

# Broadcast ENGINEERING®

THE JOURNAL OF DIGITAL TELEVISION®

N A B

preview

Your Personal Guide to NAB 2001

DTV Marketplace • DTV Answer Book • FASTtrack

Sam Boyd's  
TREMONT  
Casino

4  
QUEENS

Special  
Report:  
New Flavors  
of MPEG



System Integration by MCSi, Inc.

## The Weather Channel's TV-80 Console

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THE WHEATSTONE FACTORY commissioning and training worked out very well. It was well coordinated and the operators (both old and new hands) seemed to understand the console, the layout, and the functionality. There have not been any major operational 'bugs' using the audio console live on-air and

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— John Orr, Mgr., Broadcast Engineering Projects

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— Craig Reeves, Audio Engineer

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any questions?

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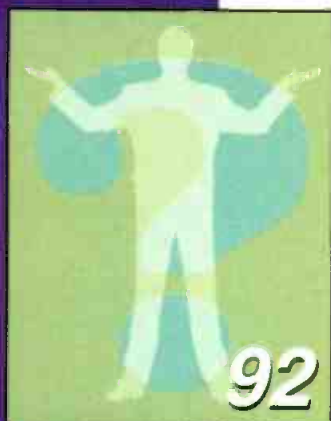
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**ON THE COVER:** This month's cover suggests the blending of new technology with the familiar. Las Vegas' Freemont street is shown lighted by digital waveforms projected overhead. Illustration provided by Tektronix.

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*By BE Staff*

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**“There’s nothing better..”**

**“DVCPRO50 clearly builds on DVCPRO25, which**

**has been an excellent workhorse format for us.**

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**It’s cost-effective and the quality is excellent—**

**there’s nothing better for our needs.”**

**- Dale Kelly, senior vice president, Pappas Telecasting**



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language network, the choice was easy: DVCPRO50. Citing both backwards compatibility with 25Mbps DVCPRO and a clear migration path to HD, Pappas chose the award-winning

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## FREEZE FRAME

A look at the technology that shaped this industry.

### VTR features

Name this Ampex VTR, year first shown at NAB and two features that made it unique from all of its predecessors. A bonus will be given to the first person who includes the official internal code name used for the machine while it was in development. Enter by e-mail. Title your entry "Freeze-frame-March" in the subject field and send it to: editor@intertec.com. Correct answers received by June 1, 2001, will be eligible for a drawing of Broadcast Engineering T-shirts.



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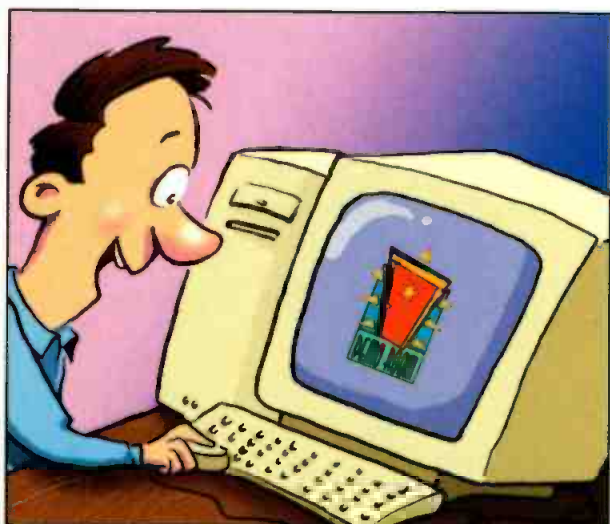
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## Welcome to the Demo Room

I usually spend this pre-NAB space promoting the upcoming convention. I'm always excited about the show and love to talk about it. But this year, I've got something else I'd like to tell you about. It's called the *Demo Room*.

Ever since the *Broadcast Engineering* website was launched, I've wanted to bring active video and audio to readers. Maybe it's because of my broadcast background that print has just never completely filled my desire to communicate. Moving pictures and audio provide a powerful form of communication that the print page can't provide. Until now, it's been impossible to tie an audio/video presentation with the print medium. Technology has changed such that and I can now offer you, the reader, that missing element — streaming video.



We've just launched the *Broadcast Engineering* Demo Room. It's available through the *BE* website: [www.broadcastengineering.com](http://www.broadcastengineering.com). Once you're on the site, look for the Demo Room logo, which is shown below. Click on the logo and you'll be launched into the room where you can select from several product demonstrations.

Vendors who want you to better understand their products provide the product demonstrations — the most effective way to get a feel for a product.

No one gets to all the booths they'd like to see at NAB. There are just too many. And having enough time to view all of the recorded demonstrations while you're there isn't likely to happen because, again, there are just too many. The Demo Room helps to solve that dilemma. You can now enjoy full product demonstrations right in the comfort of your home or office.

Products with demonstration videos are identified in the magazine with the Demo Room logo. These logos will appear next to a company's new product announcement or on their advertisement.

When you see the logo, you know there's a demo online for you to view.

The product's manufacturer provides the videos and they are solely responsible for the content. No log-in or registration is required so you're completely anonymous and it's absolutely free.

Clearly the manufacturers want you to better understand what their products are capable of and how they work, so the demonstrations are targeted on applications and functionality. From the Demo Room, you can directly access the manufacturer's site via a clickthrough if you want more information.

Many of these monthly videos will be archived for future viewing. You'll be able to enter the archive section of the Demo Room and select previous months' videos of products you may have missed during their initial publication in the magazine.

Please give the Demo Room a try and let me know how you like it. See you at NAB. It's going to be a great show.



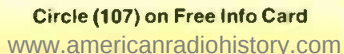
*Brad Dick*

Brad Dick, editor

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**E**ditor: In Barb Roeder's recent article, "Getting Started with Streaming Media," is the following paragraph:

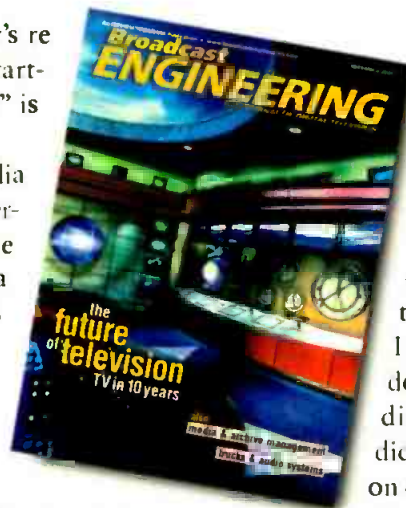
"Today's streaming media can be delivered using several different methods. True streaming media requires a specialized server such as RealServer, Windows Media Server or the Quick-Time Streaming Server (QTSS). Your content is then delivered and viewed in real time, whether it originates from a live event or an archived media file. The caveat to true streaming is that the bit rate of the movie must match the bandwidth of the connection or buffering will occur and playback will be interrupted."

I have been streaming Real Player video files off of ordinary servers (including a free server) for some time now. So long as my connection speed is adequate, I don't experience buffering or playback interruption. I have heard this statement made as regards Real Player so many times — even a presenter for an Adobe seminar insisted on it and insisted that what I was already doing was impossible!

I suspect Real Player wants people to

## **I suspect Real Player wants people to believe this, for obvious reasons, and has perpetuated the myth.**

believe this, for obvious reasons, and has perpetuated the myth. You can't blame them for trying, but if you look hard enough in the Real Producer manual it is quite clear that the only drawback of using a non-dedicated server is that you lose some of the more refined capabilities of Real Server, and that buffering and interrupted playback is "more likely" — but hardly inevitable. I have an ADSL line, and I can watch



an hour-long video presentation I created and encoded for 28K, 56K or faster connections, and never experience an interruption. When I had a 56K modem, sometimes I did, sometimes I didn't — including on dedicated servers.

So I think it's true to an extent and to a point, but it's hardly the black-and-white issue most people seem to think. I think it's more a matter of your connection speed than whether the server is dedicated or not.

STEVE SAKELLARIOS

### *Barb responds:*

Any video can be served from an ordinary server, which is sometimes referred to as HTTP streaming. HTTP is the protocol for transport of web pages over the Internet. The specialized streaming servers mentioned in the article use, Real Time Streaming Protocol (RTSP), at least as a first choice, for delivering the streaming media. RTSP has a lower overhead and less error correction, so real-time delivery is better. The error correction and feedback communication built into HTTP permits the guaranteed delivery of data, just not necessarily the timing of that data. Hence, we wait for web pages if the connection is slow, but we always get all the information unless the connection is broken altogether. If the player has to wait for packets due to poor connection performance, buffering occurs during playback.

As Steve says, "So long as my connection speed is adequate" there is no buffering during streaming from an HTTP

server. Using an ADSL line capable of up to 6Mb/s, chances are you would never see poor performance because most streams are designed for 300- to 500Mb/s even in the broadband market.

## **So how much ERP do I really need?**

Aloha, I read the article "Engineering KICU's path to DTV" by Jim Boston and David Lingenfelter. I have a simple question: What is the approximate ratio of DTV to NTSC ERP needed to maintain existing city grade coverage patterns for UHF stations?

KEN WOOLEY

### *Jim responds:*

Ken,

The FCC used the Grand Alliance guidelines in assigning DTV power for each station 12dB below the NTSC power level for UHF to UHF transitions, but didn't use it for VHF to VHF. The difference in power between NTSC and DTV is due to the signal-to-noise ratio for impaired viewing between the two. It is generally recognized that NTSC viewing becomes objectionable at 28dB S/N. With DTV, the signal hits the error cliff edge at a little above 15dB — a difference of approximately 12- to 13dB.

One reason that the FCC is concerned with UHF is that it increased the time factor for considering coverage for UHF from FCC (50,50) to FCC (50,90) (50 percent of sites receiving the signal 90 percent of the time). As you know UHF's tend to have larger grade As than VHF's because of the large powers usually radiated, but much smaller grade Bs. (Note: Grade A and B coverage is not used in DTV measurements.) Also UHF's radio horizon is usually the same as the optical horizon, whereas VHF can have RF horizons well beyond the optical. Thus the FCC tended to be a little more liberal with VHF power levels.

JIM BOSTON  
THE EVERS GROUP

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# Beyond the Headlines

## News



### Will iBlast pay for the transition to digital?

BY LARRY BLOOMFIELD

**D**igital television is not the same old television we've grown accustomed to. There's a host of new services that come to the table with digital broadcast television, causing engineers to scramble to keep up with what's out there.

The kinds of things of particular interest are the technologies that make use of the unused portion of the broadcast bitstream. The equivalent of one NTSC service over a digital television broadcast system leaves a considerable amount of room for other services, additional NTSC-quality channels or the transmission of digital information that would interest many different kinds of audiences. Keep in mind bits are bits are bits. Once encoded, one kind of digital information is virtually indiscernible from any other to the transmission system.

What is the best use of the unused portion of your bandwidth? Fill it with moneymaking services offered by com-



Administering its network from a NOC in Los Angeles, iBlast boasts a network of 253 television broadcast stations capable of reaching 93 percent of the population.

panies like iBlast. iBlast promises to be a revenue generator and its approach is a significant departure from conventional television. Considering the company recently opened an impres-

sive Network Operations Center (NOC) in Los Angeles, the company looks to be broadcast ready on a large scale.

Peter Ludé, senior vice president of engineering and operations for iBlast said, "Our network now consists of 253 television broadcast stations, which cover 93 percent of the population in the U.S., and we are adding more stations every month." Ludé explained that what made iBlast different was that each member station of the network was a shareholder and owned a piece of the iBlast action.

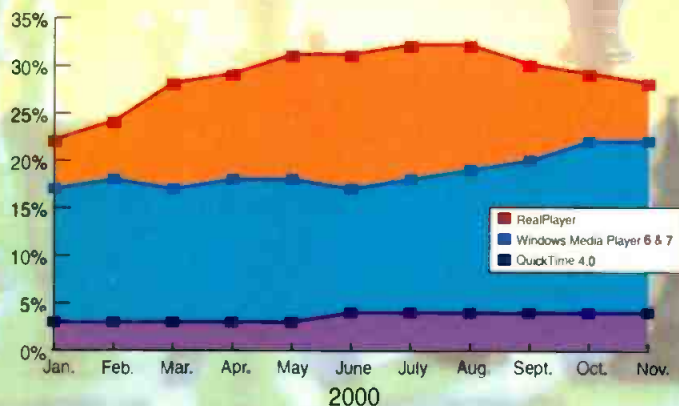
"Our service is one of the enhancements that makes DTV worth looking at," Ludé continued, "and this service is not compatible with analog television; it is a digital television service only. What makes the iBlast service distinctly different, when compared to conventional analog television services, is that the services we offer are not necessarily audio and video related. Think of it this way, anything that can be sent digitally, irrespective of the

## FRAME GRAB

A look at the issues driving today's technology.

### Streaming players' market share closely divided.

While 99% of PCs have media players, Microsoft and Real battle for supremacy.



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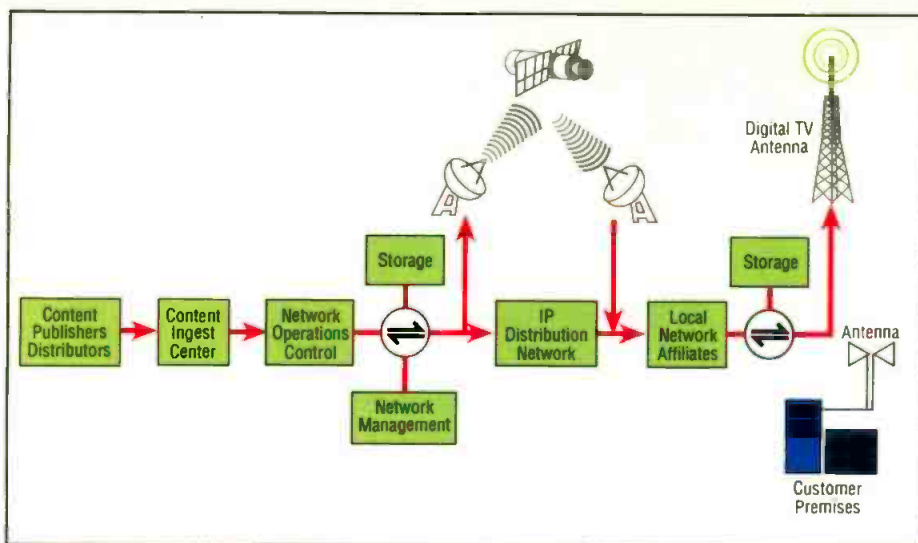
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The iBlast model delivers original content to member stations, which then passes the data into the home via the unused portion of its broadcast bandwidth.

media, CD, bit stream, games, MP3 and TV programs, can be transported on the iBlast system. Anti-virus software and latest anti-virus shields can be broadcast to users within minutes of their development.

If it can be transported on an IP (Internet Protocol) network," Ludé said, "it can be carried on the iBlast infrastructure. In addition to what has already been mentioned, iBlast can also deliver videos games to Playstation

modulation technologies other than 8VSB, Ludé reassuringly said, "the iBlast system is agnostic to the modulation system; it doesn't care, as long as it works."

Should the iBlast user not have his or her computer on at any given time, it is quite likely the desired information would be broadcast several times throughout the day.

iBlast does not have to send information in real time. This is true of any

television programming always has priority, and data will move as fast as the infrastructure can accommodate it. At current bit rates, no less than 50 full DVD quality movies can be transported a day without any noticeable difference in the television service sharing the same transmitter system.

As to the economy of delivery systems, Ludé pointed out that other delivery methods are from one- to seven-cents per megabyte now, but the iBlast approach is one or two orders of magnitude less.

Says Ludé, "We're not selling anything to broadcasters, they're our partners. We don't sell equipment, only our pipeline. Yes, we do help broadcasters broker this system, it's in everyone's best interest."

## Powell takes over

The transition to digital, from a governmental prospective, is now in the hands of the newly appointed Chairman of the FCC, Michael K. Powell. Powell is setting out to distance himself from the ways of his Clinton administration predecessors by voicing skepticism about a bevy of regulations affecting broadcasters and other ser-

vices. At his first news conference he left no question that he places greater faith in the marketplace to correct possible problems and emphasized a



FCC Chairman Michael K. Powell

sharply reduced role for the FCC.

Heading up a Commission that has two vacancies out of five and a third likely, Powell will have the opportunity to significantly reshape the FCC and related telecommunications policy. In contrast with Powell's two immediate predecessors, he has somewhat cordial relations with House and Senate leaders. According to *The New York Times*, some House and Senate leaders have taken credit for

## What is the best use of the unused portion of your bandwidth?

users and with 27 million gaming consoles in the U.S., there's definitely a market for that kind of software."

One of the things that sets iBlast apart from its competitors is the way it is distributed. Others distribute their digital content to edge server locations around the country, where the content resides on an Internet service provider's (ISP) server in the user's nearby area until it is needed by the user.

iBlast, on the other hand, is distributed to member television stations and is immediately broadcast over-the-air to users. The iBlast signal is not received by a television set, but by the user's computer system equipped with a receiver board for that purpose. This receiver board is unique in that no MPEG decoding is needed; only an 8VSB chip. For those who support

IP-based system. Multiple bits of material can be broadcast simultaneously. A computer's hard drive can be downloading MP3s while anti-virus protection is updated and the movie you want to watch tonight is slowly filling the bit bucket for recall at your convenience.

Because Hollywood is adamant about copyright protection and because the distribution of the iBlast data is via satellite, the subject of conditional access (CA) and other forms of protection come into discussion. Ludé said, "CA keeps the honest people honest. We have no specific security on our system. The content owners have that kind of thing in place already on their material and our network can accommodate it, if it is IP-based."

Fear not, with the iBlast system,

# Around the Clock... Networked News™

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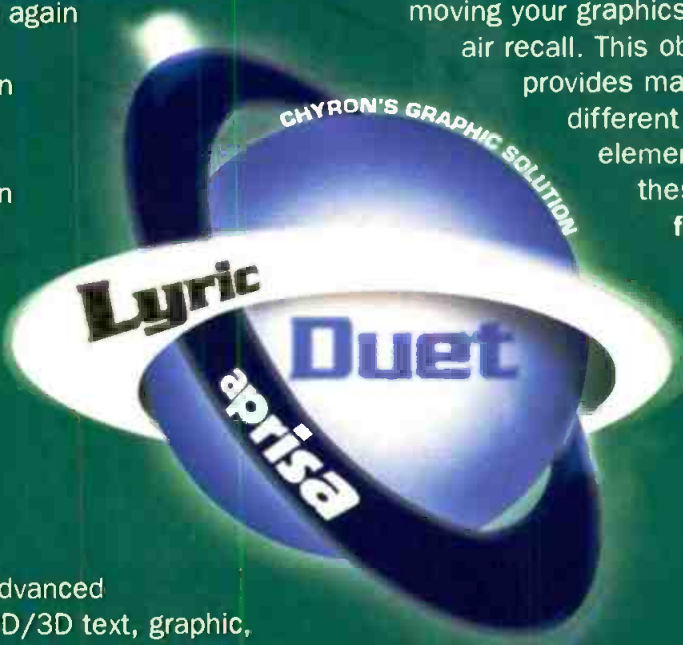
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## EEO rules invalidated

BY HARRY C. MARTIN

In a unanimous decision, the U.S. Court of Appeals for the District of Columbia Circuit vacated the EEO rules that became effective in April 2000. The Commission suspended the new rules effective Jan. 31.

While the Commission could appeal the court's decision, it is unlikely given Chairman William Kennard's departure and replacement by Chairman Michael Powell, a republican. However, it is expected some public interest groups that participated in the case will appeal even if the Commission does not. This could delay the final demise of the rules. In the meantime, broadcasters are not required to file Forms 396 (EEO Program Report filed with renewals), Form 396-A (Model EEO program filed with assignments, transfers and new applications), Form 397 (Statement of Compliance) or 395-B (Annual EEO Report). Annual Public File Reports are no longer required either.

The legal basis for the court's suspension was it found the EEO rules unconstitutional because they were not narrowly tailored to further a compelling governmental interest in preventing discrimination. Focusing on Option B of the Commission's rules, the court concluded the FCC's requirements pressured broadcasters to focus recruiting efforts on minorities and women to induce more applicants from those groups. In this connection, the

court noted that the FCC had clearly indicated it would investigate any licensee that reported few or no employment applications from minorities or women. The court said the requirement in Option B that licensees report the race of each applicant would be relevant to the prevention of discrimination only if the FCC assumed minority groups would respond to non-discriminatory recruitment efforts in some predetermined ratio, such as in proportion to their percentage of representation in the local work force. It was found any such assumption stood in direct opposition to the guarantee of equal protection under the Constitution.

Efforts to promote minority participation in the media are now being made in Congress, where various groups are seeking the reinstitution of the tax certificate program. Under the previous tax certificate program, companies that sold their stations to minority-controlled titles were eligible to defer payment of capital gain taxes. Also, in a statement released just before his departure, outgoing Chairman Kennard urged Congress to increase funding for the Telecommunications Development Fund, which provides capital for small minority- and female-owned businesses.

### Application deadline extended for Class A LPTVs

The Commission extended the deadline for eligible Class A LPTV stations to file license applications to 90 days after issuance of an order on reconsideration of the agency's LPTV Class A licensing rules. This could extend the deadline into late 2001.

Pursuant to an April 4, 2000 Report and Order that implemented the Community Broadcasters Protection Act of 1999 (CBPA), LPTV stations became eligible to convert from secondary status to the new Class A protected class created in the statute if the following was met during the 90 days preceding

the date of enactment of the statute:

(1) The station broadcast a minimum of 18 hours per day; (2) the station broadcast an average of at least three hours per week of programming produced within the market area served by the station, or the market area served by a group of commonly-controlled, low-power stations that carry common local programming produced within the market area served by such group; and (3) the station was in compliance with the Commission's requirements for LPTV stations.

In addition, the station must be in compliance with the Commission's operating rules for full-power television stations from its application date for the Class A license.

Licensees intending to seek the Class A designation were to file a certification of eligibility with the Commission no later than Jan. 28, 2000. Those licensees that filed timely certifications were to be allowed to file Class A applications up to six months after the rules adopted in the order were effective. This was on June 9, 2000, making the original application deadline Dec. 11, 2000. At the time, the Commission felt the six-month time frame was reasonable and provided ample time for eligible stations to prepare and file their Class A license applications. However, the Commission received several petitions for reconsideration that raised issues regarding everything from eligibility requirements to interference and other engineering issues.

In order to give eligible LPTV licensees adequate time to prepare and file their Class A license applications consistent with any clarification or rule changes that may be adopted on reconsideration, the Commission has extended the filing deadline until the issues raised by the petitioners have been resolved. ■

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



Send questions and comments to:  
[harry\\_martin@intertec.com](mailto:harry_martin@intertec.com)

## Dateline

On or before April 1, 2001, stations in the following states must file their biennial ownership reports with the FCC: Delaware, Indiana, Kentucky, Pennsylvania, Tennessee and Texas.

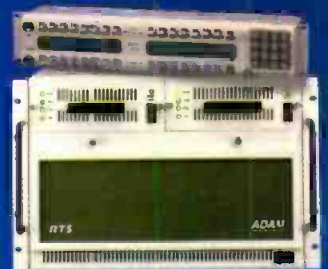
April 10, 2001 is the deadline for all stations to place in their public files their problems/programs lists and quarterly Forms 398 (Children's Programming Report) for Jan. 1-March 30.

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## Set top boxes uncovered

BY JIM BOSTON

It has recently been said that set top boxes are the next hot Internet appliances. Some would argue a killer app is also required to make the set top box (STB) pervasive. Set top boxes today have a wide range of architecture that designers can choose from. Some rely totally on hardware and firmware while others take a polar opposite approach by implementing what increasingly looks like a classic PC. Many are in between, using ASICs to implement DSP-like functions with a microprocessor interface to accomplish the required tasks. Part of this diversification is due to the fact that the market is divided into three parts depending on the type of network: satellite, cable and terrestrial. No matter what approach is taken there are similar functional blocks in every STB.

### Input

The input to the STB differs based on what transport mechanism delivers the data to the box. DTV requires 8VSB demodulation (at least for now), DVB needs COFDM

decoding, cable needs QAM, etc. Many today can handle more than one flavor of modulated data. Up front though, regardless what the RF modulation looks like, is usually a tuner/channel equalizer ASIC.

set of PES (at least one video PES and one audio PES) based on information found in the program allocation table (PAT), which vectors the decoder to the proper program map table (PMT). The PMT lists

**Actually, there is no technical reason why a broadcaster could not install a personality in an STB that looked out for the interest of the broadcaster.**

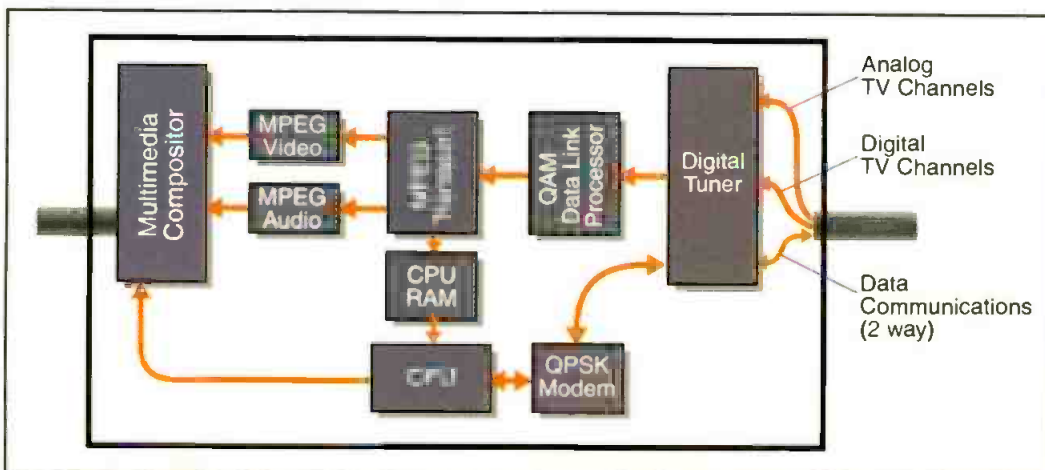
Behind that is the application specific demod, or demods, as just mentioned. Next comes the MPEG demux chip. This ASIC breaks the MPEG transport stream into its separate packetized elementary streams (PES). The desired sets of PES are then sent to an MPEG-2 decoder, which generally operates at MP@ML (Main Profile @ Main Level), and an AC-3 decoder for the audio. The decoder decodes the

all the PES that comprise a program. The STB's system controller does this. The PAT containing the various PMTs indicating the associated PES are sent no more than 400ms apart.

From the video decoder the base-band video generally passes through a graphics controller that, depending on its complexity, is also known as a multimedia compositor. (See Figure 1.) Here is where menus,

program guides and other services can be laid over decoded video. In fact many STBs today have modem ports or even network interface cards (NIC) to supply data that can be composed into a composite multimedia display that comes out the STB's video out.

Many boxes today have security sub-sections. The open cable folks like to call this section the *point of deployment* (POD) module. Non-



**Figure 1.** This simplified typical set-top box supports three types of cable signals: analog, digital and interactive digital transmission. The signals enter the digital tuner on the right, are demodulated and, if necessary, decrypted. Streams can be developed and routed to the multimedia compositor, an application-specific integrated circuit (ASIC) that develops the desired output signal format.

**Amazingly  
the gear box**  
held out to the final lap .....



scrambled information is passed through the POD module to the MPEG-2 transport demultiplexer. The POD performs decryption, authorization, entitlement and key generation. Cable STBs receive control information, application code download and electronic program guide content by tuning to an out-of-band forward data channel. These forward out-of-band channels use the 70- to 130MHz band. These channels can use ATM cell or MPEG

transport stream packet structure to transport information. The STB also sends data upstream via out-of-band reverse data channels. The upstream channel can utilize IP packets over ATM. These out-of-band channels use QPSK modulation. Their payload rate is about that of a T1 (1.5Mb/s). The in-band channels (54- to 864MHz) are known by the cable folks as the Forward Application Table (FAT). These channels carry MPEG-2 pro-

grams. They are 6MHz wide and carry 27- or 39Mb/s via QAM.

### Rapid development

As functionality of STBs starts to increase with the rollout of interactive TV and the merging of television viewing and Internet browsing, the approach taken to control the box is rapidly evolving. Full-fledged operating systems (OS) from the likes of Microsoft, Sun and fairly new companies like Power TV have developed. (See Figure 2.) These OS have allowed an abstraction layer to be inserted between the STB hardware and the application software that runs on top. This allows for the rapid development of new applications and/or methods of STB control to be implemented quickly, and across multiple hardware layers in

**As functionality of STBs starts to increase with the rollout of interactive TV, the approach taken to control the box is rapidly evolving.**

different boxes (if the drivers are available for a particular set of hardware). To facilitate this, most OS vendors provide software development kits (SDKs) as they do for other computer OS. These kits provide the APIs (and the other software layers below) for application support. Some of these even provide multimedia-authoring tools for taking full advantage of the STBs' graphical power. They are aimed at groups trying to blend advertisements and games and to facilitate home shopping on an STB.

OS also provide logical control of tuning and network delivery methods, and will also establish and maintain



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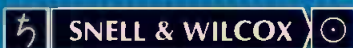
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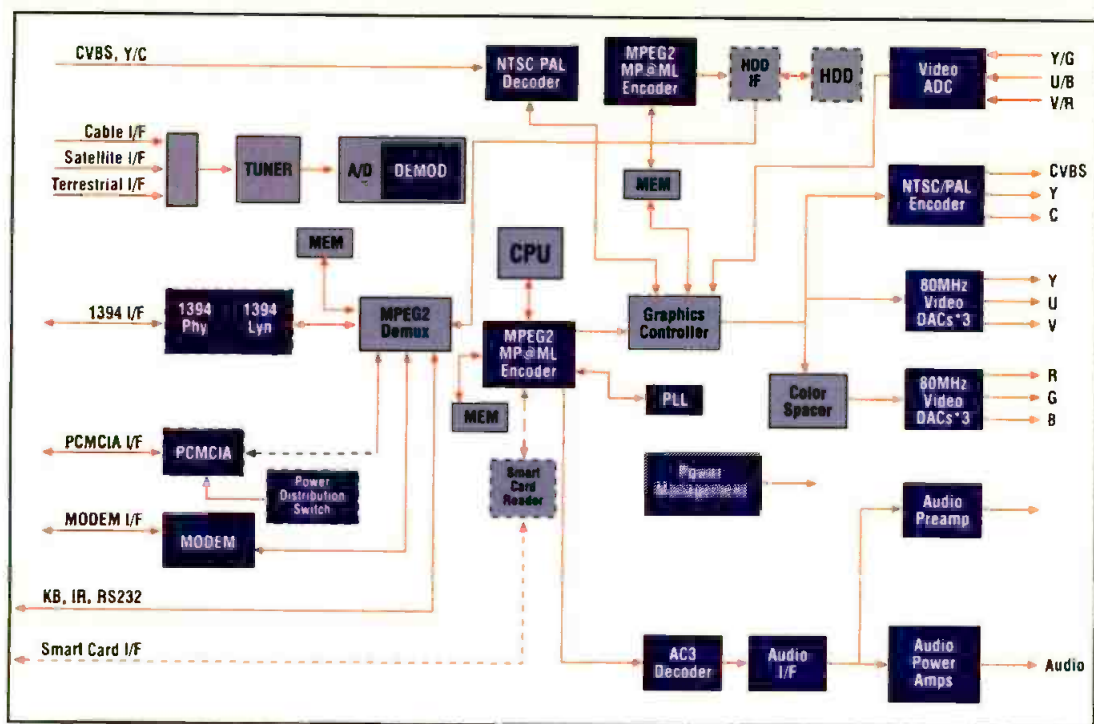


Figure 2. STBs usually rely on multiple ASICs with already well-defined roles. Note the typical ASIC technology above; DACs to drive displays, input DACs to accept external video inputs, audio drivers, AC3 decoder, 1394 interfaces and an NTSC/PAL decoder. Image courtesy Texas Instruments.

sessions between an STB as both a client and a content-provider server. The STB OS will also manage the memory in the box. In essence, a single set of hardware can take on extremely

different personalities with different applications loaded by various DBS and cable providers. Actually, there is no technical reason why a broadcaster could not install their desired person-

ality in a STB that looked out for the interest of the broadcaster.

The STB is a logical candidate for the portal into the networked house of the future. Applications that would allow the box to act as a firewall, router and hub of an internal home Ethernet are currently being developed. Boxes are currently available that have modem and 1394 (Firewire) ports. In the future, it could be technically possible to connect multiple STBs together over Ethernet or 1394. This could solve the must carry issue for both the broadcaster and the cable operator, or the local into local issue for the DBS and the broadcaster.

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

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|------------------------------------------------------|-------|--------|-------|-------|--------|-------|-------|--------|-------|-------|--------|-------|--------|
| Format                                               | A     | B      | C     | D     | E      | F     | G     | H      | I     | J     | K      | L     | M      |
| Total lines per frame                                | 1125  | 1125   | 1250  | 1125  | 1125   | 1125  | 1125  | 1125   | 1125  | 1125  | 1125   | 750   | 750    |
| Y words per total line                               | 2200  | 2200   | 2376  | 2200  | 2200   | 2640  | 2200  | 2200   | 2640  | 2750  | 2750   | 1650  | 1650   |
| C <sub>B</sub> /C <sub>R</sub> words per total line  | 2200  | 2200   | 2376  | 2200  | 2200   | 2640  | 2200  | 2200   | 2640  | 2750  | 2750   | 1650  | 1650   |
| Total active lines                                   | 1035  | 1035   | 1080  | 1080  | 1080   | 1080  | 1080  | 1080   | 1080  | 1080  | 1080   | 720   | 720    |
| Y words per active line                              | 1920  | 1920   | 1920  | 1920  | 1920   | 1920  | 1920  | 1920   | 1920  | 1920  | 1920   | 1280  | 1280   |
| C <sub>B</sub> /C <sub>R</sub> words per active line | 1920  | 1920   | 1920  | 1920  | 1920   | 1920  | 1920  | 1920   | 1920  | 1920  | 1920   | 1280  | 1280   |
| Frame rate (Hz)                                      | 30    | 30/N   | 25    | 30    | 30/N   | 25    | 30    | 30/N   | 25    | 24    | 24/N   | 60    | 60/N   |
| Interlace ratio                                      | 2:1   | 2:1    | 2:1   | 2:1   | 2:1    | 2:1   | 1:1   | 1:1    | 1:1   | 1:1   | 1:1    | 1:1   | 1:1    |
| Divisor                                              | 1     | N      | 1     | 1     | N      | 1     | 1     | N      | 1     | 1     | N      | 1     | N      |
| Serial bit-rate (Gbps)                               | 1.485 | 1.4835 | 1.485 | 1.485 | 1.4835 | 1.485 | 1.485 | 1.4835 | 1.485 | 1.485 | 1.4835 | 1.485 | 1.4835 |

Table 1. Source format parameters.

LN1) with line number information in a binary code

- Two words of cyclic redundancy codes (CRC). Two separate CRCs are calculated for the luminance data

The capacity for carrying ancillary data varies from format to format.

(YCR0 and YCR1) and color difference (CCR0 and CCR1)

Figure 1 shows details of the horizontal blanking interval for the luminance (Y) channel. Note that the capacity for carrying ancillary data varies from format to format.

Figure 2 shows a conceptual block diagram of an HDTV serializer. The serializer performs several functions:

- Each of the two bit-parallel datastreams is fed to a co-processor that inserts line number and CRC data. An additional co-processor may be used to insert ancillary data.
- The formatted bit-parallel datastreams feed a multiplexer. The two 74.25Mwords/sec bit-parallel datastreams Y and C<sub>B</sub>/C<sub>R</sub> are multiplexed word by word into a single 148.5Mwords/sec 10-bit parallel datastream in the order C<sub>B</sub>, Y, C<sub>R</sub>, Y,

C<sub>B</sub>, Y, C<sub>R</sub>, Y and so on as shown in Figure 3. In this drawing the first row shows details of the horizontal blanking interval of the Y datastream. The second row shows details of the multi-

plexed C<sub>B</sub>/C<sub>R</sub> datastream. The structure of the multiplexed Y,C<sub>B</sub>,C<sub>R</sub> datastream is shown in the bottom row.

- The output of the multiplexer feeds a parallel-to-serial converter whose output is an nonreturn to zero (NRZ) coded bit-serial datastream with a 1.485Gbps bit rate.
- The NRZ bit-serial signal feeds a scrambler that randomizes long sequences of zeros and ones.
- The scrambled NRZ datastream feeds an NRZ-to-NRZI converter, which converts long runs of ones to transitions, thus further helping the

clock recovery process in the receiver.

The digital representation of analog video signals results in a specific number of samples per total line and a smaller number of samples per active line. The difference between the total line duration and the active line duration is an analog television legacy related to the necessity of formatting and transmitting an analog horizontal as well as vertical synchronization signal to ensure a correctly timed reproduction of the picture. Component digital television replaces the analog synchronizing signals with TRS. The

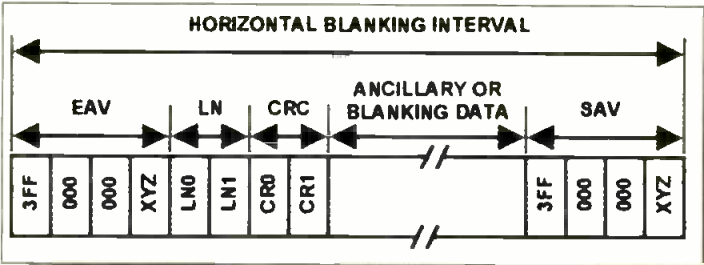


Figure 1. Details of the horizontal blanking interval showing the position of the line number and CRC data (luminance channel shown).

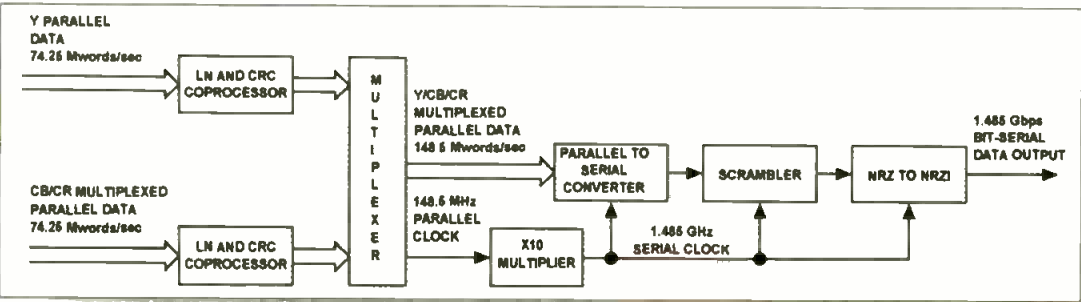


Figure 2. Conceptual block diagram of HDTV serializer.

EAV and SAV TRS have a duration of four words each or a total of eight words ensuring proper synchronization of the digital video signals. This leaves a considerable quantity of unused words in the horizontal and vertical blanking intervals for other uses such as the transport of ancillary data.

Source format D has a total line duration of 2200 samples, of which 1920 are active. This leaves 2200 - 1920 = 280 unused samples in each



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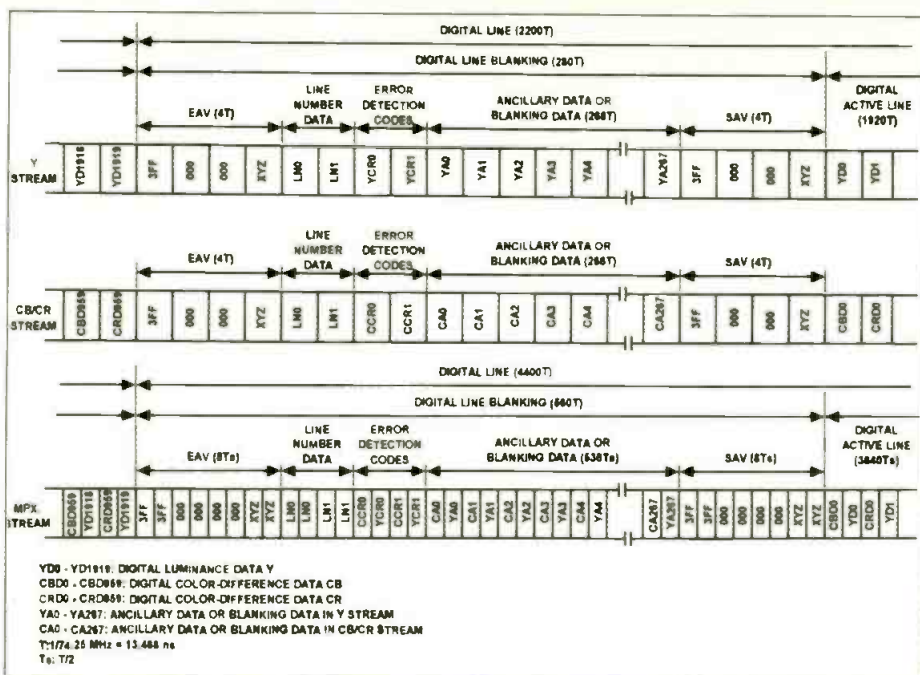


Figure 3. Formation of Y, CB, CR multiplexed datastream from separate Y and CB/CR datastreams.

of the two datastreams (Y and C<sub>B</sub>/C<sub>R</sub>). As shown in Figure 3, the combined EAV, line number data (LN0 and LN1), error detection codes and SAV data amount to 12 words, leaving 268 Y words (numbered YA0 to YA267) and 268 C<sub>B</sub>/C<sub>R</sub> words (numbered CA0 to

CA267) available for carrying horizontal ancillary data (HANC).

The vertical blanking duration is 45 lines for each of the two basic datastreams. Each active data line has a duration of 1920 Y data words (numbered YD0 to YD1919) and 1920

multiplexed C<sub>B</sub>/C<sub>R</sub> words (numbered CBD0 to CBD959 and CBR0 to CBR959), which can be used to transmit vertical ancillary data (VANC).

In a future article we will describe the manner in which ancillary data are multiplexed into an HDTV datastream.

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

The Second Edition of Michael Robin's book may be ordered directly from the publisher by calling 800-262-4729. It is also available from several booksellers.

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# Production room infrastructure

BY STEVEN M. BLUMENFELD

**H**elp me," screamed the engineer from the graphics suite. His 20GB file had just failed to transfer twice to the post room storage, and Bobby, the editor, was screaming that our network sucks and it is nothing like the one at ABCD Productions. "Who created this garbage network anyway—a bunch of monkeys?"

Believe it or not, I recently heard a similar conversation as I was touring a friend's facility, looking at their new DVD production suites. Once we were out of the fray, I turned to him and asked what was going on. To me this looked like a new facility. After he gave me the history of the place — very interesting, it was actually an old firehouse — we got down to the network question.

I discovered that because of the way the facility's network had grown up over the years, it was actually a collection of networks as opposed to a single cohesive link. Sure you could move files around, but in the worst case they went from an Appletalk network through a gateway to a switch out to a router then to a hub and finally to an artist's desktop. He had a mix of twisted pair, coax, Fibre Channel, 1394 and a Gigabit Ethernet switch they had just gotten in. What a mess! Does this sound familiar?

Networks that were once built to carry text are now being required to carry everything from graphics to real-time interactive HDTV. Walk into any post production/production room in the world and you'll see more computers than cameras. Whether video is initially created in digital format or not, digitization is a key part of virtually every production and post production process. We once thought Appletalk could do it all, only to find out that 10 Base-T is useless and 100 Base-T is not much better. Gigabits Ethernet and ATM switches are where post production networks are happening today. More and more, our post

networks are looking a lot like high-end telephone company backbone providers.

So my friend saw me snickering as he was explaining all this and asked if I had a suggestion. In my most obnoxious voice I said "Throw it all out and start over." Of course management would not think of throwing out the device they paid \$100k for, even if it is nearly worthless today. They figure, why should they if it isn't broken?

The challenge here was to take an overall view of the facility. We looked at their technology plan (amazing that they actually had one, but all facilities should) and where their customers were going to take them in the future. There seemed to be a growing need for more high def and even wide area connections to a planned remote facility and external partners.

So, over the course of the next two days, we worked out a plan to better utilize what equipment he already had and put a proposal together to migrate to a unified network. The first thing we did was segment his production processes into "islands" mainly based

on bandwidth needs. This was actually quite obvious once we had a clean sheet to work with.

So we drew out a 100 Base-T Ethernet network for the mostly ProTools audio suites, using existing equipment around the facility. This included a 16-port switch and a number of hubs. We dedicated three ports for each of the four audio rooms and added a dedicated 16-port hub for each room (a total of 18 ports per room). The remaining four ports were saved for gateway functions.

The DVD room was already a self-contained network based on Gigabit Ethernet so we left it alone.

Next were the mighty editing suites — mostly digital equipment, but still with a little bit of analog gear just to make the old timers feel at home. This is where we actually had the most trouble. There was a lot of dedicated gear with dedicated interfaces and protocols, media file servers, NLEs, routers, switchers (the video kind) and effects boxes. Here he had Fibre Channel for the media servers, Ethernet and ATM for the NLEs and effects,

## Media 100's iFinish4

Media 100 recently announced a streaming media production system for Windows 2000, iFinish4.

iFinish4 is an interactive streaming media solution optimized for corporate networks. The package enables creative professionals to develop high-quality interactive streaming media (video and audio) content for delivery on the Web. Web designers can create content with which viewers can directly interact using EventStream, which allows them to embed interactive instructions directly into streaming media programs to trigger highly visual, content-rich capabilities, including graphics, Flash animations and Java applications — all synchronized with the video on the site.

Designers can define hot spots, URL flips and chapter marks that allow viewers to interact with the stream by clicking on objects to gather information, launch related websites from the video or even purchase items depicted in the content. Such capabilities are advancing interactive online advertising and e-commerce and raise interesting questions about revenue models for broadcast stations looking to generate revenue from streaming their content.

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# LDS Conference Center

By David George and Phil Livingston



Three views of The Conference Center across from Temple Square in Salt Lake City. The images throughout were captured from tape or live broadcast using an AJA video capture card.

The recently completed center of worldwide activity for The Church of Jesus Christ of Latter-day Saints includes a nine million cubic foot world-class Conference Center featuring a 1.5 million square foot, 22,000-seat main hall equipped with HD, SD video and audio facilities. The same systems also service a 900-seat theater that is a part of the center.

This project was unique in several technical respects, quite apart from its sheer physical size, which in itself presented significant economic and technological challenges. For example, live operations support simultaneous program dissemination in 60 languages. The studios are live-theater in nature and the main hall is among the largest and best equipped in the world. All command an audiophilic state-of-the-art level of audio production and a similar level of excellence in video quality. Production in the center is distributed to literally millions of people worldwide, demanding fault tolerance and backup protection. As valuable Church history, the system also requires formatting and performance designed to support archiving in perpetuity. Live video programming from the center is produced simultaneously in both SD and HD while a third video path adds sign language as part of both distant and

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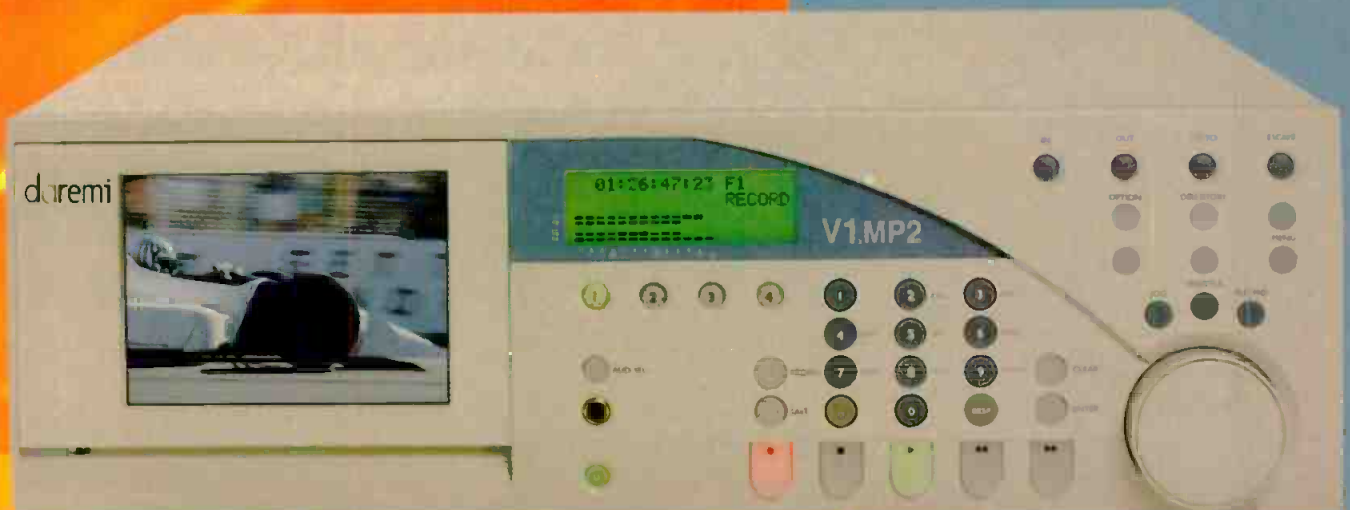
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would then be handled in the digital domain, including all facilities in the path from podium microphone, production audio, language control, routing switcher, campus distribution and master control right through to the inputs of the Divicom audio multiplexers for satellite transmission.

In the video control areas, all Dolby 5.1 surround audio monitoring is done

systems are provided and aspect ratio is switchable in all applications. The available VTR formats are HDCAM 24p, HDCAM, Digital BetaCam, BetaCam SP, DVCPRO, DV and S-VHS. Sony BVE9100 editors have RS-422 machine control routed to all necessary machines through the 64x64 router in the Technical Operation Center. Leitch HD

HSM 1600 DAs were employed exclusively for the wide number of splits required. An offline Avid room also has routable access to video and audio sources, and tape duplication is done with 60 Sony SVO 965 units.

Over 150 camera fiber drops were required to support activities in the main hall and theater, the studios, remote truck dock and existing campus studio facilities within Temple Square and the Church Office Building. Cable lengths were up to 2900 feet, and many would have required rewiring for HD if implemented in SD triax. As there was little difference between the pricing of SD and HD cameras, the decision was made to proceed with HD cameras now, rather than in the near future. However, a

small triax infrastructure was also installed to satisfy the potential requirements of visiting mobile production units.

The resultant design provided for twelve Sony HDCU-900A CCUs to power the HDC900/HDC950 cameras. These cameras provide 1080i video and are HD/SD and aspect ratio selectable. Many of the associated lenses are 60:1 to maximize coverage and to minimize the intrusive presence of the cameras. Up to six Vinten robotic heads are utilized including three fixed-position robotically raised pedestals that can extend to fifteen feet. Other robotic heads were installed in the theater in the LDS Church Office Building. From within the camera control room, robotic interfaces extend throughout the serviced areas into the main hall, the Church Office Building and Tabernacle. Monitoring for the four operating position SD and HD scopes and monitors is switched from an SD/HD Sony DVS-V322M/HDS-V322. Together these facilities ensure that video emanating from this room is of the highest quality.

Because the main hall makes it difficult for photographers to obtain good close-up photos during events, two HD workstations with AJA HD-NTV capture cards allow high-resolution pictures for

## Live operations support simultaneous program dissemination in 60 languages.

by routing Dolby E signals to Dolby decoders. Monitoring levels and speaker selection is operator-selectable via switchers located in the main control deck.

### Video

Notwithstanding the emphasis on audio, video quality was no less a concern. The live and post-produced programs are produced in a 16:9 aspect ratio, in both the HD and SD production rooms. These two rooms mirror each other and share a companion audio live/post production facility. Both rooms have nearly identical monitoring and the same control surfaces for ease of functionality: Sony BKDS7026 and HDS7000/DVS7250 production switchers with HDME700/DME7000 DMEs. An Evertz 7750 SRG-HD provides the tri-level sync signals necessary to properly lock the production room to the rest of the plant. There are several hundred Sony monitors in the facility, including BVMD32E1UW and BVMD24E1UW production evaluation units, and PFM510A1UW plasma screens. Pinnacle Lightning 500 still stores and Deko character generators round out the production equipment complement.

Full tally and control



One of two virtually identical Video Production Control Rooms. Room 1 is high definition, Room 2 is standard definition. Both rooms feature Sony BKDS7026 and HDS7000/DVS 7250 production switchers with HDME700/DME7000 DMEs.

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printing and Internet posting. Image display for either side of the main hall and for the theater is provided by Digital Projection Lighting ISSX units.

### Routing

The need for flexibility in use of the control rooms and campus feeds led to the routing of signals directly to all areas, rather than buffering each video source with distribution amplifiers, so as to support daily changes in individual facility usage. This decision, combined with the need to service many remote campus locations, dictated a large overall routing capability. Additionally, as program content evolved to include HD production, video layers for distributing both SD and HD were required.

Output program distribution consists of the main NTSC (continental American) feed and a time-delayed PAL (European, Pacific Rim etc.) feed as well as a backup stream flexible enough to cover for either one. Lighthouse Digital Systems provided the video router,



The Euphonix C-5 systems in the two Production Audio Control Rooms provide a base from which all originating sources can be 24-bit and support up to a 96kHz sampling rate for live and post production.

None of these requirements is static, and most change with each individual broadcast.

The Lighthouse OZ audio router operates without crosspoints as a full DSP router with a maximum I/O capacity of 2048x2048. All analog and

tively equal, AES pairing is eliminated and each AES channel can be treated as having stand-alone content. The OZ essentially replaces the function of system A/D or D/A by applying the source or destination audio format to the router I/O of choice.

The OZ router DSP can also multiplex any of the individual channels and group them into 56 or 64 channels in a MAD1 format. Lighthouse rate converts to create the 24-bit, 96kHz sampling that the Euphonix production audio consoles can process. This router's ability to multiplex 64 channels of audio and transport them via MAD1 streams made it possible to realize significant economies in language system cabling. For example, a satellite switcher can be placed at any remote site, connected via coax or fiber, and

---

## As a result of the digital signal processing, all channels become effectively equal.

---

utilizing non-reclocking crosspoint technology. Their 622Mb/s SD router handles and directs SDI (at 143-, 270- and 360Mb/s), FDDI and data. The HD router is used for HDTV, Fibre Channel, SONET and SDI distribution.

Audio programming is unique in that the three program streams each have up to 60 associated languages. LDS specified that each of the three feeds should be content agile and that it should be able to assign different language complements to each output line. This required that a very large salvo switching capability be implemented. Master control salvo presets could employ up to 180 AES channels, with a similar complement switched to main and standby. Language multitrack recording required another 120 router outputs, in addition to campus feeds. With most campus locations still requiring analog audio signals, format agility and full breakaway capability, several more AES channels were required.

digital formats are placed in memory along with digitized audio, TC, and RS 422 or any other control format. Essentially, any channel can be accessed by any other channel, regardless of format. As a result of the digital signal processing, all channels become effec-



A portion of the 60 Sony SVO 965 duplication decks in the Central Equipment Room.

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operated as a 32x32 or 64x64 AES, or in any preferred 16-channel group. The satellite feed can be developed with structural blocks of 64 audio channels at a time. Lighthouse Satellite MAD1 (SMADI) handled the

system and two different types of control panels, in addition to the JAVA based control system for router programming. Changes in the design of the video router and extension of the capacity of the audio router made the delivered system unique. Nevertheless, it was delivered on a Friday, bolted into racks and attached to waiting cable systems that had been pre-built in the AZCAR plant in Markham, Canada.

The hook-up was completed in one day, the Lighthouse commissioning team performed full testing and departed on the following Friday, leaving a fully operational 256x256 SDI and 2048x2048 AES router that fits into just two 7-foot racks.

#### Intercom

Bob Breitenbeker established the LDS intercom specification early in the preliminary design process and clearly

placed the goals of the theater design requirements into perspective. Theater environments employ extensive party-line systems that extend well beyond the usual broadcast studio applications. Typically, the theater staff prefers to share few channels, while broadcasters like quieter lines with specific addressing and control. In addition to typical broadcast needs, LDS needed separate party-line structures for two theaters and extensive interfaces to theater paging, wireless IFB, two-way radio and existing intercoms within their own campus, as well as communications with the local TV station.

While the use of digital matrices, with their simplified wiring, was considered, the requirement for full-bandwidth audio led to the choice of a ClearCom Matrix III to provide all necessary interfaces. Excluding custom panels, all of the equipment was provided off the shelf from ClearCom, and programming and training, like the system, proved trouble free.

Seldom have the full capabilities of any similar system been exercised by broadcasters to such an extent. Seventy-two

## Theater environments employ extensive party-line systems that extend well beyond the usual broadcast studio applications.

requirement for transporting 60 languages in streams gracefully and provided the capability of transporting blocks of channels to MAD1 inputs on the Euphonix, although the Euphonix multiplexers themselves provided enough I/O overhead to satisfy current production needs.

The large-scale salvo-switching requirement, within a continually changing needs environment, demanded a custom-designed control

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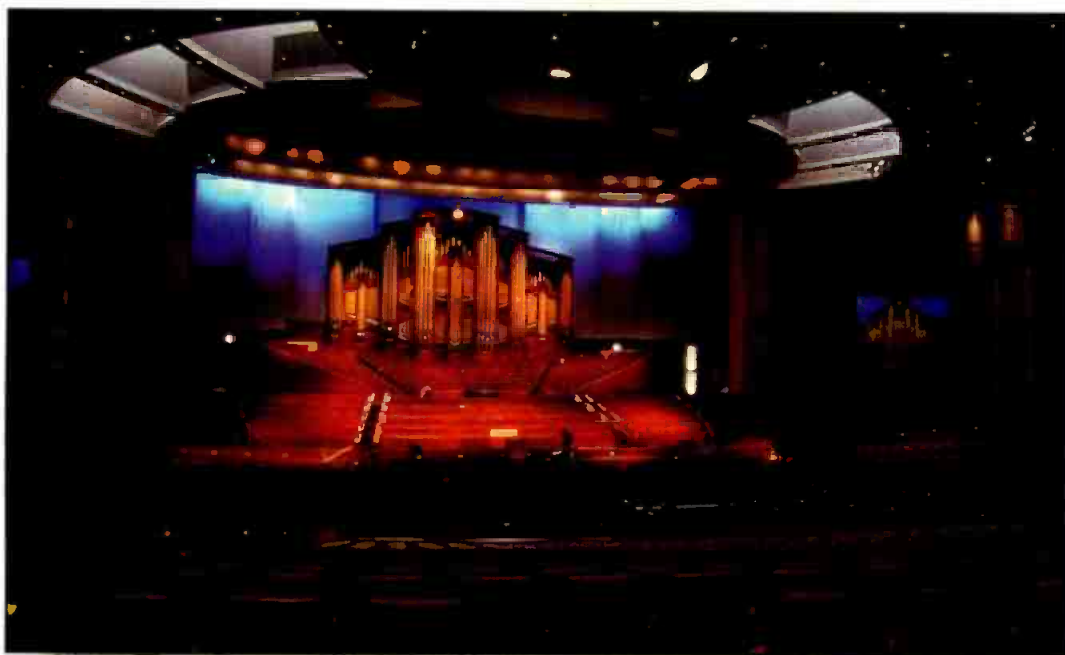
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Broadcasts from the 22,000-seat Main Hall are disseminated worldwide as well as archived as Church history, requiring formatting and performance designed to support archiving in perpetuity.

ports of the 200x200 matrix were occupied with intercom stations. An additional 20 ports were employed to service the party-line structures, while 10 more served the IFB groups. Another 20 ports serve cameras, two-way, paging, telephone, truck interface facilities, and intercom interface for the Tabernacle and communications with KSL-TV, the local NBC affiliate.

In each of the three main party-line structures eight programs are switched to any number of drops creating a party-line structure consisting of over 178 separate drops, with different configuration assignments. All of these were placed on custom-made panels with custom engraving provided by Bittree, with a fit and finish that was both functional and complementary to their elegant environment.

#### Master control

The master control system is also unique. There are three program streams of SD video, each including 60 channels of audio. The first program transmits live to Continental North America; the second is a PAL-converted, time-delayed stream intended for off-continent use. The latter stream typically originates from videotape recorded earlier, but the language complement may not be the same as that of the earlier program and plays back from a bank of synchronized PCM-800s.

The third stream is operated as a backup for either of the other two, together with any language mix necessary and is switched in concert with the real-time live content.

Standard master control processors have considerable bus structure requirements and usually have limited capability for audio channel processing. This application required a digital system that would provide single channel mono audio to support the multi-language requirement. No such switcher being available, Bytheway also designed a full breakaway AES switcher/processor made up of 6x1x4 modules that process the AES inputs as discrete audio channels with mixing capability and typical cross fades and on air control functions. This is a primarily GUI controlled system, although each program language channel can be switched manually from the front of the processor. It also has the additional feature that it can store a short audio program and repeatedly play it out for ID and test purposes.

A complementary 7x1 video switcher provides for the limited video switching necessary. Typical preview, program and clean feed outputs are included with limited titling inserted by Leitch downstream keyers into the largely pre-produced programming. As such, a single program bank is configured with one video processor and 15 audio processors. This necessitated the

networking of 48 individual processors for the switching of three video streams and 180 audio channels from the GUI interface.

As can be seen, the newest LDS facility in Salt Lake City is impressive on many fronts. It required, involved and crossed many disciplines, technologies and techniques. Indeed, those companies and individuals that were privileged to be drawn into the project can be proud of the new systems, structures and services that their work has made possible. ■

*David George is a director and senior consultant, and Phil Livingston is vice president, technology of AZCAR. John Jay, project manager and Joe Langel, project engineer, also contributed to the article.*

## Project team

Legacy Constructors,  
General Contractor

### LDS

Loren Ashcraft, Director of  
Broadcast and Event Services

Terry Lamb,  
Broadcast Services Manager

Bob Breitenbeker,  
Management Level Liaison

David Bytheway,  
Primary Conceptual Designer

Audio, video and broadcast  
engineers: Milo Lefler, David  
Salmond and Del White

### AZCAR

John Jay, Project Manager

Joe Langel,  
Project Engineering Lead

Andre VanKesteren,  
Director of Engineering

Greg Martin,  
Project Documentation

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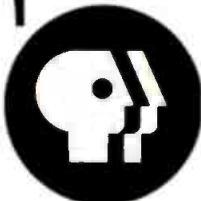
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# WVPT



## Renovated Digital Station

By Tony Mancari Sr.

WVPT-TV is the PBS station for the Shenandoah Valley and Charlottesville, VA. The station serves a total population of about a half-million in 22 rural counties with instructional programming, award-winning local productions, and high-profile community outreach activities.

While recognized for many years as a local leader, WVPT-TV has quickly gained statewide and even national exposure for its aggressive campaign to begin the transition to standard definition and HDTV formats. As such, this PBS station is among the first trailblazers to enter the digital realm in the state of Virginia.



Leitch digital synchronizers were used as bi-directional tie lines between the analog routing switcher and the new Pro-Bel 128x128 SDI router and master control switcher.

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IMAGE A



IMAGE A

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### The planning

Although WVPT is a small market station, covering the DMAs of Harrisonburg and Charlottesville, the management team was determined to think big from the start to ensure that viewers in this region have access to the same DTV technology and innovation found in larger markets like Los Angeles or New York.

Engineering contacted its counterparts at the other PBS stations in Virginia

determine very early on what you plan to hand off to your neighbors: NTSC, serial digital, or HD compressed to 45Mb/s on a microwave or satellite?

Working with WVPT's Director of Development, we developed a case statement for local fundraising. It was important to state our needs for our capital planning so we could begin to actually realize the funding necessary from our local supporters.

We were determined not to sit back

began to craft a five-year business plan to put us on the road to digital.

### WVPT's DTV team

WVPT formed a DTV team, made up of senior staff, to focus on all aspects of the planning. We conducted lengthy discussions with key personnel inside the station. What came out of the next few months' worth of meetings was quite exciting.

Everyone at the station developed a clear vision of how DTV would affect their department, their customers and our viewers. Each manager had excellent ideas and comments regarding possible program offerings and individual services. Each also had many outstanding ways to make this new unfunded federal mandate work to the good of WVPT viewers. We began to think in terms of "bits is bucks," and how we should divide our 19.39Mb/s bitstream.

Because our goal was to build a facility that all departments will eventually use, we needed honest discussion and communication with all requirements stated. It really is up to you as a director, chief, or DTV superman

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We quickly decided to move full speed ahead with our transition planning and began to craft a five-year business plan to put us on the road to digital.

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and began working with them to learn how their conversion plans were progressing. We needed to decide if any group purchases could be made and what interoperability was needed between stations. It is important to

and let the big commercial stations have all the fun – a decision was made that we would be a leader in the local market and begin our conversion early. We quickly decided to move full speed ahead with our transition planning and

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Rear view of routing rack.

### Answering the right questions

Obviously, in order to specify, design and eventually install a new broadcast facility to replace our 30-year-old technology, we had to think outside of the box. Engineering management held several lengthy conversations, discussing every possibility from every angle. During subsequent meetings, we discussed our options even further.

Numerous questions began to arise from those meetings: Is it possible to build a facility capable of standard definition multicasting with data

delivery during the day and deliver high-definition video with 5.1 audio in prime time? How about going completely

digital from the time anything hits our building? What about tapeless (that is, playing back everything from a super server, rather than tape machines directly to air)? Can we co-brand each of the SD channels that leave the building? How about fully replicating the NTSC coverage area? Questions of manpower were also considered. We have two full-power transmitters and five low-power sites. It takes every engineer we have on board to maintain the studio, the transmitters, and provide support services to our customers in all other departments here at WVPT.

### Timing is everything

So how was this task to occur? Of course, a project timeline was prepared. We originally looked at completing the total project in one phase. In a best-case scenario, we anticipated local, state and federal funding would be available at once. Therefore, a 30-page RFP was issued clearly detailing what we wanted to build.

It was time to look at replacing the station's technical core routing, distribution and tape equipment, which

to make it all happen – but it can't and won't work without the support of everyone at the station.

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meant replacing aging analog cameras with switchable 16:9 or 4:3 serial digital outputs. SD cameras were picked because of the type of productions we conduct in our local studio. It makes sense for us to do field recording in HD, but not a local auction or talking heads show. We needed to phase out our existing analog switchers, CGs and linear editing rooms, and move towards the nonlinear desktop editors. In addition to a complete studio facility, we looked at a virtual studio, HD production, and even a new building technical and office addition to accommodate the needs of DTV. It is clear that you must have a road map to where you are going and you must all go down the road together. We released the first RFP and issued a due date of Nov. 28, 1998.

After reviewing the RFP submissions it was clear we had some very good proposals from the various system integrators. Therefore, we organized a small core group from around the state to take site visits of the businesses who responded to the RFP. We traveled to selected locations the integrators had recently completed, and saw some pretty amazing facilities. All were serial digital and all were completed within budget, time and equipment availability restraints.

After reviewing the quotations, we rethought our plan of attack and decided to break the RFP into two distinct phases. First, the studio plant required the renovation of existing space and conversion of several conference rooms to technical space, with the addition of an entirely new technical office space. The second phase was RF or transmission. Both phases are equally important. One area most people at the station never see, but the other everyone comes in contact with every single day. We specified all uninterruptible power sources, generators, computer floor, multicasting, embedded audio, HD-ready and capable, and the list goes on and on.

As the fundraising picture came into focus, we realized that all funding wouldn't be available at once. It also turned out my existing analog routing switcher was beginning to fail periodically. So the project was further subdivided. Knowing that the old switcher



View of the new WVPT digital master control.

and master control wouldn't make it another year, a breakaway Request for Quotation (RFQ) was issued for a new router, master control switcher, character generation and still store graphics chain. The project also included a QC point for ingestion to our existing video server and a master control QC point.

At the same time, we wanted to begin our format conversion and also have the ability to reuse any equipment that was purchased any time from fiscal year 2000 forward. This required some rather creative thinking over plans to

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divide our 19.39Mb/s  
bit stream.

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convert the existing PBS satellite receivers to digital as they entered the plant. PBS had issued an RFP for digital receivers but, to this date, no decision has been made. That meant if we wanted to receive a satellite-delivered PBS digital signal, decode it, brand it, then switch it and transport it to our site, we needed to work within available knowns.

In the end, the plant was redesigned

to meet the technical requirements, yet be easily moved to the newly renovated tech space once completed. We also wanted to ensure that each piece would build on the previously installed piece and not become obsolete before the entire project was completed.

#### Phase one

With the purchase in March of new technical core equipment and the subsequent installation and tie line interconnection, we were already prepared for DTV multicasting, analog-to-digital format conversion, and diversifying our technical operations. We have cut over to our new fully digital Chyron Pro-Bel routing and master control switcher. This new technical core features fully integrated switching and Leitch format conversion, and uses state-of-the-art embedded audio throughout the plant. We installed Inscribe character and still stores and networked both production and master control.

The first phase of studio conversion was awarded to The Whitlock Group broadcast & presentation solutions, a nationally recognized systems integrator. Their Digital Transition Team developed the award-winning bid by building a plant around the newly released universal format frame synchronizer by Leitch. This allowed us to cross convert everything as it entered or left the digital world and then reuse those pieces as required. We are currently switching everything in digital inside the WVPT



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plant and then converting it back to analog just before we feed the signal to our analog studio-to-transmitter link (STL). In the next few months, we plan to install digital capable microwave radios, allowing me to deliver a signal directly to the mountain site for both our analog and DTV transmitters. We have recently selected ADCs as our transmitter of choice for digital.

The Whitlock Group's involvement in the project, therefore, included the system design, engineering and integration of an ITU-BT R.601 digital broadcast routing and master control infrastructure. One of the most critical aspects of the project was to seamlessly integrate the new system into our station's existing analog plant. To do this, The Whitlock Group took advantage of the new Leitch digital synchronizers. The synchronizers were used as bi-directional tie lines between the analog routing switcher and the new Pro-Bel 128X128 SDI router and master control switcher. The process includes embedding and de-embedding audio as well as audio/video A/D and

D/A conversion. The project was built and tested prior to shipment to our station to ensure a quick integration and minimum interference with existing operations. In order to provide staff training, the system was initially

**It makes sense for us to do field recording in HD, but not a local auction or talking heads show.**

installed and commissioned without removing any existing equipment. Once training was completed, the master control console was moved to its final location, which allowed for a seamless transition to the new system.

The Whitlock Group enabled WVPT-TV to design, install and migrate to an

entirely digital technical core while still maintaining our current on-air program services. This was all done with absolutely no downtime. The facility has performed exactly as specified and we're looking forward to the next phase of our conversion to digital.

The project was successfully completed in July of 2000.

#### RF phase

We now have now moved to the RF phase of the project. This means finalizing our DTV transmitter, antenna and MPEG encoder purchasing decisions. We will issue the purchase orders for equipment as the funding becomes available from local, state and federal sources.

The next specific steps in the process include installing new HVAC, electrical, and the technical grounding at Elliott Knob in Staunton, VA, for WVPT-DT and WVPY at Signal Knob in Front Royal, VA. We are in the National Astronomy's "quiet zone," so we have special considerations to keep the interference low as the government listens for extraterrestrial activity.

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It currently takes approximately six months from the time an order is placed for the transmitter, transmission line and antenna to be custom built, tuned and placed on a truck for shipment to the site. We will coordinate the construction of a new 40-foot tower at the mountain site to hold the new DTV antenna. After basic site requirements such as a new concrete pad, protective fencing and site prep are complete, we will install the following components: DTV transmitter, transmitter test and monitoring, transmission line and antenna, interconnecting digital microwave STL and TSL, and transmitter remote control.

While this work is occurring on the mountain, we will simultaneously install the following equipment at the studio site: MPEG-2 encoding, PSIP generation and data delivery terminal gear equipment. Prior to live transmission on-air, we plan to conduct program tests and notify local hospitals and nursing homes of the DTV tests. Our projected on-air date is September of 2001.

#### Phase Two

Phase Two will include the installation of a 16x16 I/O super server, which talks

to air and protect channels of automation and then automatically moves data files between a long form archive and back to the server. Simultaneously, a low-res copy is made of everything on the server so promotions, QC and corporate support can all see data at their local computer desktop.

The Whitlock Group's Digital Transition Team is working with us to finalize interconnection plans and then install this new state-of-the-art equipment into our newly constructed technical operations center (TOC) once it's complete. Stay tuned for additional news updates.

Everyone at WVPT-TV is determined to bring the very best in digital technology, digital programming, and digital services to the people of the Shenandoah Valley and Charlottesville.

In the digital age, one thing remains the same: WVPT is committed to using the expanded digital spectrum and the best technology available to advance our mission of education, culture and citizenship. This is truly an exciting time for WVPT and our viewers. ■

*Tony Mancari Sr. is vice president of Engineering/Operations for WVPT-TV.*

## The Whitlock Group/ WVPT-TV Project

### DESIGN TEAM

#### WVPT Engineering

Moss Bresnahan, President & General Manager

Tony Mancari, Vice President of Engineering/Operations

Tony Barrick, Chief Engineer

John Harper, Studio Supervisor

Scott Kessler, Broadcast & p.c. network systems

Fred Bosserman, Architect, APR Associates

Ted T. Enosaki, Principal Structural Engineer, APR Associates

#### The Whitlock Group

Kévin Thompson, Division President

Greg Doggett, Account Manager

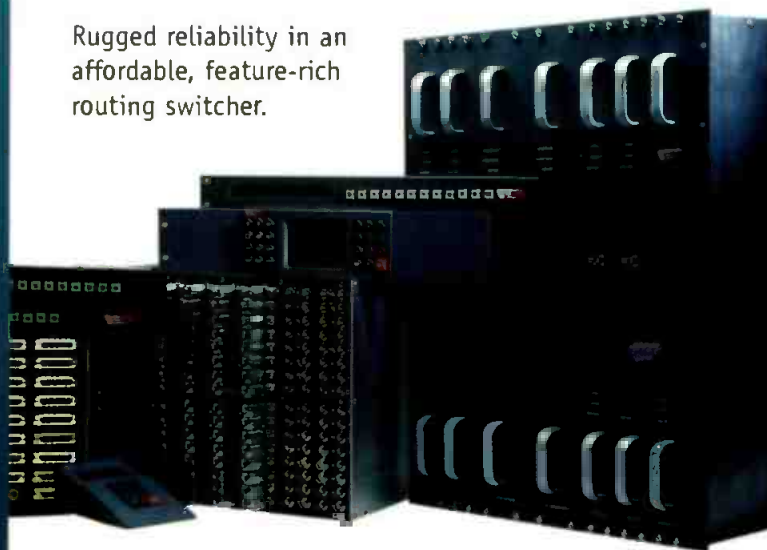
Al Vernick, Systems Sales Engineer

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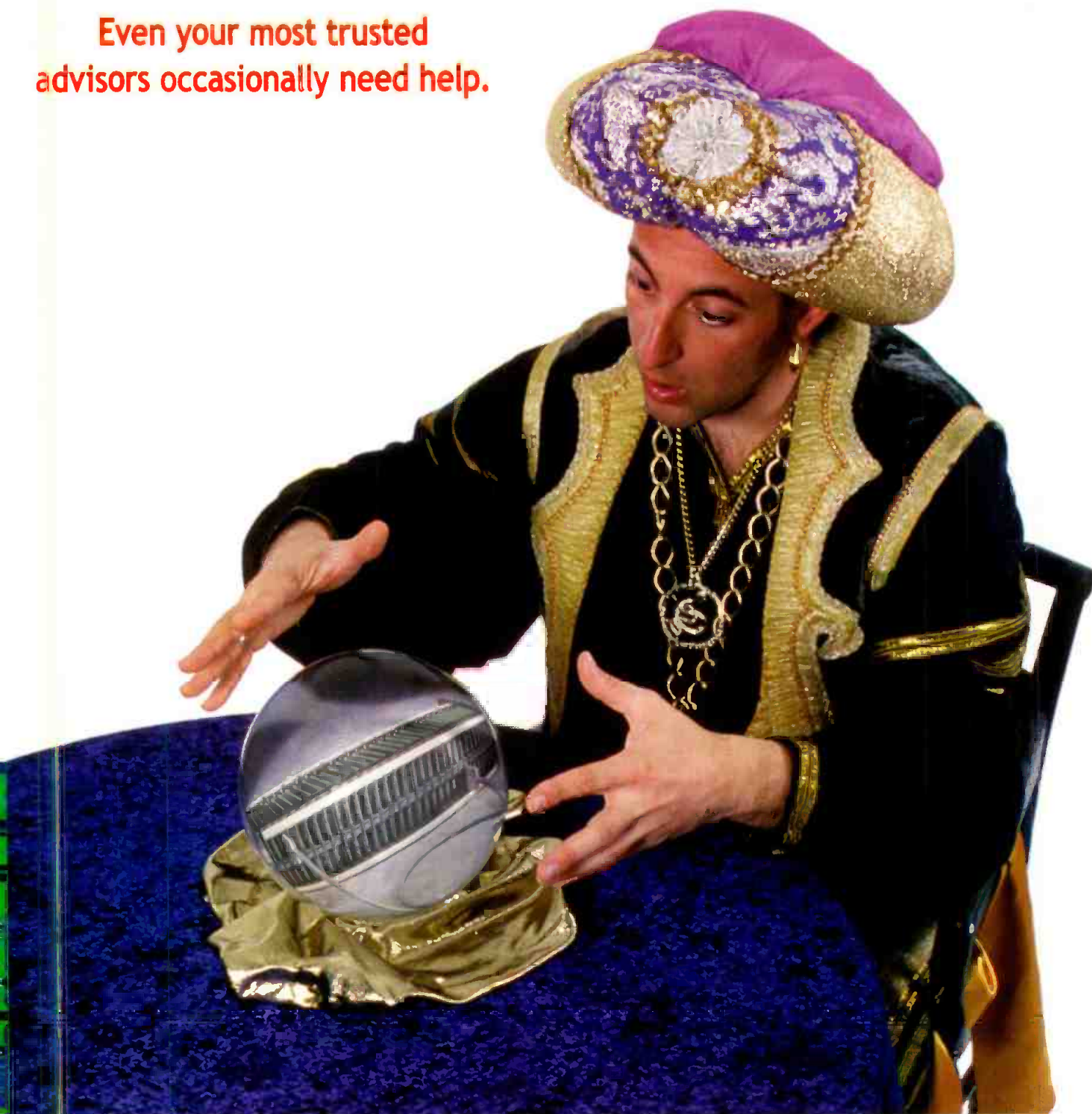
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### The STL debate goes on

BY DON MARKLEY

In what should be a quiet corner of the industry, a discussion seems to continue about systems for digital television. The argument seems to be that STLs won't work as well for digital television as they have for analog. However, the argument seems to be mainly built on fear and superstition rather than on sound engineering principles.

Some facts are evident. The systems for DTV do have a slightly lower value for power output and/or receiver threshold. This is primarily due to the bandwidth involved in such systems. Some of the manufacturers are using the same power amplifiers for DTV systems as were used in the existing analog radios. The increased bandwidth, especially in the dual systems where two signals occupy the same microwave channel, will normally lower the available power. This directly relates to the gain-bandwidth product that applies to any amplifier.

It is noted that the receiver threshold

is a few dB poorer for DTV systems. Again, the bandwidth is increased to handle the requirements of the large data capacity required. An increase in bandwidth is always accompanied by an increase in noise that in turn raises

exist in STL systems as in the main broadcast signal. Manufacturers of STL systems are making use of different modulation schemes. Some are using an 8VSB system while others are using COFDM. They have their own

**Actual elevations can vary considerably from those spewed out by the computer, especially in very irregular terrain.**

the level of signal required at the receiver if the signal-to-noise ratio is to be unchanged. However, that doesn't mean that the system will be less usable or dependable. It simply means that a little more gain must be built into the system to maintain the same fade margin and reliability.

It is also interesting to note that the same difference of opinion seems to

reasons for the methods selected and are ready to defend their positions vigorously. However, both seem to work satisfactorily in STL service, which differs significantly from broadcast signals. In STL systems, the path is carefully designed to be free from obstacles, and the signal strengths are carefully calculated at the receiving point. There are no indoor antennas, nor do antennas move. Antenna orientation is controlled and fixed. In such an environment, the differences in modulation schemes seem to make less difference in the final system performance. This seems to be more of an argument for the salesmen to pursue than for the engineer to use in system design.

The primary factors in the system design continue to be the transmitting system output power, the path, the antenna systems and the receiver sensitivity. If those criteria are properly used to design a conservative link, the system should perform as well as the older analog systems.

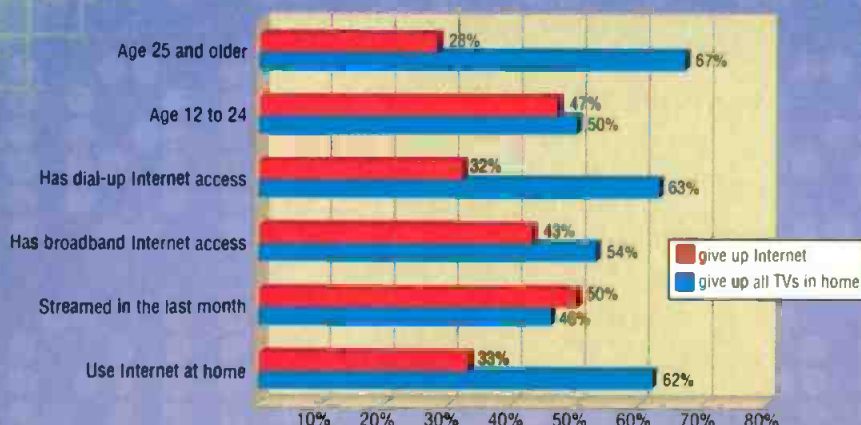
In looking at some problems that have caused STL difficulties, one problem still exists. Numerous software programs are available that will perform a path plot. These programs all make use of either a 30-inch or a three-

### FRAME GRAB

A look at consumer side of DTV.

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inch terrain database. To explain the terminology, a 30-inch database contains the elevation of terrain for each 30 inches of latitude and longitude. All other terrain points are determined by interpolation using the elevations at the corners of a square containing the point in interest. The cheaper programs

Then refer back to the latest 7.5-foot topographic maps. Using the coordinates from the computer study, identify the point that is affecting the path and confirm the exact elevation. That elevation can then be added to the computer-generated plot to check for adequate path clearance. The same applies to the exact

for normal interior temperate or northern areas and 1/8 for mountainous or very dry areas;  $f$  = frequency in GHz;  $F$  = fade margin in dB; and  $D$  = path length in miles.

Now, for the next goof – probably the dumbest of them all. The author recommended “Engineering Considerations for Microwave Systems,” published by GTE Network Systems, as a reference for microwave path planners. That book is no longer in print. If you can find one on someone else’s bookshelf, take it to the nearest copy machine. Otherwise, you are out of luck. However, other good reference books on microwave path planning are available. One is “Radiowave Propagation” by Lucien Boithias, which can be obtained from McGraw-Hill. Unfortunately, it is like most textbooks in that it tells you more than you really want to know. Yet, all of the good stuff is in there – you just have to hunt a bit.

Finally, the questions seem to keep on coming regarding STL systems. To help

## In STL systems, the issue of which modulation scheme to use seems to be more of an argument for the salesmen to pursue than for the engineer to use in system design.

usually come with a 30-inch database, as it requires much less memory. On the other hand, the better (maybe) programs use a three-inch terrain database that is much larger and more expensive. While the databases are obviously different in the interval between points, they also differ in the maps from which the data is obtained.

Database information is also available with three-meter intervals between points. That data is obviously the most accurate available and was taken from 7.5-foot topographic maps. Unfortunately, that data requires an enormous amount of space and is very expensive. As a result of all of these differences, many paths are run using a 30-inch database and are assumed to be accurate. After all, the computer says it is so and who are we to question the computer. Right? The problem is that actual elevations can vary considerably from those spewed out by the computer, especially in very irregular terrain. The author has seen errors of over 100 feet in elevations in very rough terrain or in the vicinity of large terrain irregularities such as ridges or bluffs.

The solution is fairly simple. First, use the computer program and database of choice to run the desired path. Normally, there will be one or two points that control the receiver and transmitter elevations needed to provide a path that gives 0.6 Fresnel zone clearance over the ground (don’t forget to include trees when applicable). The better programs will allow the user to identify the coordinates of such points.

elevation of the ground at both the transmit and receive locations.

If there is still any worry about the elevation accuracy, go to the point that is in question with a calibrated altimeter and check the elevation yourself. The altimeter should be taken to the benchmark nearest to the point in question and set to the elevation of that benchmark. Then go to the point and record the elevation and then transfer that to the computer plot. If all of that doesn’t work, you have really angered the terrain gods and there is no help for you.

Finally, your author has goofed (again). In a past article, the equation for determining path reliability was given as determined by Barnett and Vignants of Bell Telephone Laboratories. That equation may have been incorrectly printed. It should be as follows:  $T = a \times b \times 2.5 \times 10^{(-6)} \times f \times D^3 \times 10^{(-F/10)}$ , where  $T$  = time out of service as a fraction;  $a = 4$  for very smooth terrain including over water, 1 for average terrain with some roughness, and 1/4 for mountainous, very rough or very dry terrain;  $b = 1/2$  for Gulf Coast or similar hot, humid area, 1/4



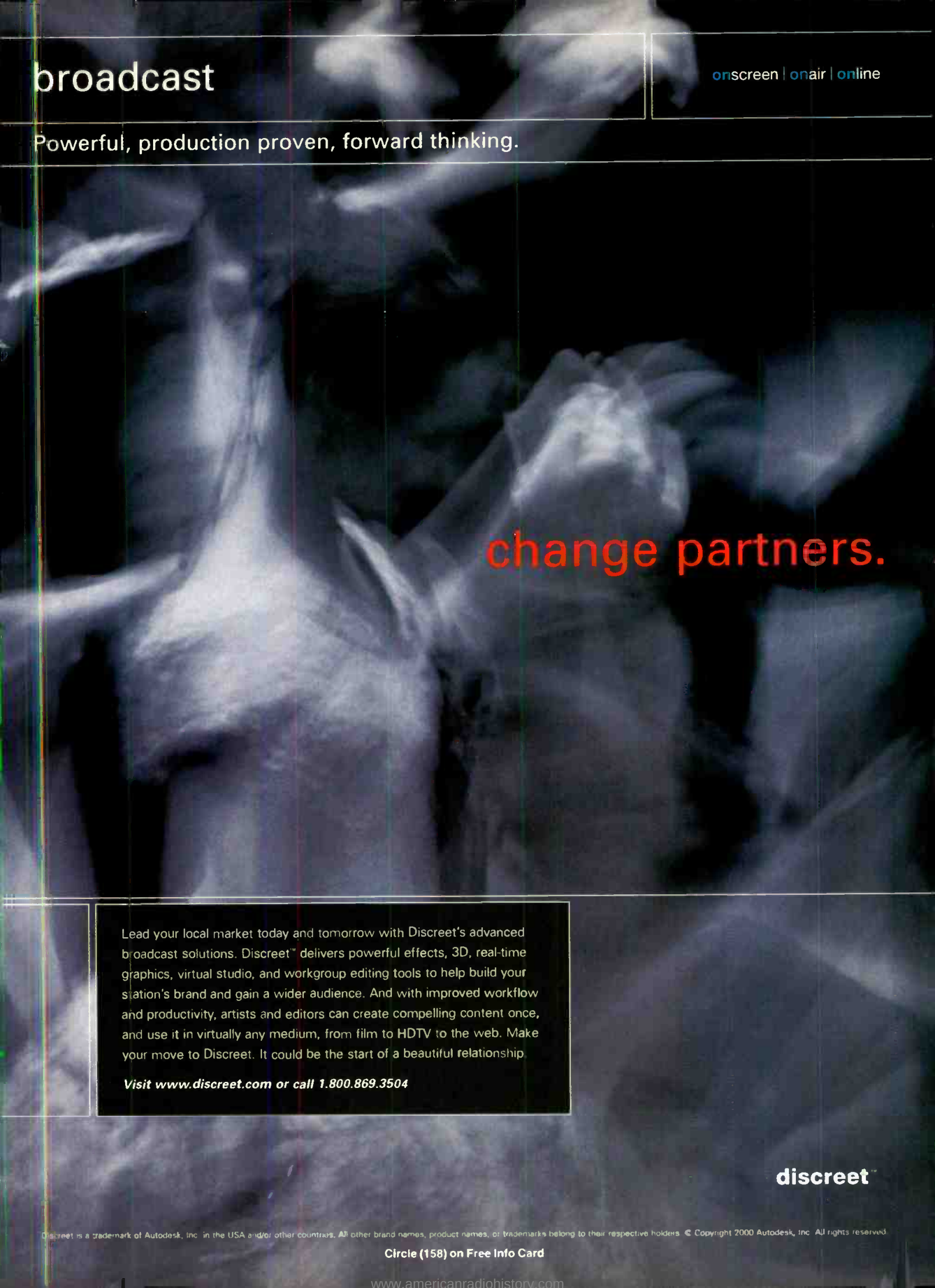
Many of today’s studio-transmitter links can handle both NTSC analog signals and ATSC digital signals on a standard STL channel. This eliminates the need for dual STL systems, and the inherent problem of needing twice the spectrum. Shown above is the Nucomm Dual Stream Plus STL system.

resolve those questions, the author offers this column as a medium to treat those issues. Let us hear from you regarding your experiences or questions concerning digital STL systems. We will attempt to either get answers for your problems or, at a minimum, offer them up for others to provide solutions based on their experiences. ■

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



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## The ins and outs of selecting a lens

BY DAVE WADDELL

**T**oday's shooters are blessed with a variety of good cameras available from many manufacturers. These cameras vary greatly in price and performance but generally all make good pictures under ideal conditions.

The most common method of selecting a camera package is to first determine which camera is most suitable for the job and falls within a certain budget. This is sound reasoning; however, what is often forgotten is the lens can be — and often is — a major mistake.

For standard definition ENG/EFP cameras, lenses generally fall into three categories: package lenses, professional grade and broadcast grade lenses. The first and least expensive is the package lens. These lenses come packaged with the camera are generally designed to be just good enough to get by. Optical quality is marginal at best, and the mechanical aspects of the lens do not hold up well over an extended period of time. These lenses should be the choice for entry-level applications or for a situation where the camera and lens are expendable.

Professional grade lenses are the next

step up and offer higher optical quality and much better mechanical strength. These lenses perform quite well in most applications and under moderate shooting conditions. Unlike the package lenses, professional grade lenses are available in various zoom ratios and focal lengths. In addition to more options, there are accessory items such as wide and telephoto converters and studio zoom and focus controls available. Professional grade lenses are designed for the mid-range cameras and, if taken care of properly, will give many years of good service.

Broadcast grade lenses are top-of-the-line in both optical quality and mechanical strength. They are designed to enhance the performance of the best cameras and to offer many years of reliable service under the harshest of conditions. News and production crews worldwide use broadcast lenses on virtually every kind of production. The newest broadcast lenses offer digital servos for faster, more precise zooms, and other digital features include quick zoom, cruise zoom, one-shot preset and RS-232 interface for remote control of

zoom, focus and iris. When your liveliness depends on your equipment the broadcast grade lens is the only choice.

Camera manufacturers are currently offering dual-format products. These cameras allow the operator to choose between the long-time standard (4:3) and widescreen (16:9) aspect ratios. A sometimes-overlooked fact in most dual-format cameras is the loss in angle of view when in the 4:3 mode as compared to a standard 4:3 camera. This results in an image that is approximately 20 percent narrower than normally expected. For example, a lens with a focal length of 8mm on a standard 4:3 camera would exhibit an effective focal length of 9.6mm on the dual-format camera in the 4:3 mode. This can become a real problem if you are accustomed to shooting at the wide end of the zoom range. To correct these phenomena, there are lenses with built-in ratio converters that are easily switched in and out as needed to correct for the 20 percent difference in angle of view. Lenses with the built-in ratio converters are available in both professional and broadcast grade products.



Camera Four, shown here at the Meadowlands in East Rutherford, NJ, is situated behind the end zone and mounted on a tripod high in the stands. Camera Four is a Panasonic AQ-7200 studio camera with a Fujinon HA66x9.5 BESM high-definition lens.

### Studio and field lenses

Both studio and field lens technology have made steady progress in the past few years. Studio lenses have become wider and field lenses longer. Present-day studio lenses feature focal lengths from 7mm to 168mm, while field lenses have gone from a standard 55X to an astounding 87X with focal lengths exceeding 2200mm.

Studio lenses are designed for close-up work with a minimum object distance (MOD) of less than three feet. The typical operating distance in an average broadcast news production is six to 10 feet. Because it is necessary for the anchor to read the teleprompter, any greater operating distance is usually prohibitive.

Field lenses are typically used for



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sporting events and large stage productions where camera placement is often a great distance from the action. Minimum object distance (MOD) of these lenses is typically in excess of six to 10 feet, rendering them useless in normal studio applications.

### HDTV lenses

HDTV has been around in various forms for many years. However, until recently few pioneers were brave enough to purchase HD equipment. That is rapidly changing and has had a great impact on lenses. Contrary to some rumors, HDTV lenses are not handpicked from the NTSC production line. HDTV lenses are the result of many years of developing technology and are vastly different from NTSC lenses. Lenses for HDTV are designed for higher resolution and much lower chromatic aberration, and the mechanical tolerances are held to an absolute minimum. Because the HDTV format is wider than NTSC, the corner resolution has to be much higher. This is critical when projecting images onto a large screen. HDTV cameras and lenses are a large investment and should be evalu-

ated closely. Be diligent in your evaluation and check out every possible resource available.

### Portable HDTV lenses

Unlike NTSC lenses, HDTV lenses are only available in the highest performance. Like the Broadcast NTSC lenses, HDTV portable lenses feature the most advanced digital zoom servo system and the latest digital features. These exceptional products are available as wide-angle zoom lenses with focal lengths from 5mm to 50mm, standard focal length of 8mm to 120mm and telephoto with a range of 7.8mm to 156mm. HDTV is making inroads in feature film and nature show production and holds great promise for the future.

### HD-digital cinema lenses

A relative newcomer to the HDTV market, digital cinema is rapidly becoming a reality. The recent introduction of the 24p HDTV camera has finally started to open some eyes. Several movie and TV specials have been produced in HD, and test shots are being performed almost daily. One of

the hurdles in the film industry's acceptance of this format has been the lack of lenses, which are the style and quality that camera operators and producers are accustomed to. The recent introduction of lenses to fill these needs has been greeted with wide acceptance.

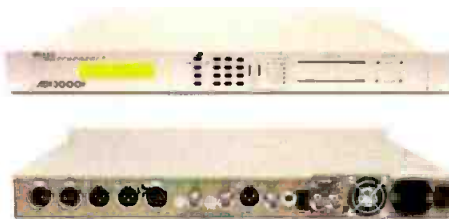
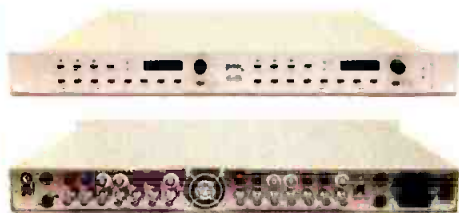
There are many different lenses available from various manufacturers, and they all serve a specific purpose. While it would be great if a lens could be designed to be all things to all people, that is not — and will never be — the case. When selecting a lens for your next camera or project, a great deal of thought should be put into how the lens will be used and what type of "look" you desire. If that lens is not correct for the application, the final results will surely be disappointing. But with the right camera/lens combination, what you capture on tape will not only match the view before you, but in some cases, what you reproduce on video will surpass what you saw through the viewfinder.

*Dave Waddell is a marketing manager and South Central Regional Sales Manager for Fujinon Inc. Broadcast and Communications Products Division.*

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### The “new” manufacturer

BY RALPH STRADER

**T**en or 15 years ago, terms like *local area network*, *Internet*, *surround sound*, *DTV* and *streaming video* were either unknown to most broadcasters or just beginning to emerge as potentially significant technologies. Now they are no longer seen as options to think about, but have become commonplace components of many broadcast operations — large, mid-sized or small.

This technology evolution has had two effects on broadcasting. It has enabled facilities to produce a better product, often in a faster and more cost-efficient method. But it's also given broadcasters more to learn and be knowledgeable about. It's not enough just to know broadcasting. Engineers today also have to be technology experts. Even more, they need to be savvy businesspeople, understanding capital justification, payback analysis and profit/loss ratios.

The net effect of this extra responsibility has been a strain on internal resources, many of which were already stretched to their limits. Following the trend of companies in just about every industry, broadcasters are streamlining their operations, whether that means downsizing internal resources, changing or cutting back on specific services, or consolidating the number of vendors or consultants they employ to use only those that provide the broadest range of services (one-stop shopping in a sense).

As a result, manufacturers are being called on more and more to augment the design process by working with stations on the more specialized aspects of their systems. By working

it was enough to manufacture quality products, get them to market at a good price and have some type of customer service department. But the broadcast industry today is a

### It's not enough just to know broadcasting. Engineers today also have to be technology experts.

closely with systems integrators, manufacturers have even become skilled in many of the tasks traditionally handled by systems integrators. This has helped to share the load of system design, especially as communications systems have grown more complex.

The need for increased third-party support and expertise is even greater in today's competitive marketplace, to complement and further strengthen the qualified internal resources of many stations. In the past,

different animal, and those elements are now simply the basic building blocks of a manufacturer's scope of services.

This trend is apparent in every aspect of broadcasting, but focusing on one specific example — intercoms — provides a strong microcosm.

As stations increasingly become parts of “groups,” intercom systems have to span multiple facilities and engineering areas. For example, during the 2000 campaign, NBC provided election coverage for NBC,

MSNBC, CNBC, all owned-and-operated facilities and the Microsoft website. There was a different technical facility for each and they all had to be interconnected through communications.

Another example of where a manufacturer working closely with a systems integrator can be a critical element in a broadcast operation is the



Telex's Willie Yau at work in the company's Lincoln, NE, facility, where the company worked closely with NBC to develop the intercom and communications systems component of NBC's “rack in a box” concept. Each “RIB” was a fully-wired subsystem loaded into one platform.

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recent trend of the "centralized control room." Operators increasingly have to manage intercom and communications systems that extend beyond the walls of one studio. Many broadcast operations have consolidated the control of several facilities into one location. This type of operating structure has several benefits. Operators are able to exercise

more control over the signals they are delivering to their audiences, and it creates a more efficient way to manage an entire broadcast network, since there is now one point



NBC and Telex engineers were in close consultation during the design of the intercom and communications systems used for the 2000 Olympics. The systems were tested by NBC at Telex's production facility in February 2000.

of management. And for operators looking to upgrade their infrastructures to new technologies, this centralized model can also help ease some of the costs associated with

contend with as achieving compatibility between newer digital gear and older analog products. Choosing the right product takes time, and that's a valuable commodity

these activities. Budgets have also gotten tighter and, accordingly, so have the timeframes for many projects. Stations have to do more with less, in less time. And they're being pressured to keep things under budget. And what about facility upgrades? They mean more than simply buying new products and plugging them in. There are such issues to

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that many engineers don't have, so manufacturers can lend assistance in this area. For example, a station that may be a fully standard-definition environment knows it will have to eventually move to high definition. Or the infrastructure may be set up to handle 4:3 aspect ratios

infrastructures, building codes and zoning restrictions that could prohibit relocation or expansion.

Stations all need specialized knowledge today. Are they adding staff with this expertise? Not all of them are, because they can't, so many stations are outsourcing these responsibilities

## Manufacturers have even become skilled in many of the tasks traditionally handled by systems integrators.

but the future is 16:9. The staff may not have the resources required to select the products that will help them complete these migrations cost-efficiently and quickly.

Finally, there are issues not only specific to broadcasters but to any professional looking to grow a business: limited layouts, outdated physical in-

and manufacturers are being called upon to take on a larger role.

Manufacturers have also broadened the scope of their customer relations, helping customers understand what products can do and how they should choose and specify new systems. The first question a customer should be asked is: "What

problems do you have that you expect the intercom to solve?" In other words, what are your goals?

This step comes even before budget, because you really can't make an intelligent budget decision until you know all the parameters in which you need to work. Once you understand those, then you can make informed budget compromises.

Many manufacturers recognize the need of broadcasters for increased design assistance, adding staff and resources specifically to provide design support for stations and systems integrators.

Change is inevitable, and necessary to the evolution of an industry. As the broadcast industry comes to terms with this, both manufacturers and facilities will need to work more closely together, as both explore their changing roles. ■

*Ralph Strader is vice president, general manager, Intercoms. at Telex Communications.*



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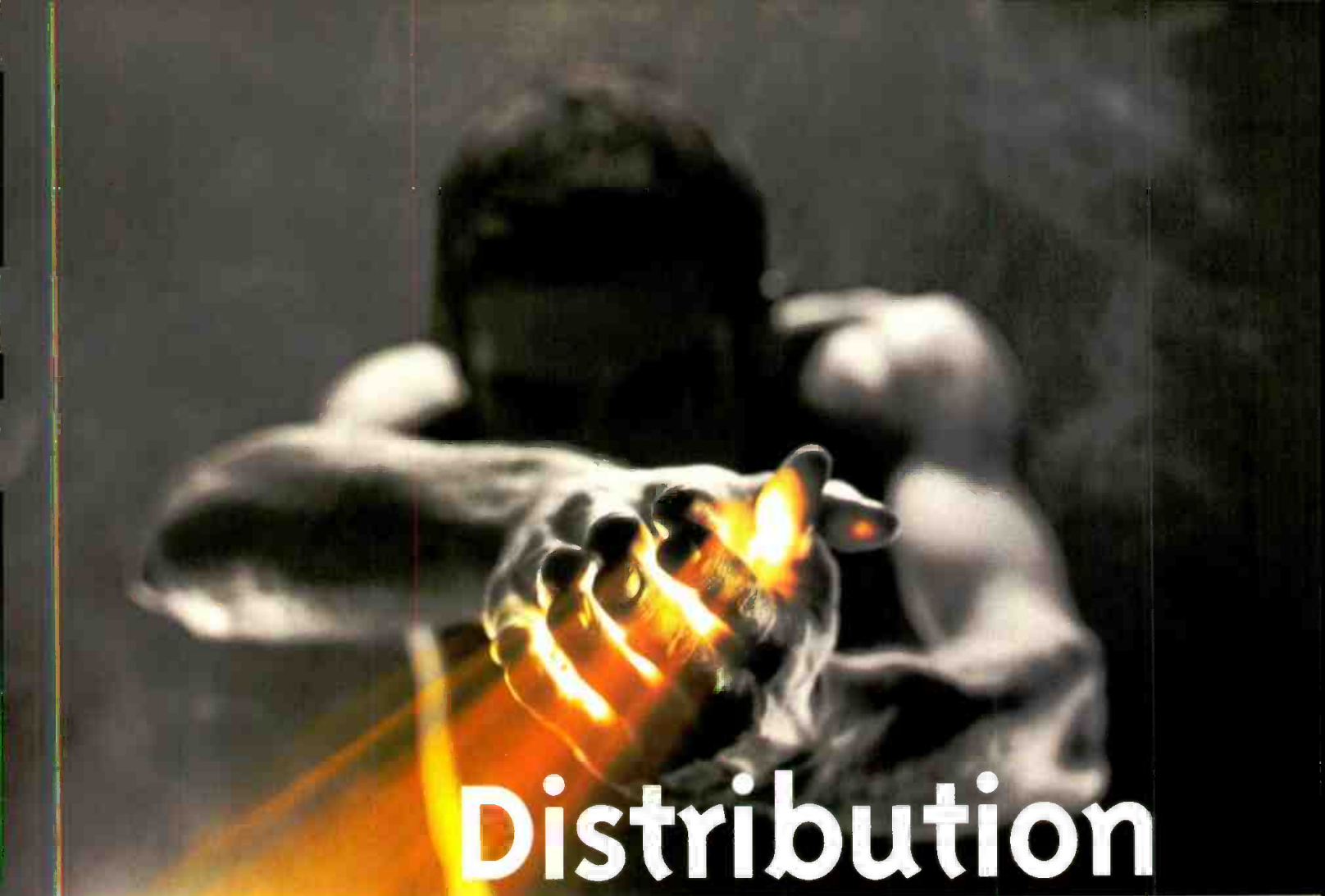
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**Hardly** a day goes by when someone doesn't call me to announce that their company has the worlds first "total solution" to something. By the time I hang up I'm usually still not convinced there was a problem in need of a solution.

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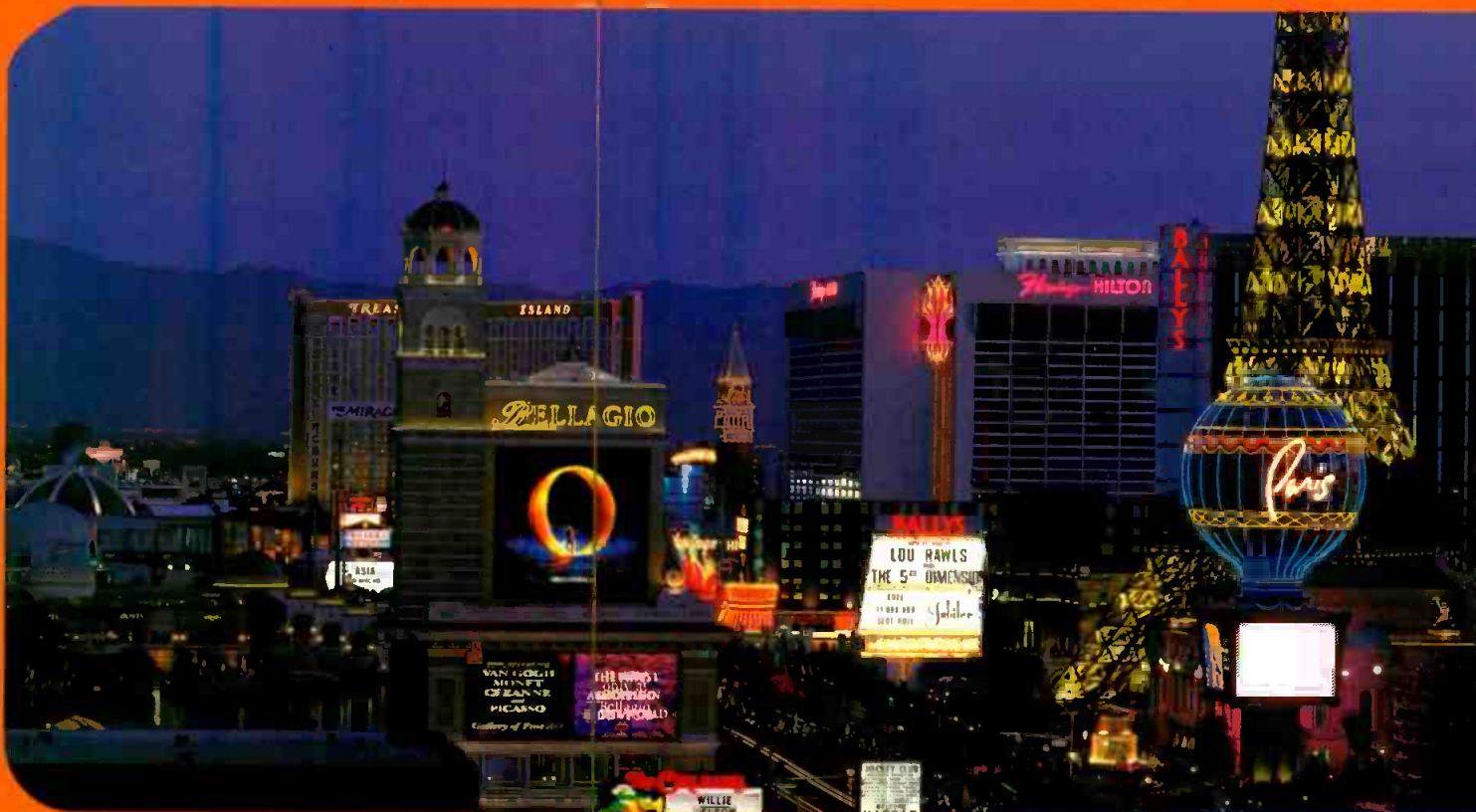
Need some help with DTV technical issues? See page 92 for the *DTV Answer Book*. Want an advanced look at hot new products? That coverage begins on page 120. Lost? Check out the LVCC and Sands maps that are bound into this issue. And to make your trek more efficient, there is FASTtrack on 232.

So read on and enjoy. I'll see you at the show.

Brad Dick, Editor

# N A B

# preview





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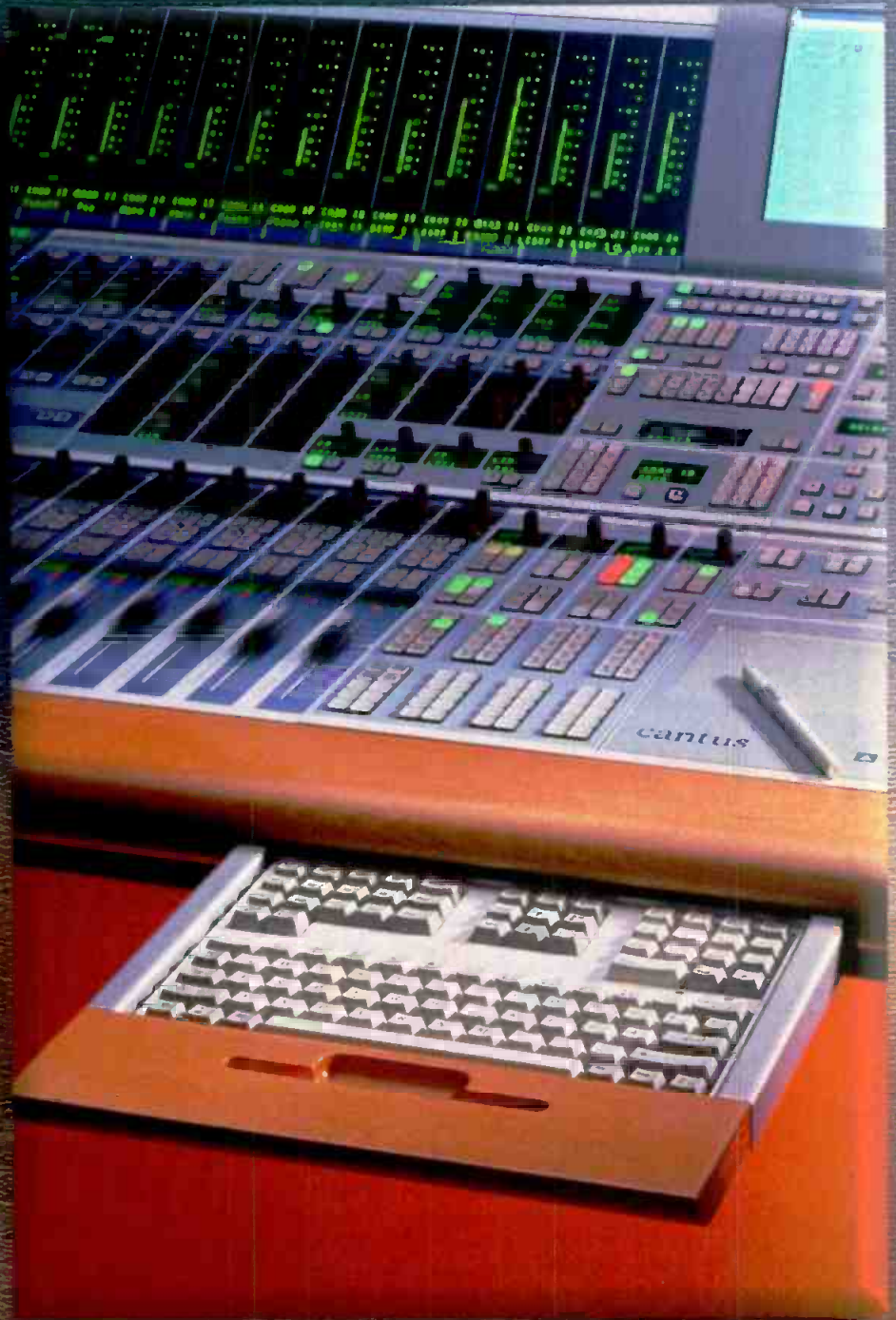
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## What changes in newsroom operations has new technology brought to CNN?



**BY GORDON CASTLE**

*Gordon Castle is senior vice president of Strategic Digital Systems for CNN.*

**S**everal years ago, CNN established a technology plan designed to create an all-digital production environment in which content and metadata is accessible to all CNN users and on all CNN

distribution platforms. This multi-year plan is changing almost every aspect of CNN's production system and, more importantly, the workflow. It is an enormous and challenging undertaking and one, in my estimation, that will put CNN in the forefront of production worldwide. CNN is altering the very core of its system requirements; our plans call for not just digital updates of existing equipment but, instead, we are leading technology providers to develop new systems and approaches.

A key aspect of CNN's technology plan is a move to systems that handle video, audio and metadata as data files. This means, of course, that video servers will replace tape machines, and computer-based nonlinear editing will replace tape editing. It is easy to see how changes such as low-resolution browse systems, nonlinear editor and video servers provide more features and functionality than videotapes and analog equipment. Users can make changes more easily, share their work with more people and exchange files across systems from city to city. Important as these are, they are only surface-issue changes and do not unlock the real power of the new technology and the ways it will facilitate changes in production, publishing and broadcasting.

One of the key requirements of our technology plan is to couple changes in technology with changes in workflow. Seemingly simple changes or advancements in new technology may actually result in poor performance when put in place without careful consideration of the entire process. For example, a nonlinear system used for cuts-only editing that does not need to be re-edited for multiple versions can be handled faster by a tape-to-tape system. However, when coupled with new workflow and a supporting infrastructure that leverages the capabilities and extension of the content, nonlinear editing is a key component in a more effective and efficient production system.

The new production system we are building will enable CNN journalists to have greater access and better control of content. Our journalists and editors will be able research, access, create and modify all aspects of content

from their desktop. And they will be able to create content that can be used in a variety of distribution platforms. Because the tools and digital media are more flexible and adaptive, we will be able to use a common infrastructure to both expand and refine the rolls of the editorial and technical staffs.

In some cases, content will be produced by a single person or team and distributed on multiple platforms, such as on-air, online to a website and via satellite to a mobile phone. In other cases, users will focus production on a single aspect or type of distribution. The key is that the analog tape-based linear system mandates a workflow and production chain bounded by the limitation of the formats and equipment. Issues such as play speed, dubbing, transfer time, generational loss and inability to actively share material or work require elaborate and rigid workflow to be successful. This is particularly true in live 24-hour news. The design of the production systems at CNN and the other 32 services was based on rigid content and information flow and processes.

As we look forward and use the Internet as a guide, the future of content distribution and consumer experiences will require services that provide interactivity and personalization. The sources that provide this information will have to be extremely flexible. And this flexibility will need to be part of the technical systems and the workflow of the journalist creating the information. The new systems we have been installing during the last few years as part of the technology plan at CNN are all working to improve our flexibility. They will not only allow more flexible access and distribution of content, but they will also make it easier and faster for us to create new production steps or techniques and handle new distribution opportunities.

---

### **We are starting to digitize more than 115,000 hours of material in the new digital archive.**

---

Digital servers in use today at CNN have already allowed for several important changes. We have been able to improve the regionalization of CNN's International networks by allowing common content to be used more flexibly on the European, Asian and Latin American channels to better match the appropriate time zone. We have also been able to centralize our commercial operations and provide a central server for all finished daily news material that can be accessed by CNN, CNN International and CNN Headline News.

Our research and viewing systems have also changed and provide our journalists with greater access. Currently, 1500 hours of raw material are available on newsroom desktops at CNN Center in 1.5Mb/s MPEG-1. And we are starting to digitize more than 115,000 hours of material in the new digital archive, which will serve as the central

long-term storage and media management system for all areas of CNN. All material will be available as high resolution, low resolution and streaming resolution as data files and will be able to be researched by anyone in CNN.

As CNN continues to make technology changes and move more content production to digital systems, journalists, editors and technical staffers will be able to grow with the new systems. The staff at CNN will develop workflow that can take advantage of the power of the new systems and changed aspects of broadcast and Web publishing. We are actively refining our production processes and building requirements for the equipment of the future. New business and technology requirements, coupled with the new digital system, will allow us to deliver news and information even faster, more efficiently and more aggressively than ever.

### Why build now for digital?



**GREG DOYLE**

Greg Doyle is president of Doyle Technology Consultants, Inc.

**W**e have seen great promise with regard to technology, digital televi-

sion and the future of broadcasting in general. As the transition to digital moves forward, many facilities have fully incorporated a digital infrastructure or islands of digital equipment in their plants. However, the full transition has barely begun. As the deadline imposed by the FCC approaches, less than 200 broadcasters are broadcasting a digital signal. Very few of these facilities have the capability to create HD images within their studios, or for that matter, ever intend to do so in the future.

The initial move to digital meant dealing with 270Mb/s component digital video. I designed my first fully digital facility in 1995 when the available equipment was cumbersome and challenging to work with. It also required us to compromise the desired functionality. The industry has managed to move through the initial digital conversion and new tools are available that allow stations to do much more than they were capable of doing in the composite analog world.

Legacy engineering and business models must be revised as alternative entertainment and technologies compete for market share. Remember, just a couple of years ago the fighting words were *convergence*, *extensible*, *open platform*, and, worst of all, *compression*. At the 1996 NAB show, the thought of accepting compression of any kind on a video image was totally taboo. By 1999, compression was accepted as the norm and the issues were what type of compression each manufacturer applied and at what bit rate.

With the acceptance of compressed media, the next transition begins -- open platforms with media captured, stored, managed and shared as a file. With this philosophy, the movement of media throughout a facility doesn't

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depend on a particular video format. It is a file, regardless of the resolution, frame rate or encoding scheme. While this is not realistic for real-time synchronous broadcasts, generators of content will thrive in this environment. Unfortunately most of the major video server manufacturers are not providing open connectivity to the storage side of the system. Currently, you will be required to purchase the storage solution directly from the manufacturer or their strategic partners. We do see this being whittled away slowly as more IT-savvy clients and system integrators demand these features. The next technical/business model is wide area connectivity to the storage devices.

## **The next technical/business model is wide area connectivity to the storage devices.**

Over the last few years we have seen broadcasters consolidate their business model as they compete for programming and advertising revenue. For better or for worse, the day of the mom-and-pop broadcaster is rapidly disappearing. As broadcasters continue this consolidation model, I envision a consolidation of the technical model as well. For example, streaming media over the Internet works on the concept of "edge caching." In other words, media is pushed across the Internet to points of presence (POP) in major cities throughout the country. This places the content geographically closer to the "last mile" for pickup by the viewer. The same technology can apply to broadcasters who have consolidated their operations from local engineering business models to a centrally operated model. The local broadcaster now takes on the functionality of the POP via wide area connectivity and provides the cache along the edge. In this case the "edge" is the feed to the transmitter. Local insertion of advertising, news coverage etc. all reside within this server-based facility and are dropped in as scheduled. Business management and core programming are managed from the central offices of the newly formed networks.

Part of managing all of this media as data will require multiple servers for capture, storage and encoding purposes. In streaming media facilities and network operations centers we typically manage hundreds of servers, PCs and encoders using what we call a KVM matrix. This equipment allows us to route the keyboard, video and mouse of multiple servers to multiple user stations. These devices provide direct connectivity to the remote server including a hard-reboot, if necessary. Category 5 or Category 6 cable is used to connect users' stations and servers to the matrix.

As new facilities are designed there will be three basic types of connectivity throughout the plant: wide bandwidth coaxial cable (for baseband audio and video); fiber; and Category 6 (or better) for network connectivity.

Future designs must include demarcation points throughout the facility to break out or repurpose wiring infrastructure in order to accommodate continued changes in equipment or functionality. In the IT industry these are called an Independent Data Frame, or IDF closet. Basically it is a wiring closet that surrounds major areas throughout the facility. These areas are built adjacent to the central machine room, server farms and large work areas.

In the near future, look for super-wide bandwidth routing backbones that will allow very low data rates as well as full-bandwidth HDTV. Consider the possibility of multiple 4Mb/s pre-encoded transport streams arriving at your facility for re-transmission. This is very common at satellite facilities that handle incoming feeds as SMPTE310 or DVB-ASI. Along with these compressed transport streams comes the need for more advanced bit splicing tools able to perform cuts and transitions within the compressed stream.

In discussing this digital transition five years ago with a station director of engineering, he said, "The way things are going, in another five years, you'll come in here and the only technical staff you'll see is a manager of information systems, the director of engineering to keep the license up to date, and a shipping department for when things break." He missed the date, but he was on the right track. The next technological wave I see coming to the broadcast facility is the movement of data, data storage and asset management. This will come in the form of IP network connected devices and file-based content on open platforms across network-based storage devices.

Webster's Dictionary defines transition as: A passing from one condition, form, stage, activity, place, etc. to another. Regardless of the FCC mandate, competition and market conditions will require broadcasting to transition to a new business model, and new technology will be required to support this new model. The first step for the broadcaster to prepare for this next wave in technology is education. It is imperative that your staff has a basic understanding of network architecture, IP management, data storage, media archiving and asset management.

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## How should a station engineer plan for the multi-step upgrades that most stations must use to become fully digital?



**BY GUS ALLMANN**

*Gus Allmann is vice president and director of engineering for TV Magic, Inc.*

**T**hough questions remain about its particular manifestations, one thing for sure, digital television is coming and as broadcast engineers there are things that we can do to prepare for the inevitable.

- **Have a plan** – Gather as much information as possible about the direction your network or management is heading in terms of DTV and their expectations. Become part of the team. Capture the global picture and get it down on paper. Simple block diagrams, descriptive prose, wish lists, business plans, flow charts or just about anything you can document about where the station is heading will be enormously helpful. Develop your plan to at least the block diagram and signal flow level. As a systems integrator we are very big on having a process map on paper that takes all this into consideration. It makes it easier to see what must be done, and a plan evolves. It's a lot less expensive to change paper than concrete, steel and equipment. Consider utilizing as many assets as you have now with a simple phased approach to adding the digital capabilities. The simplest plan might follow this path:

1. Establish digital transmission capability.
2. Upconvert present analog program to DTV signal that matches your network feed and switch the DTV formats to air with a simple 10x1 switcher. Downconvert digital-only programming to integrate with existing analog facility.
3. Build an HD-capable digital infrastructure even if you're only planning to broadcast single or multichannel standard-definition digital programming.
4. Integrate existing analog signals necessary for the transition to the all-digital facility. Test analog and digital system off-line.
5. Cut over to the all-digital system and place on-air.
6. Re-purpose old analog system and components.

Having a plan that can move you from meeting the minimum requirements with a limited budget to creating a state-of-the-art facility capable of handling almost anything will ultimately save you time, money and what little hair you may have left.

- **Transmission** – You're going to have to transmit digital

signals. If you don't already have a plan in place, it's time to get moving. Many, if not most, broadcast facilities will have to add new antennas, transmitters and towers in addition to their analog transmission system in order to remain on-air while you're building the digital transmission path. It takes a long time to design, get approvals, and build those new towers, antennas and transmitters for stations across the country. Best to get in the queue now.

- **The digital infrastructure** – A good thing about DTV is that most of the signals the engineer will have to deal with are in a serialized digital format. It can travel down coaxial cable and is easy to terminate. While the various forms of DTV can include a wide range of data rates, the future-proof model is to design and build for the highest data rates that commonly exist today. At present, uncompressed serial digital data rates approach 1.5Gb/s with bandwidth requirements approaching 2.4GHz. Remember our goal is to create a digital island or digital facility that can handle anything that management or technology may throw at it. Luckily these cabling and components exist today and don't cost much more than what we have been using in the past. In the installation of any cabling system, the largest cost will be labor. It costs the same to pull, dress and terminate a cable/connector regardless of the material cost or quality. So put in the best components that exist and you won't have to do it again for a long time. Be careful replacing existing analog cable with digital cable in the same system, the cable has a higher velocity of propagation and different loss characteristics so they may not time or equalize properly with your existing equipment.

- **Routers** – If you already have an analog routing system in place and are happy with it, there is no need to replace it. Adding serial digital video and audio levels to your router

**You're going to have to transmit digital signals. If you don't already have a plan in place, it's time to get moving.**

may be possible if you purchased one that can be field upgraded and the frame can handle the data rates intended. You can always add these levels as additional frames but that will depend on the router control system and whether the manufacturer offers those components. Worst case, you can purchase a new control system that will work with your existing router frames and also the new digital ones you plan to add. Make sure the digital router can handle uncompressed HDTV data rates and also the Asynchronous Inputs (ASI) generated by digital compressed satellite systems. Because you may be working with your existing analog router frames and using A/Ds and D/As for integration with your new digital router/

frames, make sure your control system has good path finding and tie-line management abilities. The user interface and how the router releases these tie lines are important.

- **Switchers** - If adding a digital production or master control switcher, choose one that will allow for multi-channel/multiformat operation with a single control panel. Some are networkable which can prove to be useful. Choose a multichannel standard-definition DTV format having the ability to control them from one or more locations. A switcher that integrates tightly with your router will make for a more flexible system. Make sure the DVE will be tightly integrated with the switcher. The master control switcher is the one that will have to be the most flexible. You may need to switch your analog signal simultaneously with your DTV signal for a while. The HDTV signal may come as multiple standards from various sources that change throughout the day. Consider these possibilities when developing an initial plan and be sure the switcher will be flexible enough to handle these additions or changes.

- **Networks** - This is one area that will grow tremendously. Because Ethernet will be around for a while, you should build a solid, upgradeable 10/100Mb switched network. Use CAT 5 or better cabling and patching capability, which should handle most of the near-term applications. News systems are using Ethernet to browse ingested materials to servers from client workstations, perform low-resolution editing, control play-to-air functions and many other critical tasks. Higher bandwidth networks are emerging, each with its own set of assets and liabilities. Optical and copper Fibre Channel is evolving; however, it is peculiar to certain integrated systems. Production and graphic systems are making good use of it but, as an installed topology, I would add these capabilities as they are required. I foresee the Network Analyzer becoming as common a piece of test equipment as your present waveform monitor and vectorscope.

- **Video servers** - They are here to stay and will probably replace most VTRs for anything but portable use. Most use serial digital as standard I/Os with some offering analog as well. Use the analog I/Os today while you build your digital infrastructure. Transport streams are beginning to be more common for I/O. Multiple format compression codecs are in use and compatibility is necessary if you want to share. Think this one through carefully and consider all of your applications such as image quality, editing and recording non-synchronous feeds — they all don't perform the same. Also part of this game is storage for the servers. You'll never have enough storage, so analyze your requirements carefully. Plan for the inevitable growth. Leave space and allow for the AC power requirements and heat loads. Storage Area Networks (SANs) are getting popular for server and nonlinear edit file storage. Speed is important. File format compatibility between devices that share that storage is necessary and not always apparent, even between products by the same manufacturer that perform similar functions.

Near online storage and archival storage is a must as your storage needs grow.

DTV is happening. Embrace it. You'll love it once you're in and it's just the kind of change you've been looking for. Treat it just like any other project that must be managed — plan it, organize it, implement the plan and control (refine) it. Be flexible because technology is changing quickly with fewer standards. Design for and build a solid infrastructure that can handle most anything that comes your way. Keep the pipes big and everything should fit down them. Leave room for expansion, if things get smaller or concentrated you gain space, if they grow, you have already planned for it and will accommodate it easily. Use a qualified systems integrator that works with many types of systems; their experience can be invaluable. Develop your plan NOW and don't wait until management wants it yesterday.

### **"Why seek the help of a systems integrator for a convention like NAB?"**



**BY J.T. DUGGIN**

*J.T. Duggin is executive vice president and chief operating officer of Digital System Technology, Inc.*

**F**or someone looking to begin serious research into any range of audio and video equipment purchases, shows like NAB can be, to put it mildly, overwhelming. It's like going to New York City for three days and blindly searching for all the best restaurants without any restaurant guides. Yes, you may stumble across one or two very good places, but your chances of hitting a great place at every meal greatly increase if you consult the experts beforehand.

### **Try to stick with a systems integrator that represents an industry-wide, all-inclusive complement of equipment.**

And your investment in a meal is considerably less significant than one in equipment, so it pays to consult with people who do this every day. Good systems integrators are committed to maintaining close relationships with their customers, so customers are always kept up to date on promising new technologies.

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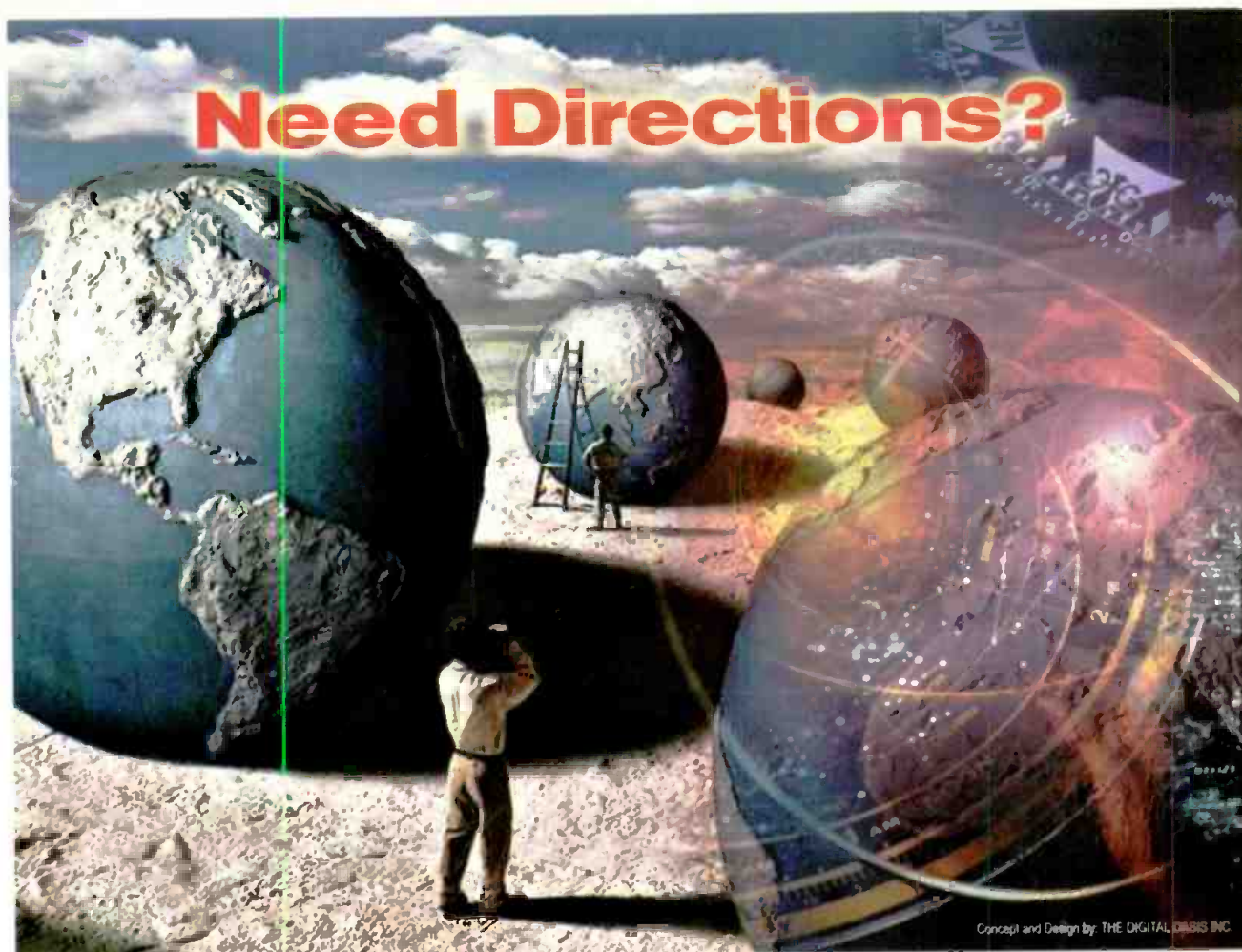


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integrator that represents an industry-wide, all-inclusive complement of equipment. Not being tied to specify any particular brand name or product line keeps the process fluid. It allows the systems integrator to act quickly in response to what the customer needs.

Good systems integrators keep current on all the latest developments, know the players involved and are tied in to noted industry professionals. Chances are that they've recently worked on a project similar to the one you're calling about. Whether large or small, broadcast or webcast, corporate or a fixed venue installation, systems integrators are trained to address a broad range of integration issues. And this does not always mean a large-scale facility design and construction. Select systems integrators are also called upon for research, consultation and financial planning services as well as smaller-scale bench repair services.

Systems integrators perform a myriad of tasks, including designing and installing Internet streaming systems, microwave systems, automation systems, satellite earth stations, post production facilities, mobile television vehicles, network operation centers, systems maintenance, training operators, pre-building systems off-site and financial planning.

And with broadcasters throughout the nation making the digital transition, systems integrators can easily clear the way down that path because they've been there many times before. Qualified systems integrators will get you safely and efficiently through the digital path due to their attention to detail and experience leading others in exactly the same direction.

Speak with a respected systems integrator prior to NAB. I guarantee the show will prove significantly more productive than it would otherwise. It will be like having the top *New York Times* restaurant critic personally escort you to the best restaurants in Manhattan.

### **What does a station need to consider upgrading to 5.1 audio?**



**BY KEN HUNOLD**

*Kenneth Hunold is a broadcast applications engineer for Dolby Laboratories, Inc. in New York.*

**A**s stations put together their DTV facilities, many key questions need to be answered about the topology and capabilities of the system. These are often called "core" decisions, because they define the basic design strategies of

the DTV station.

Consumers are being exposed to high quality audio via CD, DVD and now DTV and digital cable. Increasingly, these programs are multichannel (beyond stereo) particularly in the case of feature films, which have been almost routinely mixed

in 5.1 over the past decade. Now, episodic shows for television are being released with 5.1-channel audio.

At the initial design stage, the choices between designing for minimal two-channel audio and designing for full six-channel audio (5.1 audio) are not that different. Tools exist (described below) to carry multichannel and/or multi-program audio over a traditional AES "pair." These tools can also allow the DTV station to seamlessly integrate 5.1-channel audio into a nominally two-channel program stream.

For DTV audio, all stations should be implementing an AES digital audio infrastructure. A single "level" of AES digital routing is the minimum baseline capability that was assumed by the ATSC "Top Down" Committee in its examination of DTV station requirements. Often, stations will implement a two-level (four-channel) infrastructure because it matches the number of audio channels on broadcast VTRs. AES audio distribution allows for transparent and accurate audio distribution throughout the facility. It also future-proofs the station for further developments in audio and data transmission.

Dolby AC-3 is the audio standard in the ATSC television system. It is designed to carry from one to six (5.1) audio channels and can support multiple audio programs. This system is now called Dolby Digital, and consumers will often see references to this name on their DTV receivers as well as on their DVD players and cable set-top boxes. The station's audio programs are encoded into Dolby Digital at (or near) the DTV video compression and transmission equipment. If the station is using the built-in encoder that is sometimes part of the video encoding system, these encoders are currently only two-channel encoders (i.e., mono or stereo.) If full 5.1-channel audio is desired, a separate 5.1-channel encoder (a Dolby DP569) will be required. It can encode any channel format from mono to 5.1 channels. The built-in encoder can still be used for encoding a second-language version of the program (similar to the SAP capabilities of the NTSC system) or any of the new auxiliary services such as descriptive video (visually impaired), hearing impaired, or emergency audio channels.

**Program acquisition:** If programs are delivered on videotape for local playback, this could exist as a separate multichannel audio tape (DA-88 or similar format) that must be synchronized to the video source (often a digital VTR). In this case, you must be able to lock the two transports to the same reference, and synchronize them using timecode or other means.

Multichannel audio programs could also be delivered on the same videotape as an encoded Dolby E signal. Dolby E allows up to eight channels of audio to be delivered via satellite or VTR, and can be carried on a single AES pair throughout your system. Broadcast networks and cable programmers are using the Dolby E format to store multichannel audio programs along with the video on the same videotape or video server. This simplifies routing, timing and synchronizing the combined elements throughout the system.

**Monitoring:** Monitoring the audio signal is important in any operation. Programs delivered to DTV stations by

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networks and others will almost certainly be delivered using digital sources (satellite, digital video server, etc.) Stations need to be able to monitor digital audio signals at many points in their facility, just as they monitor their programs today. Analog routing and distribution will not go away in the new DTV stations, it will just be relegated to "utility" routing and confidence monitoring, rather than actual "on line" audio signals. Products are available from many manufacturers that handle monitoring of digital audio signals in ways that make the audio format

## For DTV audio, all stations should be implementing an AES digital audio infrastructure.

transparent to the operator. Often it is as simple as ordering the digital version of the monitoring product. Stations that have made the transition to AES routing on their NTSC stations will already have experience with this. Products also exist to monitor and troubleshoot Dolby E, Dolby Digital and PCM signals carried on an AES link.

**Local production and MCR:** If the station wishes to do local 5.1-channel audio production, then traditional multi-channel mixing and recording equipment could be used, along with a "widening" of the audio infrastructure within those operational areas.

The audio signals, whether they are 5.1 or stereo, only get encoded into Dolby Digital immediately before transmission to the viewer/listener. A full description of the Dolby Digital encoding process is beyond the scope of the question, but it is important that the programs be encoded with a "channel configuration" that accurately describes the program type. Stereo programs should be encoded as "2/0" and 5.1-channel programs should be encoded as "3/2L" (the "L" signifies the "0.1" LFE channel.) This, and other encoder settings, aids the operation of the consumer's Dolby Digital decoder, routing the number of audio channels in the program to the (possibly fewer) number of speakers the consumer may have installed in their home. This could vary anywhere from mono or stereo speakers built into the DTV set to a full-blown Home Theatre installation.

If the station chooses to implement Dolby E, there are some unique capabilities of the DP572 Dolby E decoder that have special significance in Master Control operations. The "Voice Over" feature of the DP572 allows local voiceovers to be inserted over the 5.1 audio signal, or the audio source can be switched completely to a separate two-channel source. This is usually the station's normal stereo audio, and this can be used for local inserts, news or commercials. When the decoder has been told to switch to an external two-channel source, the Dolby Digital metadata will be changed to the proper mode for stereo operation. The voiceover feature can allow the Dolby E

decoder to function as the audio section of the MCR switcher, delaying the requirement for full multichannel audio production facilities, at least in Master Control.

Audio monitoring in Master Control should be set up with a professional Dolby Digital decoder to properly monitor the signal in any format the listener may have. This includes mono, through stereo and surround, all the way up to 5.1, with a subwoofer. There are also graphic displays available to visually monitor the content and relative phase of the multichannel audio signal. If you feel that your master control area is not suitable for critical listening, consider outfitting a conference room (in addition to your control room) with a 5.1 monitoring system. If this is the same room where you entertain clients and screen their programs, it gives you a chance to view their programs and to demonstrate your audio capabilities in their best light.

The average station does not need to alter their planning all that much to include 5.1-channel audio programming as part of their schedule. As viewers are exposed to more and more 5.1-channel programs via DVD and digital cable, any lack of such programming on the DTV station will become apparent. As the infrastructure requirements are very similar, it is not that difficult to add 5.1-channel audio capability to your DTV station. By specifying the proper equipment now, you future-proof your facility by supporting 5.1-channel programs today.

More information about implementing the Dolby Digital DTV audio standard can be found in the Broadcast Implementation Guidelines, available from Dolby at [www.dolby.com/tech/ddbigpr.pdf](http://www.dolby.com/tech/ddbigpr.pdf)

### What should broadcasters do now to enter the world of streaming?



**BY STEVE SULLIVAN**

*Steve Sullivan, co-founder of the Advanced Interactive Media Group, LLC, frequently writes about media trends and technology for various publications. He can be reached at [sullicom@aol.com](mailto:sullicom@aol.com).*



**B**ack in September 1999 I was hired by a client to take a look at the concept of video streaming and the promise it held for television and radio news. A year and a half later, the project drags on like a bad cold, having been rewritten and revised multiple times as companies surge, merge and purge. If someone starting a similar study today came to me for advice, the best tip I could offer would be to make sure his or her pencil has a big eraser on it.

I began researching the issue at a convention where the



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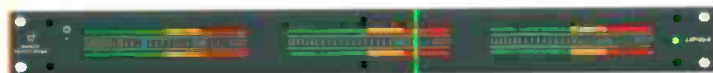
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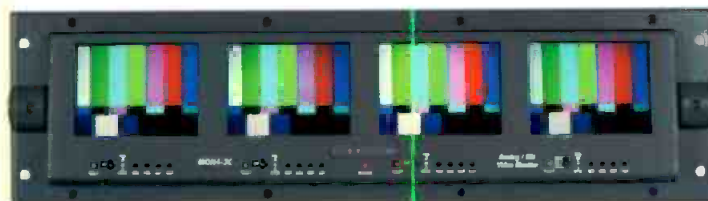
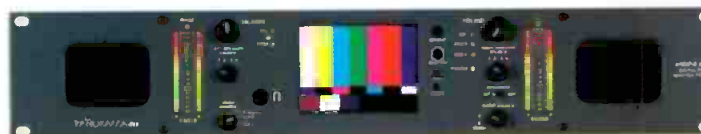


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exhibit floor was teeming with vendors eager to take a television or radio station's content and put it online for free. Each vendor earnestly and enthusiastically touted streaming media's potential in general and their company's plans to cash in on it in particular. The pitches were similar: Putting your news content online would be a great way to extend your brand into a new medium, expanding your audience and introducing bountiful new revenue streams.

By December 1999, out of the myriad search engines and aggregate sites, I had identified four companies to profile. Each had a distinctly different way it was going to handle streaming media and how it was going to monetize it. The four companies were FasTV, Zatso, BroadcastAmerica.com and Broadcast.com, which had just been sold to Yahoo for \$5 billion.

Conceptually, all the companies had exciting ideas. Each planned to take an on-air product and make it available, either in whole or in part, via the Internet. In some cases the product was streamed live. In some cases the on-air product was archived for playback on demand in its entirety. In some cases the on-air product was repackaged for customized on-demand playback. In all cases, these companies felt there would be great and growing demand for any of these products, and they were willing to take the risk to give away the technology and manpower in exchange for the chance to make money with it.

The greatest risk for a television or radio station was to

do nothing. Getting involved meant very little effort other than handing over content. The services would do all or most of the work to get the product online and would even sell or help sell it to advertisers.

There was tremendous interest from the content providers. Broadcast.com and BroadcastAmerica.com boasted streams from hundreds of stations. Unfortunately, there was not tremendous interest from advertisers or viewers. FasTV went down first, in July 2000. Zatso ceased operations last October. BroadcastAmerica.com declared bankruptcy in December. And while Broadcast.com still exists, Yahoo has relegated it to white-elephant status, seeming not to know what to do with it.

The past year's mayhem sends two clear messages. First, audiences have thus far been slow to embrace video in the online world. Second, investors are much less likely to wait patiently for advertisers to warm up to the concept.

The slow deployment of broadband hasn't helped matters. For instance, I live four miles outside the city limits of Austin, TX, one of the most wired high-tech cities in the world. But neither my telco nor my cable company has yet to provide high-speed service to my neighborhood.

Even the availability of broadband doesn't guarantee an audience. While online video is intriguing for a while, it's not very compelling. It's not fun to sit there looking at a monitor with a two-inch by two-inch streaming video on it.

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there isn't a mass audience, you're not going to get the attention of branding-type companies like Coca-Cola that would spend a half million dollars just to get their name out. So you're left trying to compete for advertising with other sites that are just as screwed as you are.

Although I'm a lot less naïve than I was a year and a half ago when I began looking at the issue, I still think that one day streaming media will play a strategically valuable role for broadcasters. Until that day arrives, however, you simply can't kick back and ignore it. This is the perfect time for you to be doing your homework. Here are a few things you can do:

**Keep an eye on what others are doing with their streaming:** Make notes on who's doing it, how they're doing it and where they're doing it. Good places to start are supersites like CNN.com and MSNBC.com. Both use plenty of video and often creatively package it. And don't limit yourself to television sites. Newspaper and radio sites are drooling at the chance to add video to their traditional content. Take a look at a major site like washingtonpost.com and a small-market radio site like wsjm.com in Benton Harbor, MI. Both destinations frequently put video content front and center and are anxiously awaiting the opportunity to do more.

**Check status of broadband deployment in your area:** Have either the telephone company or the cable providers

saturated your community with high-speed connectivity? If not, do they have a timetable for doing so?

**Know your local demographics:** Even if broadband is widely available, are the locals likely to use it?

**Determine what you would stream:** Streaming, like multicasting, becomes a benefit to you only if you have something to offer. Do you simply want to simulcast or

**There was tremendous interest from the content providers.**

**Unfortunately, there was not tremendous interest from advertisers or viewers.**

rerun your on-air product? Will you repackage material you've already aired? Will you create something new expressly for the stream?

**Get your contracts in order:** Under your current contracts do you even have the right to stream your content? What can you use and what's off limits? Make sure you fully understand how streaming might impact your current contracts with content services, freelancers and stringers, talent and even advertisers.

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Weigh the expense of doing it against the return: The Internet is tough to sell in the best of times and requires a new and different mindset on the part of your sales staff. In the absence of vendors who will stream your signal for free, you get stuck with the costs for encoding, servers and bandwidth, plus any dedicated personnel. Will it be worth the investment?

Keep an eye on developments in technology: This ties into broadband penetration, as well as improvements in player platforms and developments in mobile technology. There's a real possibility that streaming video may ultimately be a more viable product on a PDA than a PC.

And again, the most important advice of all is *keep that eraser handy*.

### What benefits do interactive and enhanced TV services provide?



**BY JEREMY THORP**

*Jeremy Thorp is chief technology officer of Tandberg Television.*

**W**hile the number of viewers engaged in interactive or enhanced television programming has not yet achieved a considerable mass throughout the world, it is an application whose time

has clearly come. The benefits are clear, with new revenue generating services and increasingly more attractive and targeted advertising meaning that the payoff to broadcasters and their advertising clients will be huge. Currently, the delay in making this dollar-inducing nirvana available is in equal parts a content and a technology issue.

#### Internet or TV?

When we talk about interactive and enhanced TV content there really are two areas: Internet-type applications on TV and TV programming enhanced with interactivity.

Many pundits are exploring how can we transfer the two-way user experience of the Web, to make the Internet work on TV. I would ask the question "does the Internet work on the Internet?" Interactive TV does offer the opportunity to convert Internet content into interactive TV content, but only good Internet content will make compelling interactive TV. Further, does Internet on TV equal TV eats Internet? It certainly provides an opportunity for broadcasters to be portals and use identical business models to ISP/portals with transaction-based activity and Web-style advertising, which can be targeted according to personal profile.

The challenge of delivering Internet applications to TV is largely solved. The challenge of keeping up with the latest PC 'plug-in' technology in the low-cost set-top box platform will remain an ongoing one. The "PC or TV" debate will continue as content from the Internet is repurposed for TV in order to meet demand. Regional variations on the penetration of PCs and digital TV will be the major driver. Usage scenarios for in-depth information/Internet browsing starts to preclude living room-based, shared entertainment devices (i.e. TVs) and the integrated home network will see a number of different devices linked to provide solutions for different types of interaction.

#### Enhanced programming

TV programming enhanced with interactivity is a whole new TV genre, extending choice into a new dimension and offering time-based data/information/transactional services. Rather than numbers of programs you get new functionality, for example different views for a sports events. Rather than being able to look at an online catalog and buy a CD, you can buy the actual CD being plugged on MTV or the watches worn by actors in sitcoms. Instead of one ad being delivered to the whole audience the advertising may be targeted according to your profile derived from your viewing, online and response activity.

Technically, enhanced interactive TV programming is a much greater challenge because of the synchronization of different content types. In traditional TV it is annoying when sound and video get disjointed — but how are TV viewers going to feel if they click to order the fine wine Fraser is drinking and receive his father's beer? The need to synchronize and integrate video and audio with data, middleware and back-end T-commerce solutions becomes imperative.

None of the areas have proven to be solid revenue models and the challenge to the interactive TV community is to create major stickiness factors, not just transfer the Internet onto TV. If the appeal is not there, viewers may choose to stick to a company who gives them great movies, offers good internet access, helps them quickly find data services (weather, shares, traffic) using a nice portal, and deals with their e-mail swiftly. Broadcasters will lose out on the enhanced appeal of multiview services and the revenue opportunities that program driven impulse buys provide.

**The need to create once,  
distribute everywhere requires  
a high degree of integration.**

Moreover, with an increasingly segmented viewership, content for each audience base must be created, making the sheer volume of content needed difficult in terms of cost and time to produce. There will surely be faster, less expensive ways to produce advertisements

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and programming catered to interactive TV in the future. Advertising must be designed to work in a hybrid, integrated environment that incorporates the best of advertising with the best of broadcast television. Responses will be generated and fed back to the advertiser with technology developed specifically for this application. The bottom line is that advertisers are trying to deliver the greatest impact to as many people as possible at minimum cost, something which traditional analog TV is pretty good at, but with maximum targeting, which old TV wasn't good at.

The shift from mass market advertising to a more focused and response-based process represents a fundamental change in the companies that will advertise and the way consumers will see advertising in the future. Up until six months ago, advertising agencies seemed to have taken a low-key approach to interactivity. Now I clearly see that they have begun speaking to this arena, analyzing the value that interactive advertising can deliver and working with interactive broadcasters to develop creative campaigns for their clients.

On the entertainment side, the advantages of interactivity to the viewer are great. They receive an enhanced, more participatory experience and can tailor it to provide the type of programming and information they request. But because there is very little large-scale deployment of services offering enhanced programming to customers, we can only speculate today about what viewers want. A diverse range of programs will be created, but only the quality content that catches the imagination of the audience will survive.

### Technology solutions through partnerships

From a technology perspective the challenges for delivering interactive content are complex. TV channels run on multiple distribution systems, satellite, terrestrial, cable and broadband IP and these must be integrated to make the enhanced broadcast on an individual channel work for the whole audience. The need to create once, distribute everywhere requires a high degree of integration. It still contains the same complexities of a single broadcast but adds into the equation delivery over different platforms and the management of multiple two-way response paths. In addition, just as traditional broadcast requires frame accurate insertion of advertising, so does interactive television.

One of the new benefits of interactive TV will be to forge alliances between previously un-thought-of partners. Technology providers will work closer than ever with content owners, TV producers and broadcasters, middleware developers will create alliances with compression experts, and Internet companies will partner with broadcast specialists to harness the potential of broadcast television.

**Now that the COFDM/8VSB debate is over, what roadblocks remain for large-scale consumer acceptance of DTV? Will the 2006 deadline remain or are delays looming?**

**BY RICHARD M. LEWIS**

*Richard M. Lewis is senior vice president of technology and research for Zenith Electronics Corp.*



**W**ith the certainty of a single digital television (DTV) broadcast standard in place, all industries need to move forward cooperatively to make DTV a reality for U.S. consumers.

As one of the original developers of DTV technology in general and inventor of the vestigial sideband (VSB) transmission system in particular, we were understandably pleased by the recent reaffirmation of the ATSC standard by broadcasters and the FCC. That is not to say that we should not continue to explore possible enhancements in VSB performance or address broadcasters' changing needs. Indeed, a number of U.S. receiver manufacturers and chipmaking labs are moving full speed ahead with improved designs for standard applications as well as proposing extensions to provide additional robustness and flexibility. And, because the ATSC standard was designed to offer plenty of headroom, we are confident that future VSB enhancements will be adopted.

With the transmission standards dispute behind us, what are the remaining roadblocks to widespread DTV acceptance? There are four: (1) the lack of compelling digital content; (2) affordability of consumer equipment; (3) cable carriage and interoperability issues, and (4) the digital copyright protection situation. Not surprisingly, these issues cut across multiple industries — broadcast, consumer electronics, cable and programming — and therefore pose some thorny challenges for both the private sector and U.S. policymakers.

### Broadcaster momentum

U.S. broadcasters have made impressive strides in terms of investing in digital TV transmission equipment. With more than 180 stations currently broadcasting a digital television signal, the industry is far outpacing the DTV transition timetable established by the FCC. While some stations have encountered problems relating to tower siting, construction and the like, the vast majority of major-network affiliates in the 30 largest media markets are broadcasting in digital. And special credit goes to the growing number of stations in smaller markets — such as Quincy, IL. (number 161) and Salisbury, MD. (number

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162) – that have begun DTV broadcasting well in advance of the government-mandated schedule.

The 2006 deadline for effecting the digital conversion remains possible, at least theoretically and assuming that the key industries come together to reach agreement on the previously listed issues. The real barrier to this timetable is that the transition has not yet captured the hearts and minds of American consumers. Consumers need a reason and the means to adopt this new technology. Without compelling content, be it HDTV or datacasting or other new applications, DTV will flounder. Without equipment that the average consumer can afford, DTV will become a footnote in the digital age.

### Content is king

Where broadcasters can do their part is in the all-important area of digital programming, a critical element in the overall DTV equation. Despite the leadership provided by CBS, which accounts for the lion's share of high-definition television (HDTV) programming, the major commercial networks have yet to feed, let alone originate, their fair share of digital content. In addition to its commitment to prime-time programs in HD, CBS has offered an unequaled amount of HDTV sports programming, including the AFC playoffs, the Super Bowl, the Masters and the NCAA Final Four.

Were it not for the efforts of CBS, PBS and a small number of independents, the early adopter would have virtually nothing to watch in true HDTV. Besides HDTV, innovative applications of multiple standard-definition television (SDTV) and datacasting may also prove compelling and help drive the DTV market. The larger point is that absent far greater amounts of compelling digital content, consumers have little incentive to make the investment in digital television equipment, especially at today's price points.

### More-affordable receivers coming

Given the paucity of digital programming, it is nothing less than remarkable that initial sales of consumer DTV equipment have posted such respectable numbers. According to the Consumer Electronics Association (CEA), nearly 650,000 DTV displays and receivers were sold last year, and CEA predicts the figure will top 1 million units this year. This sales curve compares favorably with that of color TV, for example, which needed a full decade to reach sales of a million units annually. Many will point to the small number of tuners as an indication of DTV's failure, but we feel that the high number of sales of digital-ready sets proves consumers are ready and want DTV. The industry just needs to give them a reason to go out and buy that tuner or integrated set.

### Cable, Hollywood cooperation needed

With some 70 percent of all U.S. TV households getting their local, over-the-air stations via cable, the cable industry also needs to be on board if the digital television transition is to prove successful. Headway is being made on the issue of compatibility between cable equipment and consumer electronics products.

The digital must-carry controversy, on the other hand, has proven far more difficult. Ignoring the pleas of broadcasters that cable companies should be required to carry each station's analog *and* digital signals during the transition, the FCC ruled preliminarily that cable operators must carry only one or the other. Logically, if a broadcaster is only upconverting analog content it is hard to understand why a cable company should be required to carry two versions of the same content. On the other hand, if the broadcaster is providing HDTV or SD with additional data content, the consumer is provided with benefit beyond analog television. In this case it is hard to see why the cable company should not provide the full, undiluted benefits of broadcast-quality DTV or true digital HDTV. This paradox represents a huge potential barrier on the road to digital television.

No one said that the transition to digital television would be easy. We have known all along that broadcasters, manufacturers, cable operators and Hollywood would have to work together to shape the kinds of lasting solutions that will allow this fledgling medium to succeed. Now that the transmission standards debate is behind us, resolving these few remaining issues will help deliver digital television to consumers who, in the end, will determine the true success of the DTV transition.

## ATSC initiatives for the DTV buildout



**BY MARK RICHER**

*Mark Richer is the executive director, ATSC, Washington, D.C.*



**A**lthough the basic standards that define DTV were completed several years ago, work continues to refine the system and expand the suite of functions and features enabled by the digital television system. The Ad-

vanced Television Systems Committee has a number of major initiatives underway now intended to increase the competitive edge of DTV. The ATSC, an international non-profit organization developing voluntary standards for digital television, has over 200 member organizations representing the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.

The work of the ATSC is carried out by scores of top engineers from companies around the world who dedicate their time to develop and refine standards for the DTV environment. More than a dozen committees are active within the ATSC, addressing a wide array of subjects. At present, the three most visible efforts include:

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- The DTV Application Software Environment
- Interactive services
- VSB enhancements

These efforts, like all other ATSC standards work, are being carried out in an open environment in which all viewpoints are considered. The specialist groups of the ATSC operate on the basis of consensus wherein all practical technical solutions to a given objective are evaluated by experts. It is within this process that the standards documents are developed. The approval process of a draft document is structured and ultimately is determined by a vote of the full ATSC membership.

## DASE

The DTV Application Software Environment (DASE) is a classic example of the flexibility of the ATSC DTV system. The DASE standard will define a software layer (*middleware*) that allows programming content and applications to run on a "common receiver." Interactive and enhanced applications need access to common receiver features in a platform-independent manner. This standard will provide enhanced and interactive content creators the specifications necessary to ensure that their applications and data will run uniformly on all brands and models of receivers. Manufacturers will be able to choose hardware platforms and operating systems for receivers, but provide the commonality necessary to support applications made by many content creators.

The DASE undertaking is enormous; the effort — which began three years ago — is nearing completion. The DASE standard is composed of a suite of standards documents. Five of the eight documents have been developed and are now in their first ballot/comment period. It is expected that the entire DASE suite will be finalized and approved by the full ATSC membership later this year.

## Interactive services

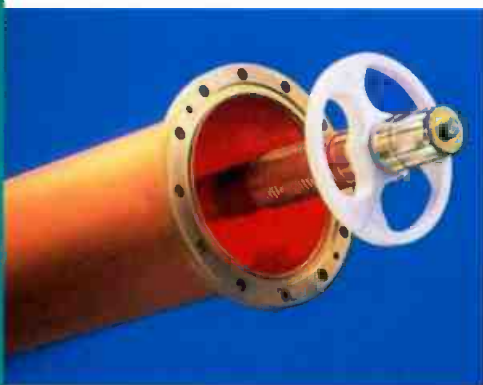
The work on interactive services is intended to define session-level protocols carried over interaction channels associated with interactive services. The interaction channel may be one- or two-way and connects a user (operating through a DTV receiver) with a service provider. The ATSC Interactive Services Protocols are intended to operate on a variety of physical networks, by focusing on higher layer protocols but not addressing specific applications. Work on this project is ongoing, with completion slated for later this year.

## VSB enhancements

Recent studies have proven that the 8VSB modulation system is clearly the best choice for broadcasters. Still, the need for better receivers and — possibly — enhancements to the transmitted signal itself have been identified as an important area for further study. Responding to the evolving needs of broadcasters, the ATSC has initiated standards activity aimed at enhancing the VSB modulation specifications that

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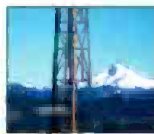
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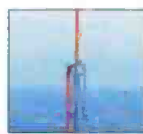
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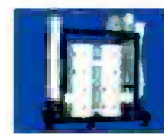
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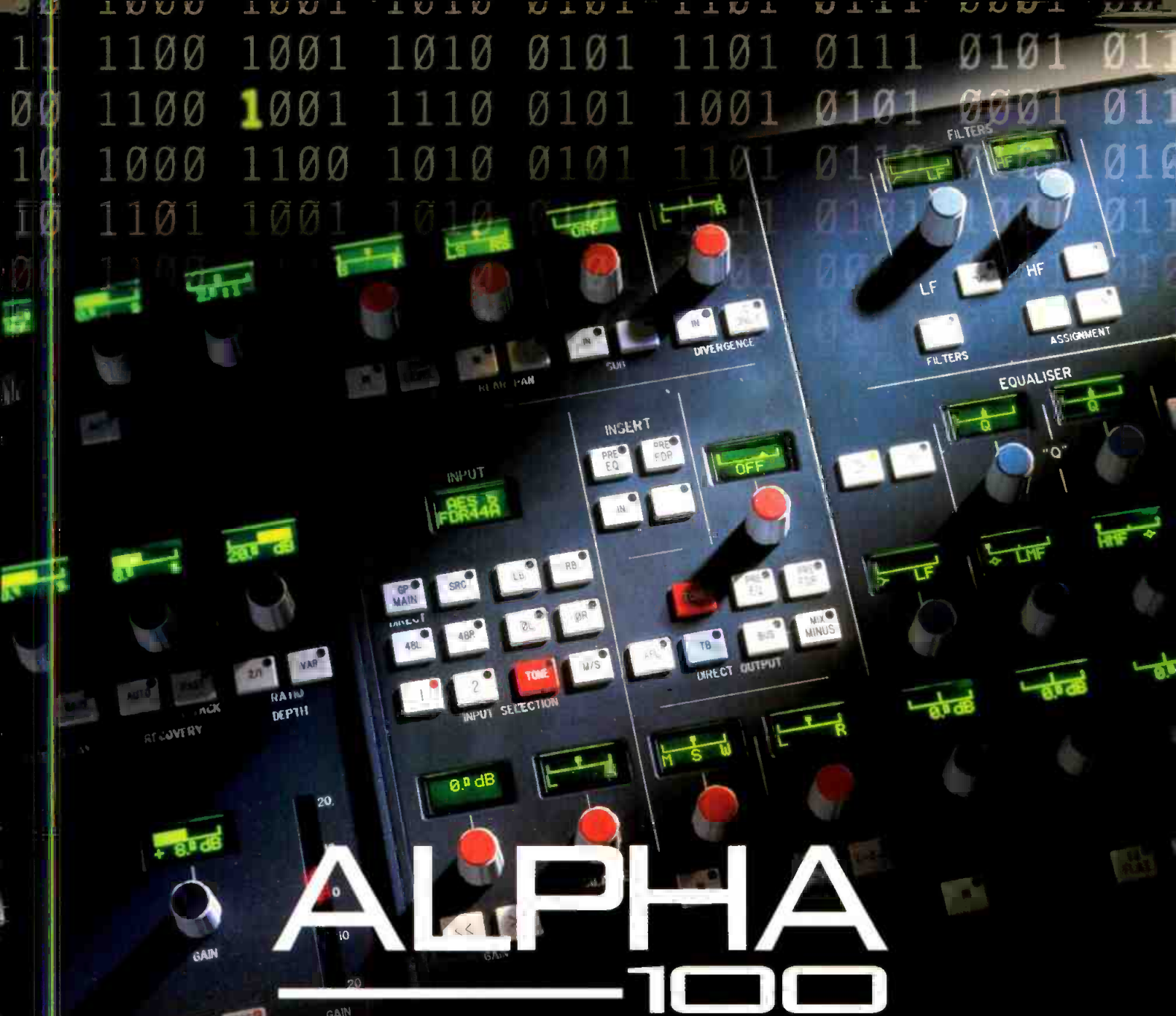


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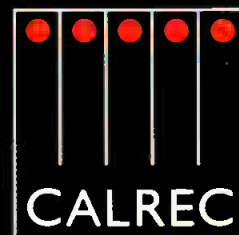
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are a part of the ATSC Digital Television standard (document A/53 and others). The new effort, being carried out by specialist group T3/S9, is intended to improve reception by fixed and indoor receivers, and to give broadcasters additional flexibility — including the ability to transmit programming and data to portable and mobile receivers. The effort by T3/S9 is moving forward in parallel with the DTV implementation process already well underway.

The first step in this effort was the issuance of a *request for proposals* (RFP) that seeks to identify possible approaches. A number of DTV receiver and chipset manufacturers, among others, have indicated they will respond with formal submissions.

While the RFP applies to *compatible* through *non-compatible* VSB enhancements, the highest priority is placed on compatible 8VSB enhancements. The RFP invites proposals covering a wide range of technologies involving modulation and/or payload enhancements; for example, adding training signals or other data intended to improve performance of the overall system. The compatible improvement of fixed and indoor 8VSB terrestrial DTV service is the top priority of this work.

In addition to fixed and indoor service, other service modes have been identified as desirable, including:

- **Portable service:** a transmission/reception system that will allow the receiving device to be moved from place-to-place, using a self-contained receiving antenna, but which remains essentially stationary during operation.

- **Pedestrian service:** a transmission/reception system that will allow a receiver with a self-contained antenna to operate successfully while the receiver is moving at speeds up to 5 kilometers per hour.

- **Mobile service:** a transmission/reception system that will allow successful operation of a receiving device at speeds greater than 5 kilometers per hour.

- **On-channel signal boosters and repeaters:** systems that permit the reception of DTV signals in areas where signal shading from terrain or man-made objects make reception difficult.

The T3/S9 VSB enhancement project is on an aggressive schedule. Critical landmarks include the following:

- Invitation to present proposals sent to proponents: May 2, 2001

- Selection of technology for field tests: Sept. 14, 2001

- Field tests begin: Nov. 14, 2001

- Review of field tests: Jan. 15, 2002

- Adoption of Standard or Revision to A/53 by T3/S9: Jan. 31, 2002

It should be noted that this schedule will be reviewed on a regular basis by T3/S9 and may be amended, if necessary.

Unlike the NTSC color television standard, the ATSC DTV system is intended to expand and grow as market requirements and business opportunities permit. The flexible nature of the fundamental digital architecture makes possible this unprecedented degree of flexibility. ■

# boldly flow.

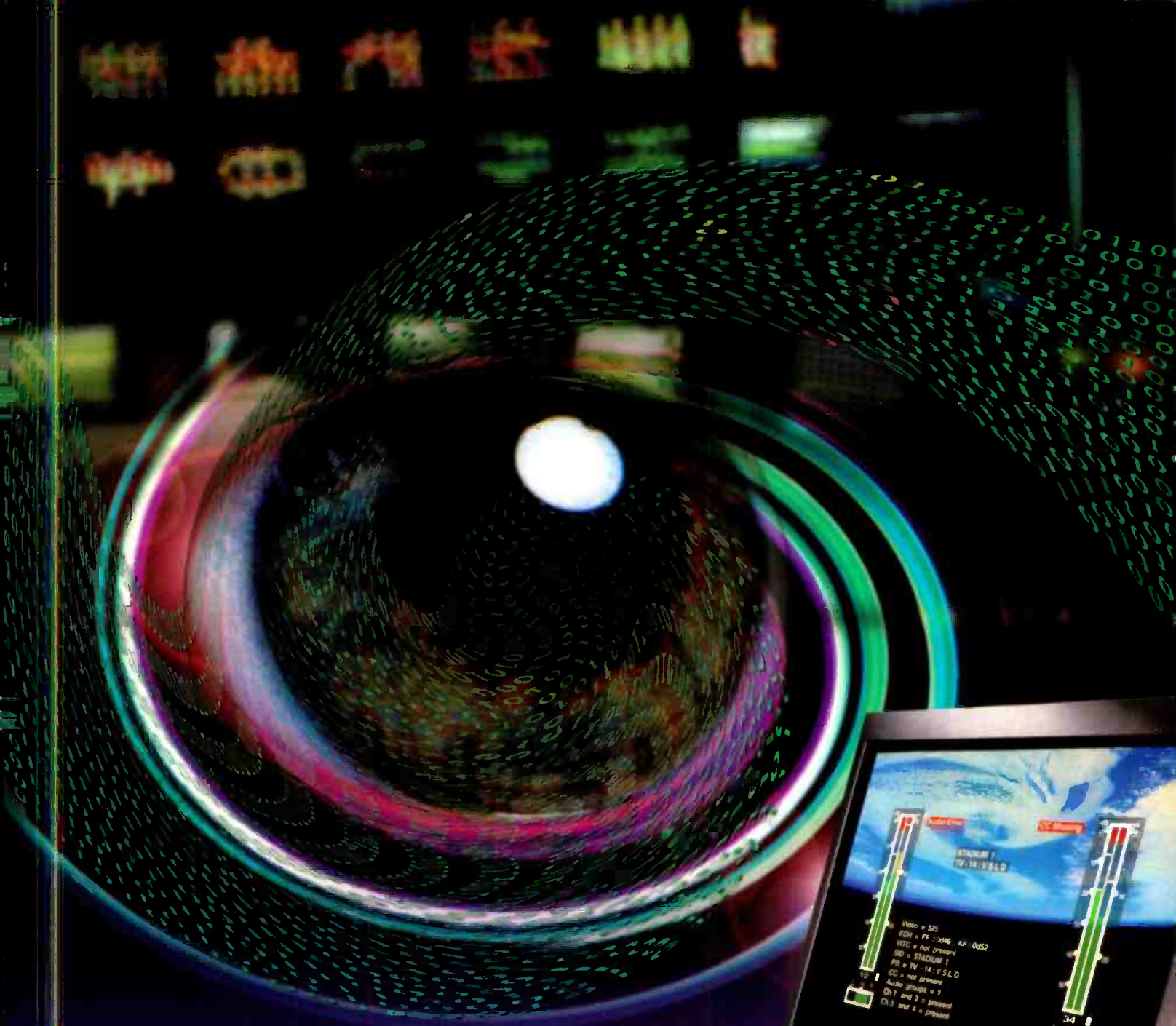
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#### Comrex Matrix:

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### DOLBY E TRI-LEVEL SYNC INTERFACE UNIT

#### Dolby Laboratories DP579:

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### BROADCAST AUDIO CONSOLE

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818-766-1666; fax: 818-766-3401; [www.euphonix.com](http://www.euphonix.com)

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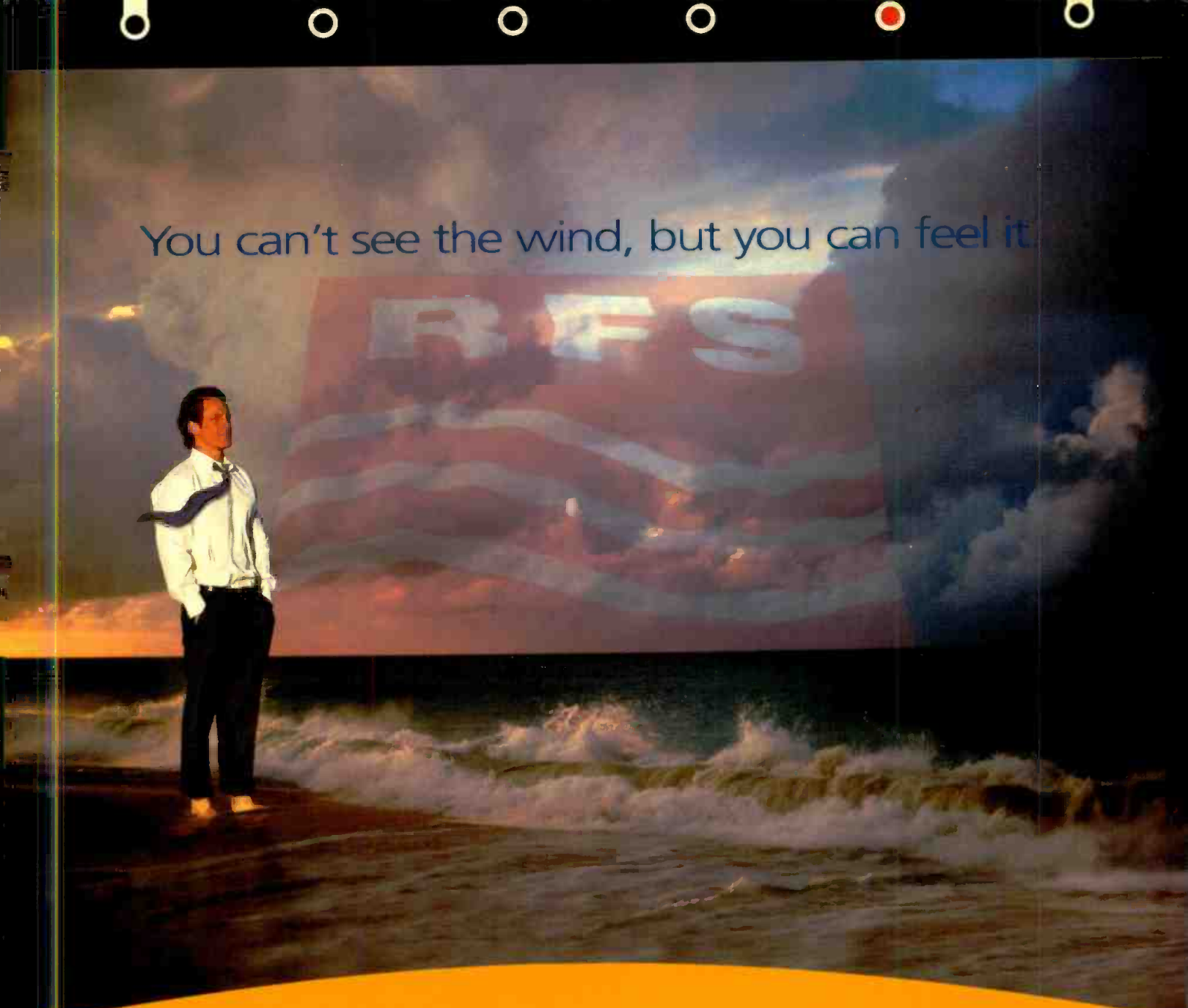
### AUDIO PROCESSOR AND DELAY

#### Fortel DTV DAS-441:

Four-channel audio processor and delay offers I/Os that include two stereo pairs of balanced analog audio and two AES pairs of unbalanced digital audio; digital I/O uses 75 Ohm BNC connectors for ease of installation; reference quality 24 bit A/D D/A converters at 96kHz for the analog I/Os ensures maximum transparency; maximum I/O levels are +28dBu.

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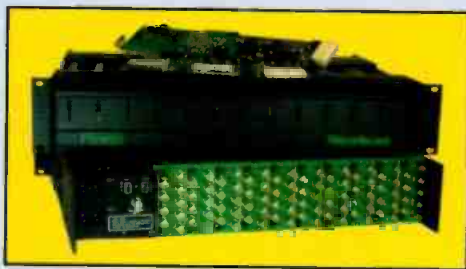
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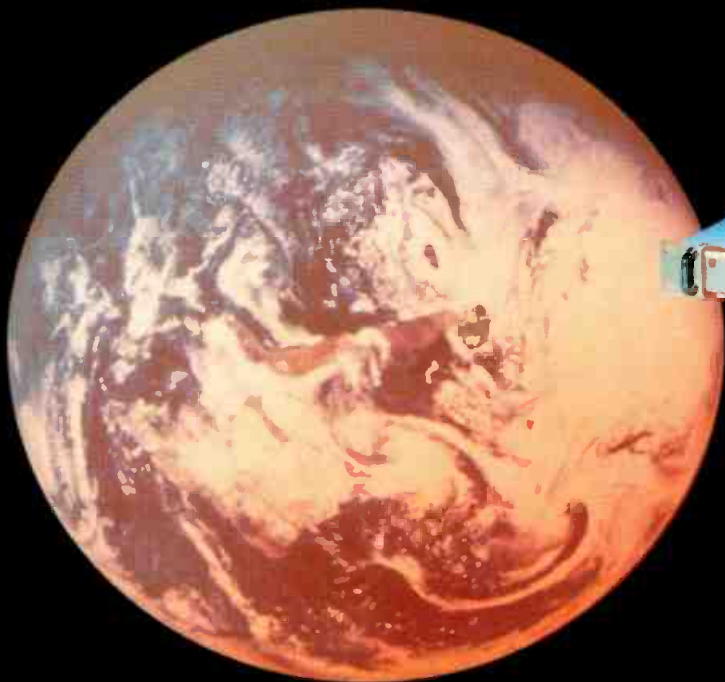
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### Solid State Logic Avant Software, V4:

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## automation



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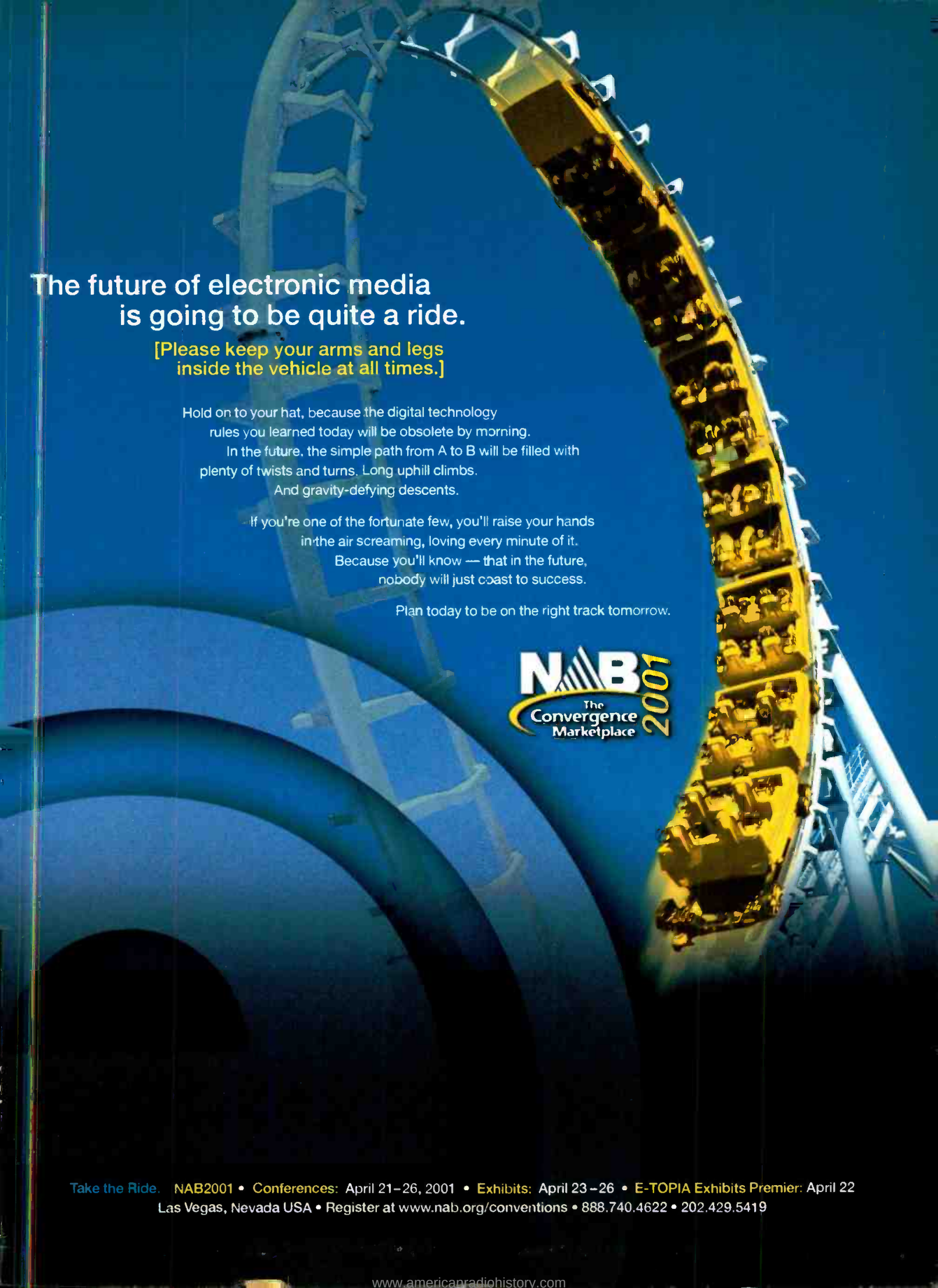
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## FLEXICODER MANAGEMENT SYSTEM

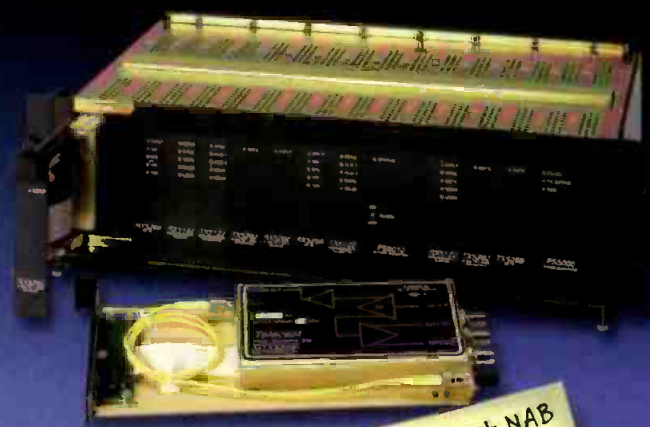
### Harris Corporation Element Manager:

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[www.sgi.com/go/broadband](http://www.sgi.com/go/broadband)



The new SGI Media Server • Up to 8 video channels • Video file transfers • Multi-format video I/O support

## NETWORK-BASED AUTOMATION PROTOCOL

### Harris Corporation NDCP:

Network Device Control Protocol is designed to provide broadcasters with an open, network-based standard for control of audio and video devices.; built on TCP/Ip as a public protocol using XML, NDCP is easy to implement and provides an open, platform-independent solution for connectivity via local or wide area networks; it is asynchronous, time-based and uses a master/slave model.

800-622-0022; fax: 513-459-3890; [www.harris.com](http://www.harris.com)

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## MASTER CONTROL SWITCHER

### Ross Video CDK 111:

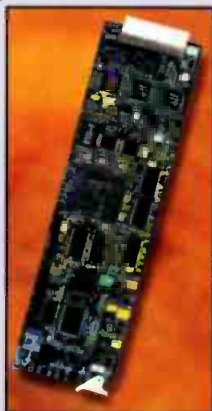
Single DA-sized card provides video mixing, keyer with built-in animated logo storage and frame synchronizers for every input; other features include full preview, program bypass relay and automation port.

613-652-4886; fax: 613-652-4425;

[www.rossvideo.com](http://www.rossvideo.com)

**Booth: L11639**

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## VIDEO SERVER AUTOMATION SYSTEM

### Encoda DAL Playlist Manager:

System is now available as a pre-packaged solution; all systems interface with any Encoda traffic product, including BIAS, Columbine, JDS 2000, Paradigm and Enterprise BMS; interface provides for efficient transfer of schedules and as-run logs between traffic and master control for automation playout and traffic reconciliation; features provides video server balancing, redundant playout and segmented program playback, as well as distributed control capabilities that allow monitoring and control from any authorized workstation.

303-237-4000; fax: 303-237-0085; [www.encodasystems.com](http://www.encodasystems.com)

**Booth: L12220 Circle (475) on Free Info Card**

## SATELLITE RECORDING SYSTEM

### Sundance Digital Intelli-Sat:

Automated system allows all network users to schedule satellite records from desktops; program controls dish positions, tunes receivers, assigns a machine to record material and switches the router; available as a complete scheduling and automation solution or single task-specific modules.

972-444-8442; fax: 972-444-8450; [www.sundancedigital.com](http://www.sundancedigital.com)

**Booth: L1355 Circle (476) on Free Info Card**

## DIGITAL NEWSROOM ENVIRONMENT

### Avid Unity for News:

Provides a shared storage and networked environment for iNews, NewsCutter and AirSPACE technologies; also feature MediaManager and TransferManager, which provide critical capabilities for finding and moving media assets with the click of a mouse.

800-949-AVID; fax: 978-640-1366; [www.avid.com](http://www.avid.com)

**Booth M8318 Circle (474) on Free Info Card**

## MASTER CONTROL SWITCHER

### Utah Scientific HD-2020:

System is compatible with existing Utah MC-500 series, providing an upgrade path to digital operation in either HD or SD; can carry two independent video channels in any combination of HD and SD; features multiple keyers and full audio processing on each channel.

801-524-9999; fax: 801-524-0555; [www.utahscientific.com](http://www.utahscientific.com)

**Booth: L10452 Circle (477) on Free Info Card**

# VERSADESK

## adds mobility to your editing room.

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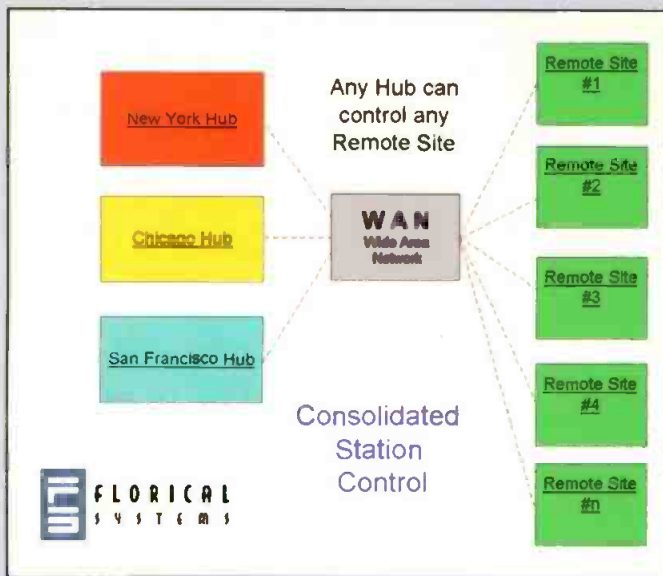


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[www.americanradiohistory.com](http://www.americanradiohistory.com)



## STATION CONTROL SYSTEM

### Florical Systems Consolidated Station Control:

Allows for control of multiple stations from a central location; features multiple time zones synchronized to Universal Coordinated Time; geographically distributed Device Servers, zero timing at the final switch for video/audio sources originating in different locations and remote ingest to central server.

352-372-8326; fax: 352-375-0859; [www.florical.com](http://www.florical.com)

Booth: L1317 Circle (478) on Free Info Card

## NEWSROOM SYSTEM

### Avid NewsCutter XP 2.0:

New release offers full support for Avid Unity for News, including MediaManager and TransferManager; allows user to edit while recording; features auto voice over, which allows one keystroke setup for voiceovers; Script-based In/Out allows the insertion or deletion of word changing the timing of edits; Send to playback lets you keep editing while moving a story to AirSPACE or another playback server.

800-949-AVID; fax: 978-640-1366; [www.avid.com](http://www.avid.com)

Booth M8318 Circle (479) on Free Info Card

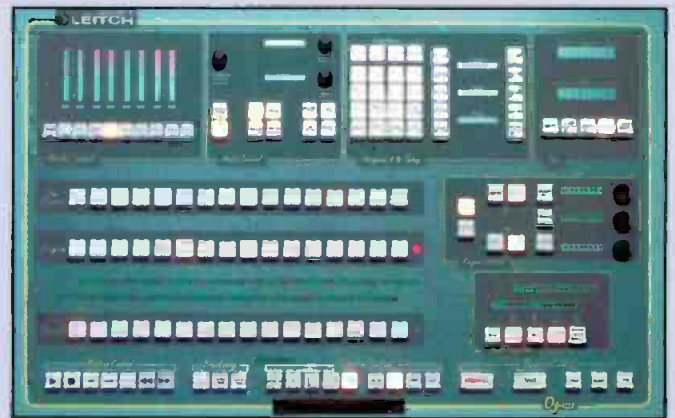
## SERVER MANAGEMENT SYSTEM

### BUF Technology Spot Server Management System:

Compact, simple, fast and powerful controller for video servers; individual clips, fill & matte (key) clips, or multiple clips are easily loaded for playback, saving valuable time and space for the operator; sequences of trimmed clips can be combined, created or loaded for playback just as easily.

858-451-1350; fax: 858-451-6589; [www.buftek.com](http://www.buftek.com)

Booth L122 Circle (480) on Free Info Card



## MASTER CONTROL SWITCHER

### Leitch Opus

Integrates digital and HD standards, providing a robust and flexible choice; includes 4:4:4 video processing and features full program and preset bus transitions, including mix, vee, fade out and cut fade as standard.

800-231-9673; fax: 757-548-4088; [www.leitch.com](http://www.leitch.com)

Booth: L8620 Circle (481) on Free Info Card

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[www.belden.com/products/apprep.htm](http://www.belden.com/products/apprep.htm)

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## cameras



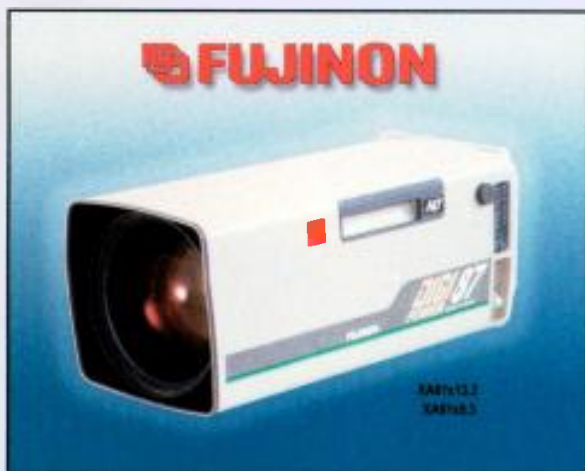
### HIGH-DEFINITION CAMCORDER

#### Panasonic Broadcast AJ-HDC27A:

This 30frames/s to 60frames/s, dual-frame-rate, progressive-scan (720p) DVCPRO HD camcorder is based on a newly developed 1.1-million-pixel, 2/3-inch, three-CCD IT imaging system that offers a sensitivity of f/11 at 2000lux. The camcorder provides 46 minutes of recording, two channels of 16-bit/48kHz digital audio, power consumption of 30W, and uses standard, 2/3-inch bayonet lenses. An HD-DSI output enables full-color live and tape playback, while the 8MB multimedia card stores camera setups.

800-528-8601; 323-436-3500; fax: 323-436-3660; [www.panasonic.com](http://www.panasonic.com)

**Booth: L7020 Circle (482) on Free Info Card**



### HDTV CINE-STYLE LENS SET

#### Fujinon XA87x Lenses:

Offer 87x magnification ideal for sports shooting and other applications where extreme close-ups and high-image quality are critical; lenses feature focal lengths up to 2300mm; XA87 series is available with an optional integrated image stabilizer.

800-553-6611; fax: 973-633-5216; [www.fujinon.com](http://www.fujinon.com)

**Booth L8739 Circle (483) on Free Info Card**

### HD CAMCORDER

#### Panasonic AJ-HDC24A:

Multi-frame rate, 720p camcorders three 2/3-inch IT CCDs feature 1280x720 effective pixel resolution and an on-chip lens system providing high sensitivity of F13 at 2000 lux (in 24-frame mode at 50 percent shutter), high smear immunity and strong color accuracy; frame switchability allows for 59.94fps, 23.98fps and several other choices.

800-528-8601; fax: 323-436-3660; [www.panasonic.com/broadcast](http://www.panasonic.com/broadcast)

**Booth L7020 Circle (484) on Free Info Card**



### HD PROGRESSIVE SCAN CAMCORDER

#### Panasonic AJ-HD C27A:

Capable of acquiring 720-line (1280x720), 60 frame progressive scan HD images; offers same compact size and weight as standard camcorder; units three 2/3-inch IT CCDs feature 1280x720 effective pixel resolution and an on-chip lens system provide high sensitivity of F10 at 2000 lux.

800-528-8601; fax: 323-436-3660; [www.panasonic.com/broadcast](http://www.panasonic.com/broadcast)

**Booth L7020 Circle (485) on Free Info Card**



### SWITCHABLE HD CAMERA

#### Hitachi Denshi HDTV cameras:

Integrated, switchable, automated pan/tilt cameras offer simultaneous HD and NTSC video and are 1080i, 480 and 720p capable with downconversion available; cameras are portable and will feature studio adapters similar to the new SA-777 studio adapter; feature digital processing, 2.2 million pixel CCDs, constant operation in 16:9 HDTV format, 1200 TVL of resolution and f8.0 at 2000 lux sensitivity.

516-921-7200; fax: 516-496-3718; [www.hdal.com](http://www.hdal.com)

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## 40 X 11 ZOOM LENS

### Angenieux Extreme Tele Zoom:

Delivers a focal range of 40x11 to provide camera operators with a high degree of versatility and coverage capabilities; features the longest focal length available with low ramping: F440mm (1 degree) at f/4 and F880mm (1/2 degree) with a 2x extender; offers high-resolution optics; digital performance features a wide variety of zoom modes and focus servo controls.

973-812-3858; fax 973-812-9050; [www.angenieux.com](http://www.angenieux.com)

**Booth L9046 Circle (487) on Free Info Card**



## VIDEO HEADS

### Bogen Manfrotto 503/505:

Two new models offer fluid movement and a built-in balance spring; 503 head is designed for payloads up to 13 lbs. and returns to zero when unloaded; 505 features a multispring package with a set of user-changeable counterbalance springs, so the unit can be used with lightweight palmcorders and large ENG cameras.

201-818-9500; fax: 201-818-9177; [www.bogenphoto.com](http://www.bogenphoto.com)

**Booth: L10777 Circle (488) on Free Info Card**

## HDCAM CAMCORDER

### Sony HDW-750/HDW-730:

Features new CCD technology and LSI, providing high sensitivity and low smear level; also features advanced digital signal processing including selectable gamma curves, and a flexible built-in HD-SDI output.

800-686-SONY; 201-930-1000; fax: 201-930-4752;

[www.sony.com/professional](http://www.sony.com/professional)

**Booth: L11600 Circle (489) on Free Info Card**



## 12-BIT DIGITAL TRIAX CAMERA:

### Thomson Broadcast 1707:

Offers all-digital operation from acquisition to transmission over triaxial cable; now available in Sportcam and Microcam versions.

800-882-1824; 201-569-1650; fax: 201-569-1511;

[www.thomsonbroad.com](http://www.thomsonbroad.com)

**Booth: L9000 Circle (490) on Free Info Card**



## PAN AND TILT HEAD

### Vinten Vision 3

Lightweight new entry in the Vision range; designed for DV camera users.

845-268-0100; fax: 845-267-0113; [www.vinten.com](http://www.vinten.com)

**Booth: L11145 Circle (491) on Free Info Card**

## TRIPOD

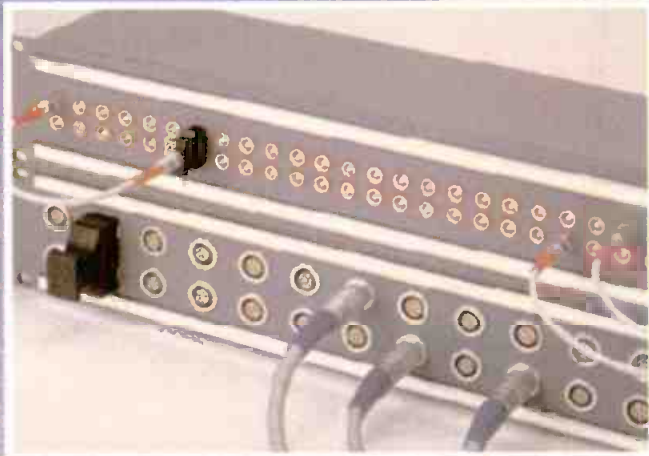
### Vinten Pozi-loc:

New range with innovative positive action and cam-operated clamps for secure locking.

845-268-0100; fax: 845-267-0113; [www.vinten.com](http://www.vinten.com)

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## HDTV CAMERA RANGE

### Ikegami HDK Family updates:

Includes the 790E, a 2/3" 2.2 million pixel CCD, switchable HDTV studio camera; 79E, a 2/3" 2.2 million pixel CCD, switchable HDTV portable companion; the 720, a 2/3" native 720p CCD HDTV studio camera; and the 720p, a 2/3" native 720p CCD HDTV portable companion.

800-368-9171; fax: 201-569-1626; [www.ikegami.com](http://www.ikegami.com)

**Booth L10420 Circle (493) on Free Info Card**



## MODULAR CHARGING SYSTEM

### Anton/Bauer Interactive 2000 PowerChargers:

Includes two- and four-position chargers, a choice of power ratings, diagnostic module, charge expansions adaptors and standard AC mains adaptor to power cameras; software updates allow charging of new battery chemistries; three-year Maxx warranty on all PowerChargers.

203-929-1100; fax: 203-929-9935; [www.antonbauer.com](http://www.antonbauer.com)

**Booth L7030 Circle (494) on Free Info Card**

## FUTURE-PROOF LENSES

### Canon:

Lenses are engineered to maximize camera performance in every format for ENG, EFP, studio and field production; company will also showcase the technological advances in its current line of lenses, as well as display its popular HD-EC (Electronic Cinematography) line.

800-321-4388; fax: 201-816-2909; [www.canonbroadcast.com](http://www.canonbroadcast.com)

**Booth L10436 Circle (495) on Free Info Card**

## TILT FOCUS LENSES

### Century Precision Optics HD Tilt-focus lenses:

Includes 24, 45 and 90mm for B4 mount; each lens provides 360 degrees of rotation and eight degrees of tilt in any direction, offering good control of the subject focus range.

818-766-37156; 818-505-9865; [www.centuryoptics.com](http://www.centuryoptics.com)

**Booth L11373 Circle (496) on Free Info Card**



## LI-ION BATTERY

### PAG USA L75:

75 watt-hour pack weighs only 1.5lbs; no-hot-swapping or piggy-backing is required as one battery will power a camera and 35W light; battery is available in Snap-On and PAG-lok mountable configurations.

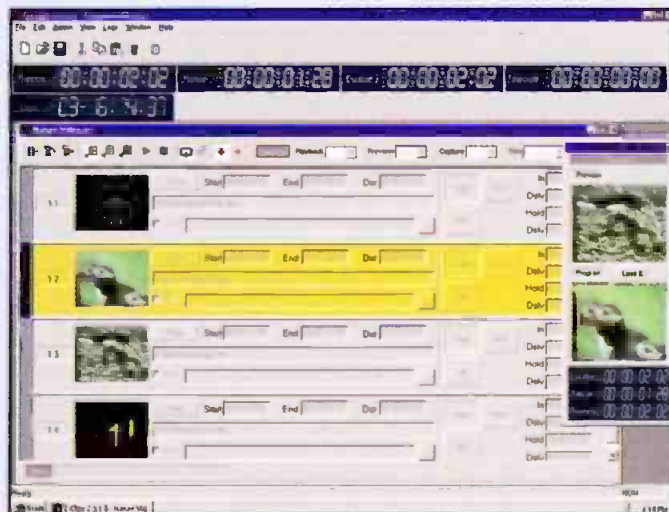
888-PAGUSA1; fax: 805-520-6949;

[www.pagusa.com](http://www.pagusa.com)

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## CGs, prompters, captioning



## VIDEO PLAYOUT PRODUCT

### Inscriber Technology LIVE!Clips:



Designed for use in news, sports, weather, music and any other 24-hour broadcast channel; offers increased board support and a media management module; available separately as software and board bundle or as software only as Inscriber E-Clips.

800-363-3400; 519-570-9111; fax: 519-570-9140;

[www.inscriber.com](http://www.inscriber.com)

**Booth S4832 Circle (498) on Free Info Card**



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## HD GRAPHICS GENERATOR

### Pixel Power Clarity HD:

Features switchable output at 720-60p through 1080-30i to 1080-24p; three-channel HD/SD; handles 4:2:2:4 or 4:4:4:4; program output channel is SMPTE292M serial digital with key and VGA HD15; options include offline preparation and multi-user software, as well as CCIR-601 I/O capability.

561-395-4801; fax: 561-395-4065

**Booth: L741 Circle (499) on Free Info Card**

## ENHANCED CHARACTER GENERATOR

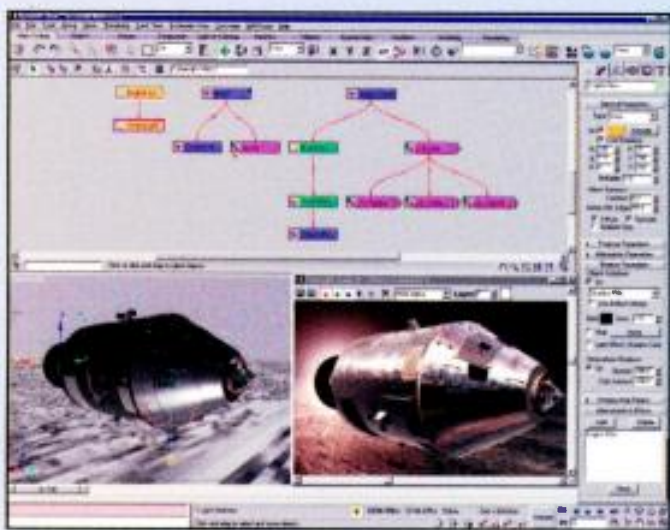
### Inscriber Technology Automation CG:

Fills tagged data fields of Inscriber layouts with live data from popular news vendors; news and sports broadcasters can save time and effort while still providing current and constantly updated information; using CII message protocol, provides maximum connectivity to link compatible news vendors including Omnibus, AP's ENPS, Avstar BCS, ProBel and ANN.

800-363-3400; 519-570-9111; fax: 519-570-9140; [www.inscriber.com](http://www.inscriber.com)

**Booth S4832 Circle (500) on Free Info Card**

## graphics



## GRAPHICS SOFTWARE

### Discreet Logic frost 2.5:

Allows for simultaneous Web updates and enables interactive and enhanced television applications with real-time graphics; effects system enables broadcasters to build graphics for television and Web branding; allows designers to take full advantage of modeling and animation while rendering in real-time.

800-869-3504; 514-272-0525; fax: 800-305-6442; [www.discreet.com](http://www.discreet.com)

**Booth: S4100 Circle (501) on Free Info Card**

## GRAPHICS SYSTEM

### vi[z]rt video engine:

System combines graphics and content management with an internal digital disk recorder in a PC architecture; allows post graphics to be mixed with real-time graphics live; also provides motion graphics authoring, rendering and playback.

212-463-9902; 877-955-2230; fax: 212-463-9931; [www.vizrt.com](http://www.vizrt.com)

**Booth: S4147 Circle (502) on Free Info Card**

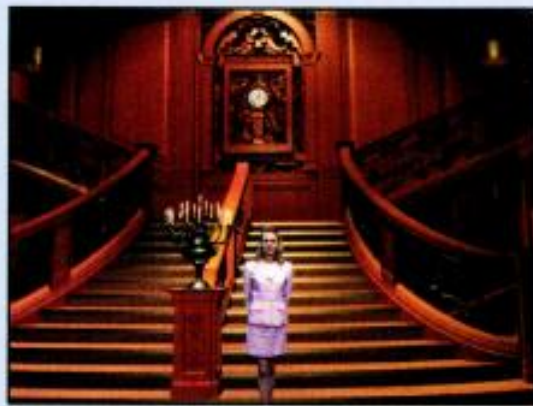
## VIDEO WORKSTATIONS

### BOXX Technologies 3DBOXX :

Features dual Athlon processors from AMD; systems are easily expanded and customized to offer up to 10 hot-swap drive bays, five expansion slots and up to 4Gb system memory; additional features include 4X AGP support and a three year warranty.

877-877-BOXX; fax: 512-835-0434; [www.bboxtech.com](http://www.bboxtech.com)

**Booth S3872 Circle (503) on Free Info Card**



## VIRTUAL STUDIO SYSTEM

### For-A digiWarp-EX:

Simple, cost-effective virtual studio system with 2048x2048 pixel, high-resolution background that allows no picture deterioration during zooms; easy system setup and breakdown for increased mobility when changing studio locations; auto defocus background in response to camera zoom.

212-861-2758; fax: 212-861-2793; [www.for-a.com](http://www.for-a.com)

**Booth: L8612 Circle (504) on Free Info Card**

## 3D VECTOR GRAPHICS AND TITLING

### BorisFX RED:

In addition to adding more host support, a standalone rendering engine and improved rendering support, it also features a revamped interface with export options and file compression for Flash, AVI and Quicktime; increased capabilities include vector paint, fully editable and animatable, rotoscoping and masking; customized creation, animation, extrusion of vector shapes, advanced text creation and animation including text on a path, type on and write on text animation styles, and enhanced 3D compositing.

888-77-BORIS; fax: 617-451-9916; [www.BorisFX.com](http://www.BorisFX.com)

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[www.americanradiohistory.com](http://www.americanradiohistory.com)

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## intercoms



### PROGRAMMABLE SOURCE-ASSIGNMENT PANEL

#### Clear-Com RCS-2000:

Eight-source by 24-destination routing panel; expandable to 15 sources by 72 destinations; users can program and control the unit from 300 feet away via PC or the RCU-60 remote control unit.

510-496-6666; fax: 510-496-6699; [www.clearcom.com](http://www.clearcom.com)

**Booth: L10373 Circle (506) on Free Info Card**



### INTERCOM

#### Telex BTR-800:

Two-channel, fully UHF intercom system; allows two distinct channels of intercom to be accessed by one or more wireless extensions to the intercom system; user synthesized to allow broadcasters to keep intercom systems clear of other wireless equipment; allows users to send a dry line level audio signal at +8dB to a given destination, allowing users to trigger a two-way radio and have audio be routed over it or any closure-activated device.

800-392-3497; 952-884-4051; fax: 952-884-0043; [www.telex.com](http://www.telex.com)

**Booth: L8763 Circle (507) on Free Info Card**

## lighting



### LIGHTING SYSTEM

#### Cool-Lux SL-3000:

Large-format on-camera soft light designed on a smaller scale; soft light reflector can be easily removed, converting the fixture into a mini broad (flood) light measuring 1½ inches by 4 inches; fixture is powered by a special 13.5-volt, 78mm double-ended 60 or 100 watt lamp.

800-ACDC-LUX; 805-482-4820; fax: 805-482-0736; [www.cool-lux.com](http://www.cool-lux.com)

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Engineer  
14 years experience  
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Manager, RF Systems  
15 years experience  
BSEE



**Ernie Mayberry**  
Sr. Director, Antenna  
Systems Management  
26 years experience  
BSEE, MSEE



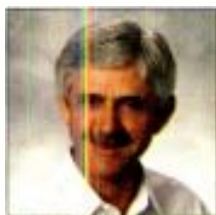
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Engineering  
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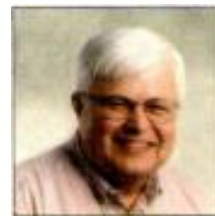
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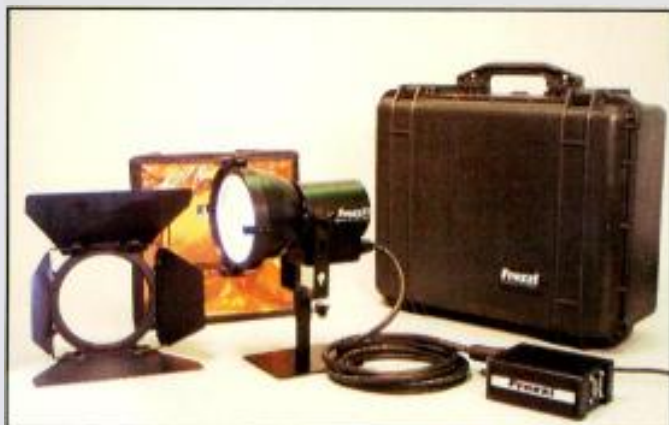
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## DIGITAL VIDEO SYSTEM

### Opticomm DVX-5000 System

Universal multimedia digital transport system for distribution over wide area networks including PAL, NTSC and SECAM for multi-channel QAM or VSB signals; offers transmission signals for the transport of digitized video, audio and control data signals over singlemode fiber; uncompressed 10-bit serial digital video system at 143, 177, 270, 360, 540 and 622Mb/s data rate is free of adjustment over a wide dynamic range; digital signal offers receiver output stability not affected by the fiber, attenuation, aging, splicing or other factors

858-450-0143; fax: 858-450-0155; [www.opticomm.com](http://www.opticomm.com)

**Booth: S3047 Circle (511) on Free Info Card**

## OPEN-INTERFACE NETWORK MONITORING SYSTEM

### Barconet Rosa 3.0:

Latest version features a solution for managing all network elements by a single, vendor-independent management system.

800-992-5016; 770-590-3600; fax: 770-590-3610; [www.barconet.com](http://www.barconet.com)

**Booth: S5360 Circle (512) on Free Info Card**

## ANTENNAS

### Comtech Antenna Systems Quick Deploy Antenna:

Is offered in 1.2 or 1.8 meter apertures; one person can assemble the units in less than 30 minutes; packaged in two air-shippable cases, one of which provides a stable base for the Elevation-over-Azimuth mount.

407-892-6111; fax: 407-892-0994; [www.comtechsystems.com](http://www.comtechsystems.com)

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## WIRELESS TRANSMISSION SYSTEM

### Canon DT-50/SDI:

Latest version of its Canobeam line allows full-bandwidth wireless transmission of a wide variety of digital video signals; system is ideal for transmitting sports events and news over 2km with a direct line of sight; sets up quickly and requires no license or frequency allocation.

800-321-4388; fax: 201-816-2909; [www.canonbroadcast.com](http://www.canonbroadcast.com)

**Booth L10436**

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## WEATHER RADAR

### Baron Services XDD-350C:

350,000W C-Band Doppler radar designed to specifically meet the needs of television meteorologists.

256-881-8811; fax: 256-881-8283;

[www.baronservices.com](http://www.baronservices.com)

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### NEC America:

Offers Spectrum Stretch technology, allowing two DMLs to operate on the same channel in 8.5MHz of bandwidth; doubles the capacity of the 2GHz ENG band; DML uses COFDM for robust transmission and reception, including mobile transmission applications.

888-383-4DTV; 214-262-3695; fax: 214-262-3687;

[www.necbroadcast.com](http://www.necbroadcast.com)

Booth: L6043 Circle (516) on Free Info Card



## DUAL CARRIER STL SYSTEM

### NuComm Dual Stream System Plus:

Combines both the analog and DTV signals over a common microwave channel; features 8VSB modulation and can provide NTSC plus five audio subcarriers, DTV signal and a T1 data pack embedded in the same signal.

918-813-0399; fax: 908-813-0399; [www.nucomm.com](http://www.nucomm.com)

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## DSNG ENCODER

### Scopus (formerly Tadiran Scopus) CODICO E-1700:

Features built-in modulator to allow for encoding and modulation in one unit.

858-618-1600; fax: 858-618-1615; [www.tadiranscopus.com](http://www.tadiranscopus.com)

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## 10-CHANNEL VIDEO MULTIPLEXER

### Communications' Specialties Pure Digital Fiberlink Multiplexer:

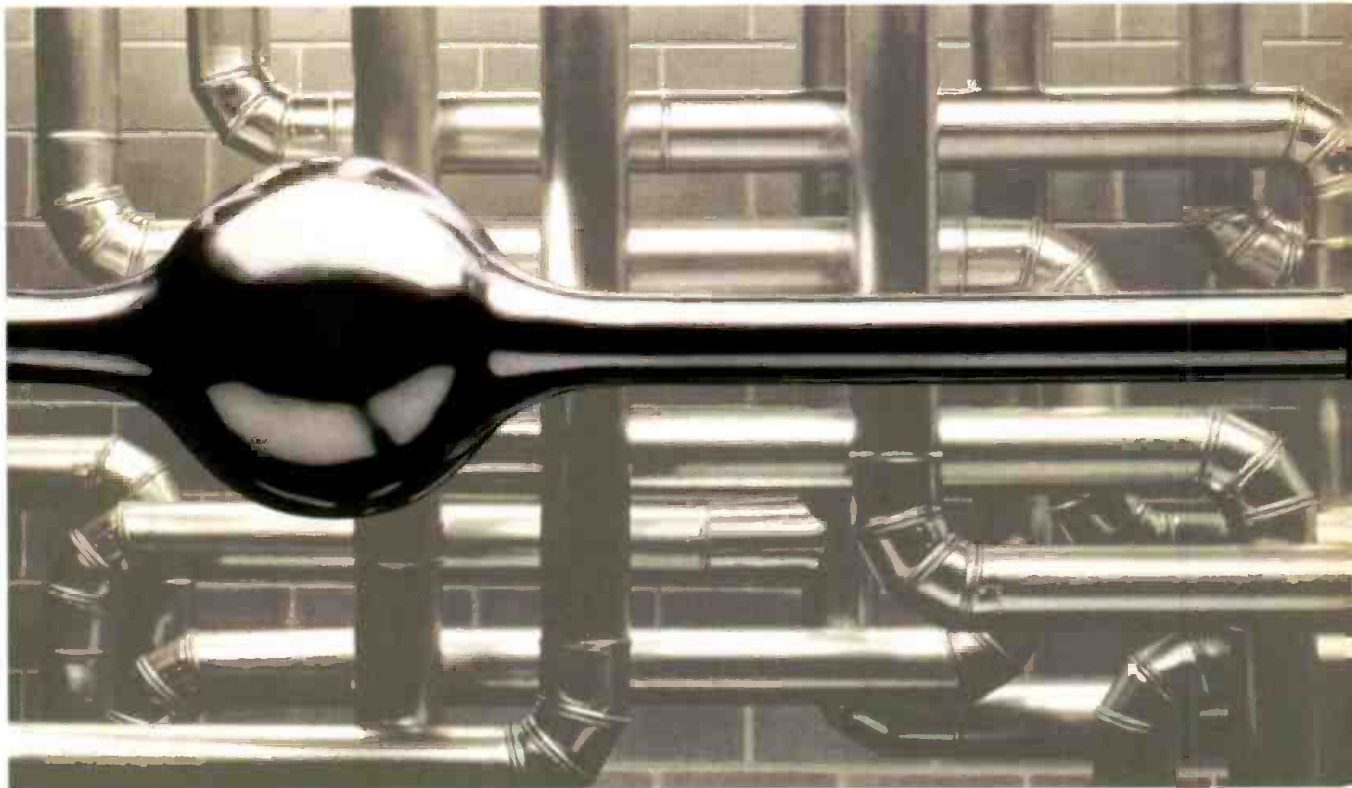
Transmits up to 10 channels of baseband analog video and optional two-way data (RS-232, RS-422, RS-485); features all digital processing and signaling; system transmits high-quality signal with no crosstalk or interference.

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## FIBER OPTIC TRANSMISSION SYSTEM

### Communications Specialties Fiberlink Video PTZ system:

Uses all-digital technology to process and transmit one-way video and two way data (for PTZ) over a single fiber; video channel compatible with NTSC, PAL, SECAM; full duplex bi-directional data channel supports RS-232, RS-422 and RS-485 standards; configurable using the same or different protocols on transmitting/receiving ends; SNR of 63dB; frequency response to 8MHz.

888-4 FAX NOW; 631-273-0404; fax: 631-273-1638;

[www.commspecial.com](http://www.commspecial.com)

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## VIDEO TRANSMISSION SYSTEM

### Fiber Options B703V:

Transmits Y/C video or two channels of full-frame, real-time composite video over a single fiber; 8MHz bandwidth provides clear high-resolution images; FM demodulation assures the image quality remains high over the full operating distance; diagnostic LED on the transmitter and receiver monitor the status of the video and optical signals.

800-342-3748; fax: 516-567-8322; [www.fiberoptions.com](http://www.fiberoptions.com)

**Booth S4166 Circle (521) on Free Info Card**

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## PORTABLE LIVE WEBCASTER

### Pinnacle Systems StreamGenie:

Offers up to 1.6GHz of real-time encoding; new features include 30 percent faster processing in single and dual CPU configurations, support for RealVideo 8.5, and the ability to split incoming audio feeds to Windows Media and RealNetworks formats simultaneously.

650-526-1600; fax: 650-526-1601; [www.pinnaclesys.com](http://www.pinnaclesys.com)

**Booth: L11327 Circle (522) on Free Info Card**

## INTERACTIVE APPLICATIONS

### NDS:

Showcasing a number of applications, including its Personalized TV System; content and delivery protection, Value@TV, VOD and content delivery systems.

949-725-2500; fax: 949-725-2505; [www.nds.com](http://www.nds.com)

**Booth S4119 Circle (523) on Free Info**

## WEBCASTING SERVICES

### e-StudioLive Webcasting Services:

New Webcasting Centers and partnerships offer hosting, content creation, customization and consulting services; provide live on-the-fly control of all elements of the webcast, including video links, graphics, chat, links, user surveys; the new services are deployed through a partnership with Digital Island; scalable services is offered on a month-to-month contract.

978-250-3334; fax: 978-250-3335; [www.e-studiolive.com](http://www.e-studiolive.com)

**Booth: L11645 Circle (524) on Free Info Card**

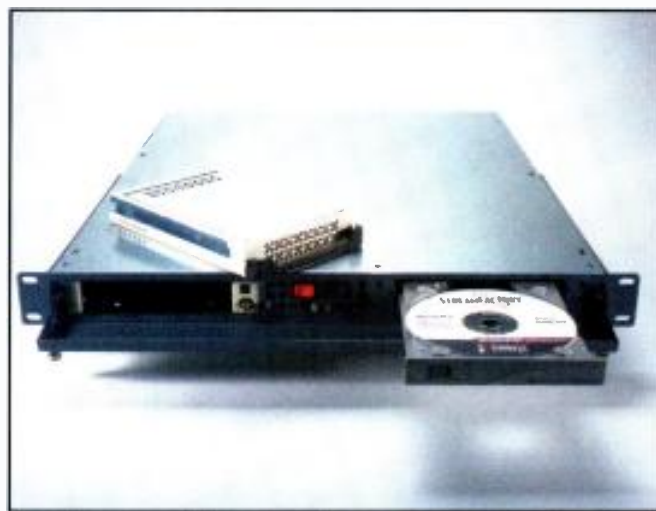
## MPEG-2 MULTIPLEXER

### Thomson Broadcast/Nextream DBX 4300 Broadmux:

Re-multiplexing solution for Digital Broadcasting Centre and Distribution applications such as DVB-S, DVB-C, DVB-T; multiplexes up to 26 MPEG-2 single or multiple service transport streams to form a multiple program transport stream.

800-882-1824; 201-569-1650; fax: 201-569-1511; [www.thomsonbroad.com](http://www.thomsonbroad.com)

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## MEDIA ENCODER

### Pinnacle Systems StreamFactory



The StreamFactory web media encoder from Pinnacle Systems provides Multi-Stream architecture, supporting Internet broadcasters with real-time web encoding of multiple and independently resized concurrent streams.

650-526-1600; fax: 650-526-1601;

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## VIDEO DELIVERY SYSTEM

### Tandberg IP MultiStreamer:

System allows TV and on-demand services to be delivered over IP broadband networks; places the majority of the decoding and translation functionality at the network head-end so less complex set top boxes are needed in customers' homes; combines an integrated receiver and descrambling solution with new MPEG-2 processing elements; can receive, decode and process transmissions from a digital satellite transponder, digital cable head-end or digital terrestrial transmitter; splits the MPEG-2 stream into single program streams, which are then transmitted as IP Multicast sessions over the xDSL network.

949-757-0488; fax: 949-757-0489; [www.tandbergtv.com](http://www.tandbergtv.com)

**Booth: S4859 Circle (527) on Free Info Card**

## PORTABLE MEDIA DELIVERY SYSTEM

### Telestream ClipRemote:

Allows for the transmission of broadcast-quality video and audio directly from remote sites to receiving stations; housed in a rugged, lightweight, shock/weather-resistant case for use in the field; system acquires media from standard news-gathering sources and encodes it to MPEG files; uses synchronous serial data interfaces for direct connection to remote transmission systems.

530-470-1300; 877-CLPMail; fax: 530-470-1301; [www.telestream.net](http://www.telestream.net)

**Booth: i7242 Circle (528) on Free Info Card**



## MPEG-2 INTERFACE CONVERTERS/PROCESSORS

### Thomcast Communications Turquoise:

Performs multi-interface signal conversion and handle multiple interface standards, including DVB-PI ASI, DVB-PI SPI LVDS & ECL, DVB SSI, SMPTE 310M and M2S; performs transport stream processing with packet format conversion.

413-569-0116; fax: 413-569-0679; [www.thomcastcom.com](http://www.thomcastcom.com)

**Booth: L9000 Circle (529) on Free Info Card**



## MEDIA DELIVERY SOFTWARE

### Telestream FlipFactory:

Eliminates encoding process by "flipping" source files into user-specified formats and forwarding the files to appropriate servers in Internet time; software simultaneously transcodes source video into multiple streaming and bit rates and sends it to FTP servers, web servers, caching networks and individual mailboxes in the format needed; Flipware architecture also allows for enhancements such as noise reduction and the addition of watermarks during the "flipping" process; simple, automated solution runs on a standard Windows NT or Windows 2000.

530-470-1300; 877-CLPMail; fax: 530-470-1301; [www.telestream.net](http://www.telestream.net)

**Booth: i7242 Circle (530) on Free Info Card**



## PWEB/STREAMING SYSTEM

### Parkervision WebSTATION for NEWS:

Live, on-demand turnkey system streams live broadcast material with multimedia graphics advertisements and URL links; allows stations to automatically edit program output for on-demand access by viewers, helping to eliminate costly post-production.

800-532-8034; fax: 904-731-0958; [www.pvtn.com](http://www.pvtn.com)

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## SWITCHER

### Thomcast Communications Amethyst:

Offers advanced switching of MPEG-2 transport streams; features continuous signal monitoring and analysis for real-time switchover triggering with no synchronization loss, a dual power supply and switching on DVB-PI ASI and M2S signals; allows users to select parameters to trigger switchover; also features RS232 and RS485 interfaces for local control.

413-569-0116; fax: 413-569-0679; [www.thomcastcom.com](http://www.thomcastcom.com)

**Booth: L9000 Circle (532) on Free Info Card**

## ENCODER

### Thomson Broadcast/Nextream DBE 4140:

Performs local program MPEG-2 encoding, receives an MPEG-2 transport stream of the national program and splices the two together; internal splicer can be triggered through in-band commands so opt-out is controllable from the national broadcast center.

800-882-1824; 201-569-1650; fax: 201-569-1511;

[www.thomsonbroad.com](http://www.thomsonbroad.com)

**Booth: L9000 Circle (533) on Free Info Card**

## DATA BROADCAST SYSTEM

### Triveni Digital SkyScraper DB-10:

Extensible modular platform for end-to-end secure data broadcasting; allows operators to insert interactive TV contents in DTV transport streams; DataFab module allows information providers to specify information contents and broadcast schedules; DataHub module allows for the allocation, scheduling and metering of the bandwidth.

609-716-3505; fax: 609-716-3503; [www.TriveniDigital.com](http://www.TriveniDigital.com)

**Booth: L3349 Circle (534) on Free Info Card**

## VIDEO DELIVERY PLATFORM

### SeaChange International VIP Streamer:

Platform for high-bandwidth video delivery over TCP/IP networks; NT/Pentium-based hardware and software solution incorporates RAID-5 storage and complete system redundancy.

978-897-0100; fax: 978-897-0132; [www.schange.com](http://www.schange.com)

**Booth: L917 Circle (535) on Free Info Card**

## VIDEO-ON-DEMAND SYSTEM

### Concurrent Computer Corp. Safari Technologies

#### VAR:

Flexible, scalable, end-to-end system; portfolio includes asset management, multimedia scheduling and video-on-demand clients interfaced to the MediaHawk video server.

954-974-1700; fax: 954-977-5580; [www.ccur.com](http://www.ccur.com)

**Booth: E2823 Circle (536) on Free Info Card**



## INTERNET ENCODER

### Grass Valley Group Aqua:

Part of GVG's Web Media Publishing offering, provides high streaming throughput per rack unit of space; features GVG's One Pass Encoding technology, whereby it can pre-process, capture, clean and encode input source and render it into multiple streaming formats at multiple rates in real time; accessible through any standard web browser; addresses stream bandwidth ranging from 28.8kb/s to greater than 2Mb/s; supports all major streaming formats.

800-824-5127; fax: 530-487-3755; [www.grassvalleygroup.com](http://www.grassvalleygroup.com)

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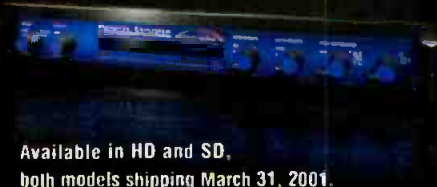
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The Primatte RT process is a revolutionary concept in video signal compositing, providing quality not possible using conventional 'chromakey' techniques. Primatte's straightforward controls allow even first time users to execute high quality chroma mattes.

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## nonlinear editors



### NONLINEAR EDITING SYSTEM

#### DPS Digital Processing System dpsVelocity 8.0:

Allows real-time streaming directly from the timeline; available as a fully integrated turnkey system or as a hardware/software bundle for installation in Windows 2000 or NT; new features include multicamera editing, real-time garbage mattes and real-time support for video files with alpha channel and multiple timeline support.

800-775-3314; 859-371-5533; fax: 859-371-3729;

www.dps.com

Booth: M9732 Circle (538) on Free Info Card



### PCI QUICKTIME CARDS

#### Digital Voodoo D1 Desktop Series:

Allows uncompressed editing with Apple's Final Cut Pro, design with Adobe After Effects and broadcast paint with Adobe PhotoShop; new features include 10-bit real-time effects; Digital Voodoo will be offering HDTV demonstrations with the new D1 Desktop 128HD; new Desktop 128HD offers full, uncompressed HDTV support and SD formats.

+61 3-9699-4633; fax: +61 3-9699-3226; www.digitalvoodoo.net

Booth: M9074 Circle (539) on Free Info Card

### 50MB/S NONLINEAR NEWSROOM EDITING SYSTEM

#### Panasonic newsBYTE50:

Offers high-speed 2x transfers in DVCPRO 50, 4x in DVCPRO speed editing; up and downloads video at faster than real time speed, includes up to two hours and 20 minutes of DVCPRO50 quality video and double that of DVCPRO video storage; additional storage can be added.

800-528-8601; fax: 323-436-3660; www.panasonic.com/broadcast

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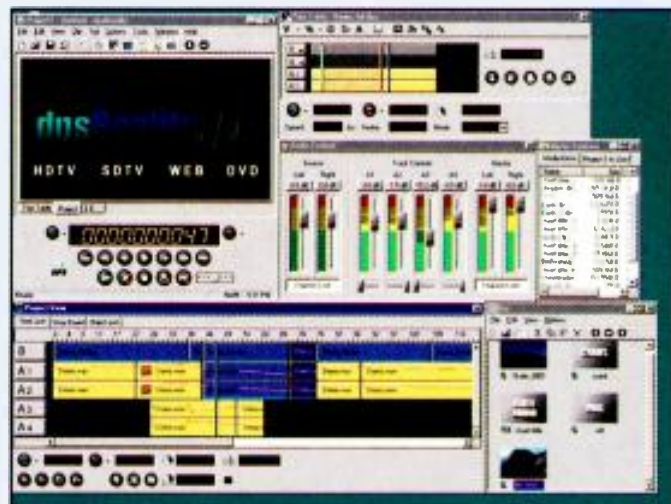
### NEWSROOM SYSTEM

#### Leitch NewsFlash II:

Nonlinear editor is fully integrated with Leitch's VR Technology servers; display included BrowseCutter journalist workstation and access to archival media via DVD archiving; newsroom integration is complete from news service to scalable playout transmission server systems.

800-231-9673; fax: 757-548-4088; www.leitch.com

Booth: L8620 Circle (541) on Free Info Card



### VIDEO EDITING SYSTEMS

#### DPS Digital Processing System dpsReality HD:

Allows users to create productions in HD and SD, as well as for DVD and Internet distribution; system allows transitions and effects to be previewed in real-time to the VGA screen or any SD monitor capable of 16:9.

800-775-3314; 859-371-5533; fax: 859-371-3729; www.dps.com

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### EDITING PLATFORM

#### Quantel iQ:

Platform offers tools for content creation, including multiresolution HD editing, networked worksharing and processing of third-party applications and plug-ins.

203-656-3100; fax: 203-656-3459; www.quantel.com

Booth: L11520 Circle (543) on Free Info Card

### INFRASTRUCTURE SOLUTIONS

#### Discreet Logic backdraft:

Bring together effects, editing, animation and media asset management to leverage new collaborative methods; newest release offers new telecine interconnectivity and facilitates the film transfer and color correction process between telecine suites and Discreet's effects systems inferno, flame and flint.

800-869-3504; 514-272-0525; fax: 800-305-6442; www.discreet.com

Booth: S4100 Circle (544) on Free Info Card



# DIGITAL DOUBLE COVERAGE.

From breaking news to the Inauguration, broadcasters around the world are using NEC Digital Microwave Link (DML) systems to re-define live television coverage.

Freed from the limitations of analog technology, DML crews keep the focus on moving images with fast setup and high quality feeds from almost any location.

Now NEC introduces Spectrum Stretch for DML: **two** digital microwave feeds on the **same** channel, at the **same** time, from trucks in **different** locations.

Visit **Booth L-6043** at **NAB 2001** for a live demo of DML with Spectrum Stretch, or contact NEC Broadcast at (888)383-4DTV, or [sales@necbroadcast.com](mailto:sales@necbroadcast.com).

CodeRunner digital radios for Spectrum Stretch demo, courtesy of MRC Broadcast, Booth L-6420

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## NONLINEAR EDITING SOLUTION

### Incite Multimedia Editor:

Enhancing its ability to deliver multiple layers of real-time video effects, unique hybrid editing tools and strong SAN performance, Incite adds support for Windows 2000, 1394 capturing and printing, and integration with more Matrox hardware: the Digisuite LS and MAX option; has also added new capturing tools to compliment its batch capturing and consolidate clip features.

800-64 1-7322; [www.inciteonline.com](http://www.inciteonline.com)

**Booth S3572 Circle (545) on Free Info Card**



## NONLINEAR EDITING SUITE

### FAST Sales US silver:

Offers MPEG-2 I-frame compression, with an uncompressed option available; edit in real time, with exceptionally fast background rendering, add the InTime Option to further enhance speed; customizable user profiles, keyboard and interface; unlimited number of video, graphic and audio layers; next-generation flexibility provides the capability to work with multiple digital and analog formats, including SDI, DV, YUV, composite and YC.

800-249-FAST; [www.fastsalesus.com](http://www.fastsalesus.com)

**Booth S4817 Circle (546) on Free Info Card**

## DVCAM FIELD EDITING RECORDER

### Sony DSR-70A:

Enhanced revision of DSR-70 DVCAM field editing recorder/player; provides full range of analog and digital interfaces, as well as a search dial function and a built-in 6.4-inch VGA LCD screen; also features playback compatibility with DV family formats (25Mb/s) including consumer DV and DVCPRO; DVCAM format uses eight-bit digital component recording with a 5:1 compression ratio and sampling rate of 4:1:1.

800-686-SONY; 201-930-1000; fax:

201-930-4752;

[www.sony.com/professional](http://www.sony.com/professional)

**Booth: L11600**

**Circle (547) on Free Info Card**



## NONLINEAR EDITING SYSTEMS

### Sony XPRi SD/XPRi HD:

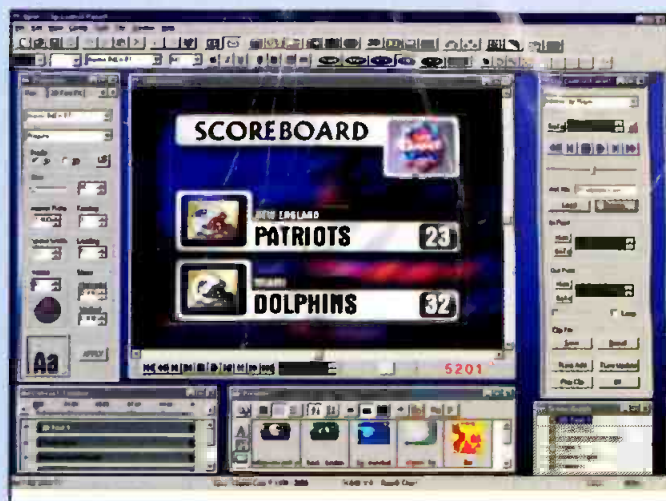
Provide SD to HD migration solutions with HD 1080-24p universal mastering; offers real-time native MPEG IMX 50Mb/s and HDCAM I/O for storage capacity; systems share the same software and hardware platform/interface; features include support for SD PAL, NTSC and HD 1080-50i/60i/24 signals, as well as external control panels, which provide a linear feel to transport, audio, effects and media parameter manipulation.

800-686-SONY; 201-930-1000; fax: 201-930-4752;

[www.sony.com/professional](http://www.sony.com/professional)

**Booth: L11600 Circle (548) on Free Info Card**

**production  
switchers, video  
effects, keyers**



## HD VIDEO PLATFORM

### Chyron Duet HD:

Also available as a standard definition system, this platform supports 56 simultaneous, full bandwidth video streams along with an object-oriented 2D/3D graphics engine that is scalable to support all DTV/HDTV resolutions and scan rates; also features the Chyron Abstraction Layer (CAL), a network interface API that provides hardware independence and a high-level programming environment for development of third party applications to interact with Chyron hardware platforms.

631-845-2000; fax 631-845-3867;

[www.chyron.com](http://www.chyron.com)

**Booth I6631 and L12300 Circle (549) on Free Info Card**





## REAL-TIME HD CHROMAMATTE SYSTEM

### Intelligent Paradigm Primatte Explorer RT/HD:

HD native product allows production and post production matting to be accomplished in real-time; software is based on IMAGICA's research and development in blue screen matting processes and color processing; core is the Video Explorer 2 video processing system.

408-725-3810; fax: 408-725-3819; [www.intelligentparadigm.com](http://www.intelligentparadigm.com).

Booth: S3449

Circle (550) on Free Info Card

## IMAGE PROCESSING TOOL

### Digital Vision AGR-IV:

Grain and noise reduction system for film, videotape restoration and MPEG pre-processing; features advanced motion processing and adaptive 3D filters; system is based on the DVNR real-time processing engine; available in SD and HD formats.

888-914-5200; 310-914-5200; fax: 310-914-0011; [www.digitalvision.se](http://www.digitalvision.se)

Booth: L5250 Circle (551) on Free Info Card

## HIGH DEFINITION INTERFACE/FRASTORE PCI CARD

### AJA Video Systems HD-NTV

Features two channels of HD-SDI I/O; can key HD-Stills from memory over live video, capture to print HD images, capture and output HD stills; offers mixer/keyer functions, split screen and genlock; offers Photoshop and PowerCG plug-ins

530-913-7767; 800-251-4224; [www.aja.com](http://www.aja.com)

Booth: L10286 Circle (552) on Free Info Card

## EFFECTS SYSTEM

### Discreet Logic 3dsmax 4:

New effects system features stable and predictable history independent IK solver, revolutionary skinning tools and render elements, which offer integration with combustion; advanced dynamics solver plug-in available

800-869-3504; 514-272-0525; fax: 800-305-6442; [www.discreet.com](http://www.discreet.com)

Booth: S4100 Circle (553) on Free Info Card



## MIXING, BRANDING AND EFFECTS SYSTEM

### Oxtel Imagestore:

New configuration of the Imagestore master control and channel branding system; features Easytext automated CG and the Squeezy DVE; multiple units can be used together for enhanced output.

877-440XTEL; fax: 973-683-1157; [www.oxtel.com](http://www.oxtel.com)

Booth: 147 Circle (554) on Free Info Card

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**SANIX CORPORATION**  
TOKYO, JAPAN FAX: 81-3-3702-9654

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## DIGITAL VIDEO EFFECTS SYSTEM

### Accom Abekas Dveous/HD:

New high-definition system features identical control interface to the industry standard Dveous; will be available as an upgrade to existing Dveous Systems; will have an identical feature set to the Dveous; can be configured as a single twin or dual twin channel system.

650-328-3818; fax: 650-327-2511; [www.accom.com](http://www.accom.com)

**Booth: S4806 Circle (555) on Free Info Card**



## DIGITAL VIDEO SWITCHERS

### e-StudioLive ECHOLab5000

#### SuperSwitcher series:

Series includes three new models and two new options, DV and Webcasting; feature an integrated NT workstation and control panel; Webcasting option streams switcher's output to the Internet; switchers feature illuminated source names, reassignable inputs, 2.5M/Es with full re-entry and six keyers.

978-250-3334; fax: 978-250-3335; [www.e-studiolive.com](http://www.e-studiolive.com)

**Booth: L11645 Circle (556) on Free Info Card**

## MASTER CONTROL SOLUTION

### Pinnacle Systems DekoCast:

Features integrated CG, DVEs, 24-track audio mixer and two-channel video and audio clip server; two live video inputs, any video clip and individual graphic objects can be independently and simultaneously controlled by the DVE; audio controls include 24-input patch control and attenuation functions.

650-526-1600; fax: 650-526-1601; [www.pinnaclesys.com](http://www.pinnaclesys.com)

**Booth: L11327 Circle (557) on Free Info Card**

## REAL-TIME 3D EFFECTS GENERATOR

### Inscriber Technology CG-FX

Post-production tool for live-to-air broadcast incorporates a broadcast-quality CG, real-time motion effects, alpha-aware logo creation, an event sequencer and a timesaving template utility; real-time 3D effects including twists, curls and shatters.

800-363-3400; 519-570-9111; fax: 519-570-9140; [www.inscriber.com](http://www.inscriber.com)

**Booth S4832 Circle (558) on Free Info Card**

## RENDERING APPLIANCE

### Advanced Rendering Technology RenderPipe for Maya interface:

Integrates RenderDrive rendering appliances into Alias/Wavefront's modeling and animation application; available for WindowsNT; Linux and Irix platforms.

650-254-7610; fax 650-254-7615; [www.art-render.com](http://www.art-render.com)

**Booth S4169 Circle (559) on Free Info Card**



## HIGH-OCTANE WORKSTATION

### Silicon Graphics Octane2 Visual Workstation:

New option for the Octane2 supports HD and SD video I/O; features uncompressed HD eight-bit RGB 4:4:4 option will be bundled with Octane2, Vpro V12 graphics and Video Breakout Box.

650-960-1980; 800-800-7441 fax: 650-933-0819; [www.sgi.com/go/broadband](http://www.sgi.com/go/broadband)

**Booth: S4132 Circle (560) on Free Info Card**



## WINDOWS-BASED STILL STORE

### AVS StillBank:

PC-based system will be shipped as a complete solution, including PC, output card and software; produces full broadcast-quality (32-bit) pictures in bitmap format; compositing is performed in real time and image importation is possible; offers an In and Out GPI trigger to be used with Manuscript 2000 Series CGs.

801-975-9799; fax: 801-975-0970; [www.avsgmedia.com](http://www.avsgmedia.com)

**Booth 12234 Circle (561) on Free Info Card**

# FAMILY VALUES

An Entire Family of Solutions for Aural and Video Demodulation

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## **msi 320** Precision Video Demodulator for NTSC

Simple, reliable and easy to use, it comes with a guarantee of support until the last analog station goes off the air. It is also available with a family of accessories designed to solve the kinds of problems you face every day.

### *Accurate BTSC stereo measurements*



The **SRD-1** connects to the **msi 320** to offer the only traceably calibrated stereo standard available. It provides Left & Right or Sum & Difference in either BTSC or Equivalent Mode, with or without pre-emphasis.

### *Automatic calibration with Tektronix™ 751 Modulation Monitor*



The **msi 751** Interface used with the **msi 320** is the only combination available that lets you take advantage of the automatic calibration feature of the 751 Modulation Monitor.

### *An easy-to-read Modulation Metering Panel*



Total modulation meter and peak flasher of Model **TVMM-1** autorange so the definition of 100% modulation is always correct regardless of the combination of BTSC signals in use. It provides convenient front panel meter indications of Total Modulation, SAP, PRO and Pilot Injection.

### *RF Preamplifier provides additional gain for distant reception*



Model **msi 100** is an RF preamplifier for optimum reception of a distant signal. It is available with an optional 10 MHz on-channel filter to provide the ultimate in low intermod performance permitting reception of a distant signal even when a powerful transmitter is nearby.

### *Carrier Failure Alarm*



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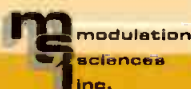
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Phone: 732-302-3090. Fax: 732-302-0206.

Or visit our website at <http://www.modsci.com> E-mail: [sales@modsci.com](mailto:sales@modsci.com)



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## studio, facility support



### SDI SAFE AREA GENERATOR

#### Broadcast Video Systems (BVS) DSA-100:

Inserts any combination of 4:3, 16:9, 14:9 safe title, safe action, center cross into SDI picture; displays letterbox, side panels and stores 10 user-defined patterns.

905-764-1584; fax: 905-764-7438; [www.bvs.ca](http://www.bvs.ca)

**Booth 8923 Circle (577) on Free Info Card**

### DV/IEEE-1394 INTERFACES

#### Miranda DV-Bridge series:

Bi-directional video+audio to DV on IEEE-1394 converters; new models in the series provide support for machine control and timecode support while another model provides analog video interfaces.

514-333-1772; fax: 514-333-9828; [www.miranda.com](http://www.miranda.com)

**Booth: L8632 Circle (578) on Free Info Card**

### REMOTE MONITORING, DIAGNOSTIC SOFTWARE

#### Grass Valley Group NetCentral:

SNMP-based software's feature set includes Internet access, schedule-based notification and predictive failure analysis; the application's design allows device types to be supported as plug-ins to a common NetCentral application network GVG plans to extend that support to its next-gen servers, production switchers, routers and modular gear.

800-824-5127; fax: 530-487-3755; [www.grassvalleygroup.com](http://www.grassvalleygroup.com)

**Booth L10409 Circle (579) on Free Info Card**

### MULTI-IMAGE MONITOR WALL SOLUTION

#### Miranda Kaleido G2:

New software version offers improved graphical treatment, multiple undermonitors per window, countdown timers and advanced status and alarm reporting.

514-333-1772; fax: 514-333-9828; [www.miranda.com](http://www.miranda.com)

**Booth: L8632 Circle (580) on Free Info Card**



### CONSOLES

#### Forecast Consoles Image Master Edit Consoles:

Pre-engineered for nonlinear, multimedia and graphics applications.

800-735-2070; fax: 631-253-0277; [www.forecast-consoles.com](http://www.forecast-consoles.com)

**Booth: M7929 Circle (581) on Free Info Card**

### SHARED STORAGE SOLUTION

#### Accom AFFINITY/san

Solution for facilities with a need for more than one non-linear edit suite; offers real-time, simultaneous high-bandwidth access for multiple users; works in an environment where several non-linear editing systems, Windows NT graphic workstations and audio suites share footage and files at the same time.

650-328-3818; fax: 650-327-2511; [www.accom.com](http://www.accom.com)

**Booth: S4806 Circle (582) on Free Info Card**



### CONFIDENCE MONITORS

#### Data Check Six Pack Series 26000 monitors:

Allows viewing of six independent serial digital or composite signals using a backlit 2.5-inch LCD display in 2RU; displays are mounted in an adjustable vertical tilt panel; unit offers front panel controls for color, brightness, contrast, selectable blue field and color kill on/off modes, as well as an LED tally light; hot-swappable modules and custom configurations are available.

619-578-0101; fax: 619-578-9215; [www.datacheck.com](http://www.datacheck.com)

**Booth: L9886 Circle (583) on Free Info Card**

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[www.americanradiohistory.com](http://www.americanradiohistory.com)

## MULTIFORMAT STREAM BRIDGE

### Sony MSB-2000:

Provides a bridge between devices supporting SDTI, SDI and DVB-ASI interfaces, including MPEG VTRs and A/V servers; features varied control protocol support for flexible network operation; control panel with LCD display enables quick configuration of equipment to accommodate different field installations.

800-686-SONY; 201-930-1000; fax: 201-930-4752;

[www.sony.com/professional](http://www.sony.com/professional)

**Booth: L11600 Circle (584) on Free Info Card**



## VIDEOSCOPE FIELD MONITOR

### Aspen Electronics VS-100:

New color monitor with TFT 4-inch active matrix LCD technology; features built-in battery compartment, audio amplifier, external four-pin XLR power input and universal video inputs, as well as an industry-standard BNC video input; system is NTSC and PAL compatible, with 234x480 resolution; universal mount system allows the unit to become a studio viewfinder.

714-379-2515; fax: 714-379-2517; [www.aspenelectronics.com](http://www.aspenelectronics.com)

**Booth: L329 Circle (585) on Free Info Card**



## QUAD-SPLIT DISPLAY PROCESSOR

### Miranda Tango:

High-quality quad-display processor with many of the enriched display features of the Kaleido; can display up to four images at full resolution in a single computer display.

514-333-1772; fax: 514-333-9828; [www.miranda.com](http://www.miranda.com)

**Booth: L8632 Circle (586) on Free Info Card**

## TEST GENERATORS

### Horita SVS-50:

Self-contained video system outputs standby full/SMPTE color bars with a source ID video overlay whenever a loss of normal video is detected; video overlay can be up to nine lines of 20 characters each and can include a time and date display.

949-489-0240; fax: 949-489-0242; [www.horita.com](http://www.horita.com)

**Booth L9773 Circle (587) on Free Info Card**

## DISTRIBUTION AMPLIFIERS

### Evertz 7700DA10/7700ADA:

Amplifiers allow for distribution of SMPTE 259M serial digital signals; feature one auto-equalized input with four reclocked outputs; the 7700DA10 is designed primarily as a re-clocking SMPTE 259M DA, but can also be used for SMPTE 310 or DVB-ASI signals.

905-335-3700; fax: 905-335-3573; [www.evertz.com](http://www.evertz.com)

**Booth: L12146 Circle (588) on Free Info Card**

## INTERCONNECTIVITY PRODUCTS

### Geffen ex-tend-it ADC-100S/R:

Extends DVI and ADC connection monitor signals up to 330 ft from a computer equipped with appropriate video cards; extension, fiber optics and CAT-5 cables may be used for the extension.

800-545-6900; [www.gefen.com](http://www.gefen.com)

**Booth M9339 Circle (589) on Free Info Card**



## DISTRIBUTION AMPLIFIER

### Multidyne VAGC-100:

Automatically maintains video level at 1V peak to peak with 100 IRE maximum luminance peak; provides automatic flatness equalization for more than 3500ft of Belden 8281 and more than 3000ft of RG59U with  $\pm 0.5$ db at 5MHz.

800-4TV-TEST; fax: 516-671-3362; [www.multidyne.com](http://www.multidyne.com)

**Booth 5055 Circle (590) on Free Info Card**

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[www.americanradiohistory.com](http://www.americanradiohistory.com)



## SERIAL DIGITAL/COMPOSITE VIDEO AND AUDIO MONITOR

### Magni Systems SDM-560M:

Provides efficient monitoring of 601, composite video/audio; features routable displays, embedded audio decoding and metering, auto measurement, alarming, reporting and complete remote control.

800-237-5964; fax: 503-615-1999; [www.magnisystems.com](http://www.magnisystems.com)

**Booth: L11373 Circle (591) on Free Info Card**



## SERIAL DIGITAL TEST GENERATOR

### Evertz Microsystems 7750TG2-HD:

Provides a continuous 4:2:2 black signal on two outputs in single link mode; two other outputs provide whichever test signal has been selected; dual link mode, the generator provides 4:4:4 test signals; four channels of embedded audio.

905-335-3700; fax: 905-335-3573; [www.evertz.com](http://www.evertz.com)

**Booth: L12146 Circle (592) on Free Info Card**

## BROADCAST VIDEO MARKER

### Boeckeler Instruments Pointmaker PVI 64:

Generates an SDI key signal from any markings made by the presenter, after which a broadcast switcher cuts the SDI video and fills the marked area with a generated color matte; provides marking and drawing features during live broadcasts, including sports, weather and news for marking of details in complex images.

520-745-0001; fax: 520-745-0004; [www.boeckeler.com](http://www.boeckeler.com)

**Booth M7460 Circle (593) on Free Info Card**



## CABLE REELS

### Hannay Reels AV-1 Series:

Specifically designed for broadcast, the AV-1 series features welded channels for stacking that promotes maximum transport and storage efficiency; a removable side-mounted connector panel allows for complete customization of XLR and/or BNC connector patterns.

877-60-REELS; fax: 800-REELING; [www.hannay.com](http://www.hannay.com)

**Booth E5321 Circle (594) on Free Info Card**

## TEST & MEASUREMENT SCOPES

### Hamlet Video International Monitor Scope and Digi Scope:

Compact, low-power on-screen display, SDI analog video and audio signal monitor; Monitor Scope offers a built-in LCD display; both are capable of serial digital video analysis measurement and monitoring, and with additional options also handle component analog video, YcrCb, GBR, composite video and audio in embedded AES/EBU and analog formats.

+44 0500 625 525; fax: +44 1494 791 283; [www.hamlet.co.uk](http://www.hamlet.co.uk)

**Booth L6130 Circle (595) on Free Info Card**

## LCD PRODUCTION MONITORS

### Panasonic 10, 15 and 18-inch monitors:

Thin and lightweight, the new series are designed for HD, SD and computer applications; 18-inch version offers a 5:4 aspect ratio, 1280x1024 SXGA resolution, high brightness and a 170 degree viewing angle; displays 1080i, 720p, 480p and 480i.

800-528-8601; fax: 323-436-3660; [www.panasonic.com/broadcast](http://www.panasonic.com/broadcast)

**Booth L7020 Circle (596) on Free Info Card**

# The World's Smallest Master Control Switcher!

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In addition to master control applications, the CDK 111 is ideal as a mixer for digital edit suites, commercial insertion, flight packs, microwave trucks and as a Synergy production switcher DSK extension.

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**CONTROL**



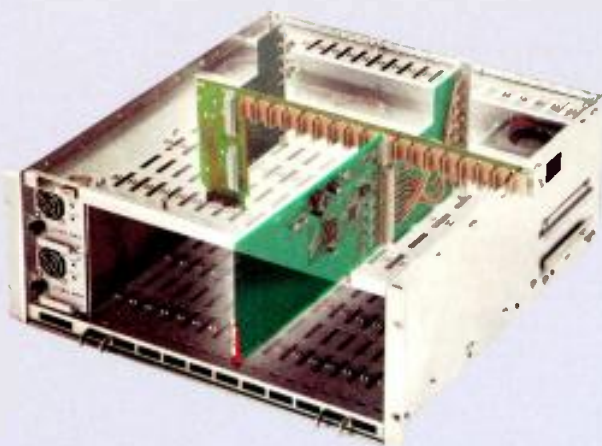
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[www.rossvideo.com](http://www.rossvideo.com)

**NAB Booth**  
**L11639**



## MODULAR SIGNAL PROCESSING SYSTEM

### Axon Synapse:

System is high density, offering 18 cards in 4RU; offers flexible remote control capabilities, Ethernet-based remote control interface; is Internet enabled and receives updates of firmware through Internet connection; allows full monitoring of all parameters, audio level control and channel swapping.

+31 13511 6666; fax: +31 13 511 4151; [www.axon.nl](http://www.axon.nl)

**Booth L1541 Circle (597) on Free Info Card**



## AUDIO/VIDEO MONITORING

### Wohler VAMP-3 SDI:

Allows users to monitor audio and video from two selectable SDI digital and one composite analog video source; also includes four auxiliary AES inputs and eight analog audio inputs; features built-in 7-inch widescreen color LCD for confidence monitoring.

888-596-4537; 650-589-5676; fax: 650-589-1355; [www.wohler.com](http://www.wohler.com)

**Booth: L6049, R2925 Circle (598) on Free Info Card**

## DIGITAL PROCESSING SYNCHRONIZER

### Leitch DPS-475:

Multifunction analog/digital video synchronizer is a strong choice for broadcasters making their digital transition; available in video only and audio/video configuration, synchronizer provides an ideal bridge from analog video signals, such as satellite and microwave feeds, to digital production facilities

800-231-9673; fax: 757-548-4088; [www.leitch.com](http://www.leitch.com)

**Booth: L8620 Circle (599) on Free Info Card**



## LCD MONITOR

### Astro Systems DM-3000:

Bright LCD with either HS SDI or analog YpbPr I/F; 14 HD formats including 1080i, 720p, 24sf, 25, 30 supported; offers graticules overlay, gamma/brightness/contrast adjustment.

818-244-1806; fax: 818-244-1878; [www.astro-systems.com](http://www.astro-systems.com)

**Booth L277 Circle (600) on Free Info Card**

**TBCs, frame  
syncs, conversion  
equipment**

## STAND-ALONE PRE-PROCESSOR

### Snell & Wilcox HD Prefix:

Incorporates proprietary noise reduction algorithms to remove film grain and electronic noise prior to compression; system supports all current HD formats.

408-260-1000; fax: 408-260-2800; [www.snellwilcox.com](http://www.snellwilcox.com)

**Booth: L10428 Circle (601) on Free Info Card**

## BROADBAND ENCODING PLATFORM

### Teranex StarStream:

Turnkey post-production encoding tool builds upon Starfront to encode at broadband speed, from 56K to T1/cable/DSL speeds; system integrates the pre-compression processor with the encoding PC and automates a majority of the encoding process; platform combines the high-end noise reduction filtering of the Starfront with Teranex's StreamConnect driver, which passes critical information to the encoding PC.

407-517-1086; fax: 407-517-1101; [www.teranex.com](http://www.teranex.com)

**Booth: E4211 Circle (602) on Free Info Card**



# The expert TOUCH

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Tel: (201) 569-1650



## SIGNAL INTEGRATION SYSTEM

### Ensemble Designs Avenue:

Provides conversion, distribution, frame synchronization, routing and test signal generation for audio and video; features several new modules and frames.

530-478-1830; fax: 530-478-1832; [www.ensembledesigns.com](http://www.ensembledesigns.com)

**Booth: L1455 Circle (603) on Free Info Card**



## TIMECODE GENERATOR

### Brainstorm Electronics SR-3R:

Specifically designed timecode reader/generator repairs drop outs, reduces jitter and corrects timecode to phase align with video; housed in a small half-rack enclosure, its front panel features a large timecode reader and LEDs to identify format and video phase; can also be used as a timecode generator to create new code.

323-845-1155; fax: 323-245-1170; [www.brainstormtime.com](http://www.brainstormtime.com)

**Booth R2855 Circle (604) on Free Info Card**

## IMPULSE NOISE ELIMINATOR

### Intelvideo INR2000:

Features multidimensional, intelligent adaptive logic to identify power line impulse noise and multidimensional video reconstruction circuits to generate the video needed to replace the impulse noise with no visible impairments.

203-348-9229; fax: 203-348-9266; [www.intelvideo.com](http://www.intelvideo.com)

**Booth L8207 Circle (605) on Free Info Card**



## STANDARDS CONVERTER

### Snell & Wilcox Mach 1:

Provides multiformat conversion with a new motion compensation technology, Motion Science; offers 10-bit serial digital and composite video inputs and outputs, in addition to providing aspect ratio conversion and linear conversion using 4-field and 4-line aperture.

408-260-1000; fax: 408-260-2800; [www.snellwilcox.com](http://www.snellwilcox.com).

**Booth: L10428 Circle (606) on Free Info Card**



## DIGITAL PROCESSING AMPLIFIER

### Hotronic Digital Proc Amp:

Provides strong video correction in non-ideal camera environments such as field news event recording; fully compatible with digital cameras to ensure correct video level, color saturation and hue when recording; automatically recognizes and accepts either NTSC or PAL serial video.

408-378-3883; fax: 408-378-3888; [www.hotronics.com](http://www.hotronics.com)

**Booth L9868 Circle (607) on Free Info Card**

## ASPECT RATIO CONVERTER

### Snell & Wilcox ARC 20:20:

Offers input and output blanking to allow operators to clean the edges of a picture, for example, when 4:3 material is being displayed on a widescreen set; background color is fully selectable.

408-260-1000; fax: 408-260-2800; [www.snellwilcox.com](http://www.snellwilcox.com).

**Booth: L10428 Circle (608) on Free Info Card**

## HD CONVERTER

### Teranex Xantus:

Performs more than 50 different conversions, including support for DTV, standards conversion, HD standards conversion and 50Hz HD formats; use of the Video Computer platform enables combinations of functions to be run simultaneously.

407-517-1086; fax: 407-517-1101; [www.teranex.com](http://www.teranex.com)

**Booth: E4211 Circle (609) on Free Info Card**

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- An integral router for multiple resource sharing
- New RIO Grande option provides additional 192 analog and 96 digital I/Os

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“When we were building our new remote truck we chose the Aysis Air Mobile, based on the dependable, high profile event experiences that other broadcasters are having with their consoles. Remember, in a live situation there's no second chance on an event—no take two. When building a truck it's important to design into it considerations for both today's business and for future expansion. Aysis Air keeps us prepared for any eventuality that may come along, and has proved very reliable and stable for live broadcasting.”

**SHAWN O'SHEA**, DIRECTOR OF ENGINEERING AND OPERATIONS,  
SOUTHWEST TELEVISION (SWTV) • A DIVISION OF CORE DIGITAL TECHNOLOGIES

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+65 (0)438 2272

[www.americanradiohistory.com](http://www.americanradiohistory.com)

## MPEG FILE ANALYSIS SOFTWARE

### Snell & Wilcox Mosalina:

Running on Windows '95, '98 or NT computers, Mosalina works faster than real-time to analyze standard definition MPEG video (high definition video analysis is also available); the software is available in Basic, Advanced and Expert versions; provides automated quality assurance during all phases of video production, including creative DVD authoring, streaming, post production, broadcast and archiving.

408-260-1000; fax: 408-260-2800; [www.snellwilcox.com](http://www.snellwilcox.com).

**Booth: L10428 Circle (610) on Free Info Card**

## PORTABLE DOWNCONVERTERS

### YEM HDC-2000 and HDC-3000 HD

HDC-2000 converts from HD analog signals to SD-SDI 4:2:2 signals and SD analog composite signals; output is 1080/25 (sF) in PAL and NTSC; features include 2:3 pulldown processing at p (sF) input and squeeze, letterbox, edge crop aspect ratio conversion modes; the HDC-3000 is exclusively for digital signal conversions: HD-SDI to SD-SDI 4:2:2 and HD SDI; both units respond to four input signal formats: 1080/23.976p (sF), 1080/29.97p (sF), 1080/59.92i and 1080/25.00 (sF).

310-544-9343; fax: 310-544-9363; [www.yem.com](http://www.yem.com)

**Booth: L340 Circle (611) on Free Info Card**

## SOFTWARE-BASED ENCODER

### MedioStream MediaPro:

MPEG-2 encoding system provides digital only input from either IEEE 1394 (Firewire) or 10/100base T Ethernet; upgrades will soon be available to allow the real-time transcoding of MPEG-2 encoded content to popular video streaming formats such as windows Media, Real G2 and Quicktime.

408-452-5500; fax: 408-452-5522; [www.mediostream.com](http://www.mediostream.com)

**Booth: E5845 Circle (612) on Free Info Card**

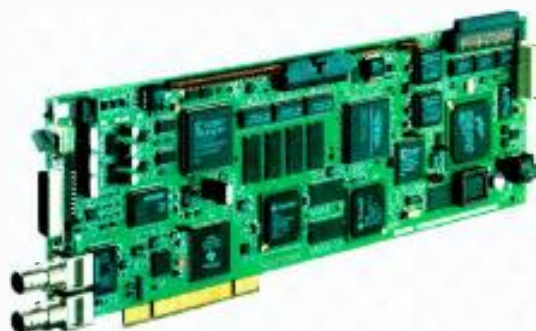
## SCAN CONVERTER

### RGB Spectrum RGB/VideoLink 1690:

Accepts inputs up to 1600x1200 resolution and outputs NTSC/PAL composite video, S-Video or component analog video; SMPTE 259M digital output is available as an option; processing circuitry eliminates interlace flicker and offers zoom, autosync and multiple levels of flicker filtering.

510-814-7000; fax: 510-814-7026; [www.rgb.com](http://www.rgb.com)

**Booth: M8350 Circle (614) on Free Info Card**



## HIGH-DEFINITION DECODERS

### Vela CineCast HD/1 and CineCast HD/2:

Single and dual-channel SCSI-based high-definition 4:2:0 MPEG-2 decoders support all 18 ATSC formats, including standard HDTV resolutions; decode DVB and ARIB compliant transport streams, receiving command and media data through an Ultra SCSI-2 LVDS interface; systems also provide dual-channel stereo decoding of MPEG layer audio, Dolby Digital (AC-3) or AAC audio.

727-507-5300; fax: 727-507-5311; [www.vela.com](http://www.vela.com)

**Booth: L346, M8329 Circle (613) on Free Info Card**



## COMPUTER TO VIDEO SCAN CONVERTER

### Extron VSC 75:

Uses exclusive digital processing to convert high-resolution computer video images from as high as 1280x1024 at 60Hz down to NTSC or PAL video for use in video recording, video conferencing or viewing applications; offers an internal color bar generator, two user-selectable levels of vertical filtering, extensive picture adjustment controls, RS-232 control and a rack-mountable enclosure.

800-633-9876; 714-491-1517; [www.extron.com](http://www.extron.com)

**Booth: M7936 Circle (615) on Free Info Card**

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[www.spectrasite.com](http://www.spectrasite.com)

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Circle (222) on Free Info Card

## DIGITAL CONVERTER

### Vistek V1667:

Modular analog to digital converter decodes NTSC/PAL to SDI; offers the features of the V1663 in a 12-bit environment; works with the 1668 encoder, it allows users to cascade conversion to accommodate analog.

+44 1628 531221; fax: +44 1628 5309 80; [www.vistek.co.uk](http://www.vistek.co.uk)

**Booth: L9064 Circle (616) on Free Info Card**



## DIGITAL CINEMA PLAYER

### Avica FilmStore:

Employs Avica's Digital Media Platform featuring compression and encryption independent hardware and software; can be used as a standalone playback device or in a server configuration; load-in, playlist creation, management and maintenance functions, including disk drive replacement can all be accomplished without interrupting playback.

800-706-0077; fax: 310-450-5353; [www.avitech.com](http://www.avitech.com)

**Booth S3869 Circle (617) on Free Info Card**

test &  
measurement

## TEST AND MEASUREMENT SYSTEM

### Videotek VTM-200:

New version of multiformat on-screen monitor includes composite display output; allows users to monitor and measure 601 and ES digital and composite analog (NTSC or PAL) video and audio signals; output display includes video picture, waveform, vector or optional audio.

800-800-5719; 610-327-2292; fax: 610-327-9295; [www.videotek.com](http://www.videotek.com)

**Booth: L9622 Circle (618) on Free Info Card**

## STREAM MONITORING AND ANALYSIS SYSTEM

### Triveni Digital StreamScope MT-20:

Allows users to monitor, measure, record and analyze properties of an ATSC DTV broadcast stream using a graphical interface.

609-716-3505; fax: 609-716-3503; [www.TriveniDigital.com](http://www.TriveniDigital.com)

**Booth: L3349 Circle (619) on Free Info Card**



## DIGITAL BROADCAST FIELD INSTRUMENT

### Acterna DTS-100

Offers extensive, real-time analysis and capture in an easily portable package; developed for in-field analysis of MPEG-2 DVB/ATSC transport streams; runs from a small, lightweight box that connects to a laptop computer via the PCMCIA interface; standard and advanced variations tailor the product to meet the specific requirements of the user.

858-715-7073; fax: 858-627-0146; [www.acterna.com](http://www.acterna.com)

**Booth: L671 Circle (620) on Free Info Card**



## HD/SDI WAVEFORM/ VECTORSCOPE MONITOR

### Leader Instruments LV 5170D:

Multiformat unit with dual CRTs features the ability to handle 14 HDTV formats, as well as optional D1 SDI and 480p analog; also features automatic format selection and colorimetry for selected system; offers detection and logging of video, audio, ancillary and color gamut errors, along with selectable alarms.

800-645-5104; 714-527-9300; fax: 714-527-7490; [www.leaderusa.com](http://www.leaderusa.com)

**Booth: L8777 Circle (621) on Free Info Card**



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## VIDEO SIGNAL GENERATORS

### **Tektronix TG700:**

Multiformat test signal platform with HD module; provides quality test signals in all major TV formats to measure and maintain performance of signal paths; generates up to 1.485Gb/s serial digital test signals for 1080 at 24p, 1080i and 720p at 50Hz, 59.94Hz and 60Hz, and 1080 at 48 segmented frames.

800-835-9433; 503-627-7111; fax: 503-222-1542; [www.tektronix.com](http://www.tektronix.com)

**Booth: L9534 Circle (622) on Free Info Card**

## SIGNAL QUALITY MANAGER SYSTEM

### **Videotek SQM:**

Multiformat audio/video system offers custom configuration and interface flexibility; input cards measure and analyze video and audio from multiple sources including composite analog video, serial digital video, analog and AES/EBU audio, MPEG and all HD formats; instantly reports errors to a master control point; system offers real-time alarms with logging.

800-800-5719; 610-327-2292; fax: 610-327-9295; [www.videotek.com](http://www.videotek.com)

**Booth: L9622 Circle (623) on Free Info Card**



## TRANSMISSION MONITORING PRODUCTS

### **Adherent AD974**

Designed to be flexible and scalable with the capability of monitoring up to eight streams in a 4U package; a web-based Graphical User Interface enables the status of the broadcast to be monitored from anywhere in the world

+44 (0) 1223 20070; fax: +44 (0) 1223 20070; [www.adherent.com](http://www.adherent.com)

**Booth: L417 Circle (624) on Free Info Card**

## AUDIO DEVICE TESTER

### **ASACA/Shibasoku AM70A Analyzer:**

Audio analyzer can deliver test results in less than 100ms; provides precise measurements of a broad range of audio signal output characteristics (signal level, distortion etc) for all types of audio devices.

303-278-1111; fax: 303-278-0303; [www.asaca.com](http://www.asaca.com)

**Booth 8333 Circle (625) on Free Info Card**

## TEST CHART

### **DSC Laboratories CamAlign Maxi test chart:**

Precise patterns enable users to optimize the performance of broadcast and professional video cameras; can be used to evaluate and service video cameras in operations, studio and field applications; patterns include standard crossed greyscales, vector colors, hyperbolics, multi-bursts, flare and monitor resolution tests; charts measure 40"x24" or 36"x24"; available in combined 16:9/4:3 formats respectively.

800-267-5227; 905-673-3211; fax: 905-673-0929; [www.dsclabs.com](http://www.dsclabs.com)

**Booth: L7586 Circle (626) on Free Info Card**



## TEST AND MEASUREMENT EQUIPMENT

### **Videotek STM-350:**

Allows users to monitor multiple transmitter sites and multiple stations from a central location; provides full confidence video and audio streaming for live motion image and stereo audio from Videotek's VTM-300 and VTM400HD systems; offers increased ability to view real-time waveforms, vector, video and audio displays using standard LAN, WAN or Internet connections.

610-327-2292; fax: 610-327-9295; [www.videotek.com](http://www.videotek.com)

**Booth: L9622 Circle (627) on Free Info Card**



## AUDIO-TO-VIDEO DELAY CORRECTOR

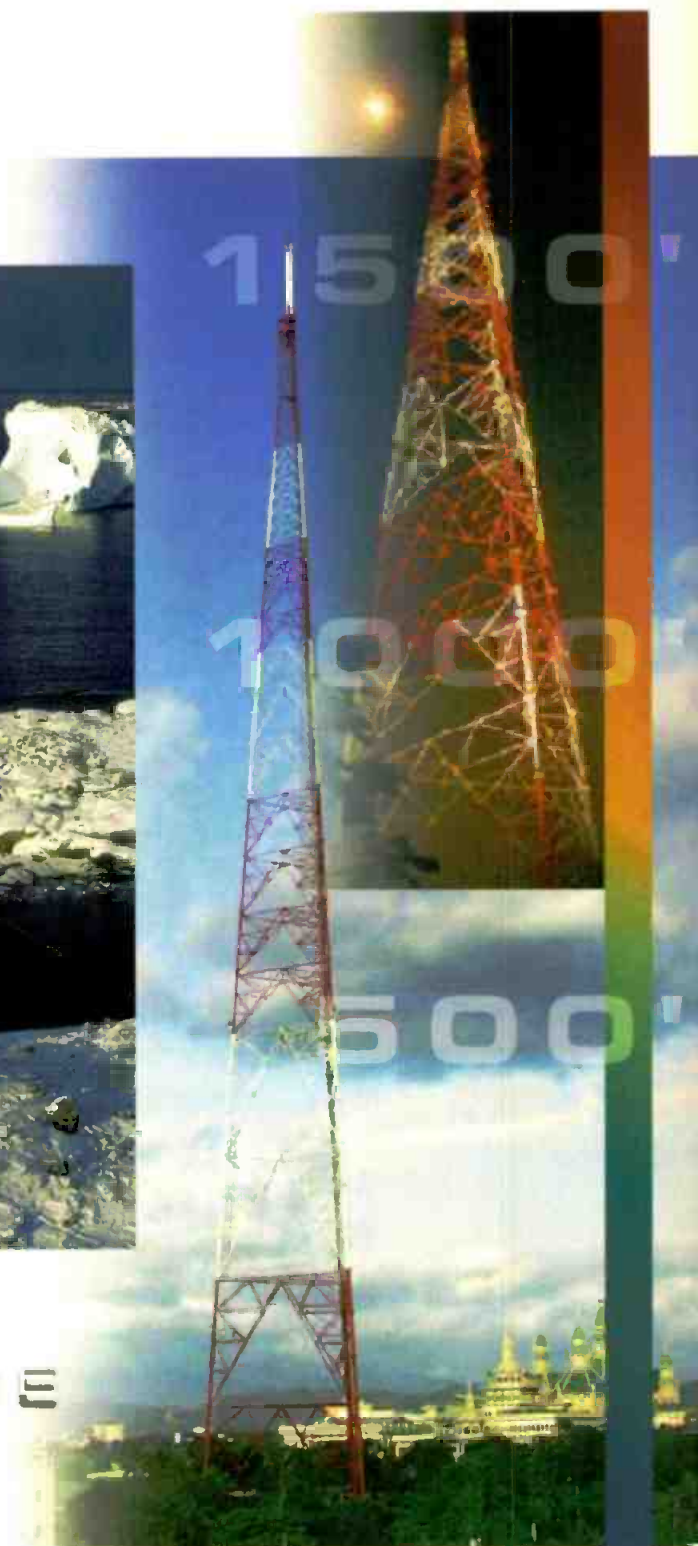
### **Tektronix AVDC100:**

Provides in-service monitoring and correction of A/V delay errors that occur during compression or other processing; allows user to reliably deliver video of definable quality; uses digital watermarking technology to embed audio time reference signals into video programming near the point of audio/video content creation, so lip-sync error can later be detected and corrected by analyzing the watermark later in the distribution chain and corrected by adjusting the audio delay.

800-835-9433; 503-627-7111; fax: 503-222-1542; [www.tektronix.com](http://www.tektronix.com)

**Booth: L9534 Circle (628) on Free Info Card**

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**[www.rohnnet.com](http://www.rohnnet.com)**

Circle (224) on Free Info Card

## TEST AND MEASUREMENT SYSTEM

### Videotek VTM-330E:

Eye Pattern Display is now on screen simultaneously with waveform, vector, audio, alarms and picture; features new Gamut display for encoded and RGB Gamut limit indications; accepts two composite analog inputs, either NTSC or PAL, with the second composite input configurable as a single CAV input; other features include closed caption detection and decoding with on-screen display and display of input signal strengths.

800-800-5719; 610-327-2292; fax: 610-327-9295; [www.videotek.com](http://www.videotek.com)

**Booth: L9622 Circle (629) on Free Info Card**

## TV transmitters

## HIGH-POWER BROADCAST TUBE

### Litton Electronic Devices L-4299

#### Constant Efficiency Amplifier:

Next-gen high-power tubes for UHF; operates at peak powers up to 120kW, offers high efficiency in comparison to standard IOT when operated in digital services.

800-861-1UHF; fax: 570-326-2903;

[www.littonedd.com](http://www.littonedd.com)

**Booth: L6119 Circle (630) on Free Info Card**



## DATACASTING SERVICES

### Harris Corporation Push and Interactive Services:

Demonstrations will be given for unidirectional push services that enable broadcasters to deliver Internet content to personal computers equipped with RF cards or personal storage devices in the home, as well as interactive TV services that enable the viewer to access data directly from the TV set by activating an icon on the screen.

800-622-0022; fax: 513-459-3890; [www.harris.com](http://www.harris.com)

**Booth L5023 Circle (631) on Free Info Card**

## ANTENNA

### Dielectric dualband antenna:

Allows a combination of UHF and high band VHF into one common pylon antenna; can be used to combine NTSC and DTV signals into one antenna; designed to fit in the aperture limitations of the existing NTSC antenna for simple DTV transition.

800-341-9678; 207-655-4555; fax: 207-655-7120; [www.dielectric.com](http://www.dielectric.com)

**Booth: L9539, R2341 Circle (632) on Free Info Card**

## STEREO RECEIVER

### Modulation Sciences Stereo/SAP Receiver:

Simultaneously recovers both the main channel stereo program and the SAP channel; each audio output is balance line level signal; tunes channels 2 through 69 and decodes any DTMF signal added to the SAP channel.

800-826-2603; fax: 732-302-0206; [www.modsci.com](http://www.modsci.com)

**Booth: L4416 Circle (633) on Free Info Card**

## DTV ANTENNAS

### Kathrein Master Transmit Antennas:

Features include broadcast operation and constant HRP for eight channels, constant beam tilt and null fill; can withstand wind velocities of up to 254mph as well as harsh winter conditions; RF power rating of 115kW average.

541-779-6500; [www.kathrein.com](http://www.kathrein.com)

**Booth L9574 Circle (634) on Free Info Card**



## ANTENNA

### Dielectric TFU-TC antenna:

Allows broadcasters to combine two UHF stations separated by one channel; designed for top and side mount configurations and for use with NTSC service, DTV service, or both.

800-341-9678; 207-655-4555; fax: 207-655-7120; [www.dielectric.com](http://www.dielectric.com)

**Booth: L9539, R2341 Circle (635) on Free Info Card**

Is the video jack you're using today designed for the signal standards of tomorrow? If not, it's time you started thinking about Switchcraft's video jack.

Engineered to be ahead of its time, our video jack *already meets the SMPTE 292M specification*. Our new HD Series delivers consistent characteristics across the bandwidth, offering you the reliability you need now...and the required performance for tomorrow.

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www.switchcraft.com

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## IOT-BASED TRANSMITTER

### Acrodyne Quantum IOT Based Transmitter

Can serve both analog and digital applications with power levels up to 280kW analog and 120kW digital; designed for high reliability and appropriate use of advanced technologies; created to fully exploit the latest generation of IOTs

610-917-1300; 800-523-2596; fax: 610-917-8148; [www.acrodyne.com](http://www.acrodyne.com)

**Booth: L8645 Circle (636) on Free Info Card**

## EAS CHARACTER GENERATOR

### Gorman-Redlich EAS-1CG:

Unit offers a built-in dedicated CG programmed to generate EAS system messages and complies with all FCC and EAS requirements; the unit can be completely programmed through the front key panel keypad or by downloading from a computer; the keypad can be used to set the position of the crawl on screen, the interval between crawl repeats and the selection of character and background colors.

740-593-3150; fax: 740-592-3898; [www.gorman-redlich.com](http://www.gorman-redlich.com)

**Booth R2200 Circle (637) on Free Info Card**

## TRANSMITTERS

### DMT (Digital Multimedia Technologies) Digital Ready UHF transmitters:

Series of analog transmitters in digital ready configuration; feature solid-state LDMOS technology and operation over the full UHF band.

+39-039-7398.1; fax: +39-039-7398.440; [dmtonline.com](http://dmtonline.com)

**Booth: L933 Circle (639) on Free Info Card**



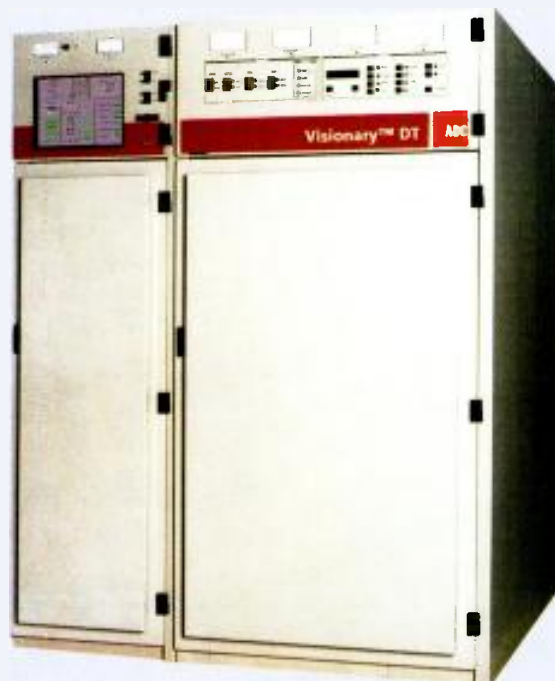
## 8VSB MODULATOR

### Ktech Communications VSB-ENC-200:

Modulates an MPEG-2 transport stream into an 8VSB signal using linear and nonlinear pre-correction techniques; accepts SMPTE 310M or DVB-ASI @ 19.392MB/s transport stream inputs and produces a 44MHz IF 8VSB signal at its output; a 23 stage PN generator is built into the unit and is used to test BER conditions to the transmitter receiver chain.

818-361-2248; fax: 818-270-2010; [www.ktechtelecom.com](http://www.ktechtelecom.com)

**Booth: M10226 Circle (638) on Free Info Card**



## TRANSMITTER

### ADC Broadcast Visionary DT:

Offers new LDMOS driver amplifiers utilizing LDMOS transistors and Marconi's newest plug-in style IOTs; provides DTV power levels up to 180kW average; uses ADC's DSP-based DT2B modulator, with Adaptive Digital Equalization, which automatically and continually tracks and corrects for both linear and non-linear distortions.

800-215-2614; 724-941-1500; fax: 724-941-4603; [www.adc.com/broadcast](http://www.adc.com/broadcast)

**Booth: L9857 Circle (640) on Free Info Card**



## Telos Digital Talkshow Systems

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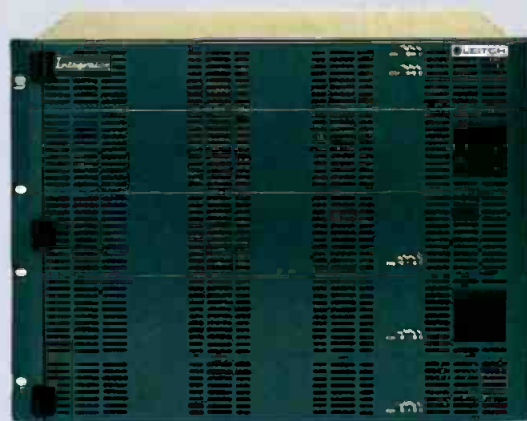
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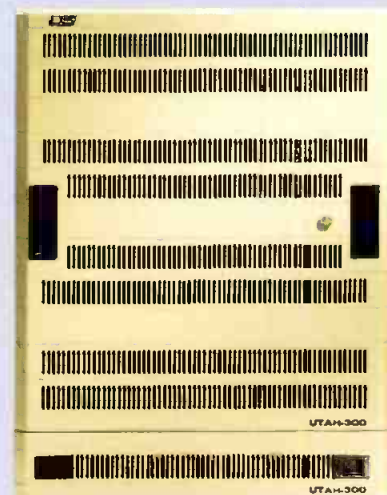
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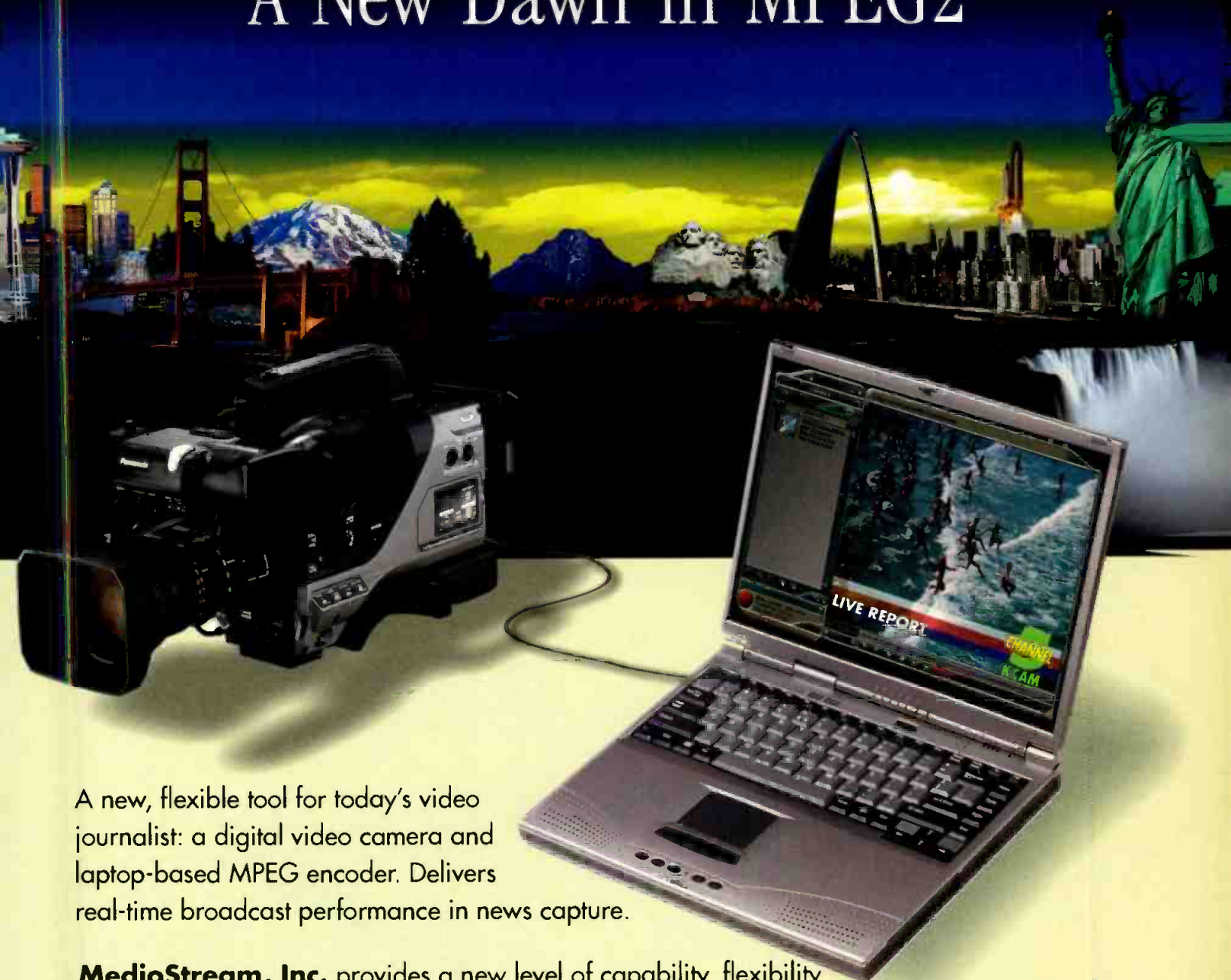
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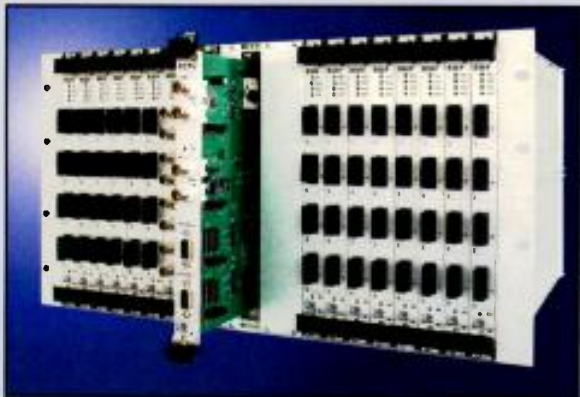


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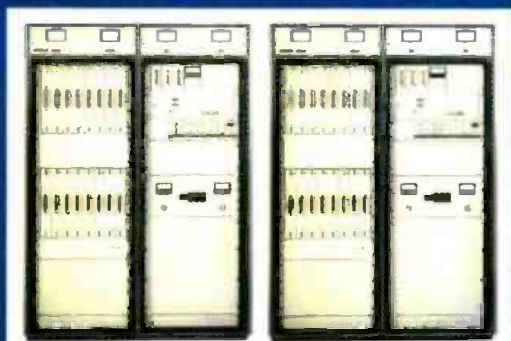


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It's even easy to use: Find what you're looking for in our category list to the right, then go to the indicated page and you'll find a listing of the companies showing that product. For your added convenience, the exhibitors' booth numbers are listed in geographic order. This ensures that scouring the floor for a particular piece of equipment will be as efficient as possible. You can start at the top or the bottom of the category list and know that your path will be as short as possible.

Issue advertisers are shown in **BLUE**. Listings are based on information provided to *Broadcast Engineering* by manufacturers. Good hunting, and we'll see you there.

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| 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 | 256 | 272 | 288 | 304 | 320 | 336 | 352 | 368 | 384 | 400 | 416 | 432 | 448 | 464 | 480 | 496 | 512 | 528 | 544 | 560 | 576 | 592 | 608 |
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| 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 | 258 | 274 | 290 | 306 | 322 | 338 | 354 | 370 | 386 | 402 | 418 | 434 | 450 | 466 | 482 | 498 | 514 | 530 | 546 | 562 | 578 | 594 | 610 |
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2 Which type of facility or operation best describes your primary business classification? (Check only ONE box.)

- 20 ☐ TV Station (including Networks & Low-Power TV)  
26 ☐ Combination TV & Radio Station  
39 ☐ Cable (including Networks)  
45 ☐ Telcoms  
29 ☐ Recording Studio  
30 ☐ Teleproduction Facility/Independent Program Producer  
40 ☐ Post-Production Facility  
50 ☐ Streaming Media — Network Provider/ISP/ IDC/Telco, Internet Content Provider/Web Publisher, Services, Software Provider  
31 ☐ Microwave, Relay Station or Satellite Company for TV and Cable  
33 ☐ TV Consultant (Engineering or Management)  
46 ☐ Systems Integrator  
34 ☐ TV Dealer or Distributor  
35 ☐ Other (please specify): \_\_\_\_\_

3 Which of the following best describes your title? (Check only ONE box.)

- A. **Company Management:**  
01 ☐ Chairman of the Board  
02 ☐ President  
03 ☐ Owner  
04 ☐ Partner  
05 ☐ Director  
06 ☐ Vice President  
07 ☐ General Manager (other than in charge of Engineering or Station Operations)  
08 ☐ Other Corporate/Financial Official  
B. **Technical Management & Engineering:**  
09 ☐ Technical Director/Manager  
10 ☐ Chief Engineer  
11 ☐ Other Engineering or Technical Title  
C. **Operations & Station Management/ Production & Programming:**  
12 ☐ Vice President Operations  
13 ☐ Operations Manager/Director  
14 ☐ Station Manager  
15 ☐ Production Manager  
16 ☐ Program Manager  
17 ☐ News Director  
18 ☐ Other Operations Title  
D. **Other** (please specify): \_\_\_\_\_

4 Which statement best describes your role in the purchase of equipment, components and accessories? (Check only ONE box.)

- A ☐ Make final decision to buy specific makes, models, services or programs  
B ☐ Specify or make recommendations on makes, models, services or programs  
C ☐ Have no part in specifying or buying

5 Which of the following types of equipment will you be evaluating for purchase in the next 12 months? (Check ALL that apply.)

1. **Audio Products**

- 1A ☐ Audio consoles/mixers  
1B ☐ Digital audio workstations  
1C ☐ Distribution amplifiers  
1D ☐ Headphones, headsets, intercoms  
1E ☐ Telephone interface systems  
1F ☐ Magnetic tape, audio  
1G ☐ Microphones  
1L ☐ Monitors (speakers)  
1J ☐ Recorders, players  
1K ☐ Switchers, routing  
1N ☐ Audio Processing

2. **Video Products**

- 2A ☐ Camera heads, tripods, pedestals, booms, dollies  
2B ☐ Cameras; lenses  
2C ☐ Graphics, titling, effects  
2D ☐ Nonlinear editing systems  
2F ☐ Editing controllers, systems  
2G ☐ Frame synchronizers, time base correctors  
2H ☐ Lighting systems  
2T ☐ Magnetic tape, video  
2J ☐ Monitors (picture, studio quality)  
2K ☐ Recorders, players  
2L ☐ Robotic camera controls  
2M ☐ Signal processing  
2N ☐ Signal routing, distribution  
2W ☐ Standards, format & scan converters  
2P ☐ Still store systems  
2Q ☐ Switchers, production/master control  
2R ☐ Video servers  
2S ☐ HDTV Equipment  
2V ☐ Virtual Sets  
2X ☐ MPEG compression/encoding systems  
2Y ☐ Projection systems  
2Z ☐ DVD systems

3. **Test & Measurement Products**

- 3A ☐ Analyzers, audio, video, RF  
3B ☐ Audio, video signal generators  
3C ☐ Waveform, vectorscope monitors  
3D ☐ Digital signal testing

4. **Miscellaneous Products**

- 4A ☐ Battery packs, chargers  
4B ☐ Cabinets, racks, consoles  
4C ☐ Cables, connectors  
4D ☐ Carts, cases (equipment, shipping), tools

5. **RF Products**

- 5B ☐ Exciters  
5C ☐ Fiber optics  
5E ☐ Power amplifiers, cavities  
5F ☐ Receivers  
5G ☐ Remote production vehicles, program relays  
5H ☐ Satellite T/R components, electronics  
5P ☐ STL/ENG components, electronics  
5J ☐ Switches, RF coaxial  
5K ☐ Transmitters  
5L ☐ Antenna systems, towers  
5M ☐ Transmitter, remote controls  
5N ☐ Tubes  
5Q ☐ Weather, radar RF products  
5R ☐ Cable/set top/CA systems

6. **Automation & Computer Products**

- 6A ☐ Accessories/peripherals  
6E ☐ Automation systems  
6H ☐ Business automation  
6T ☐ Commercial insertion systems  
6J ☐ Cards, technical monitoring  
6K ☐ Machine control  
6L ☐ Newsroom automation  
6M ☐ Platforms, Macintosh  
6N ☐ Platforms, PC/NT  
6W ☐ Platforms, SGI  
6P ☐ Record/playback automation  
6Q ☐ Software, engineering  
6R ☐ Software, production, planning  
6X ☐ Video interface cards  
6Y ☐ Networking products  
6Z ☐ Digital asset management

7. ☐ None of the Above

6 What is the budget for equipment and services you are evaluating for purchase in the next 12 months? (Check only ONE box.)

- 1 ☐ Less than \$24,999  
3 ☐ \$25,000 - \$99,999  
5 ☐ \$100,000 - \$299,999  
6 ☐ \$300,000 - \$499,999  
7 ☐ \$500,000 - \$999,999  
8 ☐ \$1,000,000 - \$1,999,999  
9 ☐ \$2,000,000 and up

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## **TBCs, frame syncs, conversion equipment**

|                                                 |        |
|-------------------------------------------------|--------|
| AJA Video .....                                 | L10286 |
| Grass Valley Group .....                        | L10409 |
| Snell & Wilcox .....                            | L10428 |
| Keywest Technology Inc .....                    | L11633 |
| Evertz .....                                    | L12146 |
| Teranex, Inc. ....                              | L1255  |
| Cobalt Digital, Inc. ....                       | L134   |
| Axon Digital Design BV .....                    | L1541  |
| Pixel Instruments .....                         | L430   |
| Hi-Tech Enterprises, Inc. ....                  | L4347  |
| SAV Systemes Audiofrequence<br>Videonique ..... | L436   |
| Visual Matrix Corp. ....                        | L4623  |
| Digital Vision, DV Sweden AB ...                | L5250  |
| Wohler Technologies, Inc. ....                  | L6049  |
| Media Concepts .....                            | L6338  |
| Zaxcom Inc. ....                                | L8473  |
| FOR.A-Video Gainesville .....                   | L8612  |
| Leitch Incorporated .....                       | L8620  |
| Videotek, Inc. ....                             | L9622  |
| ADC/Nvision .....                               | L9857  |
| Hotronic, Inc. ....                             | L9868  |
| Extron Electronics .....                        | M7936  |
| RGB Spectrum .....                              | M8350  |
| Inline, Inc. ....                               | M9745  |
| Sonifex Ltd. ....                               | R3001  |
| Gennum Corporation .....                        | S203   |
| Tandberg Television .....                       | S4859  |
| Fortel DTV Inc. ....                            | T1023  |
| Bexel Corporation .....                         | T155   |

## **Test & measurement equipment**

|                              |        |
|------------------------------|--------|
| Logic Innovations .....      | E3217  |
| Snell & Wilcox .....         | L10428 |
| Magni Systems Inc .....      | L11373 |
| Keywest Technology Inc ..... | L11633 |
| Neutrik USA, Inc. ....       | L11636 |
| Evertz .....                 | L12146 |
| AVCOM OF VIRGINIA, INC. .... | L12515 |
| Audio Precision .....        | L1529  |
| Astro Systems, Inc. ....     | L277   |
| Avtek Systems .....          | L331   |

|                                                |        |
|------------------------------------------------|--------|
| Modulation Sciences .....                      | L4416  |
| Audio accessories, Inc. ....                   | L4428  |
| Image Video .....                              | L4621  |
| Visual Matrix Corp. ....                       | L4623  |
| Whirlwind .....                                | L4645  |
| Multidyne Video & Fiber Optic<br>Systems ..... | L5055  |
| ESE .....                                      | L5730  |
| Rohde & Schwarz L5750                          |        |
| Ktech Telecom .....                            | L577   |
| Wohler Technologies, Inc. ....                 | L6049  |
| Amco Engineering Co. ....                      | L6110  |
| Communications & Power<br>Industries .....     | L6114  |
| Hamlet Video International .....               | L6130  |
| Z Technology, Inc. ....                        | L614   |
| DVB .....                                      | L667   |
| Acterna .....                                  | L671   |
| Pixelmatrix Corporation .....                  | L7768  |
| Leader Instruments Corp. ....                  | L8777  |
| Broadcast Video Systems .....                  | L8923  |
| Burst Electronics Inc. ....                    | L8974  |
| Tentel Corp .....                              | L9025  |
| Tektronix Inc. ....                            | L9534  |
| Videotek, Inc. ....                            | L9622  |
| HORITA Co., Inc. ....                          | L9773  |
| Hotronic, Inc. ....                            | L9868  |
| Nelson Custom Case Co. ....                    | M10224 |
| Extron Electronics .....                       | M7936  |
| Ward-Beck Systems Ltd. ....                    | R2124  |
| Potomac Instruments .....                      | R2140  |
| Brainstorm Electronics .....                   | R2855  |
| db Technologies .....                          | R2855  |
| Sound Devices, LLC .....                       | R2900  |
| Prism Media Products .....                     | R3000  |
| AUDEMAT S.A. ....                              | R3035  |
| EDX Engineering, Inc. ....                     | R3137  |
| Gennum Corporation .....                       | S203   |
| Communications & Power<br>Industries .....     | S2732  |
| Audio Precision .....                          | S4504  |
| Tandberg Television .....                      | S4859  |
| Bexel Corporation .....                        | T155   |

## **TV transmitters, feedline, antennas, towers, services**

|                                              |        |
|----------------------------------------------|--------|
| LeBlanc Broadcast Inc. ....                  | L10445 |
| Richland Towers .....                        | L1146  |
| DigiTAG .....                                | L1214  |
| Marconi Applied Technologies                 | L12545 |
| RF Technology, Inc. ....                     | L12549 |
| Advanced Designs Corp. ....                  | L12564 |
| SpectraSite Broadcast Group                  | L12611 |
| Itelco, Inc. ....                            | L1417  |
| Thomson Components & Tubes                   | L4628  |
| Harris Corporation .....                     | L5023  |
| Rohde & Schwarz .....                        | L5750  |
| Ktech Telecom .....                          | L577   |
| NEC .....                                    | L6043  |
| Communications & Power<br>Industries .....   | L6114  |
| Shively Labs .....                           | L6116  |
| DVB .....                                    | L667   |
| TRON-Tek, Inc. ....                          | L8086  |
| Acrodyne Industries Inc .....                | L8645  |
| Micro Communications, Inc. ....              | L8768  |
| Andrew Corporation .....                     | L9510  |
| RFS Broadcast .....                          | L9528  |
| Dielectric Communications .....              | L9539  |
| Kathrein Inc., Scala Division ....           | L9574  |
| Allen Osborne Assoc. Inc. ....               | L9772  |
| ADC/Nvision .....                            | L9857  |
| Kline Towers .....                           | L9883  |
| LEL Computer Systems .....                   | M7446  |
| Magnum Towers Inc .....                      | R1934  |
| Bext, Inc. ....                              | R1947  |
| Utility Tower Company .....                  | R2136  |
| Dielectric Communications .....              | R2341  |
| Rohn Industries, Inc. ....                   | R2547  |
| Shively Labs .....                           | R2705  |
| Radiacion Y Microondas, S.A.<br>(Ryma) ..... | R3025  |
| UNIMAR Inc. ....                             | R3030  |
| Armstrong Transmitter .....                  | R3115  |
| Andrew Corporation .....                     | S2722  |
| Communications & Power<br>Industries .....   | S2732  |
| Litton Electron Devices .....                | T1143  |
| Thomson Components & Tubes                   | T1451  |

## Video editing systems

|                                        |        |
|----------------------------------------|--------|
| Media 100 Inc. ....                    | i6511  |
| Chyron Corporation .....               | i6631  |
| Pinnacle Systems, Inc. ....            | L11327 |
| Quantel .....                          | L11520 |
| Play, Industries .....                 | L11657 |
| BUF Technology .....                   | L122   |
| Omnibus Systems LTD. ....              | L12234 |
| Chyron Corporation .....               | L12300 |
| Editing Technologies Corp. ....        | L1269  |
| Editware .....                         | L165   |
| Astro Systems, Inc. ....               | L277   |
| Pixel Power Ltd. ....                  | L741   |
| Avid Technology, Inc. ....             | M8318  |
| Adobe Systems Incorporated .           | M9619  |
| DPS - Digital Processing Systems ..... | M9732  |
| Boxx Technologies .....                | S3872  |
| Discreet .....                         | S4100  |
| Matrox Electronic Systems Ltd.         | S4113  |
| Accom, Inc. ....                       | S4806  |
| Fast Multimedia AG .....               | S4817  |

## Video routing

|                                              |        |
|----------------------------------------------|--------|
| Logic Innovations .....                      | E3217  |
| Teleglobe Communications Corporation .....   | E3817  |
| Lightworks Inc. ....                         | E6206  |
| Prime Image, Inc. ....                       | L10382 |
| Grass Valley Group .....                     | L10409 |
| Utah Scientific, Inc. ....                   | L10452 |
| DNF CONTROLS .....                           | L1155  |
| Keywest Technology Inc .....                 | L11633 |
| Evertz .....                                 | L12146 |
| Sigma Electronics Inc. ....                  | L12639 |
| Cobalt Digital, Inc. ....                    | L134   |
| Network Electronics AS .....                 | L229   |
| VELA .....                                   | L346   |
| Hi-Tech Enterprises, Inc. ....               | L4347  |
| SAV Systemes Audiofrequence Videonique ..... | L436   |
| Image Video .....                            | L4621  |
| Philips Digital Video Systems ....           | L5010  |
| Multidyne Video & Fiber Optic Systems .....  | L5055  |
| RDL Radio Design Labs .....                  | L5961  |

|                                            |        |
|--------------------------------------------|--------|
| Media Concepts .....                       | L6338  |
| Fast Forward Video .....                   | L8083  |
| Video International Development Corp. .... | L8165  |
| Netcom .....                               | L8209  |
| FOR.A-Video Gainesville .....              | L8612  |
| Leitch Incorporated .....                  | L8620  |
| Miranda Technologies, Inc. ....            | L8632  |
| PESA Switching Systems, Inc. ..            | L8757  |
| Broadcast Video Systems .....              | L8923  |
| Burst Electronics Inc. ....                | L8974  |
| Comprehensive Video Group ....             | L9020  |
| Allen Avionics, Inc .....                  | L9052  |
| Lucent Technologies .....                  | L941   |
| Videotek, Inc. ....                        | L9622  |
| Allen Osborne Assoc. Inc. ....             | L9772  |
| HORITA Co., Inc. ....                      | L9773  |
| ADC/Nvision .....                          | L9857  |
| Hotronic, Inc. ....                        | L9868  |
| Datatek Corporation .....                  | L9949  |
| InnovaCom .....                            | M10134 |
| LEL Computer Systems .....                 | M7446  |
| Video Accessory Corporation .              | M7857  |
| Extron Electronics .....                   | M7936  |
| VELA .....                                 | M8329  |
| Folsom Research, Inc. ....                 | M9168  |
| Gefen Systems .....                        | M9339  |
| Inline, Inc. ....                          | M9745  |
| Optivision, Inc. ....                      | M9749  |
| Telecast Group AS .....                    | R1663  |
| AV Communications PTY LTD ....             | R1837  |
| Ward-Beck Systems Ltd. ....                | R2124  |
| RDL Radio Design Labs .....                | R3143  |
| Genum Corporation .....                    | S203   |
| Force Inc. ....                            | S3563  |
| Scientific-Atlanta Inc .....               | S4142  |
| A.F.A. Products/Videobank .....            | S4823  |
| BarcoNet .....                             | S5360  |
| Fortel DTV Inc. ....                       | T1023  |
| PixStream Incorporated .....               | T823   |

## Weather/data services

|                                |        |
|--------------------------------|--------|
| SpaceCom Systems .....         | E5523  |
| AccuWeather .....              | L10768 |
| Weather Central .....          | L11651 |
| Advanced Designs Corp. ....    | L12564 |
| AWS, Inc. ....                 | L1477  |
| Pixel Power Ltd. ....          | L741   |
| Allen Osborne Assoc. Inc. .... | L9772  |
| CIPRICO INC. ....              | M8336  |
| Baron Services .....           | R1673  |
| SGI .....                      | S4132  |

## Wire, cable, connectors

|                                   |        |
|-----------------------------------|--------|
| Neotec Graphic International ...  | E5811  |
| Neutrik USA, Inc. ....            | L11636 |
| RF Technology, Inc. ....          | L12549 |
| IMMAD ECVS .....                  | L1277  |
| Marshall Electronics, Inc. ....   | L144   |
| Switchcraft, Inc. ....            | L4403  |
| Audio accessories, Inc. ....      | L4428  |
| Trompeter Electronics Inc. ....   | L4631  |
| Whirlwind .....                   | L4645  |
| Lemo USA, Inc. ....               | L5354  |
| Multimedia Accessories, Ltd. ...  | L5740  |
| Gepco International, Inc. ....    | L5856  |
| Hitachi Denshi America Ltd .....  | L6414  |
| Wireworks Corporation .....       | L8204  |
| Patchamp .....                    | L8209  |
| Belden Electronics Division ..... | L8783  |
| Andrew Corporation .....          | L9510  |
| ADC/Nvision .....                 | L9857  |
| Extron Electronics .....          | M7936  |
| Inline, Inc. ....                 | M9745  |
| Cool-Lux .....                    | R2009  |
| TASCAM .....                      | R2141  |
| Audio-Technica U.S., Inc. ....    | R2647  |
| Andrew Corporation .....          | S2722  |
| Marshall Electronics, Inc. ....   | S3460  |
| Delco Wire & Cable .....          | S3760  |



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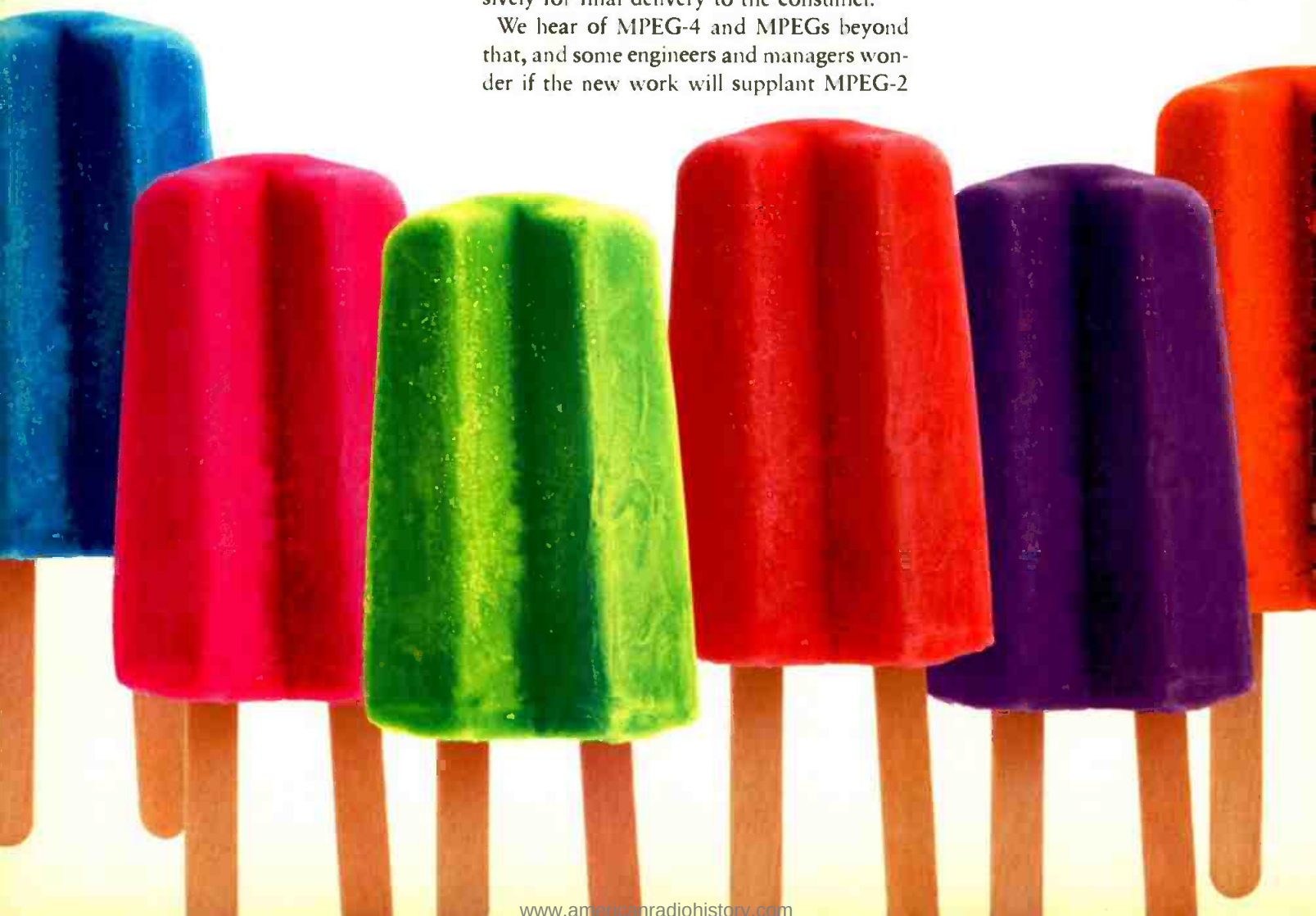
[www.americanradiohistory.com](http://www.americanradiohistory.com)

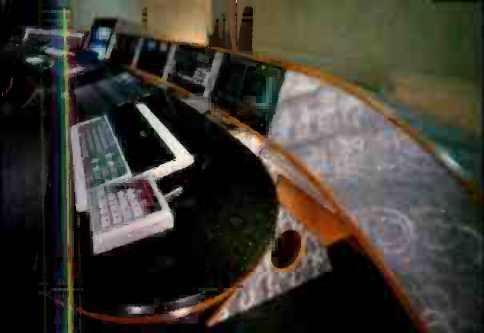
# the new **flavors** of **MPEGs**

By Peter Symes

**C**ompression standards have become a matter of great importance in the television broadcast community. Most television industry activity revolves around Motion JPEG, MPEG-2 and DV compression, with MPEG-2 being used almost exclusively for final delivery to the consumer.

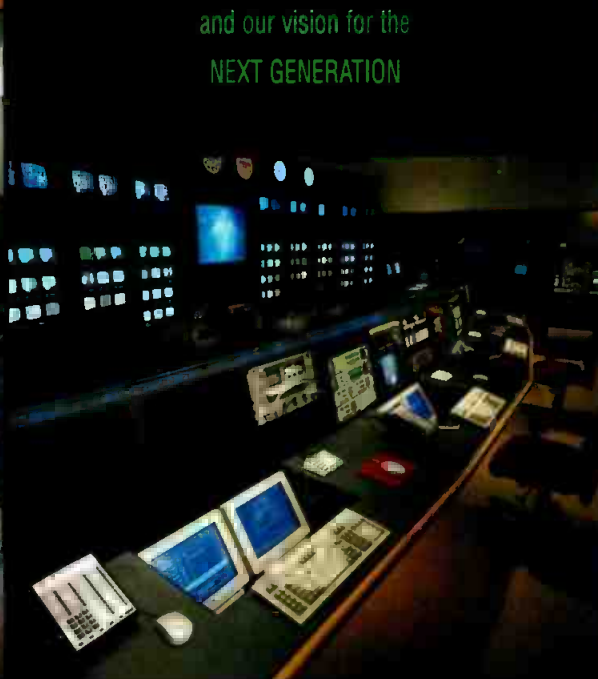
We hear of MPEG-4 and MPEGs beyond that, and some engineers and managers wonder if the new work will supplant MPEG-2





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and require even more capital investment. Do broadcasters need to think about MPEG-4, MPEG-7 and MPEG-21? Will these developments mean that a digital conversion today will become obsolete within a few years? More optimistically, will the new systems mean new revenue opportunities?

### The evolution of MPEG compression

The impact of compression on broadcast television started with JPEG or, more accurately, with various proprietary implementations of Motion JPEG

standard defines a tool set, the syntax of the bit stream and the operation of the decoder. It does not define the operation of the encoder — any encoder that produces a syntactically valid bit stream that can be decoded by a compliant decoder is fair game. This allows for the evolution of encoding technology without change to the standard, and without rendering existing decoders obsolete.

MPEG-1 was frozen (i.e., subsequent changes were allowed to be editorial only) in 1991. In the same year the

The success of MPEG-2 is best highlighted by the demise of MPEG-3, intended for high-definition television. MPEG-3 was soon abandoned when it became apparent that MPEG-2 embraced this application with ease. MPEG-2 is the basis for both the ATSC and DVB broadcast standards and the compression system used by DVD.

Perhaps the most fundamental change brought by MPEG-2 is the number of compliance points. MPEG-1 defined a single compliance point. Every MPEG-1 compliant decoder had to decode any MPEG-1 compliant bit stream. MPEG-2 capabilities include a vast range of image sizes, encoding tools and data rates, suitable for different applications. A decoder capable of handling every possible MPEG-2 bit stream would be enormously complex and expensive, and enforcing this generality would preclude the use of the standard in most environments.

The MPEG committee decided on a structure of profiles and levels. *Profiles* define the tools and syntactical elements that may be used; *levels* define the permissible ranges of parameters. Various combinations of profile and level are provided to allow practical subsets to be implemented in a standard manner, as shown in Figure 1. For standard definition television we generally use Main Profile at Main Level (MP@ML) or the studio 4:2:2 Profile at Main Level (4:2:2@ML). For high-definition television we use the same profiles at High Level (MP@HL and 4:2:2@HL).

## In one interesting demonstration, video coverage of a soccer game was processed to separate the ball from the rest of the scene.

systems that enabled nonlinear editing, broadcast-quality disk-based servers and more. Unfortunately there was no standard for adjusting JPEG compression to fit an image sequence within bandwidth limits, so each manufacturer's solution was different, and there was no possibility of interchange of compressed signals.

The first international compression standard for motion imagery, MPEG-1, was developed between 1988 and 1992 and included motion compensation for temporal compression. MPEG-1 represented a remarkable technical achievement, but had little direct impact on the television broadcast industry. It was, by design, limited to CIF picture size (352x240 pixels), to approximately 1.5Mb/s compressed data rate and had no tools to handle interlaced images.

It should be noted that the tool set and syntax developed for MPEG-1 was vastly more powerful than was represented by the constraints of the standard. MPEG-1 syntax was used for direct-to-home satellite broadcasting, and to compress HDTV by one of the proponents during the competitive phase of the Advanced Television Service proceedings.

MPEG-1 was also noteworthy for its approach to interoperability. The

MPEG-2 process was started, and MPEG-2 became a standard in 1995. The initial goals were simple — there was a need for a standard that would accommodate broadcast-quality video, including interlace.

In many ways, MPEG-2 represents the “coming-of-age” of MPEG. The greater flexibility of MPEG-2, combined with the increased availability of large-scale integrated circuits, meant that MPEG-2 could be used in a vast number of applications.

| Profile | Level     | Resolution                        |                                 |                                    |                                   |                                    |
|---------|-----------|-----------------------------------|---------------------------------|------------------------------------|-----------------------------------|------------------------------------|
|         |           | 4:2:0                             | 4:2:0                           | 4:2:2                              | 4:2:0                             | 4:2:0, 4:2:2                       |
| HIGH    |           | 1920 x 1152<br>80 Mb/s<br>I, P, B |                                 | 1920 x 1080<br>300 Mb/s<br>I, P, B |                                   | 1920 x 1152<br>100 Mb/s<br>I, P, B |
|         | HIGH-1440 | 1440 x 1152<br>60 Mb/s<br>I, P, B |                                 |                                    | 1440 x 1152<br>60 Mb/s<br>I, P, B | 1440 x 1152<br>80 Mb/s<br>I, P, B  |
| MAIN    |           | 720 x 576<br>15 Mb/s<br>I, P      | 720 x 576<br>15 Mb/s<br>I, P, B | 720 x 608<br>50 Mb/s<br>I, P, B    | 720 x 576<br>15 Mb/s<br>I, P, B   | 720 x 576<br>20 Mb/s<br>I, P, B    |
|         | LOW       | 352 x 228<br>4 Mb/s<br>I, P, B    |                                 |                                    | 352 x 288<br>4 Mb/s<br>I, P, B    |                                    |
| LEVEL   |           | SIMPLE                            | MAIN                            | 4:2:2 PROFILE                      | SNR                               | SPATIAL                            |
| PROFILE |           |                                   |                                 |                                    |                                   | HIGH                               |

Figure 1. The combinations of profile and level in MPEG-2. Standard definition has generally used Main Profile at Main Level, while HD uses the same profile at High Level.

## MPEG-4

The wheels of international standardization grind slowly, and to ensure a standard is eventually achieved there are strict rules that prohibit substantive change after a certain point in the process. By the time a standard is officially adopted, there is often a backlog of desired enhancements and extensions — as it was with MPEG-2. As discussed above, MPEG-3 had been started and abandoned, so the next project became MPEG-4. Two versions of MPEG-4 are already complete and work is continuing on further extensions.

At first, the main focus of MPEG-4 was the encoding of video and audio at very low rates. In fact, the standard was explicitly optimized for three bit rate ranges:

- Below 64kb/s
- 64- to 384kb/s
- 384kb/s to 4Mb/s

Performance at low bit rates remained a major objective and some creative ideas contributed to this end. Great attention was also paid to error resilience, making MPEG-4 suitable for

use in error-prone environments such as transmission to personal handheld devices. However, other profiles and levels use bit rates up to 38.4Mb/s, and work is still proceeding on studio-quality profiles and levels using data rates up to 1.2Gb/s.

More importantly, MPEG-4 evolved into a new concept of multimedia encoding with powerful tools for interactivity and a vast range of applications. This article can provide only the briefest of introductions to the system as the official “overview” of this standard spans 67 pages.

### Object coding

The most significant departure from conventional transmission systems is the concept of objects. Different parts of the final scene can be coded and transmitted separately as *video objects* and *audio objects* to be brought together, or *composed*, by the decoder. Different object types may be coded with the tools most appropriate for the job. The objects may be generated independently, or a scene may be analyzed to separate, for example, foreground and

background objects. In one interesting demonstration, video coverage of a soccer game was processed to separate the ball from the rest of the scene. The background (the scene without the ball) was transmitted as a “teaser” to attract a pay-per-view audience. Anyone could see the players and the field, but only those who paid could see the ball.

The object-oriented approach leads to three key characteristics of MPEG-4 streams:

- Multiple objects may be encoded using different techniques and then composited at the decoder;
- Objects may be of natural origin, such as scenes from a camera, or synthetic, such as text; and,
- Instructions in the bit stream, and/or user choice, may enable several different presentations from the same bit stream.

The generalized system for object coding in MPEG-4 is shown in Figure 2. This diagram also emphasizes the opportunities for user interaction within MPEG-4 systems — a powerful feature, particularly for video game designers.



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These capabilities do not have to be used. MPEG-4 provides traditional coding of video and audio and improves on MPEG-2 by offering enhanced efficiency and resilience to errors. However, the true power of MPEG-4 comes from the architecture described above. The coding of objects independently offers a number of advantages. Each object may be coded in the most efficient manner, and different spatial or temporal scaling (see below) may be used as appropriate.

### Video coding

Many of the video coding tools in MPEG-4 are similar to those of MPEG-2, but are enhanced by better use of predictive coding and more efficient entropy coding. However, the application of the tools may differ significantly from earlier standards.

MPEG-4 codes video objects. In the simplest model a video is coded in much the same way as in MPEG-2, but it is described as a single video object with a rectangular shape. The representation of the image is known as *texture coding*. Where there is more than one video object, some may have irregular shapes, and generally all will be smaller than a full-screen background object. This means only the active area of the object needs be coded, but the shape and position must also be represented. The standard includes tools for *shape coding* of rectangular and irregular objects, in either binary or gray-scale representations (similar to an alpha channel).

### Scalability

In the context of media compression, scalability means the ability to distribute content at more than one quality level within the same bit stream. MPEG-2 and MPEG-4 both provide scalable profiles using a conventional model; the encoder generates a base layer and one or more enhancement layers. The enhancement layer(s) may be discarded for transmission or decoding if insufficient resources are available. This approach works, but all decisions about quality levels have to be made at the time of encoding, and in practice the number of enhancement layers is severely limited (usually to one).

Later versions of MPEG-4 include the *fine grain scalability (FGS)* profile. This technique generates a single bit stream representing the highest quality level, but allows for lower-quality versions to be extracted downstream. FGS uses bit-plane encoding. The quantized coefficients are "sliced" one bit at a time, starting with the most significant bit. This provides a coarse representation of the largest (and most significant) coefficient(s). Subsequent slices provide more accurate representations

and such depth in every aspect, that the potential applications are endless.

### MPEG-7

The first question about MPEG-7 is "why seven?" As mentioned above, the cancellation of MPEG-3 caused the sequence of real standards to be MPEG-1, MPEG-2, and MPEG-4. There were those on the committee who took the pragmatic approach and expected the next standard to be MPEG-5. The "binary-buffs" saw the

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## The new MPEGs will not replace MPEG-2 as the definitive standard for delivery of video to consumers.

---

of the most-significant coefficients, and coarse approximations of the next most significant and so on.

Spatial scaling, including FGS, may be combined with temporal scaling that permits the transmission and/or decoding of lower frame rates when resources are limited. As mentioned above, objects may be scaled differently. It may be appropriate to retain full temporal resolution for an important foreground object, but to update to the background as a lower rate.

### Other aspects of MPEG-4

MPEG-4 is enormous, and the comments above touch on only a few of the many aspects of the standard. There are studio profiles for high-quality encoding that, in conjunction with object coding, will permit structured storage of all the separate elements of a video composite. Facial and body animation profiles will permit a stored face to "read" text in many languages. Further extensions of MPEG-4 may even provide solutions for digital cinema. Figure 3 shows the MPEG-4 profiles defined today.

Some describe MPEG-4 as the standard for video games, and certainly many of the constructs are ideally suited to that industry. However, even a cursory examination of the standard reveals such a wealth of capabilities,

historical 1-2-4 as the start of a pre-ordained binary sequence, and wanted the new work to be MPEG-8. Finally, it was concluded that any simple sequence would fail to signal the fundamental difference from the work of MPEG-1 through MPEG-4, and MPEG-7 was chosen.

MPEG-7 is not about compression; it is about *metadata*, also known as the "bits about the bits." Metadata is digital information that describes the content of other digital data. In modern parlance, the program material or content, the actual image, video, audio or data objects that convey the information, are known as *data essence*. The metadata tells the world all it needs to know about what is in the essence.

Anyone who has been involved with the storage of information, be it videotapes, books, music, whatever, knows the importance and the difficulty of accurate cataloging and indexing. Stored information is useful only if its existence is known, and if it can be retrieved in a timely manner when needed.

This problem has always been with us and is addressed in the analog domain by a combination of labels, catalogs, card indexes, etc. More recently, the computer industry has given us efficient, cost-effective, relational databases that permit powerful search engines to access stored information

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in remarkable ways — provided the information is present in a form the search engine can use.

The real problem is that the world is generating new media content at an enormous and ever-increasing rate. With the increasing quantity and decreasing cost of digital storage media, more and more content can be stored. Local and wide-area networks can make the content accessible and deliverable if it can be found. The search

engines can find what we want and the databases can be linked to the material itself, but we need to get the necessary indexing information into the database in a form suitable for the search engine.

We might guess from knowledge of earlier standards that the MPEG

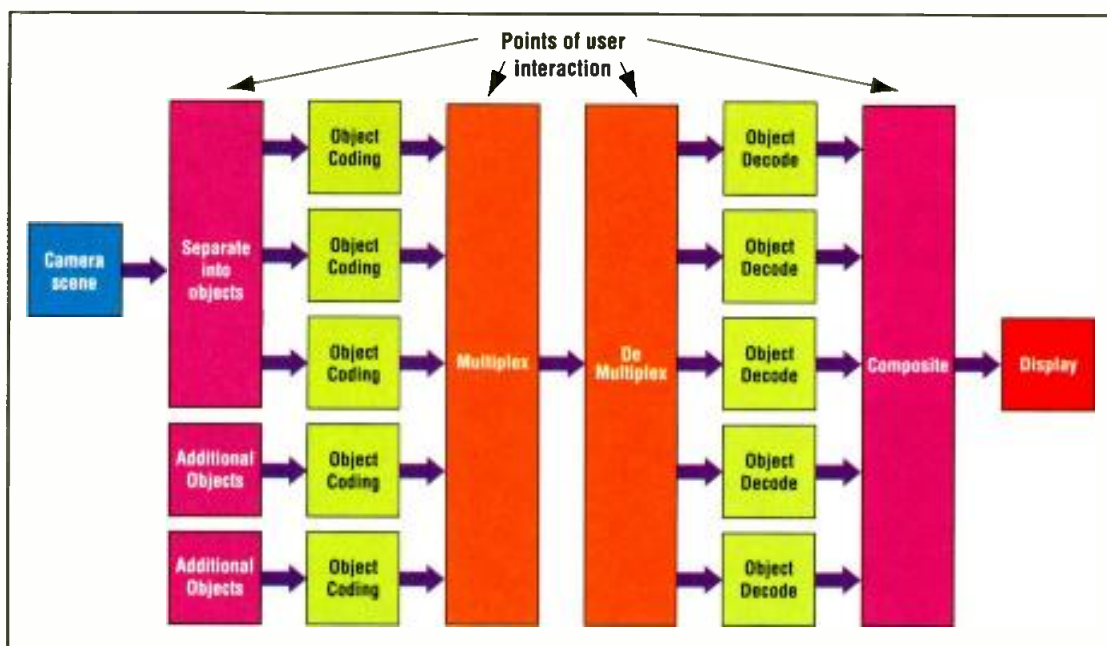


Figure 2. The generalized system for object coding in MPEG-4 illustrating the various points of possible user interaction.

ments may be present and how they will be encoded.

MPEG-7 defines a structure of *descriptors* and *description schemes* that can characterize almost anything. In theory, primitive elements such as color histograms and shapes can be combined to represent complex entities

index and retrieve items in ways unimaginable a few years ago. We will then need a system to control access, privacy and commercial transactions associated with this content. This is where MPEG-21 is targeted.

## MPEG-21

MPEG-21 again differs from the earlier work of the committee. The basic concept is fairly simple — though wide reaching. MPEG-21 seeks to create a complete structure for the management and use of digital assets, including all the infrastructure support for the commercial transactions and rights management that must accompany this structure. The vision statement is “to enable transparent and augmented use of multimedia resources across a wide range of networks and devices.”

The work is at an early stage, but a committee draft is planned by December 2001. As with other MPEG projects, we can expect an initial standard with increased sophistication and flexibility contained in later amendments.

## Conclusions

MPEG-2 is firmly established in the consumer market. Millions of MPEG-2 decoders already exist in DVD players and digital cable, satellite and terrestrial television receivers. In a sense, this simple fact answers one of the questions posed: The new MPEGs will not replace MPEG-2 as the definitive standard for

## Stored information is useful only if its existence is known, and if it can be retrieved.

committee would not concern itself unduly with mechanisms for generating data. MPEG rightly takes the view that if it creates a standardized structure, and if there is a market need, the technological gaps will be filled. In previous MPEG standards, the syntax and the decoder were specified by the standard. In MPEG-7, *only* the syntax is standardized. The generation of the metadata is unspecified, as are the applications that may use it. MPEG-7 specifies how metadata should be expressed. This means the fields that should go into a database are specified, and anyone designing a search engine knows what descriptive ele-

ments such as individual faces. It may be possible to index material automatically such that the database can be searched for scenes that show, for example, George Burns and Ella Fitzgerald together.

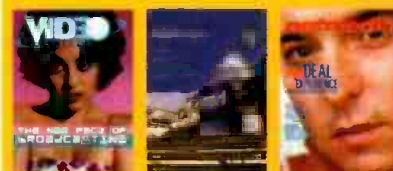
The constructs are not confined to images. To paraphrase the official FAQ, it should be possible to use a voice sample to search for recordings by, or images of, Pavarotti, or to play a few notes on a keyboard to find matching or similar melodies.

The rapid advance of storage and networking systems will enable access to vast quantities of digital content. As technology advances to satisfy the needs of MPEG-7, we will be able to

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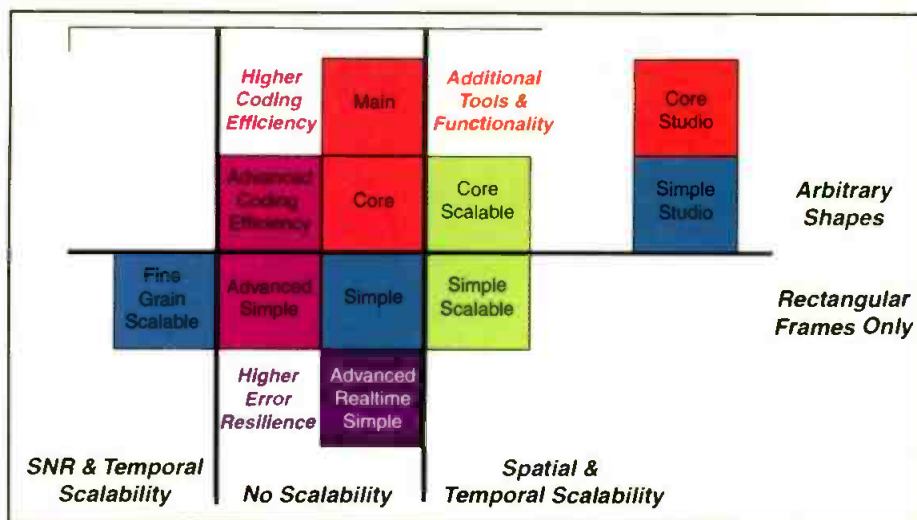


Figure 3. MPEG-4 profiles, as they are currently defined.

delivery of video to consumers by these mechanisms.

However, MPEG-4 may still be important to broadcasters for a number of reasons. Digital broadcasting will include program-related data, and may be targeted at devices other than conventional television receivers. MPEG-4 constructs may use MPEG-2 compression and may be carried on MPEG-2

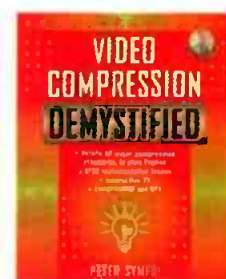
transport streams so this could be a viable mechanism for data-enhanced programming.

Probably more important, however, is the use of MPEG-4 on the Internet. Most broadcasters now see streaming media as an essential part of their operations and are obliged to support popular streaming formats. The efficiency for low-bit rate applications, documen-

tation as an international standard and the flexibility of the FGS option all suggest MPEG-4 will be a major factor in the future of streaming media.

MPEG-7 and MPEG-21 will likely be of great importance to broadcasters in the future, but neither is a compression standard. The advent of these standards will impact many aspects of facility design and operational models, but not in ways that will devalue investments made today. In contrast, if MPEG-7 and -21 are successful, they will together provide a tremendous boost to e-commerce, and greatly enhance the value of digital assets. ■

*This article includes material extracted and adapted from Video Compression Demystified by Peter Symes (McGraw-Hill, 2001) by permission of the publisher. Details at [www.symes.tv](http://www.symes.tv). Peter Symes is Manager, Advanced Technology, and a Fellow of Grass Valley Group.*



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## Field Report

### Acterna's DTS-400: MPEG-2 monitoring at EchoStar

BY JEFF MCSCHOOLER

In May of 1996, EchoStar Communications Corp. launched DISH Network, our direct broadcast satellite (DBS) system. Since then, the service has grown exponentially, and today it boasts more than five million customers across the U.S. To the team of experts who run EchoStar's primary satellite uplink facility in Cheyenne, WY, the success of the DISH Network system is not an accident. EchoStar's Uplink Engineering groups are responsible for processing, encoding and multiplexing all content and contribution feeds in the EchoStar facility.

At EchoStar, customer service is our number one responsibility. We are not looking to be second best, and we are not looking to be just OK; we want to be the best. The only way to be the best is to know what's going on in our system at all times.

In the burgeoning digital age, we work to shield our customers from the vulnerabilities of MPEG-2 compression and transmission. Key to our success is Acterna's DTS-400 MPEG-2 Digital Broadcast Monitoring System.

EchoStar's need for MPEG-2 monitoring became urgent a few years after the initial deployment of DISH Network. When DISH Network first began, we had a limited ability to monitor the stream from the time it was encoded to the time the set-top box decoded it. We needed to ensure that the set-top boxes at the customers' homes were decoding the television signals properly.

More specifically, many common errors in the MPEG-2 system layer aren't immediately visible on a set of video monitors. Dropped packets, corrupt tables or missing Packet IDs (PIDs) can cause degradation in picture quality or complete channel loss. These errors are more easily detectable when using the right MPEG-2 monitoring tool.

stream in the network. The system had to be both smart and easy to use.

The DTS-400 monitoring system provides EchoStar with a global supervision system for all 500 channels on our primary service. The entire network is monitored from a single screen of top-level status indicators representing the current health of all uplink and downlink

## Many common errors in the MPEG-2 system layer aren't immediately visible on a set of video monitors.

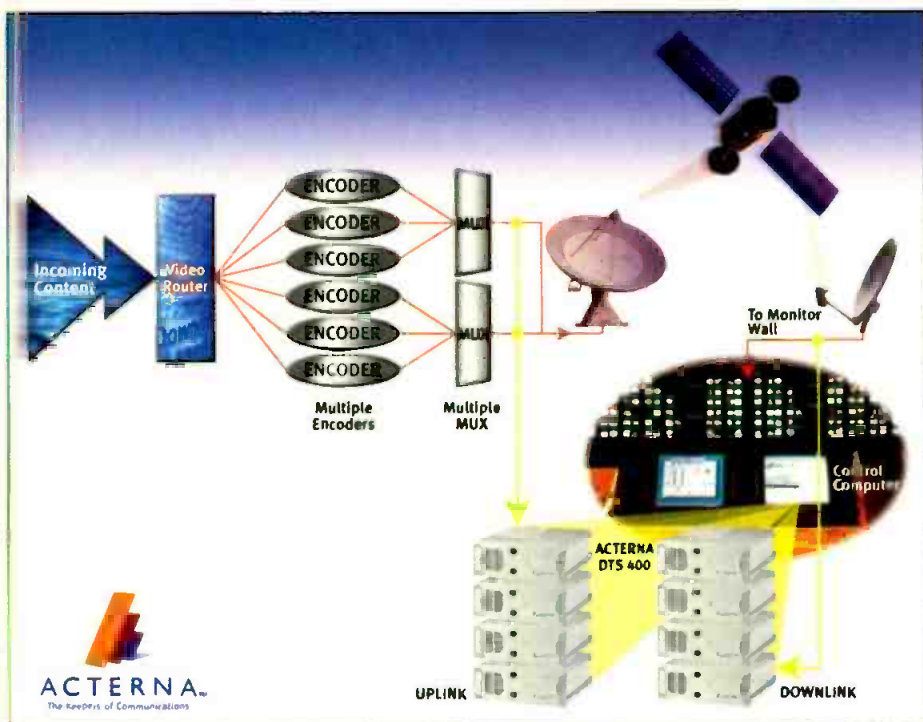
### Evaluating systems

To combat these issues, we began evaluating MPEG-2 monitoring systems. We needed a system that provided continuous network-wide monitoring while at the same time giving us access to real-time analysis of each individual transport

transport streams. When an indicator changes from the normal green color to yellow or red, denoting that an error has occurred, operators begin immediate real-time analysis of the problem stream at the click of a button. Thus the monitoring system allows users to



At its state-of-the-art Uplink Center in Cheyenne, WY, EchoStar uses the Acterna DTS-400 MPEG-2 digital broadcast monitoring system to monitor all 500 of DISH Network's primary services.



**Figure 1.** Simplified rendition of EchoStar's broadcast chain. EchoStar uses the DTS-400 MPEG-2 monitoring system to continuously monitor both uplink and downlink signals for all 500 of its primary services.

examine every element in every transport stream across the network in real time.

With its comprehensive real-time analysis capability, the DTS-400 completely opens any transport stream on the network to the operator's view. Using the network, program and PID

uses the familiar Windows NT interface, so novice users quickly become familiar with the software. All analysis windows are available at a single click, and a hierarchy tree structure allows for rapid navigation through table and descriptor decodes. This intuitive and easy-to-use structure has made the DTS-400 a natural training tool.

#### Results

In the two years since its implementation, the fully scalable DTS-400 system has grown to support DISH Network's success. As EchoStar expanded to broadcast additional services, the DTS-400 system was doubled in size to support the new services.

The DTS-400 has enabled EchoStar personnel to quickly identify, troubleshoot and resolve errors in the MPEG-2 system layer. With the DTS-400 system, we have been able to drastically reduce the impact of errors on our customers, even eliminating many problems before they reach the viewer.

*Jeff McSchooler is director of technical operations for EchoStar, Cheyenne, WY.*

## EchoStar has been able to drastically reduce the impact of errors on its customers.

information displays, operators can view network parameters or check the status of each program or PID in the stream. With PSI/SI table and descriptor views and the timing display, users can examine the full decode of all tables and descriptors, as well as analyze spacing and jitter on all PCR PIDs. In addition, the ETR290 screen and event log provide at-a-glance troubleshooting and diagnosis. These extensive real-time capabilities eliminate the hassle and delay of capturing files for offline analysis.

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# TechTV flips for Telestream's FlipFactory

BY MARK R. SMITH

**F**or the TechTV engineering department, the time for change was now. It was past time, really, to find a better way to repurpose video from TechTV's on-air broadcasts for use on the network's website ([www.techtv.com](http://www.techtv.com)). The second exposure provided by the Internet was great, but manually converting the video for the Web was a debacle, given the various encoders employed by Internet users.

According to David Seedall, who serves as vice president of engineering and operations for TechTV, a San Francisco-based on-air and online network dedicated to the digital lifestyle, the network had been having trouble doing its encoding manually. They determined that a better way to handle encoding would be to employ an automated system.

What the TechTV doctor ordered was FlipFactory, a new technology from Nevada City, CA-based

Telestream ([www.telestream.net](http://www.telestream.net)). Telestream's ClipMail Pro is used to encode video content into MPEG-2 files, which are delivered to FlipFactory via FTP and then transcoded into multiple stream-

contracts to support the Real Media, Windows and Quick Time codecs. This requirement made distribution three times more difficult, because they had to create three streams at differing bit rates.

**The need came about because, unlike broadcast TV, there was no single, universal format to view streaming media on the Internet.**

ing media formats and bit rates. This allows users like TechTV access to their broadest possible viewing audience.

TechTV partnered with Telestream to help provide input as a beta site during the final stages of product development. TechTV pointed out particular difficulty streaming media because they had

As a result, every clip of video produced at the studio must become six bit streams.

TechTV not only has those multiple sources of streaming media on its own website, but also feeds content to other platforms with their own bit rates and combinations that vary from the network's streaming media standards — like the high-speed portal RoadRunner.

The FlipFactory allows TechTV to automate the creation and delivery of the stream to these multiple distribution points.

### Why automation?

Since the process of encoding streaming media is very repetitive and tedious, employing the manual method means people get bored, and when the volume is high, that's inviting costly mistakes. Settings get changed inadvertently and there are quality control issues that can be avoided by using an automated system.

It's the same on the distribution side. The system assumes the functions of the FTP service as well as the



Ed Fong, Master Control Operator, keeps track of signal quality at TechTV in San Francisco. Photo courtesy of TechTV. Photo by Auguste Raffael.

encoding. The system is scalable. CPUs can be added as needed to support the number of streams desired. Each CPU supports one stream. TechTV has an eight-processor Windows NT/2000 server, providing them with the capability to run dozens of Flips at once.

Automation in the encoding and distribution of streaming media is necessary because, unlike broadcast TV, there is no single universal format to view streaming media on the Internet. Similarly, because of the various speeds of Internet connections, there are different bit rates for the formats. Also, streaming media must be viewable on a number of platforms, such as handheld devices, laptops and new Net appliances. So broadcasters wishing to reach their largest potential audience must produce multiple formats with varying bit rates.

Prior to the advent of FlipFactory, creating multiple formats and bit rates was a manual process, using basically single-seat software on PCs and Macs.

The system's automation software creates all the streaming formats

sistent results as well, by using the same source file for multiple outputs. Encoding is an ideal process for a computer to take over, because of its repetitiveness.

FlipFactory solved the quagmire at TechTV by encoding its video content for use on the Web in whatever flavor the viewers opted to use. For encoding now, the system can be set and run without needing adjustments for weeks at a time, rather than requiring the man-hours

that were necessary before.

TechTV has been able to reduce the time needed to create streams by 75 percent by implementing the automated system. ■

*For more information on Telestream's Flipfactory, circle (450) on the Free Info Card.*

*Mark R. Smith is a freelance writer and has covered broadcasting and post production for a decade. He resides in Odenton, MD, and can be reached at msmith1277@aol.com.*

## Prior to the advent of FlipFactory, creating multiple formats and bit rates was a manual process.

and bit rates the user specifies, and automatically delivers those files to streaming servers for access from a website. The software can be integrated with content management systems. TechTV's facility is being integrated with a Virage indexing system called Videologger, which makes the video on the network's website searchable. The integration makes the work flow that much more seamless for the operator. The system provides more con-

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NAB Booth #R2647



# Streaming media products: Moving from software to hardware

BY JOHN LUFF

In the early 1970s I remember trying to understand the papers given at the SMPTE Winter Television Conference on "Bit Rate Reduction." The ideas seemed foreign — taking perfectly good video and squashing it into digital form and then wringing out the excess content to make it smaller for storage and digital transmission. Of course today we would find nothing out of the ordinary. BRR — video compression — is used in consumer camcorders, hard disk personal video recorders, and perhaps most ubiquitously in little windows (and big windows) on our PC screens. The basic technology stems from research into removing redundancy in complex data.

It can be shown that mathematically loss-less compression can achieve something slightly less than a 3:1 compression ratio. Typical professional video recorders generally operate at closer to 10:1 compression. Satellite transmission for program backhaul is done at about 25:1 reduction. DBS signals are at almost 50:1 compression.

Then there is streaming media, which operates at a tiny fraction of the data rate of other uses. Try a 700:1 compression ratio for 300Kb/s. If you have only a dial-up connection, the ratio becomes an astounding 6000:1. It is against this backdrop that we consider the issues related to hardware and software solutions for streaming media.

### Compression for streaming

When the concept of streaming video to the Web was created a few years ago, it sufficed for most purposes to simply show a "changing" picture, for moving images would seem to dictate a frame rate in positive numbers. The quality of compression for streaming has improved from both major vendors (Microsoft Windows Media and Real Networks RealVideo), and the

ability of the Internet and private networks to handle high bandwidth media has improved at the same time, multiplying the net effect to consumers. As both the technology and bandwidth continue to improve the quality of the delivered application should become quite good.

**It is clear from the compression ratios that must be achieved that every opportunity to make the job easier ought to be taken.**

The process of streaming involves two distinctly independent processes: encoding and delivery. Encoding requires an input card for audio and video, the compression software and storage for the output file, unless it is passed immediately to the delivery system in a live broadcast. Delivery usually involves passing the file to a server from which it is accessed by the consumer. This server could be a single point source for content not expected to require wide distribution or a considerable number of concurrent users, or a distributed network of servers which cache the stream nearer to the users' location, a scenario illustrated in Figure 1. This method enables delivery to multiple users, while avoiding often-clogged segments of the Internet.

The media to be streamed must be converted from analog (or digital) video to the appropriate compressed format. This process is not at all different from ingesting for a broadcast playout server. Until recently this process was generally done in a computer with an appropriate input card, loaded with software that completed the appropriate compression. It is clear from the compression ratios that must be achieved that every opportunity to make the job easier ought to be taken.

Feed lousy, noisy video in, and get a "less than stellar" result. It is also important to make sure that the intended target bit rate is one that can be delivered end-to-end to the consumer. Poor video, made worse by dropped frames and constant recovery from network errors, will make what might

have been a successful experience one the consumer will reject as a failure. Anecdotally, I marvel that users who would not tolerate a VHS tape stopping periodically will actually watch video on a computer that seems to suffer from too much cholesterol.

### Products for streaming compression

In the last year several manufacturers have introduced products intended solely to compress and either store or forward to the delivery server video from professional formats. Indeed a recent issue of a consumer computer industry magazine reviewed such products. They tested quality and features and pronounced their judgments.

These products include simple systems intended to perform only one type of compression at a time (usually selectable between Windows Media Player and Real Video formats). But the marketplace has moved considerably beyond making the ingest computer more user friendly. Some products allow both formats to be created at the same time. Others provide the ability to combine the compressed stream with other elements, automating the assembly of a coherent and locally branded webpage. One carries it much further, with control of cameras,

switching and effects, character generation, web advertisements, and other elements in a very sophisticated presentation. This might be viewed as TV studio in a box, with the output dedicated to Web access.

At the extreme edge is a system from one manufacturer that combines all of the above plus user interactivity that allows users to assemble a newscast from their choice of stories. While one might question the journalistic value of some people's judgment, it is a natural extension of the freedom of choice on the Web. Such streaming on demand playlists may well demonstrate a major change in the way users interact with streaming media in the future, allowing a user to assemble a virtual broadcast channel for seamless viewing, provided bandwidth was not an issue, which of course it still is.

Various factors need to be considered when picking streaming media products for installation into a broadcast station. I encourage customers to look back down the wire from the consumer's viewpoint. If the customer can reasonably be expected to accept all streaming formats, it is clear that support for a single format would be a limitation you should avoid. If you are placing your newscast on the Web you may be able to select a single format, for your viewers will likely come back regularly and therefore take the time to load the appropriate codec. On the other hand, if your product has wide use, or is one which viewers are less likely to visit regularly, you should consider support for all likely target formats. If the time sensitivity of your content is such that you cannot take the time to sequentially encode in multiple formats you should consider either a single solution which does both simultaneously, or perhaps redundant systems, which will allow you to create two streams at the same time from separate encoders.

The input side of the encoder is very important to the engineer who must implement the system. Some systems are built with unbalanced audio inputs and poor quality NTSC decoders. Others have component digital and AES inputs. Streaming encoders work

very much like more mainstream compression products, and perform significantly better if you can deliver either component digital video or at least NTSC that has been decoded well (assuming a component input on the streaming encoder). Some encoders allow you to control the source tape deck when encoding from a VTR, so you might look for an RS-422 port. A few permit 1394 inputs (DV streams), which would allow a simple and very effective interface.

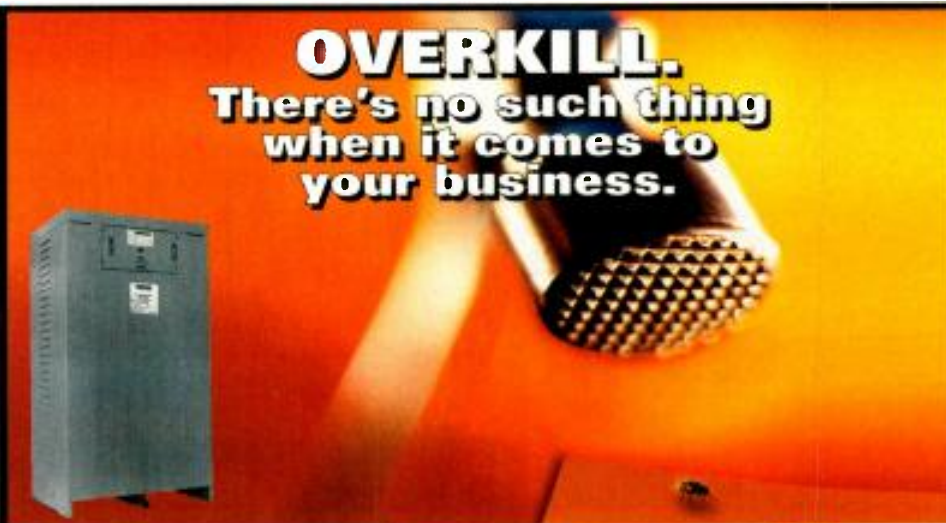
It is important to recognize the issues that affect the ease of use and ultimate quality of the product at the output of the encoder. The size (pixel map) of the encoded image, bit depth, encoded bit rate and encoded frame rate are all linked in complex ways to allow the end user the most effective image possible. Some encoders using lower quality decoders suffer from being unnecessarily soft, or do not adequately remove NTSC artifacts from the signal prior to encoding. Others do not maximize the potential quality

of the encoding process. Some allow two-pass encoding, analyzing the complexity of the material and then tweaking the encoding to apply the largest number of bits from the target bit rate to the most challenging portions of the content.

As with many things in our industry, buying by brand name has become difficult. Some of the manufacturers of streaming products come from the computing industry and have added video-based products only recently. Others who have roots in video graphics have leveraged their television expertise to move towards Webcentric products. The best advice possible with these products is to be sure the company you pick understands how you run your business, can support you well and has the financial stability to remain in business as the .com bust proceeds. ■

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

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## Business highlights from broadcast and production

BY STEPHANIE TWEITO, ASSISTANT EDITOR

**Keops Broadcast**, a developer of KDMAM (digital media asset management) solutions for the broadcast, post-production and corporate markets, announced it is changing its corporate name to **Keyvia Inc.** The name change follows the company's transformation from a fully-owned subsidiary of Keops Technologies Inc. to an independent business entity.

**Sony Electronics Inc.** has become a worldwide distributor of **The Bulldog Group, Inc.**'s Bulldog software and will act as the exclusive distributor for the United States and Japanese broadcast markets with minority investment.

EMMIS Communications, an owner and operator of radio, television and magazine entities in U.S. markets, has purchased **Omneon Video Networks'** Omneon Networked Content Server System as its infrastructure for recording and playback of Sony HDCAM material.

**Inscriber Technology Corporation** announced that Quantel is now shipping the new iQ system that integrates Inscriber's text and graphics technology into Quantel's new platform.

**Sierra Video Systems** recently supplied Cox Communications with a routing switcher built at their Grass Valley Plant. The facility will utilize the Yosemite 128 x 256 fully-populated video plus stereo audio router to distribute video and audio feeds and commercial insertions to Cox's network stations.

**NEC America Inc.**'s parts and support division has moved. Full sales and support can be obtained at their new address: NEC America Broadcast Equipment Department; 6535 N. State Highway 161; Irving, TX 75039-

2402; 888-383-4DTV (toll free); 214-262-3642 (main); 214-262-3687 (fax).

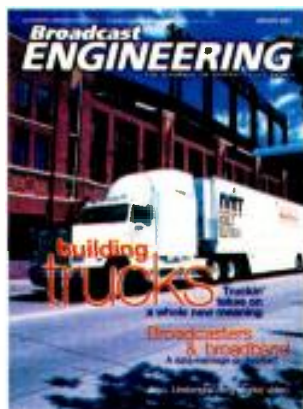
Azteca America, the U.S. Hispanic television network that will be launched next quarter by partners Pappas Telecasting and TV Azteca, has made a \$1,150,000 investment in **Panasonic** DVCPRO50 4:2:2 digital video equipment to support network operations at its new operations center in Dallas.

**Harris Corporation** announced an agreement to provide Hearst-Argyle Television, Inc. with a full range of DTV transmission equipment, furthering Hearst's digital build-out.

**Technology Rentals and Services (TRS)**, a division of The CIT Group, has purchased six new **Ikegami** HDK-79D cameras and a TDP-360 HD video switcher, giving TRS the tools for broadcast-quality production in HD or SD.

**Canon Broadcast**, a division of Canon USA, has officially changed its name to **Canon Broadcast and Communications**. The division is responsible for three product lines: Broadcast lenses, the Cano-beam optical beam communication system and Closed Circuit TV lenses.

**Avid Technology, Inc.** announced its Avid Media Solutions division has formed a new broadcast group to be headed by Matt Danilowicz, the former president and CEO of iNEWS, LLC.



### Clarification:

The photographer for the January cover photo of NMT's all digital truck was incorrectly identified. The photo was actually taken by Concept; Deborah Rice and John Benson.

### People

**Robert Mitchell Sillman**, owner, chairman of the board of directors and former president of Electronics Research, Inc. (Evansville, IN) died Feb. 12 in Baltimore.

Before purchasing Electronics Research, Inc., Mr. Sillman was a radio consulting engineer with the FCC, the Radio Research Laboratory at Harvard University and the U.S. Navy Bureau of Aeronautics.

## Screen Shot

### Canon lenses deliver presidential inauguration

SWTV, mobile production specialists, selected the HD-and SD-ready Canon 86xs lens for its Image Stabilizer system to cover the 2001 presidential inauguration. Providing the feed for national network coverage, the lenses were on Ikegami cameras that were on scaffolding 50 yards from the podium and about 50 feet in the air. With the lens' optical shift Image Stabilizer and the Power Optical System, the crew had a lens that matched the highest zoom ratio to shake-free shooting.



### NEC's Digital Microwave Link covers Inaugural Parade

CBS News Washington used NEC's Digital Microwave Link (DML) during the Inaugural Parade as part of their Inauguration coverage. This was the first use of a COFDM moving shot by the News division in Washington, whose shots were called by CBS News in New York.



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## SONY

### DSR-PD150

#### 3-CCD Mini DV CAM Camcorder

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

- Allows two scanning modes: 480 progressive (for still) or interlaced (for video).
- Complete Professional Audio functions with two built-in XLR inputs.
- Built-in electronic zoom lens features Autofocus and SuperSteadyShot with an MTF 12K high quality optical lens with manual Zoom, Focus and Iris control.



- Built-in slot for a flash memory card or Memory-Stick for still image storage. Up to 988 JPEG pictures can be stored in one 64 MB MemoryStick. The stored images can be mixed or keyed to the live image allowing logo insertion and/or mix effects.
- High resolution (500 lines) B&W viewfinder and a color swing out bright color LCD panel are included.

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



- 1/3 inch x three 380K pixel (effective 340,000 pixels) CCD's that allow two scanning modes: 480 progressive (for still) or interlaced (for video). They also provide high quality acquisition with increased resolution and sensitivity at reduced noise and vertical smear. • One touch auto focusing in manual focus mode.
- 530 lines of horizontal resolution, allowing you to capture your subject with tremendous detail.
- Switchable aspect ratio 4:3 (TV mode) or 16:9 (Movie mode).
- DX1-801 high resolution 1.5" black & white viewfinder (same as in DSR500i & DVC-355) enables easier focusing. Automatic switches from 4:3 aspect to 16:9.
- Records in DVCAM or DV, standard tapes or mini. Up to 270 minute recording in DV mode onto a 184 min DVCAM tape.



- The DSR-300A has three 1/2" IT Power HAD CCDs to deliver 800 lines of horizontal resolution: 620S S/N ratio and high sensitivity of F11 at 2000 lux.
- Power HAD CCDs also gives you a low smear level of -110 dB (DSR-300) allowing more freedom to shoot highlighted subjects.
- With built-in 26-pin VCR interface, they can feed composite or S-Video output signals to an external recorder for parallel or back-up recordings. VCR recording modes including Parallel, Internal (only) and External (only) are selected via the trigger switch positioned on the operational panel.
- With the DSR-300A, a picture previously recorded on tape can be superimposed on the viewfinder screen (Freeze Mix Function), allowing you to easily frame or reposition the subject (as in the previous shot. Combined with the SetupLog function, the retake shot becomes a breeze.

## Panasonic

### AG-DVC200

#### Full Size DV Camcorder

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

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



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

## JVC

### GY-DV500

#### 1/2-inch 3-CCD Professional DV Camcorder

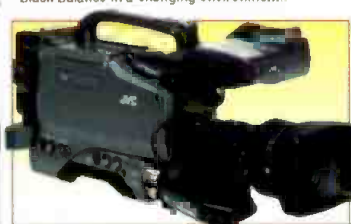
The GY-DV500 combines the convenience and cost-effectiveness of Mini DV with the performance and features you need. Incorporate three 1/2-inch 380,000 pixel IT CCDs for superior picture performance (equivalent to 750 lines of resolution) superb sensitivity of F11 at 2000 lux and minimum illumination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



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

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

- Automatic Functions
- Continuous Auto Black (CAB) circuit assures perfect Black Balance in a changing environment.



shooting situations such as press conferences, exclusive interviews, and sporting events. Record isolated camera views (ISO Cam) during a live multi-camera shoot, making it ideal for parallel shooting at live concerts and other events. Naturally, we've made sure the GY-DV550 is equipped with all the other capabilities you need, including a standard 1/2-inch bayonet mount for use with a great diversity of professional lenses, bidirectional IEEE 1394 (NTSC), two 48 kHz 16-bit digital PCM audio channels, and a built-in SMPTE or EBU timecode reader/generator, as well as XLR microphone inputs, audio outputs, headphones output, and both composite and Y/C outputs. Maximum versatility, top-level performance, and superior cost-efficiency make the GY-DV550 the smart solution for producers who need a camcorder capable of doing double-duty in both the studio and the field.

Ready for EFP remote control (RM-LP57/LP55) The EFP remote connects directly to the GY-DV550 for precise control over the video parameters.

Return video output for Tele-Prompter Tele-Prompter capability assures full support for studio program production. Genlocking function To meet the demand for systemization, the GY-DV550 is equipped with a genlocking function that includes SC lock to assure high-resolution pictures.

### SR-VS10U

#### MiniDV and S-VHS VCR Combo

The SR-VS10U is a unique all-in-one video solution combining MiniDV and Super Hi-Fi Stereo in one VCR. The MiniDV deck allows direct playback of cassettes you've recorded on a MiniDV camcorder without any cables to connect. One easy solution!

- Mini DV Format & High Resolution Super VHS and VHS
- Digital AV Technology w/ TBC and 4MB Frame Memory
- PCM Digital Audio (DV) and Hi-Fi VHS Stereo with MTS Decoder • Jog/Shuttle on Remote
- VCR Plus+ with "Cable Eye" Cable Box Controller
- Insert Editing with Flying Erase Head • Plug & Play
- Audio Dubbing • Auto Index and Index Search

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

### Special Purchase

**BUY any JVC GY-DV500U Package!**  
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GY-DV500U with Viewfinder, Lens and IDX  
GY-DV500U with Studio Kit  
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Anton Bauer Battery Kit ..... A Value of 999.95  
OR: IDX Battery Kit ..... A Value of 849.95

### GY-DV550U

#### 1/2" 3-CCD DV Camcorder

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

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



## Panasonic

### AG-DVC10

#### Mini DV 3-CCD Camcorder

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

- High-Quality DV Recording
- Records on Mini DV cassettes in either SP (standard Play) or LP (Long Play) mode
- Records audio either as 16-bit 2 channel, or 12-bit 4-channel
- Superior 3-CCD Picture Quality
- 1/4 inch 270K-pixel IT 3CCD image sensor • 43 mm filter

- 12x Optical zoom
- Gain Up to +12dB
- Neutral Density Filter
- Manual Focus, Manual Iris
- New Shoulder-Type Design
- Excellent Shooting Stability
- Light weight weighing approx 6 lbs. • Extremely mobile
- I-Link (DV IEEE1394) Terminal



## antonauber HyTRON 50 Battery

Weighing a mere 310g (880 grams) and packing 50 Watt-hours of energy - enough to operate a typical ENG camcorder for two hours, the HyTRON 50 is the most advanced lightweight battery in the industry.

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

**Specifications:** 14.4 V, 50 WH (Watt Hours)  
5-3/4" x 3-1/2" x 2-1/4", 1.9 lbs (880g)  
Typical runtime: 2 hours @ 25 Watts 3 hours @ 17 Watts

## QUAD 2702/2401 Four-Position Power/Chargers

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

## IDX NPH-50 50 Watt Nickel Metal Hydride Batteries

Packed with 50-watts of power, these batteries provide long run times, using them as you would a traditional NP-type battery. Equipped with IDX's proprietary SF technology, they can even be charged in existing Negative Delta V style chargers, like the Sony BC1-WD, or any IDX nicad battery charger. Both batteries are identical except that the NP-H50DX adds a power indicator.

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

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

## JL-2 PLUS

2-Position Multi-Formal  
Charger/Power Supply

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

## SONY 800 SERIES UHF WIRELESS MICROPHONE SYSTEMS



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



## DSR-20/40 DVCAM Player/Recorders

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

- i.LINK** They both offer i.LINK (IEEE1394) input/output. In addition, in the "Digital dubbing including TC Copy" mode, full information of video, audio and time code of the original tape can be copied to another tape. Especially useful when making working copies of the original tape.
- Inputs and Outputs** They provide a full range of analog video inputs and outputs for integration into current analog-based systems. They both offer composite and S-Video input/output, while the DSR-40 (only) offers a component output as well. The DSR-20 is equipped with analog audio inputs and outputs (RCA), the DSR-40 with RCA inputs and XLR-balanced output. These connections in combination with their i.LINK interface allow a smooth transition to an all digital system in the future.
- Record/Playback Functions** Automatic repeat function for repeated playback. After reaching the end of the tape, the DSR-20/40 automatically rewinds the tape, then starts playing back the segment again.

### DSR-20 Only

- The DSR-20 can be powered by AC or DC.
- Equipped with Control L interface, the DSR-20 can perform simple Time Code-based editing when connected to another DSR-20 or other similarly equipped VCR/cameras.

### DSR-40 Only

- Equipped with an RS-422A interface, it can perform as the editing player in A/B roll or cut editing system.

## DSR-30 DVCAM Digital VCR

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

- Records PCM digital audio at either 48kHz (16-bit/2 channel) or at 32kHz (12-bit/2 channel).
- Equipped with Control L, capable of SMPTE Time Code based accurate editing even without an edit controller. Built in editing functions include assemble and separate video and audio insert. By searching for either an index point or Photo Data recorded by the DSR-200A camcorder, the DSR-30 drastically cuts the time usually required for editing. The DSR-30 can record up to 135 index points on the Cassette Memory thanks to its 16K bits capability.
- Audio lock ensures audio is fully synchronized with the video for absolute precision when doing an insert edit.

- They are capable of searching for Index Points, which are recorded on the tape as "in-point" marks every time a recording starts. They can also search for photo data recorded on a DVCAM cassette by the DSR-200A/300/PO-100, or where the recording date has been changed.
- Reference Input** External sync input enables synchronized playback with other VCRs. Especially important in A/B roll configurations. In addition, the DSR-40 only allows adjustment of H-sync and SC phase via the menu.
- Control S Interface** The DSR-20/DSR-40 have a Control S input allowing control via the optional DSRM-20 Remote Control.

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

- In addition to Control L, the DSR-20 also incorporates an RS-232 interface for remote control of basic VCR functions from a PC.
- Supplied with the RMT-DS20 Wireless Remote for control of basic VCR functions.

- The DSR-40 is not equipped with a synchronization capability, the editing accuracy is performed by pre-roll and play.



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

## UVW-1200/UVW-1400A

Betacam SP Player • Player/Recorder

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

- Ideally suited for work in computer environments, because RGB signals can be converted into component signals and vice versa with minimum picture degradation.
- 25-pin serial interface allows external computer control of all VCR functions based on time code information. Baud rate can be selected from between 1200 to 38,400 bps.
- Built-in Time Base Stabilizer (TBS) locks sync and subcarrier to an external reference signal as well as providing stable pictures. High quality digital drop-out compensator further ensures consistent picture performance.
- Equipped with two longitudinal audio channels.
- Auto repeat of entire or a specific portion of the tape.

- Built-in character generator can display VTR status, time code, self-diagnostic messages, set-up menu, etc.
- Both read LTC Time Code and UB (User Bits). The UVW-1400A also generates LTC and UB (Free-Run/Rec-Run).
- Control of jog, shuttle, playback, record, pause, FF and REW with the optional SVRM-100A Remote Control Unit.
- Composite and S-Video as well as component via BNCs which are switchable to RGB output. The UVW-1400A has two switchable sync connectors and a Sync on Green.
- Analog audio and video input/outputs make it fully compatible with non-digital equipment.

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

## UVW-1600/UVW-1800

Betacam SP Editing Player • Betacam SP Editing Recorder

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

- Optional BVR-50 allows remote TBC adjustment.
- RS-422 interface for editing system expansion.
- Two types of component output, via three BNC connectors or a Betacam 12-pin dub connector.
- Frame accurate editing is assured, thanks to sophisticated servo control and built-in time code operation.

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

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

Sony's best production monitors ever, the PVM-M Series provide stunning picture quality, ease of use and a range of optional functions. They are identical except that the "M4" models incorporate Sony's state-of-the-art HR Trinitron CRT display technology and have SMPTE C phosphors 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 phosphors for the most critical evaluation of any color subject.
- Dark tint for a higher contrast ratio (black to white) and crisper, sharper looking edges.
- Each has two composite, S-Video and component input (R-Y-B-Y, analog RGB). For more accurate color reproduction, the component level can be adjusted according to the input system. Optional BKM-101C (video) and BKM-102 (audio) for SMPTE 259M serial digital input.
- Beam Current Feedback Circuit
- 4.3/16:9 switchable aspect ratio.
- True multi-system monitors they handle four color system signals: NTSC, NTSC 4.43, PAL & SECAM.
- External sync input and output can be set so that it will automatically switch according to the input selected.
- Switchable color temp: 6500K (broadcast), 9300K (pressing picture). User preset (3200K to 10000K).
- Blue gun, underscan and H/V delay capability.

PVM-14M2U ..... List Price 1,265 ..... For B&H price ..... Call  
PVM-14M4U ..... List Price 1,570 ..... For B&H price ..... Call  
PVM-20M2U ..... List Price 2,525 ..... For B&H price ..... Call  
PVM-20M4U ..... List Price 2,920 ..... For B&H price ..... Call

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| Professional Grade VHS     |       |                  |       |
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| PG-30                      | 2.29  | PG-60            | 2.39  |
| PG-120                     | 2.59  |                  |       |
| Broadcast Grade VHS Box    |       |                  |       |
| BGR-30                     | 3.49  | BGR-60           | 3.99  |
| BGR-120                    | 4.69  |                  |       |
| H4715 S-VHS Double Coated  |       |                  |       |
| ST-30                      | 6.99  | ST-60            | 7.49  |
| ST-120                     | 7.99  |                  |       |
| M221 Ni 8 Double Coated    |       |                  |       |
| Metal Particles            |       | Metal Evaporated |       |
| P630HMP                    | 4.49  | E630HME          | 7.69  |
| P660HMP                    | 6.29  | E660HME          | 10.49 |
| P6120HMP                   | 8.49  | E6120HME         | 13.99 |
| M321SP Metal Betacam (Box) |       |                  |       |
| OS5                        | 10.99 | 10S              | 11.99 |
| 30S                        | 13.99 | 60S              | 20.99 |
|                            |       | 90S              | 32.99 |
| OP121 DVC PRO              |       |                  |       |
| 12M (Med)                  | 7.49  | 23M              | 8.79  |
| 63M                        | 19.99 | 66L              | 22.50 |
| 94L                        | 30.99 | 126L             | 39.99 |

## maxell

| Broadcast Quality Hi8 Metal Particle |      |               |      |
|--------------------------------------|------|---------------|------|
| P6-30 HM BQ                          | 5.39 | P6-60 HM BQ   | 6.09 |
| P6-120 HM BQ                         | 7.99 |               |      |
| P7 PLUS VHS                          |      |               |      |
| T-30 Plus                            | 1.69 | T-60 Plus     | 1.99 |
| T-120 Plus                           | 2.19 | T-160 Plus    | 2.69 |
| MGX-PLUS VHS (Box)                   |      |               |      |
| HGXT-60 Plus                         | 2.69 | HGXT-120 Plus | 2.99 |
| HGXT-160 Plus                        | 3.99 |               |      |

| BO Broadcast Quality VHS (Box) |       |           |       |
|--------------------------------|-------|-----------|-------|
| T-30 BQ                        | 3.89  | T-60 BQ   | 3.99  |
| T-120 BQ                       | 5.99  |           |       |
| BO Professional S-VHS (In Box) |       |           |       |
| ST-31 BQ                       | 6.79  | ST-62 BQ  | 6.99  |
| ST-126 BQ                      | 7.45  | ST-182 BQ | 13.99 |
| Betacam SP                     |       |           |       |
| B30MSP                         | 13.49 | B60MSP    | 19.99 |
| B90MSP                         | 27.95 |           |       |

## Panasonic

| Mini DV Tape |       |                     |       |
|--------------|-------|---------------------|-------|
| AY-DVM-30    | 6.49  | AY-DVM-30 (10 Pack) | 5.99  |
| AY-DVM-60    | 5.49  | AY-DVM-60 (10 Pack) | 6.49  |
| AY-DVM-80    | 12.99 | AY-DV123EB          | 20.95 |

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

## SONY

| Hi-8 Professional Metal Video Cassettes |      |             |       |
|-----------------------------------------|------|-------------|-------|
| P6-30 HMPX                              | 4.79 | E6-30 HMEAD | 5.99  |
| P6-60 HMPX                              | 5.79 | E6-60 HMEAD | 9.99  |
| P6-120HMPX                              | 8.99 | E6-120HMEAD | 13.99 |

| PR Series Professional Grade VHS                  |      |        |      |
|---------------------------------------------------|------|--------|------|
| T-30PR                                            | 2.39 | T-60PR | 2.59 |
| T-120PR                                           | 2.79 |        |      |
| BA Series Premier Hi-Grade Broadcast VHS (In Box) |      |        |      |
| T-30BA                                            | 3.69 | T-60BA | 4.19 |
| T-120BA                                           | 4.99 |        |      |

| MO Master Quality S-VHS (In Box) |      |         |      |
|----------------------------------|------|---------|------|
| MOST-30                          | 7.49 | MOST-60 | 7.69 |
| MOST-120                         | 7.99 |         |      |

| BRS 3/4" U-matic Broadcast Standard (In Box) |       |                   |       |
|----------------------------------------------|-------|-------------------|-------|
| KCS-10 BRS (mini)                            | 8.99  | KCS-20 BRS (mini) | 9.99  |
| KCA-10 BRS                                   | 8.99  | KCA-20 BRS        | 9.49  |
| KCA-30 BRS                                   | 10.69 | KCA-60 BRS        | 14.99 |

| XBR 3/4" U-matic Broadcast Master (In Box) |       |                   |       |
|--------------------------------------------|-------|-------------------|-------|
| KCS-10 XBR (mini)                          | 9.79  | KCS-20 XBR (mini) | 11.29 |
| KCA-10 XBR                                 | 10.29 | KCA-20 XBR        | 11.79 |
| KCA-30 XBR                                 | 13.29 | KCA-60 XBR        | 17.39 |

| BCT Metal Betacam SP Broadcast Master (In Box) |        |           |           |
|------------------------------------------------|--------|-----------|-----------|
|                                                | Single | 10 Pak/Ea | 50 Pak/Ea |
| BCT-5M (small)                                 | 10.99  | 9.99      | 9.19      |
| BCT-10M (small)                                | 11.49  | 10.29     | 9.79      |
| BCT-20M (small)                                | 12.99  | 11.49     | 10.99     |
| BCT-30M (small)                                | 13.49  | 12.49     | 11.99     |
| BCT-30ML                                       | 13.49  | 11.89     |           |
| BCT-60ML                                       | 20.99  | 19.99     | 18.99     |
| BCT-90ML                                       | 30.99  | 28.99     | 27.99     |

| BCT Metal Betacam SP Broadcast Master (In Box) |        |           |           |
|------------------------------------------------|--------|-----------|-----------|
|                                                | Single | 10 Pak/Ea | 50 Pak/Ea |
| BCT-5M (small) .....                           | 10.99  | 9.99      | 9.19      |
| BCT-10M (small) .....                          | 11.49  | 10.29     | 9.39      |

|                 |       |       |       |
|-----------------|-------|-------|-------|
| BCT-10M (small) | 11.49 | 10.29 | 9.79  |
| BCT-20M (small) | 12.99 | 11.49 | 10.99 |
| BCT-30M (small) | 13.49 | 12.49 | 11.99 |
| BCT-30M         | 13.49 | 12.49 |       |

| Mini DV Tape       |       |                    |       |
|--------------------|-------|--------------------|-------|
| DVM-30EX w/Chip    | 12.79 | DVM-60EX w/Chip    | 16.99 |
| DVM-30EX "No Chip" | 11.99 | DVM-60EX "No Chip" | 12.99 |
| DVM-30PR "No Chip" | 7.99  | DVM-60PR "No Chip" | 9.75  |

| Full Size DV Tape with Memory Chip |       |           |       |
|------------------------------------|-------|-----------|-------|
| DV-120MEM                          | 24.99 | DV-180MEM | 26.99 |



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## COMPUTER VIDEO EDITING



### High Performance Non Linear Editing Turnkey Systems

With B & H's extensive experience and knowledge in both video production and computer configuration, these attributes are combined to custom build the best non-linear turnkey systems in the industry. Our knowledgeable staff will assist you in designing a full video production suite around your needs. Any specially designed turnkey system is available for the wide variety of manufacturers we deal with: Avid, Canopus, Digital Origin, DPS, Matrox, Media 100, NewTek, Pinnacle, Play and Sony. These systems will also meet your particular production needs. You can have your choice from Analog, Component, DV, MPEG-2, Uncompressed or DVD authoring workstations with the best special effects and media creation software available. From our knowledgeable sales staff to our trained and experienced system integrators and technical support team, we care about what the customer wants.



We deal with only the highest quality and manufacturer approved materials for our turnkey system. Our custom built workstations go through a rigorous period of testing and burn in period. No non-linear workstation leaves B & H's location without being 100% approved by our highly experienced technical staff.

In addition, your non-linear system will be designed around your specifications. From motherboards to keyboards, these systems will have your personal signature on them. And after receiving your system, unlimited technical support is available for 60 days, with additional support available.

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### System Configurations

- 7 Bay full tower with 300 watt Power Supply.
- Intel Pentium III 866 MHz or 1GHz Processor.
- Asus CUSL2 Dual Processor Motherboard
- 256mb of SDRAM PC133 (Kingston or PNY)
- Matrox G450 display card • IBM Deskstar 30GB ATA 100 IDE System Drive • TEAC 40X internal CD-Rom Drive
- 3.5" Floppy Drive • Microsoft Mouse • Keyboard
- Microsoft Windows 98/NT/2000 full operating software
- Norton Utilities (NT System only).

| Computer System with       | Operating System |          |          |
|----------------------------|------------------|----------|----------|
|                            | 98               | 2000     | NT       |
| Pentium III 866 MHz System | 1,349.95         | 1,399.95 | 1,499.95 |
| Pentium III 1 GHz System   | 1,699.95         | 1,799.95 | 1,899.95 |



### Xpress DV

#### Powerful Video Editing Tools

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

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

#### Express DV on Dell Precision 220 Workstation

866 MHz Processor,  
128mb RDRAM  
**\$4,499**

1 GHz Processor,  
256mb RDRAM  
**\$4,999**



### Precision 220

#### Workstation Bundle

Shown with optional Monitor



### DV-Rex M3

#### Mobile Real-Time DV Editing Workstation

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

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



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### DigiSuite LX

#### Real Time DV Edit Bundle

DigiSuite LX offers all the great features of the best-selling Matrox DigiSuite platforms, plus DV, MPEG-2, and 1394 support. DigiSuite LX provides native DV and MPEG-2 editing under Windows.

- Award-winning realtime feature set
- Native-DV and 50-Mbps MPEG-2 editing
- MPEG-2 output for DVD and CD authoring
- 1394, analog component, Y/C, and composite support built-in
- Integrated web video creation tools
- Field-proven, reliable technology



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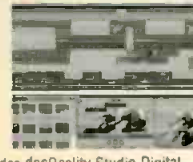
### Velocity

#### Real-Time Non-Linear Editor

dpsVelocity™ is the ultimate real time non-linear editing system for digital video professionals.

A joint effort of DPS' award-winning hardware and software development teams, dpsVelocity delivers faster, sharper and easier edits while raising the bar for reliability and affordability.

dpsVelocity-Real Time NLE Bundle includes dpsReality Studio Digital Disk Recorder card, dpsReality player, audio/video breakout cable, dpsVelocity NLE software, Inscrber CG titling software and Digital Fusion DFX Compositing software.



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### RT-2000

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Professional Real-Time MPEG2 & Native DV Editing with incredible, real-time 3D Effects!

- True Three-Layer realtime editing
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- Analog and DV input/output - S-Video, composite, Firewire (IEEE1394) • MPEG-2 output for DVD and CD authoring • RealVideo, Windows Media, and Quicktime output for web video streaming • Breakout box • Bundled with Premiere RT Real-Time editor, Title Express, Sonic Foundry, ACID Music and DVDIt LE



**\$999.95**



### Final Cut Pro

#### Professional Editing Software

Professional Editing, Composing and Special Effects Software for Macintosh.

The easiest way to transfer material from DV sources to your hard disk; edit, composite, and add effects to the video and audio; and play the results. It has an advanced feature set that professionals will love, yet it's also easy enough for novice video producers who are just discovering DV and FireWire. Final Cut Pro supports DV and all QuickTime formats, including iA-JPEG and web-ready streaming video.



Final Cut Pro - Version 1.25

**\$989.95**



### G4/Final Cut Pro

#### Complete Video Editing Systems

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- Includes: • Apple G4/466 Computer
- Final Cut Pro version 1.25 editing software
- Total of 256MB of memory
- 45GB of ATA/100 storage
- CD-RW rewritable CD writer
- Final Cut Tutorial CD
- Mitsubishi Diamond Pro 2040 22" Monitor
- Apple Care-three year warranty
- Complete System Integration and testing



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##### Great System

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- Final Cut Pro version 1.25 editing software
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- Artel Boris Graffiti CG Program
- Final Cut Tutorial CD
- Mitsubishi Diamond Pro 2040 22" Monitor
- Apple Care-three year warranty
- Complete System Integration and testing

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##### Best system

- Includes: • G4/533 DUAL Processors
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- 150GB (2x75) of ATA/100 storage
- VST Ultratex IDE controller card
- ATI Rage Orion dual display card
- Total of 256MB of memory
- Artel Boris Graffiti CG Program
- Final Cut Tutorial CD
- 2 Mitsubishi Diamond Pro 2040 22" Monitors • CD-RW writer
- Apple Care-three year warranty
- Complete System Integration and testing

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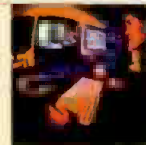
**\$2,999.95**



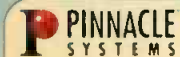
### Media 100 LE

#### Real Time DV System for Mac

Media 100 LE a complete digital video system that is unmatched for price performance. It includes real-time editing and playback, real-time COLOR FX, real-time preview MOTION FX, four tracks of real-time audio, and real-time preview dissolve. It also includes 24 accelerated effects, genlock support, and an integrated character generator. Built-in QuickTime codec provides transparent interoperability with any QT application. With Media 100 LE, you can finish broadcast quality programs on-line quickly



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**Leitch/DPS Digital Processing  
System dpsVelocity 8.0**

The Leitch/DPS dpsVelocity 8.0 allows real-time streaming directly from the timeline. New features include multicamera editing and real-time support for video files with alpha channel and multiple timeline support.



**Seachange International  
Broadcast MediaCluster**

The Broadcast MediaCluster server system from SeaChange International can store more than 4.2 terabytes of video. It supports up to 42 I/Os delivering 30Mb/s MPEG-2 4:2:2 long-GOP video, with two AES audio channels each.



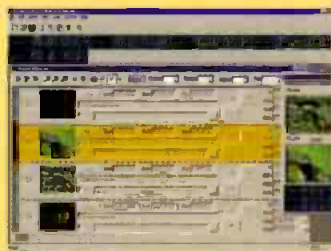
**Chyron Duet HD**

Chyron's Duet HD supports 56 simultaneous, full-bandwidth video streams along an object-oriented 2D/3D graphics engine. The platform also features the Chyron Abstraction Layer (CAL), a network interface API that provides hardware independence.



**Pinnacle Systems  
StreamFactory**

The StreamFactory web media encoder from Pinnacle Systems provides MultiStream architecture, supporting Internet broadcasters with real-time web encoding of multiple and independently resized concurrent streams.



**Inscriber Technology LIVE!Clips**

Inscriber Technology's LIVE!Clips is designed for use in 24-hour broadcast channels. It offers increased board support and a media management module, and is available separately as software and board bundle or as software only as Inscriber E-Clips.

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You'll Walk Away Feeling Like The King Of The Jungle.

**Hotronic's** SDI Proc Amp provides excellent video correction in non-ideal camera environments such as field news event recording. It's fully compatible with digital cameras, ensuring correct video levels, color saturation, and hue when editing. The easy to use digital video adjustment and LCD display, for monitoring video setting status, makes this product ideal for efficient and cost effective operation. It automatically recognizes and accepts both NTSC and PAL serial video, and features adjustable white, black, and chroma clipping within legal limits.



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March 2001

Broadcast Engineering

275

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ES-207A  
\$175

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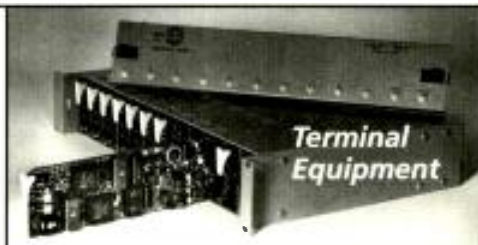
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### TECHNICAL DIRECTOR

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## Mergers and beehives

BY PAUL MCGOLDRICK



**H**aving a title like *Industry Watcher* gives me an inherent right, I believe, to look over others' shoulders and criticize what they do — both good and poor. It is particularly interesting to compare my own observations with those of analysts who see the corporate world rather differently, jumping straight past the beehive to the anticipated jars of honey.

I am welcomed into maybe fifty companies a year to share with them their perceived direction of travel (their road maps) and to talk in some depth about products that are coming. But when I read analysts' reports of these same companies I often wonder if we've visited the same company, the picture painted is usually so different from what I see happening in the trenches.

This overview is a privilege and a curse, but in either case my adrenalin always spikes when companies that I know well are involved in mergers and acquisitions. Three in the last year showed a good spectrum of the various situations that can happen; to protect the innocent I should say that although all the businesses are in the electronics industry, only one set is directly in broadcasting.

The first example is of a \$7 billion acquisition. The cultures of the two companies were very different. One was an old player that had grown really product-smart in the last few years and was now big. The company it acquired was always run on a shoestring, but it had some talented designers and a market sense in the Far East that was brilliant. The merger was completed extremely quickly and the first fears of Goliath dominating the picture were totally squashed. Management wisely kept the larger company's original plans from dominating the picture. The best of both was retained, and the best employees were given the authority — regardless of

the side of the fence they had originally been on. It was a joy to watch, and both locations are still a pleasure to visit.

The second example was not so happy. The company acquired in this case was bought as the first in a number of transactions to build up a group of related operations. The money was from

uct crossovers and conflicts between the two operations, plus culture clashes galore. I see a disaster in the making.

The day this third announcement was made, a meeting was held with all the employees at the company being acquired. The new CEO made reassurances about stability, the future, com-

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suits on the East Coast. The company had been family-owned and although the transaction was only in the tens of millions, a lot of livelihoods were involved. The power vacuum when the owners left in their newly purchased luxury cars was massive. The business has moved from being quite conservative and traditional to a place where some managers now use four-letter words like commas, and where loyalties no longer exist for either management or the company direction. There is no marketing, product development is on a crawl to nowhere and sales are in the hole. Sad to watch, totally predictable, and now probably repeating in the parent company's other acquisitions.

The third example is a work in progress. A man who has an extremely short fuse runs the company that is making the acquisition; the corporate focus is totally on market perception and value, and products are announced somewhat prematurely with insufficient backup. The company being acquired in the deal (worth a couple of billion dollars) has been around for a good while and has always been run level-headedly by a man who wanted to be there. His untimely death left the company in the hands of the co-founder, who is much happier studying things through a microscope. There are all sorts of prod-

mon goals: all the usual material issued in these situations to hopefully keep the best employees from bailing out. It's not working — the best are already looking elsewhere in a community where they will have no problem finding an equal or better opportunity.

Many acquisitions take place with the employees kept totally in the dark until the day the deal closes; even when an announcement is made they have no opportunity to go see what is being bought. So management, the boards and the investors have to make their judgments about product lines, employee capabilities, attitudes and corporate culture based solely on the assertions of the management on the other side. That picture is always clouded over by what that group of people *hope* their company is really like, there in the cubicle hive.

I'd like to see more companies in merger-land listen to their worker bees, and involve them as honestly and quickly as possible. They can probably see better than their bosses what is real, what is valuable and what is junk that no one has had the courage to ditch. A clear look at those things dramatically increases the odds of a merger with a sweet conclusion, at least in one hive-watcher's opinion. ■

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

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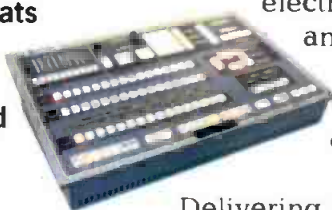
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