is preferred. RF/Transmitter systems operation and maintenance experience a plus. Salary range is $20,000 to $24,000 per year, depending upon experience. Interested applicants should send resume and the names and addresses of three references to: David Hutto, Director, MSU TV Center, P.O. Box 6101, Mississippi State, MS 39762. Deadline is August 21, 1998, or until an acceptable candidate is found. MSU is an AA/EOE.

TECHNICAL OPERATIONS MANAGER Be part of Cincinatti's digital future and work for a major broadcast player. Keep the current engineering department running and help the Director of Engineering design and build the new digital facility. The ideal candidate is a major-market Assistant Chief or Operations Manager looking to move up who enjoys a fast-paced environment and working with people. Maintenance and operations background and experience with collective bargaining agreements necessary. Send resume to: Cindy Hutter, Director of Engineering, WLWT-TV 140 W. Ninth Street, Cincinnati, OH 45202, or e-mail: chutter@wlwt.com. EOE.

MAINTENANCE TECHNICIAN WHAS-TV11, Belo station in Louisville, KY is looking for a experienced technician who likes challenges. You should have 3-5 years experience in installation and maintenance of broadcast equipment. Must work well under pressure as part of a team with heavy emphasis to support a winning news operation. Must be a self-starter requiring minimal supervision while producing high quality results. EOE. Send cover letter and resume to: Cindy Vaughan, HR Director, HR 98-5, WHAS-TV, 520 W. Chestnut St. Louisville, KY 40202

Post a job opening and promote your company! Advertise in *Broadcast Engineering's* Help Wanted section!

Circle (49) on Free Info Card

BROADCAST MAINTENANCE ENGINEER WCIA TV, the leader in central Illinois television is currently accepting applications for a full time Maintenance Engineer. Qualified candidates must have a formal education equivalent of Associate of Arts Degree in Electronics and three years experience in television maintenance. SBE CBTE preferred. Duties include maintaining and troubleshooting all studio and News equipment. Live Newscast support is required. The ability to work as a team player across departmental lines as well as working efficiently with minimal supervision is a must. Qualified applicants should send resume to: WCIA, Maintenance Engineer, PO Box 20, Champaign, IL 61824-0020. WCIA is an Equal Opportunity Employer. Pre-Employment Drug Test Required.

MAINTENANCE ENGINEER INDY Teleproductions, a premiere serial component digital production and post production facility in the Midwest, is seeking a qualified Maintenance Engineer. Responsibilities include diagnosis, analysis, repair and performance of preventative maintenance for the 2-studio and 5-suite facility. Good client and vendor interface skills are sought in the candidate along with SBE / FCC Certification and computer networking skills. Visit www.indyteleproductions.com for specific facility information. Send your cover letter and résumé to Director of Engineering, Wabash Valley Broadcasting, 4555 W. 16th Street, Indianapolis, IN 46222 or email to draper@indyteleproductions.com.

ENGINEERING PROFESSIONAL Major market television group broadcaster seeks a "hands-on" Assistant Director of Engineering for the group. You will be based in Los Angeles but will work with and travel to all our major market "O&O's". The ideal candidate will have 5-10 years experience as Chief or Assistant Chief Engineer working in UHF stations. Superior salary and benefits. Fax resume to (310) 348-3659 - EEO

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Ad Index

	Page Number	Reader Service Number	Advertiser Hotline
Ange lieux	29	16	201-812-3858
Anto Bauer	73	42	800-422-3473
ASCA dio Video Corp.	27	15	888-843-7004
BAF mmunications Corp.	136	70	407-324-8250
BARC Comm. Systems	99	45	216-871-7617
BASF/ TEC	91	43	888-295-5551
Beck sociates	139	100	888-422-8600
Best P wer Technology	61	34	608-565-7200
B&H oto-Video	132-135	65,66	800-947-9928
Canar	110	64	818-365-2446
Clear m Intercom	97	40	510-527-6666
Comm unications Specialties	40	25	516-273-0404
Coms Laboratories	36	18	301-428-4032
Diele ic	130	53	207-655-4555
Digita System Tech.	121	59	626-472-7701
DNF Industries	116	55	818-252-0198
Doren Labs Inc.	101	46	213-874-3411
DPS	111	47	606-371-5533
DTV	129		
Dura USA	9	10	800-548-5489
Euph ix	93	44	650-855-0400
Extron lectronics	103	52	714-491-1500
Faroo a Laboratories	19	6	408-735-1492
Fujino , Inc.	39	24	973-633-5600
James under & Assoc.	38	19	913-492-4666
Harris orp./Broadcast Div.	3	4	606-282-4800
Henr ngineering	136	68	626-355-3656
Hitac Denshi America	45	28	516-921-7200
Holad y Industries Inc.	114	50	612-934-4920
Hood n Corp.	139	101	310-379-6391
Horit	114	71	714-489-0240
Inter Publishing	120		800-288-8606
JVC P fessional Products	13	12	800-JVC-5825
Kino Inc.	112	48	818-767-6528
Leitch corporated	144	3	800-231-9673
Majo chnologies	25	14	905-890-6338
Matth Electronics Ltd.	118	57	914-763-8893
Mira Technologies Inc.	55	29	514-333-1772
Motorola Semiconductor	67		602-952-3200
Mountaingate	49	20	800-556-0222
Multidyne Electronics	136	69	800-4TV-TEST
N D S Americas Inc.	59	32	949-725-2554
NVision Inc.	42-43	27	916-265-1000
Odetics, Inc.	15	5	800-243-2001
Panasonic Broadcast	4-5		800-528-8601
Panasonic Broadcast	47		800-528-8601
Pathlight Technology Inc.	50	21	607-266-4000
Pesa Switching Systems	69	37	800-328-1008
Philips Broadcast TV	7	9	800-962-4287
Play, Inc.	11		916-631-1865
Professional Communications Sys	57	30	813-888-5353
Quantegy Inc.	95	39	770-486-2800
Quantel Ltd.	20,21	7	800-218-0051
Radamec	127	51	908-518-0685
Ross Video	63	23	613-652-4886
RTNDA	96		202-659-6510
Sanix Corporation	137	67	708-677-3000
Scitex Digital Video	41	26	888-846-7017
Snell & Wilcox Ltd.	31-33	8	408-260-1000
Snell & Wilcox Ltd.	104-109	61-63	408-260-1000
Sonic Foundry	115	54	800-57SONIC
Sony Electronics	37		800-635-SONY
Standard Communications	117	56	310-532-5300
Storage Technologies Corp	71	41	800-STORTEK
Tech America	58,60,62	31,33,35	817-415-6441
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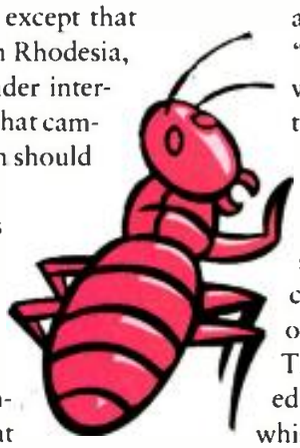
EOM

Cashing in on bugs

BY PAUL MCGOLDRICK

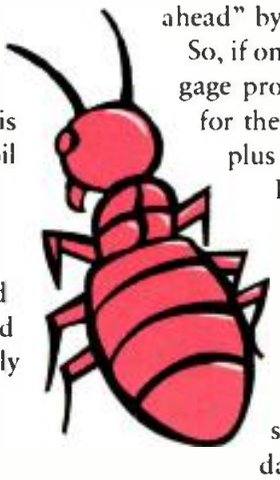
I was sitting at my desk-cum-bench at EMI in 1978 when I received a telephone call from an ex-colleague at the BBC. He had a problem with a yoke on one of our camera channels. After an Image Orthicon was replaced, the geometry was all over the place. This was not an unusual phone call except that he was working in southern Rhodesia, which, at the time, was under international sanction. Neither that camera nor that Image Orthicon should have been there.



Later that same year, I was in Moscow wrapping up a large contract for the Soviet Olympics. Luckily, we finished and got paid before the invasion of Afghanistan made a mockery of that Olympiad. We needed fairly frequent access to the TV tower in the city, and we were given carte blanche in the tower after we promised — at the Soviets' request — not to get off the elevator at two particular floors. "No problem!" Of course, at the first opportunity, we got off on the floor above and walked down the stairs to the "off limits" floors. They were packed solid with current vintage two-inch VTRs. They were fitted with kits that allowed them to record at slower tape speeds. The bays were loaded with current Japanese monitors and current test equipment. What were they doing? Recording radar signals — from where I do not care to know. This was happening during a period when I couldn't get an export license for a CATV-type of spectrum analyzer. We had to carry one in, do the job and take it home.

My naivete at the time was obviously something that I hadn't noticed I was carrying around. It never occurred to me that with every panic, embargo, war, pestilence, dictatorship and customs duty, there comes an opportunity for someone to make money. In Nigeria, where I have also lived and worked, it was routine to see, hear, buy and bribe in order to live properly. An event one Sunday morning at Murtala Muhammad Airport in Lagos did not surprise or shock me. The airport was closed to all traffic for four hours while "emergency runway repairs" were being made. I happened to be in the customs shed at the time looking for a "lost" shipment, which in fact, had never left British airspace. While I was there, a cargo 747 landed. It was full of lace — a banned import. The lace was efficiently loaded onto a fleet of trucks and whisked off. It was an open secret that the shipment had been organized for the country's First Lady.

Maybe these lessons in opportunity and similar stories have led me to be rather cynical about wholesale panics. While we continue to embargo Iraq, for example, I have to wonder who is making all the money from the oil being shipped out through Turkey. Hopefully, it would be the Kurds, but that is highly unlikely. I guess we have not learned that political correctness and making a buck are often mutually inclusive.



The millennium bug

All sorts of people are making money out of the millennium bug, the year-2000 problem, Y2K or whatever else you want to call it. Panic has managed to get thrown around some of the world, as if we didn't have enough problems coming up with the usual hysteria associated with a mere change of numbers in the date. If you hit the Internet, you will find sites offering Y2K services only to discover that all they are really offering is to convert your mutual funds into gold. Companies are spending fortunes to bring back long-retired programmers that are needed to read billions of lines of code to correct and modify dates to four digits. Our government is starting to panic and measure departments in percent of completeness.

How will it affect you? Probably not at all. Planes will not fall out of the sky, wars will not be triggered, viruses will not be released, your studios will not stop working and your towers won't fall down. Yes, your bank may be affected, so might your insurance company, your mortgage provider, your stockbroker (although they may have bigger problems with their software that doesn't provide for the Dow Jones Index to rise above 9999.99), but most of those industries have already been affected because their businesses "work ahead" by nature.

So, if on Jan. 5, 2000, your mortgage provider sends you a check for the total value of your loan plus interest, just smile.

For most of us, protection is easy. If you are running Win95, for example, there is a Microsoft patch available (on-line). Win98 is already compliant. If you are running software that involves dates under COBOL or FORTRAN, Digital has a software package that assesses and corrects Y2K problems. Of course, all this assumes you are using a Mac or you are working on a PC of more recent vintage than the blueprints of Bill Gates' house. ■

Paul McGoldrick is a free-lance writer and consultant based on the West Coast.

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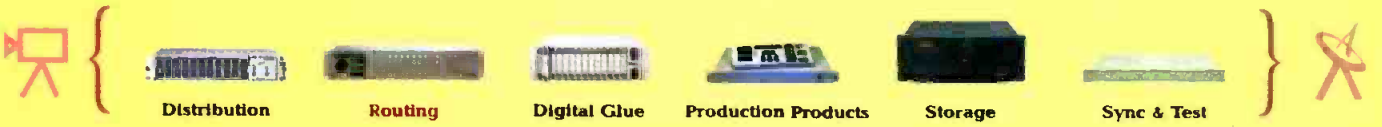

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