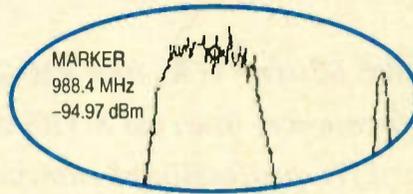


TECHNOLOGY

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Sony Sees All-Digital Future

End-to-End Network Technology Will Feature Compression and 'Son of Digital Betacam'

by Frank Beacham

NEW YORK

Sony Electronics has ushered in what appears to be a complete convergence of video, computing and telecommunications technology by announcing a new system architecture for the all-digital television facility of the future.

Sony executives said their end-to-end network technology is so revolutionary it will "transform the future of the broadcast and production industry."

The complete system will be shown in working prototype form at NAB '95, Sony said. New product deliveries will begin in late 1995 and continue through 1996 and 1997.

START TO FINISH

Sony plans to integrate a high-speed digital video network with distributed server archi-

ture and several types of storage technology. The system architecture, which is based on the established 4:2:2 digital platform, is centered around four key technologies:

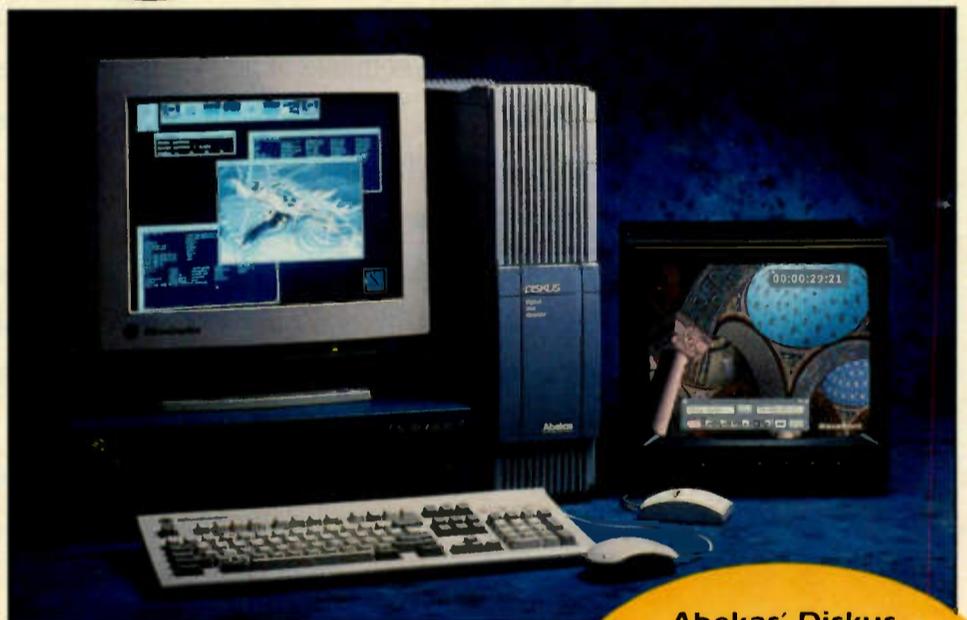
- an advanced high speed digital communications network;
- an application-based hierarchy of bit-rate reduction levels;
- hybrid data storage using both tape and disk;
- and integrated system management software.

As for the network, Sony said it had rejected ATM (Asynchronous Transfer Mode) method in favor of the Serial Digital Interface (SDI) protocol (standardized as SMPTE 259M) to carry base-band digital 4:2:2 video and audio. To expand the network's capabilities, Sony selected the Serial Digital Data Interface (SDDI), a variation of SDI that adds data communications capability.

According to Sony, SDDI is television-friendly, operates at high speeds and provides reliable point-to-point and point-to-multi-point video, audio and data communications. Both SDI and SDDI pass through existing digital routers and distribution equipment.

Bit rate reduction was also enthusiastically embraced by the manufacturer.

"We at Sony believe — with no ifs, ands or buts — that bit rate reduction is the best thing that ever happened to television because the one thing we haven't had for 50



Abekas' Diskus disk recorder puts video in the 10-bit realm.

See page 28 for a review.

years and more is management of bandwidth," said Larry Thorpe, vice president of Sony Advanced Systems in the U.S. "With bit rate reduction, we have real-time dynamic intelligent management of bandwidth, and we are going to exploit that to the hilt at every level of the system."

Three levels of bit rate reduction are key to the new system. Level 1, the highest quality, is the current Digital Betacam format. Sony said Level 1 video offers D-1 image quality operating over the network at 90 megabits per second (Mbps).

Level 2 will be a studio quality video signal that operates between 30 and 40 Mbps. This video could easily pass through digital signal processing systems and allow substantial post production.

Level 3 is to be a new 18 Mbps ENG format with a subjective picture quality equal to Sony's analog Betacam SP format. It would use 10-to-1 compression and is not designed for high-end production or for beyond five or six generations of image manipulation in post production. (Digital Betacam uses 2.3:1 compression.)

The new ENG format, dubbed "son of

(continued on page 6)

Business News Services on the Rise in Europe
See Page 8



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PROFESSIONAL



PEOPLE

CHYRON ELECTS NEW CHAIRMAN

MELVILLE, New York

Mark C. Gray — a former executive of Sony Corp., Pinnacle Systems and Ampex — has been appointed chairman of the board and chief executive officer at Chyron Corp.

Gray will continue to hold the title of president, a job he has held since he joined the company a little more than a year ago.

"This new appointment will further allow us to put a company plan into place that we've been adopting for the past 10 months," Gray said. "We will broaden our markets served to include new areas of video technology and new product lines."

COMPUTER VIDEO

GETRIS TEAMS UP WITH PINNACLE

GRENOBLE, France

Graphics systems developer Getris Images has entered into a joint development project with Pinnacle Systems aimed at creating an interface between the two companies' products.

The link will connect Getris' Eclipse, Venice and Hurricane graphics systems with Pinnacle's stillstore and video networking systems.

"The move allows customers access to a powerful combination of elegant and sophisticated professional videographics and paint tools in a networked, still storage system," said George Uibel, business manager for Pinnacle's FlashFile and FlashGrafix products.

Pinnacle also recently entered into an agreement with Fast Electronic to integrate Pinnacle's Alladin Media Recorder with the Fast Video Machine desktop production suite.

BUSINESS

PRO-BEL GROUP RESTRUCTURES

READING, U.K.

The Pro-Bel Group has launched a new company, Pro-Bel Software Ltd., designed to take advantage of computer-based products developed by the group's subsidiaries.

Specifically, the new company will combine the resources of Procion ICS, which makes computer-based control systems, and Pro-Bel Ltd., which makes automation systems.

"The market has changed in the last few years, with a greater emphasis now being placed on the control of systems," said Ray Hartman, Pro-Bel Group Chairman. "Because of the convergence of these systems, and the need to expand our automation and servicing capability, we believe the time is right to merge all our resources to create an even more powerful presence."

PROGRAMMING

24-HOUR SPANISH NEWS SERVICE AIRS

MIAMI

Telemundo, the Latin American satellite broadcaster, has launched TeleNoticias, a 24-hour Spanish language news and information channel.

The service — backed jointly with Reuters Television, Argentinean conglomerate Artear and Spanish broadcaster Antena 3 Internacional — is being broadcast to Spain and Spanish-speaking countries in the Americas.

The channel will rely on Reuters' news gathering ability along with Telemundo's broadcast expertise.

"Reuters has a tradition, an ability as a news gatherer, but it has no experience as a broadcaster," said Enrique Jara, chairman of TeleNoticias and Reuters' director of media products. "Telemundo does not have the infrastructure that Reuters has as a news gatherer, but it has experience as a broadcaster, something that Antena 3 and Artear have in common."

As of presstime, the signal was being fed to Mexico, Argentina, Nicaragua, Bolivia, Ecuador, Venezuela, Spain and Brazil. Programming consists of news, business reports, sports, international weather and features.

BUSINESS

VISTEK FORMS NEW UNITS

BUCKINGHAMSHIRE, U.K.

Vistek Electronics has completed a major reorganization within the company resulting in the creation of three autonomous divisions.

The company is now divided into the Broadcast Products Division, headed by Robert Wright; the Broadcast Systems Division, headed by Keith Agombar; and the Telecommunications Division, headed by David Leftley.

Broadcast Products will concentrate on Vistek's traditional products: format converters, monitors, clock and logo generators, etc.

Broadcast Systems will handle large automation contracts involving routing matrices, switchers and mixers.

Telecommunications will develop new product areas, including ETSI and MPEG 2 codecs.

"Splitting the company into three divisions allows us to focus the resources of sales and R&D more effectively," said Granville Cooper, managing director.

PEOPLE

DISCREET LOGIC NAMES NEW PRESIDENT

MONTREAL, Canada

David N. Macrae, a former director of Microsoft's Advanced Technology unit, has been appointed president and chief executive officer of graphics software developer Discreet Logic and has been named to the board of directors.

Macrae will assume the responsibilities of former company president Robert Schiller, who is to be appointed chairman, and Richard Szalwinski, founder of the company.

At Microsoft, Macrae was responsible for the products of SoftImage Inc., which Microsoft acquired last year. Discreet

Logic and SoftImage recently settled a long-running patent dispute over the rights to the Flame image processing software.

TRADE GROUPS

SMPTE ALIGNS WITH IBC, ITS

WHITE PLAINS, New York

The Society of Motion Picture and Television Engineers has accepted the International Broadcasting Convention and the International Television Symposium organizations as sustaining members.

The agreements mean that ITS and IBC will both support SMPTE activities, such as publication of ITS and IBC papers in the SMPTE's monthly journal, and vice versa.

IBC and ITS will also work with the SMPTE on two annual conferences in 1995: The Advanced Television and Electronic Imaging Conference in San Francisco this month, and the SMPTE Technical Conference in New Orleans in September. In addition, ITS will take part in the SMPTE conference scheduled for Cologne, Germany, in 1996.

The SMPTE will also exhibit at the IBC show in Amsterdam this fall and the ITS Montreux event in June.

NETWORKS

BBC AIRS AGAIN IN HONG KONG

HONG KONG

Nearly seven months after the BBC's World Television Service was removed from the Star TV satellite network serving China, the program has been picked up by the Wharf Cable system here in Hong Kong.

BBC World Service Television began transmitting on Wharf Cable 24-hours-a-day on November 16. The service currently reaches roughly 800,000 homes as one of 12 basic channels. By the end of 1995, Wharf Cable officials expect to increase subscription to 1.5 million homes.

In other developments, the BBC recently announced that a news and information channel has launched on Eutelsat II-F1 at 13 degrees East.

NEW TECHNOLOGY

AUSTRALIAN TELECOM EYES MULTIMEDIA

SYDNEY

Australia's public telephone company, Telecom, recently announced two agreements aimed at the creation of new video services throughout the continent.

The company has entered into agreements with Rupert Murdoch's News Limited for a \$3.5 billion partnership to create a 64-channel pay television service to be launched in early 1995.

Telecom currently operates a hybrid coaxial/fiber cable network that serves about 100,000 homes

In addition, Telecom has joined with U.S. software developer Microsoft to provide a host of digital information and video services. Much of the services will be culled from "The Microsoft Network," an on-line service currently available to users of Microsoft's Windows operating system.

Meanwhile, the privately owned Optus telephone service is getting underway with its own plan to roll out cable television service.

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So What Is Broadcast Quality?

by Harvey Dubner and Robert Dubner

GUEST COMMENTARY

The merger of video systems and computer technology is affecting both industries tremendously. Professional videographers at one end and computer professionals on the other are both feeling the affects of the new order of things. But whether you are coming from the computer world and now adding TV capability, or coming from TV and adding computer capability, you must be concerned with what constitutes "broadcast quality television" in our new computer/TV world.

As computers and camcorders proliferate, it must be appreciated that, to a greater and greater extent, "broadcast quality" refers to showing something on a TV set from a tape or computer, rather than from an antenna or cable. It is this "modern broadcast quality" that we will address.

IS IT BAD ENOUGH?

Broadcast quality: We often see this term in a context that implies "good enough for broadcast purposes." This concept may have been useful with regard to tape recorders, but when we talk about computer-generated images, we might be better off talking about broadcast poorness instead of broadcast quality. It may come as a shock to people just getting started in generating graphics for NTSC that the question is usually not, "Is it good enough for television?" but rather, "Is it bad enough to convert well?"

In the U.S., NTSC officially stands for National Television Standards Committee, but many folks refer to it affectionately (sort of) as Never Twice the Same Color. When the decision was made 40 years ago to make color television compatible with the 50 million or so black-and-white TV sets that already existed — TV sets that knew nothing about a new-fangled color signal — the committee pulled off a miracle.

The committee invented a modification to the existing black-and-white transmission standard that enabled old monochrome receivers to show the new color signals in reasonable black-and-white. And the new color receivers could likewise handle the old monochrome signals.

This was all well and good a generation or two ago, but today we are generating images that the committee never dreamed of. Digitally generated images have characteristics never seen in the signals that came from the big old Vidicon television cameras in use at the time the color standard was developed.

Computer people who are just getting involved with television are laboring under a severe handicap: They have been staring at high quality, high frequency computer monitors that can produce col-

orful, detailed, quiet, high resolution pictures. What a surprise when such a picture is sent through a converter and shown on a TV monitor! Suddenly the artifacts appear.

A full-semester college course on signal theory could be devoted to the artifacts involved in converting a beautiful computer-generated image to composite video, such as NTSC, PAL and SECAM. The tops and bottoms of graphics flicker because of two-field interlace. All kinds of "jaggies" appear due to aliasing, particularly if the image was generated at a higher resolution than that of a current television display.

If someone anticipated that problem and rendered the images in a 640 x 480 dot graphics mode, chances are that they will be appalled by a rather ghastly "chroma creep," especially if dithered colors were used.

You do not know what "chroma creep" is? That is the "up escalator" visual effect you see on the edges of brightly-colored graphics images. In NTSC, it happens because the format's 3.58 MHz color signal is inside the overall 4.2 MHz luminance bandwidth. In PAL, the effect goes sideways. Technically, the problem is known as intermodulation distortion. Practically, it means that a nice, sharp computer image can end up with very wiggly edges; areas of dithered colors can look like something out of a nightmare.

As you can see, it is not easy to convert computer pictures to broadcast

quality TV.

Years ago, we saw talented professional computer artists using paint systems to make pictures for broadcast. They would not work from a composite video monitor, but insisted on using a component monitor. Although the end pictures were works of art, they were unusable for the TV show.

The best artists eventually developed techniques that allowed for relatively faithful conversion; mostly they had to learn to be content with images that seemed, well, blurry on the high-resolution monitors.

NEW LESSONS

Computer people who are now adding TV to their repertoire must study the characteristics of NTSC, PAL and SECAM. They must learn the cost, performance and idiosyncrasies of commercially available hardware converters. Software converters must be tested with many different test pictures.

This learning process will not be quick or easy to accomplish, but if you want broadcast quality TV there is not much else you can do.

Next, we turn to video professionals. Our company has manufactured and sold expensive equipment to the video industry for many years, and although we have a great deal of respect for video engineers as a group, there was one behavioral characteristic they often exhibited that would drive us to distraction: They would examine the TV output on a US\$8,000 monitor

with their eyes eight inches from the screen.

Perhaps there were times when this was justified, but often we could not help but think of our home TV set, where about 15 percent of the left side of the picture was missing, the video was snowy and full of ghosts because of poor reception, and everything had a greenish tinge.

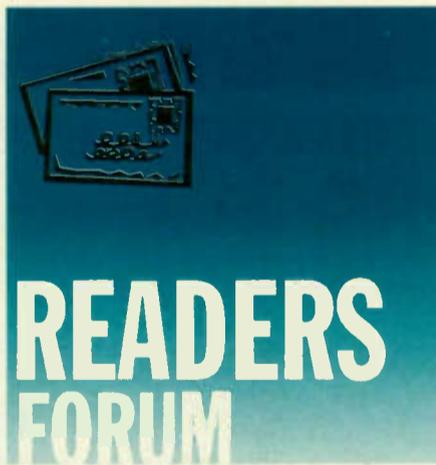
(Note from Robert: My father likes the image greenish. I used to try correcting it, but he would twist the HUE knob back toward green. Eventually I gave up. He now owns a better set and has a cable connection, so the full picture is visible and the reception is much better. But the flesh tones are still green.)

The moral of the story is to beware the perfectionist who will blow the entire budget getting things to look just perfect.

Have you ever been in an audio recording studio where the engineers, producers and artists are all excited about the work they are doing? Then there is always that bittersweet moment when the final mixdown is played through a cheap six-inch speaker, just to make sure it will sound okay coming out of an ordinary car radio.

The concept of "modern broadcast quality" means that video professionals will have to lower their concept of quality, or at least be aware that many people will be looking at their product through the video equivalent of a cheap radio. They must learn, of all things, to compromise. If they don't or won't, the new TV world will pass them by. They must also learn about computers and how they

(continued on page 13)



Send letters to Readers Forum, TV Technology, Box 1214, Falls Church, Virginia, 22041, USA or MCI Mailbox #302-7776

Digital firsts

Dear TV Technology:

Thanks for your wonderful paper. It means a lot to us since a lot of the trade magazines just do not reach Estonia.

Yesterday, November 27, 1994, we had the pleasure of finishing the first digitally edited piece of video in Estonia. It was a music video consisting of three hours of source material, all shot on location in the exotic beach areas of southwestern Estonia.

Since our regular BVW 70 head was broken at the time, we were able to borrow the first Digital Broadcaster (an AD516 and an Amiga 4000/40 with a 1 GB hard drive and 4 GB of external memory) to test and evaluate.

We had been reading a lot about off-line hard disk editing, but we had never used one. All of Estonia is still strictly Betacam SP.

Being under extreme time pressure, we started by loading in 40 minutes of source material, thus color correcting it through our JVC KM 3000 and Sony BVX 10P. The Digital Broadcaster still had some difficulties in playing back moving scenes in broadcast quality, even though it was connected to a Fastlane SCSI II driver and a Barracuda 4 GB hard disk.

The editing was done in the EDL-Master list window, and we had a hard time learning how to tag "clips" in the EDL. The manual was quite small and did not give many answers to our questions under the time pressure. Still, all clips were easily named in the "Reel" list.

By the way, I do not know if it is possible to move the Digital Video Recorder and Timeline windows away from the EDL and Reel master window on larger monitors, but while working with a 14-inch Multisync, we had to close those control windows in order to see the Reel list and to import clips to the EDL list. The manual did not explain a solution to the problem.

Our clients had arrived and in the beginning, we planned to leave all rendering of dissolves until later. We had planned 150 of them with one-second durations in the 4.40 clip. The clients did not want to imagine dissolves while working, so we tried to render the first three dissolves immediately to prove our point. To our surprise, the rendering took so little time that we decided to render all dissolves in the background as we proceeded. Rendering did not slow down any other functions of the Amiga. We are not using Amigas in our studio. We have PC 486/50 with genlock and 3DS, etc.

Editing with the graphical timeline was

wonderful and much more reliable than our current edit controller. We missed a jog wheel, of course. It was just hard to place or scrub any edits with the poor mouse.

At the same time, knowing that we were not rolling tape back and forth felt good, since editing music videos is very "head consuming." In the past, we have had our tapes break from editing music videos.

After finishing the actual edits, we were able to present the finished work to our clients. They pointed out some things, as did we, so we decided to change about half our dissolve durations. All of these changes took about 30 minutes to render. One minor concern was that the Amiga froze about four times during the edits. No data was lost, but we had to re-boot.

After 24 hours, the job was done and transferred to Betacam SP, and we were told by the supplier (Computervision's Rani Meister) that we had just completed the first ever digital edited video in our country.

Our impression is that the digital off-line editing is not ready yet to replace the conventional tape editing. But for jobs such as music videos and commercials, I would rather click the mouse than worry about head hours. On the Broadcaster, you can see the whole job as a preview, including multiple transitions, yet you do not have to be committed to those cuts. And if you want to change something, the whole clip moves closer with the "No gapes" button.

Uco M. Coote
CEO
Ad-Post Studios
Tallin, Estonia

CONTINUED FROM PAGE 1

Sony Backs All-Digital Future

Digital Betacam" by Thorpe, is also the key to Sony's strategy in what could lead to a new format war on the news gathering front.

A key feature of the new 18 megabit Betacam format is its ability to "stream" at four times speed for data entry onto a hard disk for non-linear post production. Acquisition material can also be played double speed through a new digital modem over a standard Ku band transponder used for satellite news gathering (SNG). This, said Sony, will open the "bottleneck" now caused by the necessity to play back field tapes at real time speed into hard disk storage devices.

"Eighteen megabits was sort of magic because if you double it, it becomes 36 megabits per second," Thorpe said. "That just happens to go through a 27 megahertz half (Ku band) transponder that is commonly used for SNG. Happily that 18 megabits per second also gives us a 4:2:2 picture quality that's as good as Betacam SP."

In creating a tape streamer for field acquisition of news, Sony positioned itself as an opponent of the concept of hard disk-based camcorders.

Thorpe said Sony had studied the idea of a disk-based camcorder closely and had actually built prototypes. But, he said, "there are a few strikes against it."

He cited cost of media, robustness and record time versus picture quality as key problems with the concept. "The biggest show stopper of all," Thorpe said, is that hard disk media is several times costlier than the oxide tape used today by most news

gathering organizations.

On the image quality front, he said that in order to get the quality of today's Betacam format, it is necessary to trade off recording time. And finally, he said, "a little bit of a shake can crash the disk."

"Make no mistake about it," Thorpe said. "A company that has done as much as we have in camcorders is not about to make a foolish decision on the next generation camcorder."

Thorpe admits Sony's tape streamer idea is counter to the disk-based camcorders expected at NAB from other manufacturers.

"We are going to go out and say something 180 degrees out of phase with what Avid and Ikegami and BTS say," said Thorpe. "We did a lot of work on the disk and we know a lot about camcorders. We do not agree (disk) camcorders will succeed in the marketplace."

PERSONAL DECISIONS

Asked where the multi-generational cutoff point is on the new ENG format, Thorpe responded: "That's in the eye of the beholder. You and I might disagree."

Sony expects the price to be one of the most attractive elements of the camcorder.

"It will be much cheaper than the Digital Betacam camcorder...better than half the price," Thorpe said. "It will be competitive with a BVW-300A, our lowest-end analog

single piece camcorder."

Thorpe said the economies for the new camcorder will come in compromises in encoding and decoding that can't be made with the high-end Digital Betacam format.

"And we can tailor the camera to the capabilities of the recorder," he said.

Thorpe said Sony has not yet decided whether a complete system of products will

"We at Sony believe...that bit rate reduction is the best thing that ever happened to television..."

**- Larry Thorpe, V.P.,
Sony Advanced Systems**

be created around the new low-end camcorder format.

"It could be used as an industrial format if we come out with all the elements of a system that would support production and post production," he said. "The jury is out on what we are going to do there. We are going to show this at NAB in prototype form and we are going to engage in a lot of discussion to see what people want."

The new Betacam format is the acquisition component of a totally new digital news gathering system coming from Sony.

"The news architecture is based on distributed servers," Thorpe said. "There is an input server, called the daily server. The idea is to come in with bit rate-reduced signals right into the server and then out on the high speed network.

There, it can be accessed by everybody in the edit suites or at journalist's workstations.

"Finally, after all the scripts have been written and the editing has been done, it will all be routed into an air buffer," Thorpe continued. "There, a play list is created and it goes to the output server and then to a digital master control switcher. Everybody is tied together on a local area network."

As for storage, Sony said it will adopt a hybrid approach that combines RAM, hard disk drives, magneto/optical disks (MO) and digital tape. Different parts of the system have widely varying storage, capacity, access time and throughput requirements, and each technology will be used in an application specific design, as dictated by cost, user needs, speed and storage capacity.

Sony said it had standardized its MO disk system to an eight-inch platter that offers about 3.2 gigabytes of storage. Four heads are used to access the platter, and several disk platters can be combined to create a server.

Sony said it will manufacture an MO server for a variety of functions, including commercial automation. A single server can have 100 MO players, offering the capability of 33 hours or 5,000 30-second spots recorded at the 18 megabit per second rate. The server can also be configured for multichannel use and for near video-on-demand applications.

Sony said it will also show a complete line of system management software with a uniform graphic user interface, several editing systems and an all-digital 4:2:2 outside broadcast vehicle.

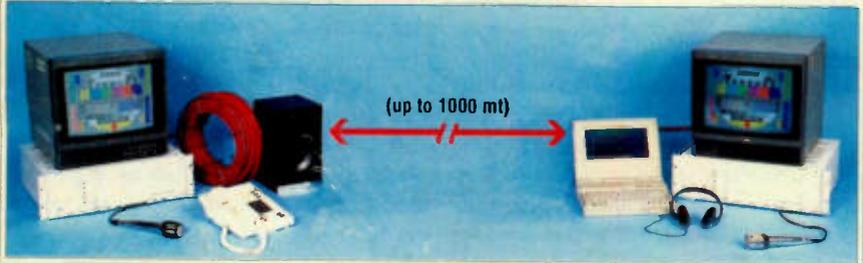
Sony's plan for total digital network integration is the product of several years of development, the company said. Its implementation will require a major re-education process for an industry that remains mostly in the analog world. The transition, Sony said, will be gradual. ■

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Paris Opens Its Arms To 98th AES Convention

PARIS

Audio equipment and technical discussions will fill the Palais de Congres for the fifth time as the Audio Engineering Society returns to The City of Lights this month.

The 98th AES convention is set to take place February 25-28, bringing four days of conferences and workshops and nearly 200 exhibitors.

This year's show will highlight the latest advances in digital technology and sound theory. Among the leading draws will be developments in coding techniques, sound reinforcement, signal processing and acoustics.

The show will open at 10 a.m. on Feb. 25 with discussions on audio data reduction and architectural acoustics. The data reduction session will feature papers on tonality detection, wavelet filtering, MPEG compression and multichannel source coding for HDTV. The architectural acoustics session will focus on sound absorption, time distribution and sound diffusers.

Saturday will also see a morning workshop devoted to audio and video carriers.

On Sunday, Feb. 26, the society will bring its attention to audio electronics, with papers on synthetic music, recent discoveries in amplification and digital-to-analog converters. Sunday's program will also include two sessions on sound reinforcement, concentrating on multimedia systems and wave front synthesis.

Workshops on Sunday include digital media developments, wave front sculpture

and multiformat premastering.

Monday will bring the AES's presentation on signal processing, with papers on multiband analysis, convolution processing, electro-acoustic reverberation and several types of filtering. Transducers will also take center stage on Monday, as issues such as inverse radiation, diffraction and flux modulation distortion are reviewed.

Monday's workshops will cover acoustic music and measuring auditory and visual interaction.

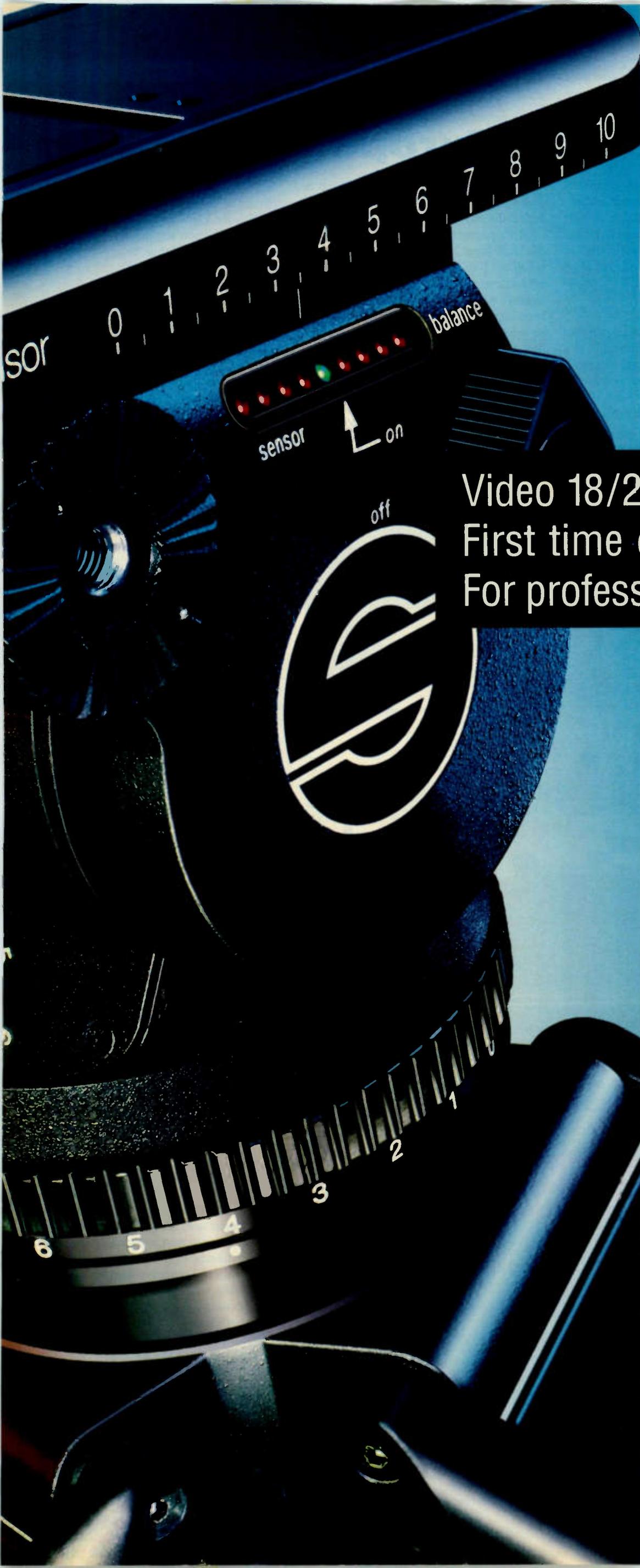
Sessions will close out on Tuesday with discussions on measurement techniques, networking and psychoacoustics, plus a workshop on digital audio broadcasting.

On the show floor, many of the world's leading audio manufacturers will present their latest developments. Scheduled to attend are AKAI, AKG, Amek/TAC, AMS/Neve, Avid, DAR, DigiGram, Dolby Labs, Otari, Philips, Siemens, SSL, Sony, Studer and Tektronix.

Throughout the show, AES technical and standards committees will convene. Subjects include signal processing, acoustics and sound reinforcement, transducers and transmission.

Special events include an education fair, featuring information on colleges and institutes that offer instruction in audio. ■

For further information, contact show organizers at P.O. Box 80, F-75722 Paris Cedex 15; telephone: +331-4734-7104; FAX: +331-4056-0923.



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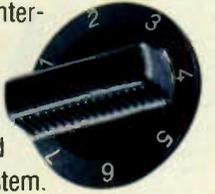
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Business News Rises in Europe

by Chris Dickinson

LONDON

European business people are looking forward to a massive explosion in the number of news and information services about to be launched by a host of providers.

One of the most talked-about services, European Business News (EBN), the first dedicated business TV channel to launch since the demise of Zurich-based European Business Channel a few years ago, goes live at the end of February.

Business TV is a hot subject in Europe at the moment: besides EBN, NBC SuperChannel is about to massively hike its

business programming in January; Pearson's FT Television is planning to launch a desktop business TV channel in 1995; Bloomberg, a U.S. company, plans to launch another business channel; Reuters already has one; and even the BBC is believed to be interested in launching a service.

TWO IN ONE

EBN is actually preparing to launch two services. The first, starting in February, is a conventional, 24-hour satellite channel, broadcasting in PAL on Eutelsat Hot Bird 1 over Europe, Russia and parts of the Middle East and Africa. The second, which will launch at an as yet unspecified date, will uti-

lize the latest digital TV standards and be sent via cable to businessmen and money traders directly onto their desktop computers.

EBN's partners Dow Jones — publisher of the Wall Street Journal — and Flextech have taken a 15-year lease on a floor in a new office development opposite the Old Bailey in London. Throughout the fall, the group has been energetically filling it with an automated newsroom, production studios, post production rooms and a transmission control center.

One hundred staff are being recruited to run the new center, and news bureaus are planned for the main financial centers in Europe.

EBN Managing Director Michael Connor said the analog channel is only the first step.

"In the future, we intend to fully exploit the digital technology — a 36 MHz transponder is an enormous piece of real estate and there is an awful lot we can do with it," Connor said. "Down the line, it will allow us to 'publish' other video information services. We could have EBN and a whole variety of video information services, not all of them continuous or in real time."

JUST BUSINESS

Editorially, the EBN channel will be business news "about Europe, by Europeans, for Europeans." The channel's first dedicated bureau will be in Frankfurt, and it will also draw on journalists at Dow Jones' 70 existing offices around Europe, plus feeds from its U.S. operations and from another joint venture, sister station Asia Business News (ABN).

Real-time price and market data, weather and travel reports will be supplied by Dow Jones Telerate, its own teletext service. Beyond this, Connor says EBN will make almost all of its own programming in-house. But he adds that he is open to proposals from outside program makers about supplying material.

Overall, the channel's content will seek to cover consumer topics as well as international business issues.

"Business interests everyone," Connor said. "Our research shows that there is enormous demand from the business person in Europe for information on a real-time basis. It will be business news in the broadest sense. We will have media, lifestyle, personal finance, Eastern Europe — in fact, we will be very much like the Wall Street Journal. It will have the same editorial sensibilities."

The technical facilities being installed include two fully automated studios with associated control rooms, four edit suites and computer graphics rooms, network control, a central machine room, newswire facilities and lines to and from BT Tower.

For the newsroom, the channel has bought the German made Newswire 2000 news system (Reader Service 23), which uses Windows software. Michael Lahey, EBN's director of operations, said the Newswire 2000 system was chosen because of the flexibility it gives journalists.

"It was the only platform that really used the Graphical User Interface we wanted, instead of a DOS system, and let us use both Macintosh and Windows PCs on the same network," Lahey said. "It also has the ability to do still store browsing and has all its functionality in one box."

One thing the system does not do, however, is allow the journalists to edit video — though an additional Quicktime software package does let them create a simple EDL that can then be taken to one of the stand-alone edit suites elsewhere in the facility.

ANALOG START

The channel uses analog Betacam SP as its main acquisition, post production and play-out format, eschewing one of the new digital formats or a disk-based system. Lahey said the decision was based partly on cost and partly because there were still doubts about the new technology.

"We have to produce a lot of television in real time and we were not fully persuaded that the new technology could handle it," he said. "We looked at Avid, but for us the equipment is expensive and it has not yet proven that it works in a real-time environment."

"As for Betacam SP, we felt that with the cost of Digital Betacam at US\$55,000 and Betacam SP with analog-to-digital connectors at

(continued on page 10)

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SONY

CONTINUED FROM PAGE 8

Europe Eyes Business News

US\$20,000, this was the way to go." BTS (Reader Service 108) is supplying 25 Betacam SP VTRs and a large part of the technical equipment in the facility, including five LDK-9P CCD cameras, several Venus digital routing switchers and the full range of Diamond digital vision mixers: the DD10, DD20 and DD30.

Lahey said the playout machine is an Odetics TCS90 (Reader Service 43), configured with Betacam SP VTRs. Again, this was chosen after the latest disk-based systems appeared not to be ready.

On the graphics side, EBN has bought Leitch still stores (Reader Service 4), Aston Motif character generators (Reader Service 97)

and Pixel Power's Collage paint system (Reader Service 55), chosen because it is a "non-proprietary, off-the-shelf system."

COMPUTER POWER

One of the most significant acquisitions for EBN was the purchase of a Silicon Graphics Onyx super computer (Reader Service 15),

which will be used to create what the channel hopes will be a star attraction: sophisticated 3-D illustrations of financial data and trends. The software to create these graphics has been developed by sister channel ABN and is already in use at that station. By connecting the Onyx with the Telerate data service, 3-D graphics can be created in real time, without any operator having to construct painstaking renders.

The Onyx will eavesdrop on the data sources and, at the drop of a hat, will pluck 20 figures out of the air and display them in spectacular 3-D graphics.

"We want the audience to say: 'I've never seen anything like that in my life,'" Lahey said.

The other advantage of the system is that it does not require a dedicated graphics operator to run it — the graphics are created automatically and are called up by the director in vision control.

The emphasis on labor-saving devices extends to EBN's two studios, both of which run without cameramen. Instead, the BTS cameras are controlled by the director from the control room, using a robotic camera system supplied by Radamec EPO (Reader Service 10). A special touch-screen control displays a montage of frame-grabbed images from up to eight cameras, which can be selected or stored in memory.

It is by using labor-saving devices and running everything as tightly as possible that EBN intends to succeed where the ill-fated European Business Channel failed. Connor adds that advertisers are perhaps more eager to join up with the station now than they might have been during the recession.

Of course, optimism for the future of business TV extends to EBN's rivals. In January, Financial Times Television, a part of Pearson subsidiary Thames Television, began uplinking its supply of specialist business programming to NBC SuperChannel from the current one-hour-a-day to well over four hours. The company also plans to launch a desktop specialist business TV service next year.

COMMERCIAL FACTORS

Ciaran Fenton, FTT's commercial director, said the enthusiasm for business TV is fueled by a number of factors.

"The cost of production has come down," he said. "For example, in the past it was unheard of to have no vision mixer. Now the director mixes as a matter of course.

"There is also Factor X, which is that a lot of people feel if they do not get out there now, someone else will. Newspapers are also to some degree trying to protect their positions."

Fenton added that viewers are also beginning to realize that the so-called information superhighway opens up a wider choice to them, allowing them to demand specialist channels.

For Bloomberg, a news agency that runs a desktop business TV service in the U.S., Europe is also ripe for the picking. Bloomberg's Editor-in-Chief Matthew Winkler says the new channel will be a 24-hour-a-day pan-European service sent directly to desktop workstations. He says it will cover the whole gamut of programming.

"The only thing we will pay lip-service to will be war, peace and airplane crashes," he says.

The Bloomberg screen will be sub-divided into parts, consisting, for example, of a talking head, graphics and tables, and live pictures. The timetable for the launch is still under wraps, although it is expected to be sometime in the first half of 1995. ■

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Does Anyone Use What They Build?

by Mario Orazio



SOMEWHERE OUT THERE *You might not have noticed* that people will buy anything.

Not too long ago, a friend of mine, who believes in doing such awful things to his body as exercising, showed me a catalog he received. The catalog featured items for people who no longer wish to be able to taste their food. These things go by names like Capital Punishment, Gunpowder, Hell-Fire & Damnation, Hell In A Bottle, etc., and they are euphemistically referred to as "sauces."

I shall now quote, verbatim, from a description of one of said "sauces" in said catalog:

"The name for this sauce comes from the chemical endorphin. Naturally produced by the human brain to help relieve pain, it has the same effect as morphine. Endorphin Rush may give you that radical sensation, but, then again, so will hitting your thumb with a hammer! WAY BEYOND HOT. D1205 5 oz. all natural \$6.25"

I am not making this up. Here is a catalog selling something they say will have the same effect on you as hitting your thumb with a hammer. They want US\$6.25 for five ounces of the stuff, and I have every confidence that they will get it.

ECONOMIC (REMOTE) CONTROL

That is why I am not in the least surprised that the cable television industry here in the U.S. continues to collect money each month. I am not talking about lousy systems that deliver unviewable pictures or the greedy ones that purchased remote controls wholesale for two dollars each and leased them to subscribers for US\$4 a month.

What I had in mind was the ability to change channels without going deaf (of course, ear pain does generate endorphins, so I should be happy I saved \$6.25). I have travelled across the U.S. more times than I care to remember, and I have experienced a lot of cable TV systems. I must tell you that there is not a single one that lets me change channels and keep the same sound volume.

Recently, I even visited the great CableLabs cable system in Boulder, Colorado, which is supposedly the *creme de la creme* of cable systems. When the entire U.S. cable industry comes together to make a model of the way a system ought to be, I expect the best. But "the best" has sound levels all over the place.

Now, I will be the first to admit that broadcasters do not transmit alignment tones very often, and neither does the American Movie Classics channel or the QVC shopping network. But it is possible to adjust audio levels without tones.

Manufacturers of TV technology also suffer from inattention to major details.

I read every now and then about some airline that rotates employees so that one day you are a baggage handler and the next you

are vice president of marketing. I would like to say very firmly that I think being a latrine-tank emptier does not — repeat not — qualify an airline employee to fly a 747. But I also think it couldn't hurt for a pilot (or a vice president) to experience latrine emptying every now and then, just to keep things in perspective.

Likewise, I think there should be some heavy duty rotations in TV technology. When Ampex came out with the VTR, no one knew what features would be nice to have; you have to expect that of new technology. But it is now about the 70th year that video cameras have been in existence, so why would a manufacturer of fine video cameras, who shall remain nameless (but whose name starts with "I" and rhymes with "brickegami"), come out with a new camera with a worse viewfinder than it had in the older models?

This nameless manufacturer knows fully well that camerapeople need detail, and it has provided lovely amounts of detail in the past. But the viewfinder on a new product (that I will refer to only as the SE-377) has not only less of that, but also, from what I have seen, some power supply problems that I thought we had overcome sometime around the end of the Edison-Tesla war.

And why would this same nameless manufacturer use different sizes and shapes for the filters in each of its models so that you cannot bring your filters with you when you upgrade cameras? Manufacturers of HDTV cameras have gotten together on a lens mount; why can't a single manufacturer standardize its own filters?

A long time ago, I think I ranted about a nameless film manufacturer (whose products come in yellow boxes with a palindromic name) offering a line of electronic photography equipment each piece of which had different connectors. Sony (which shall also remain nameless) is not quite that bad in the UVW cheapobeta series, but just barely.

I will now actually name a company (mainly because I am not sure they still exist, so how angry could they get?): Dynasciences. It was a good company, as I recall; ahead of its time on a lot of things. About 10 years ago, they developed the image stabilization system that Canon and Sony are just beginning to apply.

If my memory is still intact, Dynasciences came up with a video production switcher with a control head that was smaller than an 8" x 10" photograph. Instead of rows of buttons, it had a keypad for entry.

If you wanted camera 3 on the air, you punched a sequence like "CAM. 3. PGM. ENTER" by which time, no doubt, the director wanted VTR 2. At the time, I recall thinking, "Whoever designed this thing has never been in a working control room in his life!" I recall thinking the same thing while

looking at some switchers at NAB last year.

I have no doubt that the top designers at such nameless camera mounting magnates as Sachtler and Vinten have never been on the kinds of remote shoots I have been on. If they have, then they must think I am a devotee of Sacher-Masoch, while their taste is more in the realm of the Marquis de Sade.

I prefer not to think of them as evil perverts, which means I do think of them as — how shall I put this delicately? — having a considerably less than encyclopedic knowledge of all camera mounting situations than their otherwise excellent products would tend to indicate.

LITTLE GREEN MEN

Before I go too far off the deep end and force my publisher to cash in holiday gifts to make up for lost ad revenues, let me just say that I do not think the manufacturers are alone. I mean — doesn't anyone at CNN ever watch CNN? Forget all the green faces for the moment. Does it bother anyone at that nameless news network that President Clinton's voice comes over the air before the pictures of his face?

Can we all get together to buy an audio delay unit? Please? Yes, I know — it is tough to keep track of the precise delay required, and what happens when the director throws in a DVE, and so on? Forget precise. Forget perfect matching. Just do something.

Goodness knows I have certainly pulled my share of boners over the years (well, okay, more than my share). But it is rather nice to learn from mistakes — your own or someone else's. After a top-rated show gets broadcast with out-of-phase effects, you would expect the producers to buy phase indicators of some sort. There is a fair amount of them available, but I wish I had a nickel for each stereo audio facility I've

seen without them.

The theme of SMPTE's technical program at the (soon to be late?) great World Media Expo in Los Angeles last fall was "The Digital Era... Ready or Not?" That is just too easy a question: not.

I have showered my wrath on manufacturers, cable and broadcasters; I might as well talk about the satellite industry, which is dragging us kicking and screaming into the digital era. I am not going to criticize their bit-rate reduction algorithms, but satellite transmission is not exactly the newest phenomenon in the world. Has anyone ever heard of rain fade?

There should be a law! The people foisting 18-inch dishes on an unsuspecting public should be required to watch all their television through the same dishes during a thunderstorm. And that is not all.

Lighting designers and audio boom operators should be required to trade jobs once a month. Camera manufacturers and camera operators should trade jobs during a winter football game, and the lens manufacturers should get in on the job rotation during hockey — just to see how long they can keep the puck in focus. When the lens designers get tired, I think it would be nice for a director to experience depth of field up close and personal.

Intercom headset manufacturers should be required to serve as stage managers at rock concerts. Anyone who works with rental equipment should swap places periodically with the rental house maintenance crews. Producers and remote site strike crews should swap places every now and then, although I don't know who would learn more. And masked engineers should field some journalistic flak without hiding behind an alias. ■

Mario Orazio is the pseudonym of a well-known television engineer who wishes to remain anonymous. Send your questions or comments to him c/o TV Technology. Or drop him a note on e-mail 581-6729@MCIMail.com.

SHOW LISTINGS

7-10 MARCH — COMDEX/COMEXPO '95

Mexico City. To be held at the Exhibition Pavilion or Sports Palace, the show will feature Windows World and Latinet/Telecom. For information, contact The Interface Group at 300 First Ave., Needham, MA, 02194-2722, USA; telephone: +1-617-449-6600.

20-22 MARCH — 1995 PAN ASIA SATELLITE AND CABLE TELEVISION

Hong Kong. Returning for its fifth annual conference, the show will provide the latest in satellite and cable technology. For information, contact AIC conferences, 51 Anson Road, #09-55 Anson Center, Singapore. 0207; telephone: +65-222-8550; FAX: +65-226-3264.

3-5 APRIL — CABLE & SATELLITE

London. Now in its ninth year, Cable & Satellite will take place at the Grand Hall at Olympia. For further information, contact show organizers at 26 The Quadrant, Richmond, Surrey, TW9 1DL, U.K.; telephone: +44-81-948-9800; FAX: +44-81-948-9866.

10-14 APRIL — NAB '95

Las Vegas. The U.S.'s premiere television trade show returns to Las Vegas. For information, contact the organization at 1771 N Street NW, Washington, D.C., 20036-2891, USA; telephone +1-202-429-5350; FAX: +1-202-429-5406.

18-20 APRIL — BRASIL LINK

Rio de Janeiro. Brazil's largest pay-TV conference returns to the Inter-Continental Hotel and the Nacional Rio Conference Center. For further information, contact Global Exposition Holdings, 1909 Avenue G, Rosenberg, TX, 77471, USA; telephone: +1-713-342-9826; FAX: +1-713-342-1158.

26-29 APRIL — BROADCAST TECHNOLOGY INDONESIA

Jakarta. Running concurrently with Communications Technology Indonesia, the show caters to the professional sound, film, video and lighting industries. For information, contact Eileen M. Lavine, 4733 Bethesda Ave., Suite 700, Bethesda, Md., 20814, USA; telephone: +1-301-656-2942; FAX: +1-301-656-3179.

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Making Some Sense Out of Entropy

The More Complex Your Video Signal Is, The More Data It Will Require

league David Wood of the EBU, for the research work that produced these graphs, and the paper they presented at IBC 1994.

program material without loss of information, a maximum of 3 bits per pixel are required. To a first approximation, we can consider that the active samples corre-

by Brian Flowers

ENGINEERING CORNER

When it comes to digital television, the study of entropy is crucial in determining how much data will be needed to code a video sequence.

A caption or test-pattern with no movement on the one hand, and full amplitude random noise in the red, green and blue channels on the other hand, represent the extreme low and high values of entropy in television signals. When one frame has been sent, the entropy of the caption or test-pattern drops to zero, provided it is noise free, whereas the random noise signal is totally unpredictable, so it has maximum entropy. Normal television signals lie between these extremes, and Figure 1 shows how the entropy values of typical program material is spread between these limits.

GOING TO EXTREME

The equivalent entropy extremes for audio would be 1 kHz tone and white noise, with perhaps a Mozart string quartet representing the middle zone, which is known in general terms as the zone of organized complexity.

Still captions have low entropy of 0 to 0.5 bits/pixel, and newsreader shots also have

fairly low entropy of 0.5 to 1.0 bits/pixel. Films and other programs have higher entropy values of 1 to 2 bits/pixel and a few sequences with plenty of moving detail reach nearly 3 bits/pixel.

In fact, Hollywood films tend to have lower entropy values than television productions because the film camera's depth-of-field is usually more limited than that of a television camera. Hence when the hero embraces the heroine in close-up, the Hollywood background is usually out of focus and therefore lacking in detail. This may explain why low bit-rate codecs are often demonstrated using film material.

Figure 2 is a graph of entropy (horizontal axis) against the percentage of program material (vertical axis) whose entropy does not exceed a given value. I am indebted to Nick Lodge of the ITC and to my col-

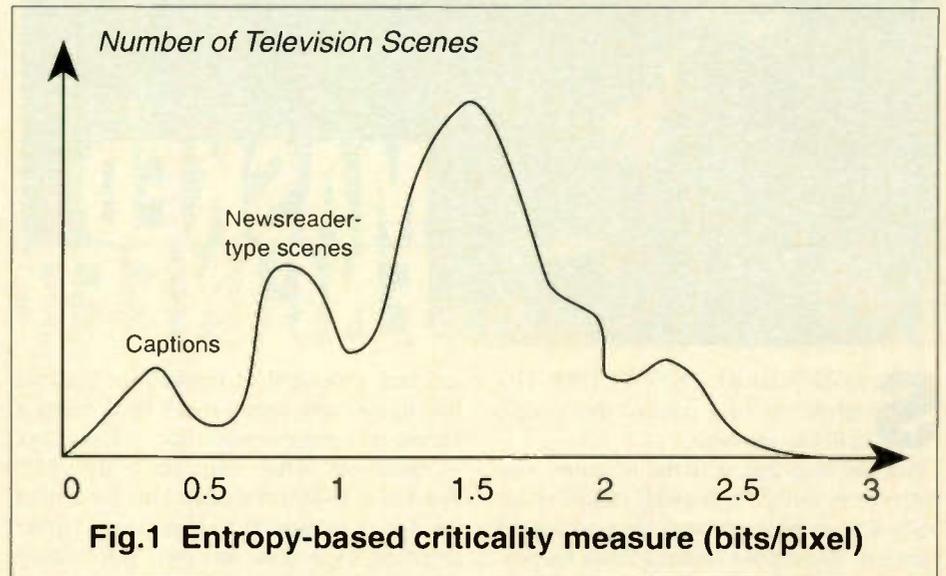


Fig.1 Entropy-based criticality measure (bits/pixel)

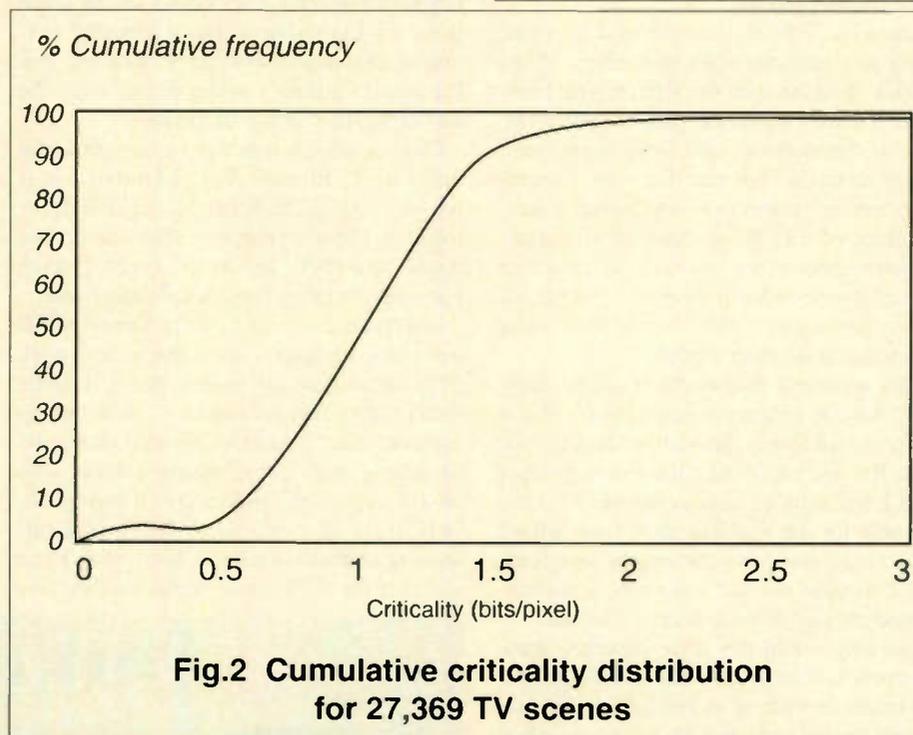


Fig.2 Cumulative criticality distribution for 27,369 TV scenes

respond to pixels. The CCIR Rec.601 4:2:2 signal has 720 active samples per line. There are 576 active lines per frame in 625-line signals and 480 active lines per frame in 525-line signals, which have 25 and 30 frames per second respectively. If we multiply these figures to obtain the number of samples per second, we get:

$$720 \times 576 \times 25 = 10,368,000 \text{ samples/second}$$

or

$$720 \times 480 \times 30 = 10,368,000 \text{ samples/second}$$

In other words both systems have the same number of samples per second, which explains why the EBU and SMPTE received awards for inventing CCIR-601.

If we round off this figure to 10,000,000 active samples/second, it is clear that to transmit virtually all television programs with full CCIR-601 quality, we need about 30 megabits per second (Mbps), which is precisely what a 34 Mbps codec provides for the vision signal.

DUMPING INFO

Consequently lower bit-rate codecs have no choice but to throw away some information. Of course it is done in such a way that the eye hardly notices most of the time, but if low bit-rates are used upstream of editing facilities, especially digital editors, then the missing information can cause problems.

The difficulty in setting clear standards arises because we can now have a situation where the picture is good most of the time, but not so good some of the time. When the accountants realize that they can reduce transmission costs by using lower bit-rates, arguments ensue with old-fashioned engineers like myself who have spent a lifetime trying to improve picture and audio quality.

With analog transmission, the situation is clear. Everyone agrees that we need a weighted signal/noise ratio of at least 50 dB on contribution circuits, and we normally have nearly 60 dB. This value is relatively immune to changes in picture content, so the received signal is either within tolerance or out of tolerance.

Nevertheless, costs can be reduced by using a lower FM deviation and hence a lower RF bandwidth, provided the S/N ratio remains within tolerance. Intelsat doubled its satellite channel capacity by

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adopting half-transponder channels many years ago. They encountered a few problems of crosstalk between adjacent channels when color bars were sent, so they tried to ban color bars on Intelsat channels. However trying to stop broadcasters from sending color bars is like trying to stop cats from hunting birds. In fact, I know a cat called Daisy who watches high altitude

lar shape of the analog spectrum. The 34 Mbps signal is backed off 8 dB below saturation at the satellite input, whereas the analog television signal is backed off only 6 dB. This corresponds to transmit EIRPs from our Geneva earth-station of 70 dBw and 72 dBw respectively. The 2 Mbps Euroradio signal is backed off 18 dB and an 8 Mbps signal would be backed off 16 dB.

point where the error correction systems cannot cope, total collapse ensues. In contrast, when the upleg transmit power of an analog video signal is reduced, the received baseband signal becomes progressively noisier and suffers from adjacent channel and/or orthogonal channel interference.

the codec manufacturers, has brought the 34 Mbps ETS 300 174 transmission system to fruition. At least three manufacturers can provide fully interworking codecs with analog interfaces conforming to EBU specification. To quote my old school motto, "qui patitur vincit." ■

The large power margin of 16 dB was due to the fact that the 34 Mbps signal was almost alone in a 72 MHz bandwidth transponder, and most of the orthogonal channels were unoccupied. For a fully loaded transponder situation, with two 34 Mbps signals and one 2 Mbps signal in each transponder, failure would occur at around 60 dBw EIRP. Nevertheless this represents a very respectable power margin of 10 dB.

Brian Flowers is head of service and project manager for the European Broadcasting Union's new Eurovision Control Center in Geneva. He studied engineering at the University of Southampton and served for two years in the Royal Air Force before joining the BBC. In 1962, he was assigned to the EBU's control center in Brussels and has since worked at numerous levels of responsibility for the center. He is a member of the Royal Television Society.

After five years of painstaking effort, the EBU in conjunction with ITU, ETSI and

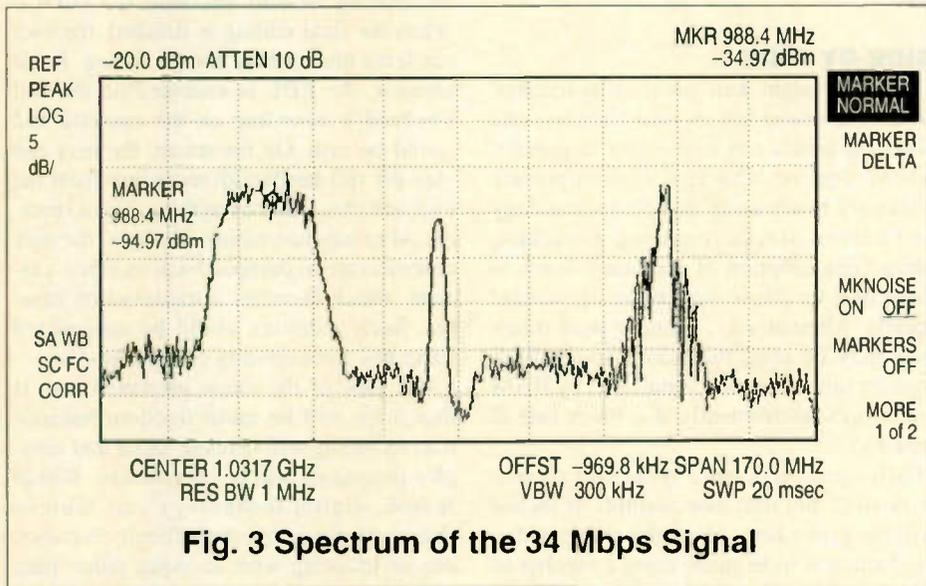


Fig. 3 Spectrum of the 34 Mbps Signal

airliners, ready to pounce if they decide to land nearby.

During the past two weeks, I have been testing ETSI 34 Mbps codecs via the EBU leased satellite channels of Eutelsat II - F4. Figure 3 shows the resulting spectrum of the 34 Mbps signal. A 2 Mbps Euroradio signal and an analog television signal are also present, going from left to right on the display.

Notice the nearly rectangular shape of the digital spectrums compared to the triang-

Having obtained virtually perfect transmission quality of the 34 Mbps signal at the correct nominal power, we then reduced the transmit power until the picture deteriorated. At 54 dBw the picture was still perfect, and at 53 dBw it became unusable.

This sudden deterioration at threshold is typical of compressed digital transmission systems. There is very little redundancy in the bit-stream of a compressed signal, so once the bit error ratio increases to the

CONTINUED FROM PAGE 5

What is Broadcast Quality Anyway?

interact with video equipment, including cost/performance tradeoffs.

Individuals who do not learn these lessons risk becoming like any of dozens of different companies that have sprung up and disappeared over the years. These companies typically have been peopled by very talented graphics designers and computer graphics specialists who delighted in generating marvelous images, using workstations and 4,000-line super-high-resolution, non-interlaced monitors. These same people would turn up their noses at component video's admittedly poor image quality. But those companies learned too late that composite video is where the market is, and not enough people wanted their lovely pictures. So they disappeared.

KNOW IT ALL

In summary, it is becoming increasingly clear that for someone to produce "modern broadcast quality" video, all one has to do is:

- a. know everything there is to know about computer hardware and software and be able to program a variety of computers in many computer languages;
- b. know all there is to know about

video hardware, including many years of actual hands-on experience producing broadcast TV.

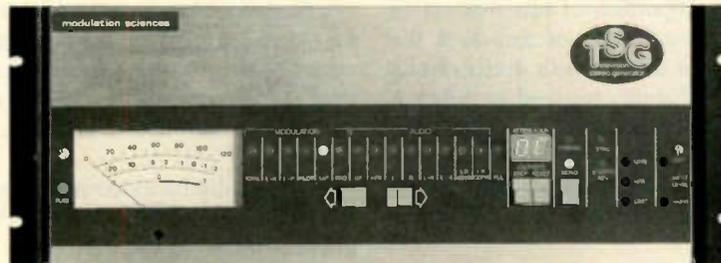
c. learn how to integrate computers and TV in the most cost-effective way.

Since there are obviously few people with all these characteristics (we would love to help, but we are rather busy right now), some kind of team approach is indicated. Computer and TV people must join forces. Each must learn as much as possible about the other's discipline. Both must learn to compromise. With this cooperation, silly, costly and unnecessary mistakes can be avoided. And you will successfully produce "modern broadcast quality" television. ■

Harvey and Robert Dubner have been involved with digital electronic graphics for TV from its inception. Dubner Computer Systems developed and won an Emmy for the first real-time animation system suitable for broadcast and post production.

Their new company, Dubner International, sells the Scene Stealer, which they describe as "a unique device for taking the drudgery out of videotape logging." For information, circle Reader Service 41.

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A Peek Into the Digital Future

We Need To Break the Bonds of Analog Thinking And Concentrate on Using Digital Appropriately

by John Watkinson

VIDEO WATCH

Advancing technology has transformed video recording into something completely unrecognizable in the short time since the introduction of the digital D-1 format.

While analog recording fought a valiant rearguard action, the future of video recording is now, to all intents and purposes, digital. If anything, the pace of technology is accelerating, making it harder to anticipate developments. In this look at what the future might bring, I will rely on existing basics to establish what products might be in store.

One of the strengths of digital video is that once it is converted from analog signals, video becomes data that is indistinguishable from other types of data; it simply becomes a quantity of ones and zeros. The quality in data is its reliability; a measure of the proportion of bits that are in error. Even if all types of data look the same, we can draw some distinctions between the reliability required by different applications. Computer data are quite intolerant of error, whereas digital video is remarkably tolerant. Audio comes somewhere in between.

OPEN FIELD

At the time of this writing, no single digital recording technology has dominated the others, leading to the conclusion that no single one is best in all circumstances. Digital recording only requires some parameter to be maintained in one of two states and takes place on a wide variety of media. These include random access memory (RAM), magnetic disk drives, optical discs and tape. In computerland, media have primarily been compared on three factors: access time, cost per bit and transfer rate. Subsidiary considerations include exchangeability, reliability and reaction to power loss.

RAM has extremely rapid access time because it has no moving parts, except for electrical charge. Magnetic disks come next because the entire recording area is exposed to a two-dimensional access mechanism (rotation and radial access). Optical discs have the same access principle, but the pickup is heavier and slower. Tape comes last in this race because it has to be shuttled to expose the desired area to the pickup.

However, if we contrast the cost per bit, we see an entirely different picture. Here, magnetic tape is supreme because it is such a simple medium to manufacture. Rotary head tape is the leader in this field because it currently offers higher recording density than stationary heads. Magnetic disk drives need an air film between the disk surface

and the head to eliminate wear so they can stay on-line for years at a time. This causes a spacing loss and limits the recording density. Also, the precision metal disk substrate costs more to make than plastic film. These factors increase the cost per bit. Optical discs are also expensive to make because of the complex construction. Most expensive is RAM, which is extremely intricate, with every bit having its own wiring inside a chip.

So there you have it. The best medium on one scale is the worst on the other. Thus, there is no overall best storage technology, and this will continue to be true in the future because improvements will occur to all media in parallel until physical limits are reached.

MORE STORAGE

In the past, the sheer data rate of digital video was a problem, and we were grateful to be able to record it at all. In the future, the inevitable increase in density offered by all media will mean that the actual recording step becomes easy and we will compare equipment using other criteria. One of these will be the transfer rate.

We have become accustomed to the limitations of analog production equipment, where real-time operation was the norm. In analog video production, all dubbing was done at normal speed, so that it could be monitored. With read after write and error correction, digital media can transfer data reliably without human intervention; they can be designed to monitor themselves better than we can. There is no longer a constraint to use real-time transfer, and when time costs money, the best recorder may be the one that dubs fastest, as it is in computerland.

Although digital video is commonplace, the number of products that can dub raster than real time is extremely small; this is a lesson the video industry and its manufacturers have, to a great degree, not learned. The computer industry already knows this lesson and may make stunning video products in the future before today's video equipment manufacturers have discarded the analog tradition. In addition to media that can operate at high speed, there will also be a need for an interface standard for high-speed transfer between units.

Another consequence of increase storage capacity is that compression will no longer appear so attractive for recording. It may be just a phase we are going through. One justification for data reduction is that it helps in faster-than-real-time transfer. If, for the sake of argument, 4:1 compression is used, the data rate is 1/4 the original. If the original data rate is maintained, the material can be transferred at four times real-time.

The relative merits of different storage media will not change greatly in the future, so current computerland solutions will still be applicable. For a long time, computers have combined storage media in real applications to extract the best of each. Figure 1 shows how this approach can be applied to solve video production problems. The computer processor is replaced or supplanted by a digital signal processing (DSP) device (essentially, a computer optimized for signal processing rather than general calculation), but the usual computer arrangement of RAM, disk and tape is retained. The

communications ports are replaced by digital video and audio interfaces. The disk drive here would use Winchester technology because it does not need to be removable as there is a tape cassette for that purpose.

SIDE-BY-SIDE

The disk might well use parallel transfer, where each head has its own circuitry, and all components can move data in parallel where required. The tape deck might use stationary heads using thin film technology and narrow tracks requiring a tracking servo. The adoption of stationary heads is designed to allow operation at several speeds. Alternatively, a rotary head transport may be used that has a single high transfer rate but which is buffered by RAM and works intermittently if a lower rate is required.

Such a general purpose system is extremely flexible, but only one example of its use will be given here. Consider that a video production is to be made using a number of sketches where several takes will be made of each one. Subsequently, the best sections of each take are combined in a final edited program. During each take, audio and video from the input converters is recorded in full bandwidth on the tape cassette in the second of two partitions. At the same time, the

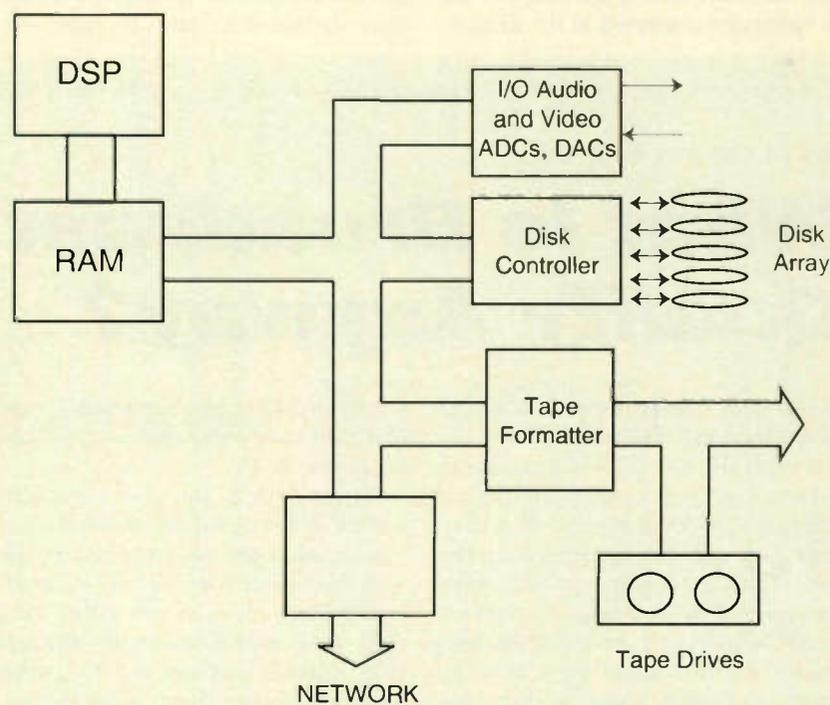
ports multiple access and the user can see and hear the beginning of the recording before the end is transferred.

Editing is now performed using the compressed disk files, but only for the purpose of creating an edit decision list (EDL). When the final editing is finished, the user can leave the machine and go fishing. In his absence, the EDL is executed on the full bandwidth recording on the cassette and stored on disk. On his return, the user can play the full bandwidth recording from the disk and check that everything is as expected. After any last-minute changes, the disk contents can be dumped back to a new cassette, which becomes a transmission master. Such a device could be assembled tomorrow from existing components.

The view of the future presented here is that there will be more freedom because data recording will become easier and complex processing will be inexpensive. Within reason, digital technology can achieve almost anything, and the difficulty becomes one of knowing what to make rather than how to make it. This is a double-edged sword because manufacturers are unlikely to risk a radical product if the market is too conservative to understand its benefits.

There is still a lot of thinking constrained by the limits that were due to analog technology, limits that no longer exist. Unless

Figure 1 - Video Production Using Computer Architecture



video and audio are compressed in the DSP and recorded on the hard disk.

At the end of each take, the data-reduced file from the disk is transferred to the first tape partition along with a complete record of the control panel setup. At the end of the recording session, the tape contains a full bandwidth version of everything, but at the beginning of the tape is a browsing file that contains a compressed version. The tape can be taken away and edited in a different machine or brought back to this machine.

Upon installing the cassette, the data-reduced file is transferred to the disk and the console setup is reloaded. If 4:1 compression is used and the tape plays at 10 times normal speed, this transfer occurs at 40 times normal speed. However, this process need not be completed before editing begins because the disk controller sup-

such thinking is liberated, then users are unlikely to take advantage of the freedom of the digital domain and they will not demand innovative products from manufacturers. ■

John Watkinson is an independent consultant in digital audio, video and data technology and is the author of seven books on the subject, including the newly issued Introduction to Digital Video and The Digital Video Tape Recorder. He is a Fellow of the Audio Engineering Society and is listed in Who's Who in the World. He regularly presents papers at conventions of learned societies and has presented training courses for studios, broadcasters and facilities around the world. He is currently writing a book on audio and video compression.

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Controlling Exposure to RF

by Doug Lung

RF TECHNOLOGY

Last year, there was a lot of publicity in the United States about people claiming that brain tumors or cancers were caused or exacerbated by RF energy from handheld cellular phones and two way radios. Obtaining zoning approval for new cellular or communications towers has become difficult because of the RF radiation issue.

While TV broadcasters' towers tend to have less problems with radiation because they are usually located outside major population areas, it has become a problem in cities like Seattle, Honolulu and even on mountains in Colorado.

Concern about these RF hazards led to a discussion about thermal versus non-thermal radiation effects. As a ham radio operator, I have read the warnings about looking into microwave dishes and yagi antennas radiating at UHF and microwave frequencies. The warnings mentioned that the eyes could be damaged by internal heating caused by the RF radiation.

Like many people who work with RF, I

believed that RF heating was the main danger and that the current ANSI radiation limits were based on thermal effects. After all, the limit is based on energy absorbed, specified in milliwatts per square centimeter, and energy absorption, whether at infrared or microwave, will cause an increase in temperature.

Jules Cohen was one of a four-member committee that drafted the standard. He said the standard was not based on thermal effects but on biological effects caused by exposure to radiation at specific absorption rates (SAR), which might be damaging over a long period of time.

The first harmful biological effect noticed in the test animals as the SAR was increased was related to behavior, specifically failure to perform a trained task. This effect was noticed at a rate of 4 watts per kilogram, then dropped to 0.4 watts per kilogram for safety. This is not to say there weren't other effects of RF exposure. When I asked Jules Cohen about eye damage from RF exposure, he mentioned that years ago RF diathermy was used to heat the eyes to such an extent that the skin surrounding the eyes was darkened, without immediate, obvious harmful effect on vision.

MAKING SENSE

What does this mean? First, thermal effects from RF exposure may not be significant, compared to other effects. Second, the other effects are likely to affect behavior, which, as we know, can be difficult to measure in humans. Finally, the amount of RF exposure required to cause a harmful effect in animals was high — 4 watts per kilogram. Of course, whether lower amounts of RF energy might cause even

subtler changes is difficult to determine from animal studies.

So where does this leave us? It is difficult, if not impossible to prove a negative. We cannot prove that RF at a low level does not cause some harmful effect, just as we cannot show that low levels of common toxins in peanut butter or city tap water do not cause some harmful effect. The best advice is to keep the danger in perspective and avoid unnecessary risks.

▽▽▽

Not too long ago, I finally had a chance to take a look at ITS's new Model ITS-830 1 Kw solid state LPTV transmitter. ITS low power transmitters are sold internationally by Harris Corporation (Reader Service 74.)

I was impressed with the construction of the transmitter after seeing it at NAB. The features vs. price ratio was among the best in the business. Adjusting the transmitter for differential gain, ICPM and intermod performance was not difficult. But like most transmitters using common amplification, adjusting linearity meant watching intermod, differential gain and low frequency linearity all at the same time. We were able to get the transmitter within four percent linearity with the in-band 3.58 MHz vs aural carrier peak intermod at 54 dB below peak carrier. We did notice some intermod riding on video peak white. ITS was still tweaking the design of the intermod corrector and company officials felt that this could be eliminated.

David Neff, ITS's broadcast systems product manager in the U.S. and one of the engineers that designed the unit, commented that the usual method of adjusting chroma/aural intermod using a high chroma red

field is not always the best. Because the luminance level of the red field does not change, adjusting with that signal often allows intermod levels to go much higher at other video levels. He recommended using a modulated ramp to adjust for best intermod performance.

RINGING SAWS

I also noticed some ringing on the 2T pulse and IT bar. This appeared to be coming from the SAW filter, which ITS offered to replace. I understand that both the intermod and SAW filter problems were corrected after my visit.

ITS includes a bandpass filter as part of the transmitter. Many LPTV stations are located at sites with two-way radio users. These users are concerned about new transmitters increasing the noise floor at the site. I have found that broadband solid state amplifiers, unlike cavity-tuned tube amplifiers, put out a measurable amount of out-of-channel noise, which can be a problem for translators working with weak signals. This noise is usually 80 to 90 dB or more below the carrier, so reducing it by another 30 dB or so with a bandpass filter usually puts it below most sites' existing noise levels. Unfortunately, most bandpass filters do not do a good job rejecting harmonics. ITS includes notch filters for harmonics, but I would recommend additional filtering if second or third harmonic falls near one of the receive frequencies at the site.

If your channel is near the upper part of the UHF band, I strongly recommend an additional filter to protect 2 GHz microwave receivers. I have had good luck with filters from Micro Communications, Inc., in New Hampshire, now part of the Pesa Group under the name Pesa-MCI (Reader Service 20). ITS has its own filter division, so they may also be able to provide the additional filtering.



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It does not take much time with the transmitter to see that it was designed by engineers who not only know how to design TV transmitters, but also understand what happens in the field after the transmitter is sold. Most of my experience with solid state LPTV transmitters has been with Acrodyne units (**Reader Service 30**), so that is my point of reference.

I was concerned that the two final amplifier modules ITS used were too heavy for one person to lift. Several times I have had to remove and install Acrodyne's final amplifier modules by myself for repairs or return. A close look at the ITS amplifier showed me it was possible to remove individual amplifier subassemblies from the amplifier chassis with a little unsoldering. Each subassembly with heat transfer plate was small enough to ship easily.

CURRENT METERS

Enough metering was provided on the front of each amplifier chassis to verify it was working, but I would like to have seen a way to monitor individual amplifier currents without sliding out the amplifier assembly. The way the transmitter is designed, the amplifier must first be disconnected from the combiner before it can be pulled out, then it has to be reconnected with a jumper cable, which, of course, upsets the phase balance between amplifiers. This is not a problem because each final amplifier has an isolator and load its output, but it would be nice to take readings from the front for logging without shutting down the amplifier. Acrodyne now includes that feature on its new 600 watt amplifier drawer.

ITS's exciter layout is easily accessible. Instead of one huge board, like Acrodyne's economy exciter, the ITS unit has functions logically divided between individual boards. Each board has test points for

checking the RF or video signal (as appropriate), and each board can be easily removed from the chassis. ITS supplies the cables needed to get its pin type connectors to a standard BNC connector. Most adjustments are clearly labeled.

The local oscillator (LO) is a non-synthesized type, and is mounted in an oven. This results in a very phase stable oscillator. Acrodyne shifted to a synthesized local oscillator in their economy exciter because of the long lead time (three months or more) involved in obtaining aged crystals.

**I have found the Acrodyne
synthesized LOs to be more stable in frequency
than most broadcast Part 73 exciters.**

Unfortunately, with the synthesizer comes increased phase noise and sensitivity to vibration. ITS gets around the lead time issue by keeping a crystal in stock for each channel and offset. I have found the Acrodyne synthesized LOs to be more stable in frequency than most broadcast Part 73 exciters, in spite of the poor phase stability. The non-synthesized oscillators may not be as frequency stable because the crystal is operating at significantly higher frequency. It is also thinner and hence more susceptible to aging.

STACKING UP

So how does the ITS-830 measure up to the competition? I like the construction, the remote control interface and the attention to detail. I like the exciter. The only major disadvantage I see to this unit is that the final amplifier is a bit under-powered. According to ITS, it does not have the headroom to operate with more than 5 per-

cent aural carrier. ITS tells me that in spite of operating the transistors near the maximum power, the transistors have been very reliable — they knew of no field failures. While the transistors currently being used are made by Motorola, they are testing transistors from other sources as well.

Acrodyne's new transmitter, using Acrodyne private labeled transistors, has lots of headroom, even with 10 percent aural power. My ideal transmitter would have Acrodyne's finals and ITS's exciter. As of now, I cannot find a strong reason to

recommend one transmitter over the other. I plan to order one of each for my next two LPTV sites. That will give me a chance to give both a real world test.

▽▽▽

Two months ago I asked transmitter engineers to send me life data on their high power UHF transmitter tubes. I was trying to get some handle on relative performance of klystrons, MSDC klystrons and klystrones.

Several stations reported getting from 30,000 to more than 40,000 hours from these tubes. One third-hand report said an EEV 3762 had accumulated 100,000 hours, but I could not substantiate that. External cavity MSDC klystrons seemed to be getting similar life, with the exception of one station that could not make the tubes last over 8,000 hours. I suspect a magnet assembly might be at fault here.

The big red integral cavity Varian klystrons (**Reader Service 53**) hold the

records for the longest life — I received several reports of tubes lasting more than 70,000 hours in aural service. Some of these tubes have even approached that life in visual service, though the norm seems to be 30,000 to 40,000, same as the external cavity tubes.

OVER THE TOP

Meanwhile, I've heard several reports of EEV IOT input cavities arcing over. The problem turns out to be in the material used to insulate the input cavity from the high voltage on the tube. The material worked fine as long as the temperature stayed low enough. As temperature increased, defects in the material caused it to break down. This problem was not noticed earlier because most well-designed transmitter sites have enough air conditioning to keep the temperature from reaching the critical point. EEV should have a fix for the problem by the time you read this. (**Reader Service 62.**)

I received one second hand report of EEV IOT life from San Francisco. The tube was removed from service while still functioning after 20,000 hours because its grid current was starting to increase.

Joe Wozniak and Dr. Tim Hulick of Acrodyne gave me some information on the performance of the Thomson tetrodes in their 25 KW and 30 KW transmitters. According to Acrodyne, most of these tubes are lasting 20,000 hours, even at 30 Kw output.

As always, your comments and contributions are welcome. E-mail them to me via the Internet to dlung@gate.net or via Compuserve to 70255,460 or fax them to me at +1-305-884-9661. ■

Doug Lung is vice president and director of engineering for the Telemundo Group of stations.



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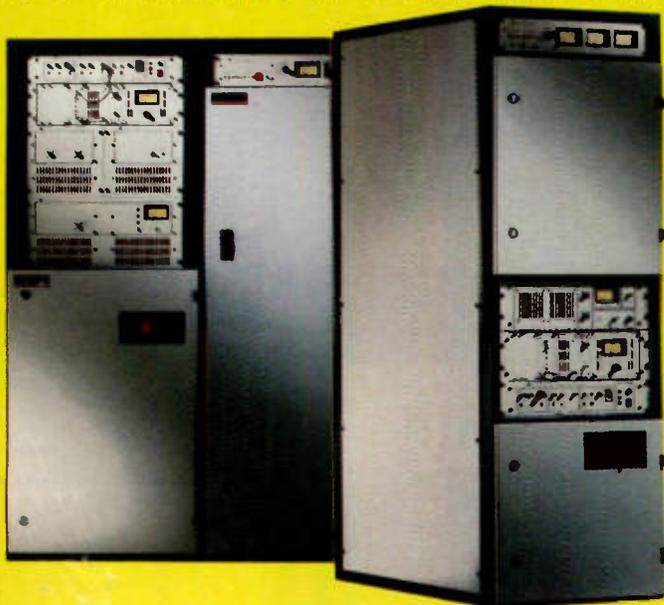
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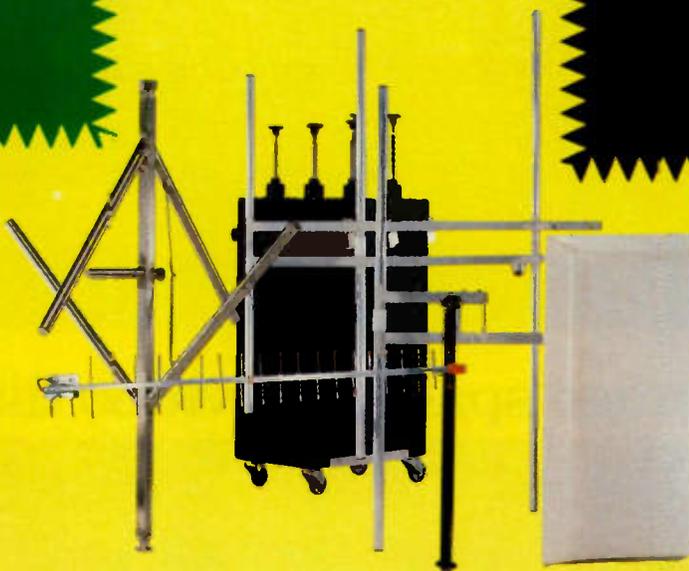
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3-CCD CAMERA

JVC has developed the KY-27UPCH 2/3-inch, 3-CCD camera designed for use with Hi8 and Betacam Pro VTRs.

The camera can shoot in light as low as 1.5 lux with 100 percent video level. The 2/3-inch IT CCDs feature micro lens technology for a sensitivity of f/9 at 2,000 lux, a 62 dB signal-to-noise ratio and 750 lines of resolution.

Other features include automatic level control and full-time auto white balance.

For further information, contact JVC in Japan at +813-426-60-7560; FAX: +813-426-60-7569, or circle Reader Service 78.

SATELLITE RECEIVER

Standard Communications has introduced the Continental MT620 multistandard satellite receiver, a cost-effective alterna-



tive to the company's Intercontinental receiver.

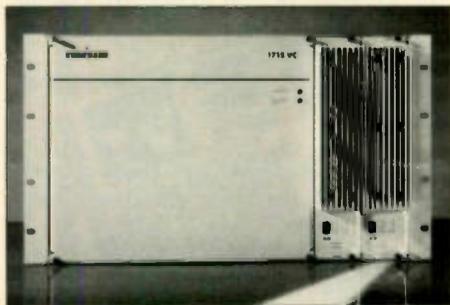
The unit is compatible with all recognized 950-1450 and 950-1750 MHz LNBs, as well as wideband 950-2050 operations. Also featured is an AFC tracking circuit that continuously corrects for LNB drift and is directly linked to the 100 MHz accurate PLL.

For further information, contact the company at +1-310-532-5300; FAX: +1-310-532-0397, or circle Reader Service 17.

TRANSMISSION SYSTEM

Alcatel STR has introduced the 1715 VC CATV transmission system designed to add new services to cable delivery systems.

When combined with STM-16 or OC-48



equipment, the 1715 provides up to 32 video signals and 32 stereo audio signals over a single mode fiber. The system fea-

tures a 155 Mbps interface, which puts it in compliance with SDH/SONET standards.

The system can also be configured to provide 16.2 Mbps data streams, 16 AES/EBU digital audio signals or 32 NICAM and 32 audio signals.

For further information, contact Alcatel at +411-465-2426; FAX: +411-465-3440, or circle Reader Service 99.

EQUALIZING AMP

Pro-Bel has introduced the 6830 analog video equalizing distribution amplifier featuring four outputs with six different bode equalizers.

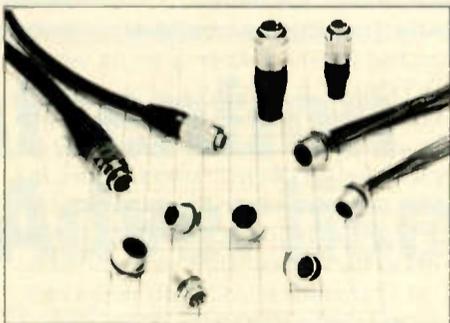
The device has three control options ranging from card-edge adjustment to full remote control using the 2316 serial interface card. Up to 10 6830 units can be controlled by a single card.

For further information, contact the company at +44-734-866-123; FAX: +44-734-755-787, or circle Reader Service 86.

CONTACT CONNECTORS

Hirose Electric offers the HR25 series of subminiature, round, multicontact connectors designed for high density applications, such as CCD cameras, measuring instruments, sensors and mobile radio interfaces.

The unit is available with between four



and 20 contacts with outside diameters of 10.5 mm to 12.5 mm. Each connector is equipped with a rubber gasket at the engaging and panel mounting sections to prevent water penetration.

For further information, contact the company in the U.S. at +1-805-522-7958; FAX: +1-805-522-3217, or circle Reader Service 28.

RECORDING CONSOLE

Otari has developed the PicMix recording console for surround sound mixing, panning and monitoring.

The system offers 32 inputs supporting all current surround sound formats, including

Dolby Stereo, Dolby Digital (SD-R), DTS Digital and Sony SDDS Digital.

For further information, contact Otari in Germany at +49-2159-1778; FAX: +49-2159-508-613, or circle Reader Service 127.

MONITOR/RECEIVER

The RF Utopia transmitter monitor-receiver from Broadcast Technology offers a complete monitoring system with alarm outputs and optional RS-485 serial and parallel interfaces.

The system monitors vision, audio and NICAM carriers, and alarms can be set for RF carriers, sync and video amplitude, modulation depth, NICAM errors and pilot tone.



Alarm outputs are both emitter follower and closing contact relay types.

For further information, contact the company at +44-1264-332-633; FAX: +44-1264-334-509, or circle Reader Service 121.

I/O BOARD

ImMIX has begun shipping a new component I/O board for its VideoCube desktop post production system.

The board provides direct input and output connectors for analog component (R-Y, B-Y, Y) signals, as well as S-Video (Y/C) and analog composite connectors.

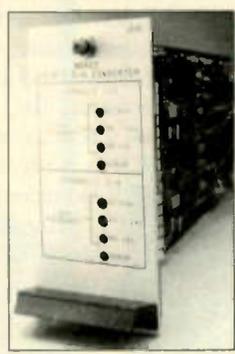
The unit is available as an option to new VideoCube systems, or as a field upgrade for existing systems.

For further information, contact ImMIX at +1-916-272-9800; FAX: +1-916-272-9801, or circle Reader Service 135.

AUDIO D/A

Grass Valley Group manufactures the M9422, a 20-bit digital-to-analog converter for AES/EBU digital audio.

The unit features better than 110 dB signal-to-noise and is available with 2 digital inputs and



four analog outputs.

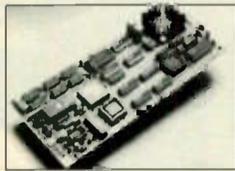
Users can match the M9422 with Grass's MAX-900 and MAX-9000 products in the same 3 RU frame. It is available with XLR or BNC I/Os.

For further information, contact Grass Valley at +1-916-478-3000; FAX: +1-916-478-3187, or circle Reader Service 117.

DIGITAL SERVO

The Meta-Speed digital servo from Options International Inc. is a microprocessor-based device that increases film transfer speeds for telecine operations.

The unit operates at 0 to +96 frames per second and includes an internal quartz timebase reference for high stability.



Installed with a simple PC-board swap, Meta-Speed requires no motherboard modifications, other than to add Speed Bus on MKIIIBs.

For further information, contact the company at +1-615-327-8090; FAX: +1-615-327-1326, or circle Reader Service 14.

FADER AUTOMATION

Soundtracs has unveiled the Topaz fader and mute automation package for its Topaz 8-bus project console.

The PC-based system (soon to be available on the Mac) provides recording, replay and editing of VCA fader movement



to frame accuracy and mute information to quarter-frame accuracy.

For further information, contact the company at +44-81-399-3392; FAX: +44-81-399-6821, or circle Reader Service 89.

ROUTING SWITCHER

Australia's Practel has created the Series 5000 router capable of high bandwidths for HDTV and computer graphics operations.

The system is completely self-contained, requiring no external power supplies or central processing. With its low power consumption and low heat dissipation, cooling fans are not required for a noise-free control room.

Up to 16 modules can be configured for a 512 x 512 matrix, and the system is capable of controlling eight levels of breakaway.

For further information, contact the company at +618-266-3433; FAX: +618-266-1031, or circle Reader Service 44.

Send new product press releases along with black and white photographs to: Marketplace Editor, P.O. Box 1214, Falls Church, VA 22041 U.S.A.

USER REPORT

Students Value JVC BR-S822

by Shinsuke Onishi
Chief of Technical Production
Japan Journalist College

TOKYO

The aim of Japan Journalist College is to develop professional journalists from the beginner level. All told, there are about 1,500 students enrolled in our program.

The school was established in 1972 at Yotsuya, near Shinjuku in Tokyo. Our professional graduates are trained to enter the mass communication industry, and many

find work in the newspaper, magazine, television, radio, film and advertising industries.

GLOBAL VIEW

To become a smart journalist, one must understand the positioning of journalists in society, as well as the actual technique and practice to produce and transmit information in detail. Therefore, all our students are trained to take a global view by studying such issues as politics, economics, jurisprudence and management. We have a good reputation with students because they utilize

the types of systems found in professional media organizations here in Japan.

I am responsible for our Program for Media Journalists. This is a two-year course with 100 new students each year. We have first- and second-year courses, including documentary production, news gathering, video reporting, visual writing and a range of video production courses, such as animation and computer graphics. These courses are designed to familiarize students with the planning and production of business video software for publishing, education, advertising, event production and video artistry.

Our decision to use JVC videotape recorders goes back to the creation of our

produce mainly documentaries and other programs for the course requirements. We also appreciate the strong after-service follow-up from the JVC dealers. They are very responsive, even with small repairs.

Of course, we do have some requests we wish JVC to consider to improve the operability of the professional S-VHS editing systems, such as the 22 Series.

A more simplified menu system would be more convenient for our students. We suggest placing the more often-used functions on the front panel.

It would also be helpful to have an automatic S-VHS/VHS selection. Currently, it is necessary to tilt the front panel to select the mode. And it is then easy to forget which mode the machine is in.

With so many students using our facility, usage is very intense. We would like to see a more robust mechanism. Still, the ruggedness

of the machines is tremendous. The BR-8600 decks we purchased long ago are still in use today.

We would also like JVC to



The BR-S822 offers students a chance to learn professional news editing.

Broadcast Journalists

Program. In 1982, the JVC KY-1900 three-tube camera and the portable 3/4-inch U-Matic CR-4400 were used by broadcasters throughout the world, with extensive use here in Japan. In addition, the BR-8600 VTR was used as an off-line system in the broadcast and production industry.

These products were very reliable, rugged and accurate with acceptable picture quality and ease of operation. It was therefore decided that the training of our students would rely on JVC systems.

In 1986, a broadcast professional studio and editing room was installed at the college, including a BR-8600 machine. By 1992, after a careful and exhaustive evaluation of many systems, a BR-S822 S-VHS master edit recorder was installed to improve the practical technical level of our facility.

BIG AND SMALL

We use the small-size S-VHS-C cassettes, as well as full-size cassettes, for acquisition, so the 22 Series' C/full-size dual compatibility with no need for adapters proved very useful.

We now have six BR-S822 master recorders in three edit suites using the JVC RM-G860 edit controller. We also have one BR-S525 variable tracking player for slow or fast motion, stills and variable time effects. And we also make use of other JVC products, such as switchers and monitors.

For practice, we often use JVC's consumer GR-S505 camcorder, so the superior tracking and timebase correction capability of the S525 is of key importance.

We often use C-cassettes for acquisition. The 20-minute record time is short, but it gives us fast access and makes it easy to edit subjects with large amounts of material.

When we use the full-size cassette, the 22 Series has the ability to visibly search at 32-times normal speed, which also makes it easy to cue. Even when we use the machine in its control track editing mode without engaging timecode, the accuracy is not bad.

The BR-S525 variable tracking player makes real slow-motion playback possible because of the VT heads that track the tape patterns perfectly. We use these functions to

widen the peripheral product line to include such accessories as a 3-D effects generator and an audio mixer in one unit.

With professional video production systems moving toward computer-based non-linear editing, and as the era of tape appears to be in decline, we would like to ask JVC to develop products that incorporate state-of-the-art technology. We are looking forward to seeing JVC's future product lines. ■

Editor's note: Shinsuke Onishi joined Japan Journalist College in 1985 after spending many years in the professional broadcast industry.

The opinions expressed above are the author's alone. For further information, contact JVC in Japan (Telephone: +81-426-60-7569; FAX: +81-426-60-7560), or circle Reader Service 45.

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BUYERS BRIEFS

Optical Disc Corp. has available the DVD-7100 videodisc recorder, capable of storing four hours of CCIR-601 video.

The unit uses single-sided 12-inch discs.

Applications include satellite uplinking, video-on-demand, mass storage server systems and commercial displays.

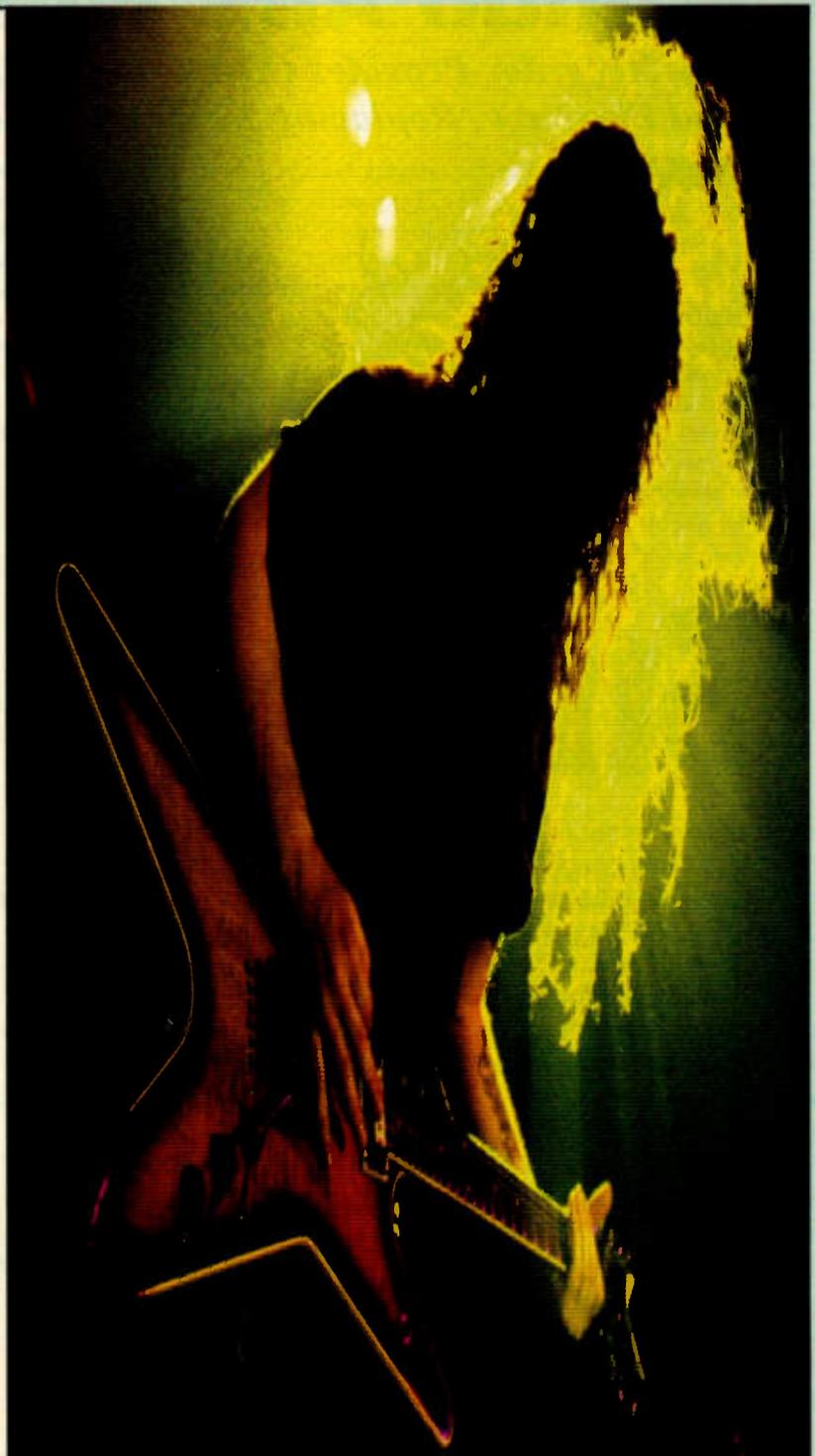
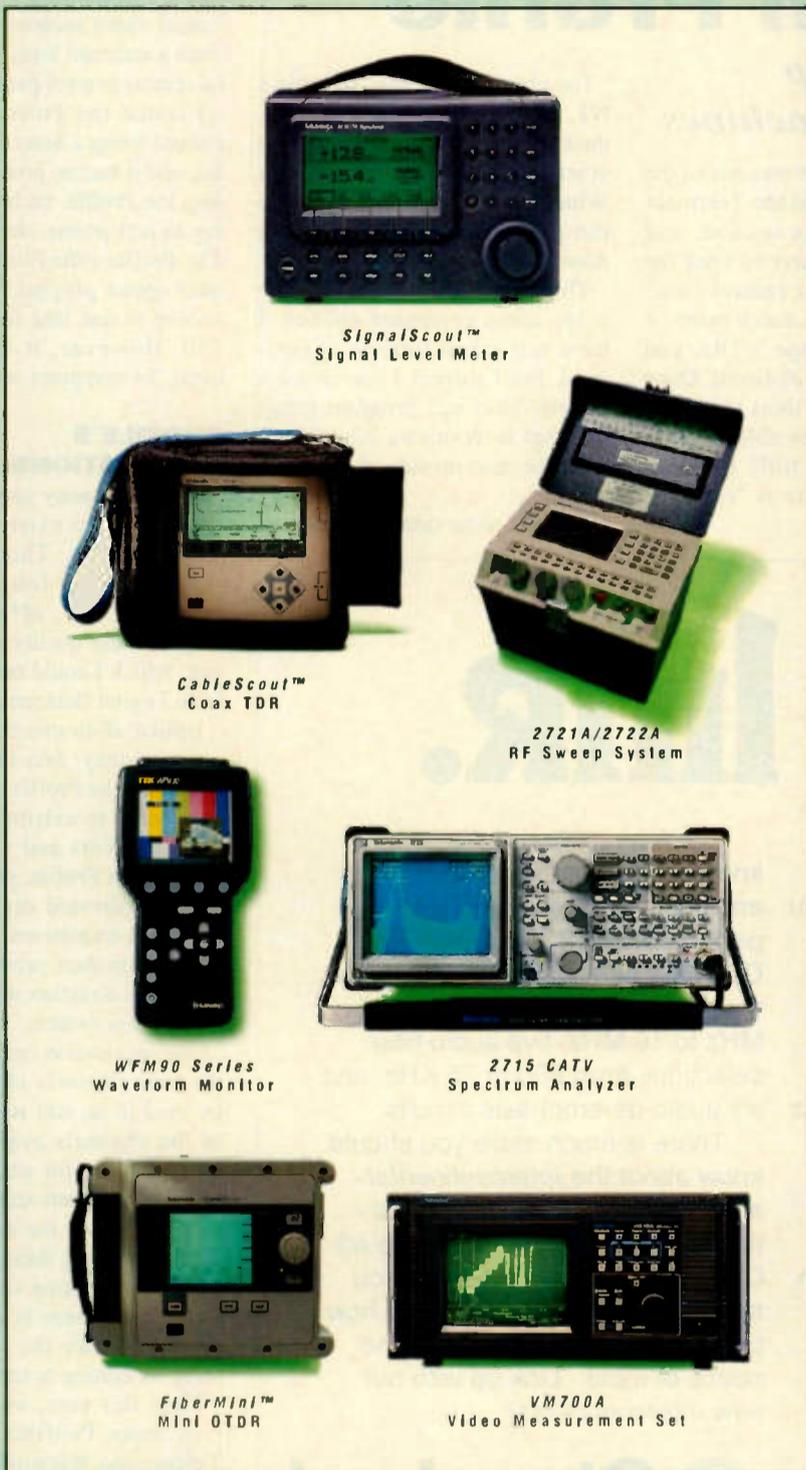
For further information, circle **Reader Service 18**.

Hewlett-Packard has introduced a 4:2:2 video disk recorder capable of three, six or 12 minutes of on-line recording.

The unit does not use compression. Potential applications include telecine work and computer-generated productions with real-time 3-2 pulldown.

8-bit and 10-bit configurations are available, and the system can be tailored to 525-line or 625-line operation.

For further information, circle **Reader Service 11**.



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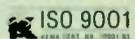
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U S E R R E P O R T

Telemundo Airs with Profile

Tektronix Disk Recorder Provides On-Air Back-Up Recording and Playback, Replacing Four VTR Machines

by Doug Lung
Vice President
Telemundo Group

MIAMI
I am fortunate enough to be at one of the first sites to receive Tektronix's professional disk recorder. It went on the air Nov. 30, 1994, playing promotional announcements for our new TeleNoticias 24-hour worldwide Spanish language news service.

After the network launched on Dec. 1, the Tektronix Profile began providing on-air back-up recording and playback. After some additional testing, we also plan to use it as playback of short bumper material.

How well does it work? We received the unit Nov. 28, had it operational Nov. 29 and on the air Nov. 30. It has been difficult to do any extended testing because people cannot resist playing with it.

The user interface was one of the reasons we selected the Tektronix Profile. The layout is clean, and we do not even have to read the manual with most control functions. The controls match many of those found on tape VTRs, and they are not at all cluttered. Once the unit is set up, most videotape operators should be able to operate the unit with little training. The key phrase here is "once the unit is set up."

The system runs under Windows NT, and in our preliminary production run unit, we still have to start up the program under Windows NT. Then, we exit it in the proper fashion by shutting down each of the applications.

This is not difficult, but it may scare some computer-phobes. I have not taken time to experiment, but I suspect I can create a simple "start up" program group like that in Windows 3.1 to automate the start up side of the operation.

However, some videotape operators

will not be happy with a computer interface. So, Tektronix offers eight RS-422 ports on the Profile. These can be used to operate the virtual video recorders in the box from a standard Sony protocol serial remote control panel.

I tested the Profile's RS-422 control using a Sony RM-450 editor, and it had no problem controlling the Profile, including searching to edit points, shuttle and jog. The Profile offers full range variable speed playback, but I was unable to test that from the RM-450. However, it worked fine using the computer screen control.

PROFILE'S APPLICATIONS

There are many applications for the Profile in existing edit and control rooms. The Profile can replace up to four videotape machines. It offers instant response and quality at its highest rate, which I could not distinguish from Digital Betacam.

Unlike all-in-one-box, all-from-one-company, non-linear editing solutions, the Profile can be easily connected to existing switching, digital effects and audio equipment. With Profile, producers can see complicated digital effects, keys and transitions in real time with a finished product quality. Technical directors do not have to learn a new system.

One application enables three of the four channels of a Profile to be used in an edit room with one of the channels available to the control room for playback. This setup will permit stories to go to air even before the edit room has finished editing them. I hope that does not happen often, but in every case there is no way you could duplicate the speed of this setup by editing to tape.

Early this year, we plan to put five more Profiles on line at Telemundo Network in Miami. One will be used for news story and bumper playback; the other four will be used in network master control. I have been discussing a system with Louth Automation that will permit two machines to provide a videodisk cache for all spots airing on the network. This will reduce wear on our Sony digital LMS BVC-400 LMS.

Because the Profile can handle four independent channels simultaneously, one three-hour Profile can provide not only a three-hour delayed West Coast feed, but Central and Mountain time zone feeds as well. If only it were as easy to get the extra satellite channels.

You may wonder why I am using two Profiles for the LMS disk cache, and two Profiles for the delayed feed. Redundancy is the reason. RAID (Redundant Array of Independent Disks) configurations promise complete protection from failure of one disk drive.

While disk drives arguably pose the greatest failure risk, what happens if the RAID controller for the drives

(continued on page 26)

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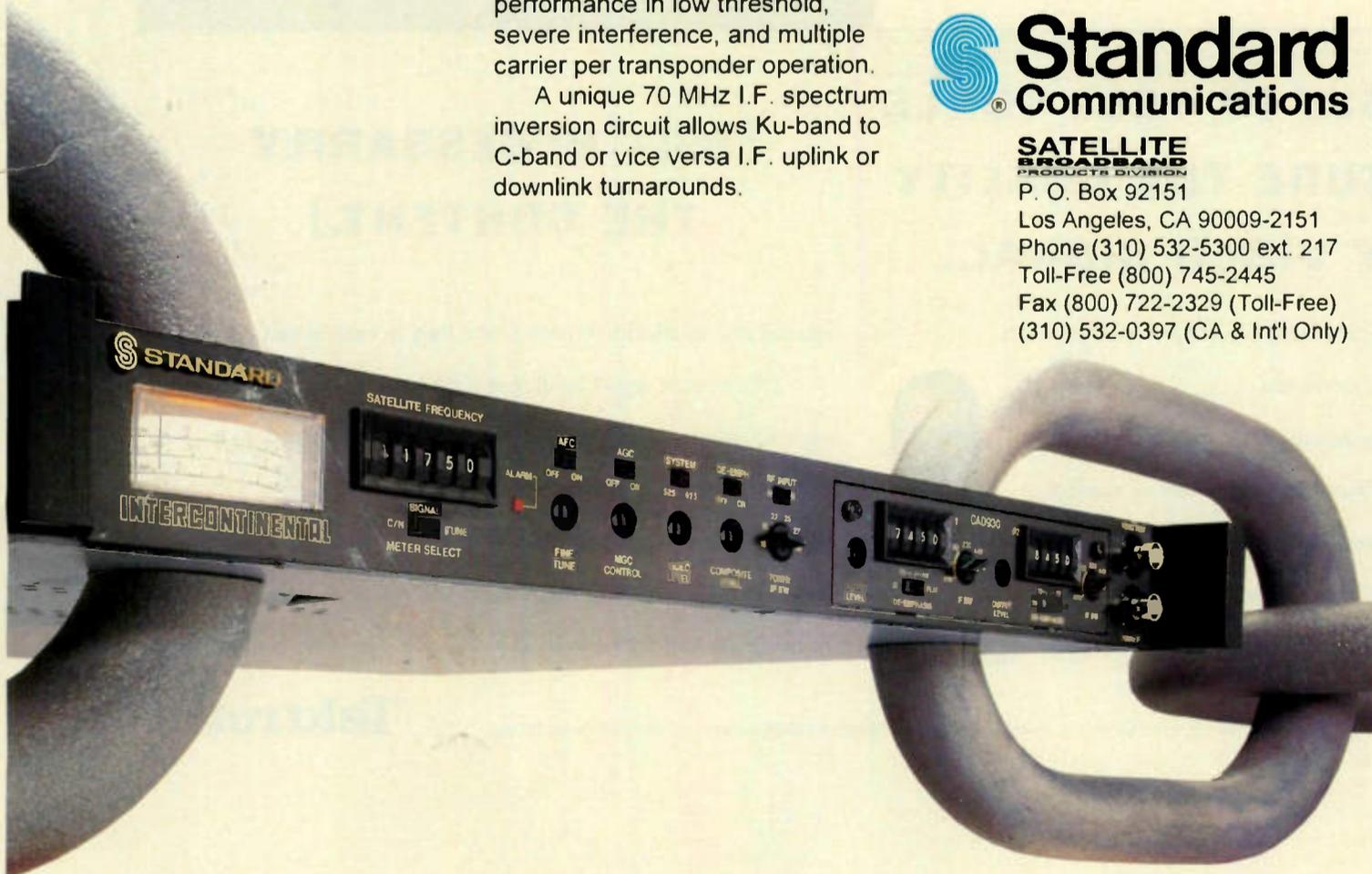
The *Intercontinental* is built for knowledgeable and discriminating engineers and offers proof of performance RS250C and CCIR567 certification. It features six I.F. bandpass filters, from 36 MHz to 16 MHz, five audio filter selections from 880 to 75 KHz, and six audio de-emphasis circuits.

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24 BUYERS GUIDE



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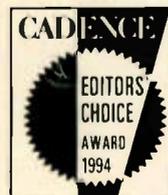


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CONTINUED FROM PAGE 24

Profile on the Air

fails, or if some other board dies in the unit? What happens if the software crashes? If you have worked with some of the cutting edge software for routing switchers and other video equipment, you know crashes often happen at the worst time.

I could not take this risk with a network signal. For reliability, nothing beats having two com-

pletely independent units. Tektronix pricing is low enough that the base price of two Profiles is not that different from the base price of a single RAID-based product.

The Profile uses the JPEG-2 compression chip. The JPEG compression algorithm compresses each frame independently of

the surrounding frames. This is important if you want to edit material precisely. With MPEG 2 hardware, it can only be edited if it is completely decompressed so that all frames are again independent.

A Tektronix engineer told me the company had spent a lot of time fine tuning its JPEG com-

pression algorithms to minimize artifacts. He illustrated the point by telling me a Digital Betacam compression-buster tape passed around at the Montreux exhibit did not crash the Profile.

Compression crashes are not the only reason to be careful when selecting a video disk recorder system. Ten years ago, one-inch machines were expected to last 10 years before they had to be replaced. Many have made it that long. Seven years ago Betacam and M-II machines were supposed to last seven years. Some have made it that long. How much is

the computer you bought three years ago worth today?

Tektronix has wisely chosen an open architecture and is actively encouraging other vendors to support the product. This means you will have a choice about the software that controls the unit. It also increases the chances that it will be written by a person or company that specializes in the application you are running.

INSTANT FEEDBACK

Tektronix is planning a plug-in 2 M/E switcher for the Profile. The Profile's built-in 32 x 32 serial digital router makes this possible. More important, the extra RS-422 ports (remember, the virtual video recorders do not use more than four of the eight ports available) will permit the use of an external switcher control panel.

It seems obvious to me that editors will prefer using a panel with instant tactile feedback and fader response instead of a computer screen and mouse.

The Profile is based on standard computer technology using an EISA computer bus with a separate video bus. The Intel i486/66 microprocessor system is located on a plug-in board, which will allow it to be upgraded if needed. The i486 is not fast enough to handle the video operations.

Tektronix used an Intel i960 RISC processor for this work. The JPEG compression hardware is on a plug-in board. Tektronix expects to offer a board with MPEG-2 compression when MPEG-2 chip sets become more available.

The Profile has an expansion bus that increases the number of disk drives beyond the eight internal spots.

It also will permit connection of magneto-optical disks (MO disks) once their speed and capacity is sufficient for video storage. This flexibility provides some protection against obsolescence of these key components.

At this year's NAB, there will be many more video disk recorder systems. I feel confident, based on Tektronix's reputation for broadcast productions, that the Profile will hold its own against the competition.

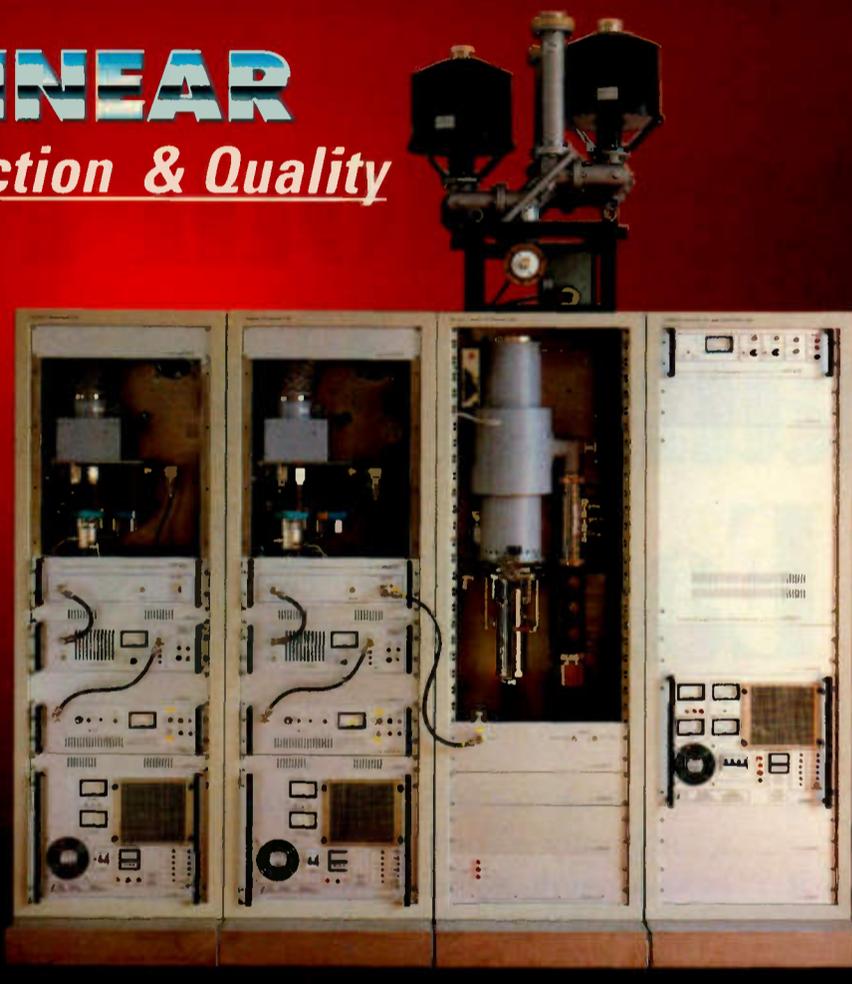
I do not expect the technology to hold up as long as the VPR-2 or BVH-2000 one-inch machines. However, if Tektronix is successful in gathering third party software and hardware support, I expect the Profile will last longer than my PC, perhaps much longer. ■

Editor's note: Doug Lung is vice president and director of engineering for the Telemundo Group of stations and writes a column entitled "RF Technology" for TV Technology.

The opinions expressed above are the author's alone. For further information, contact Tektronix in the U.S. (Telephone: +1-503-627-4697; FAX: +1-503-627-5801), or circle Reader Service 12.

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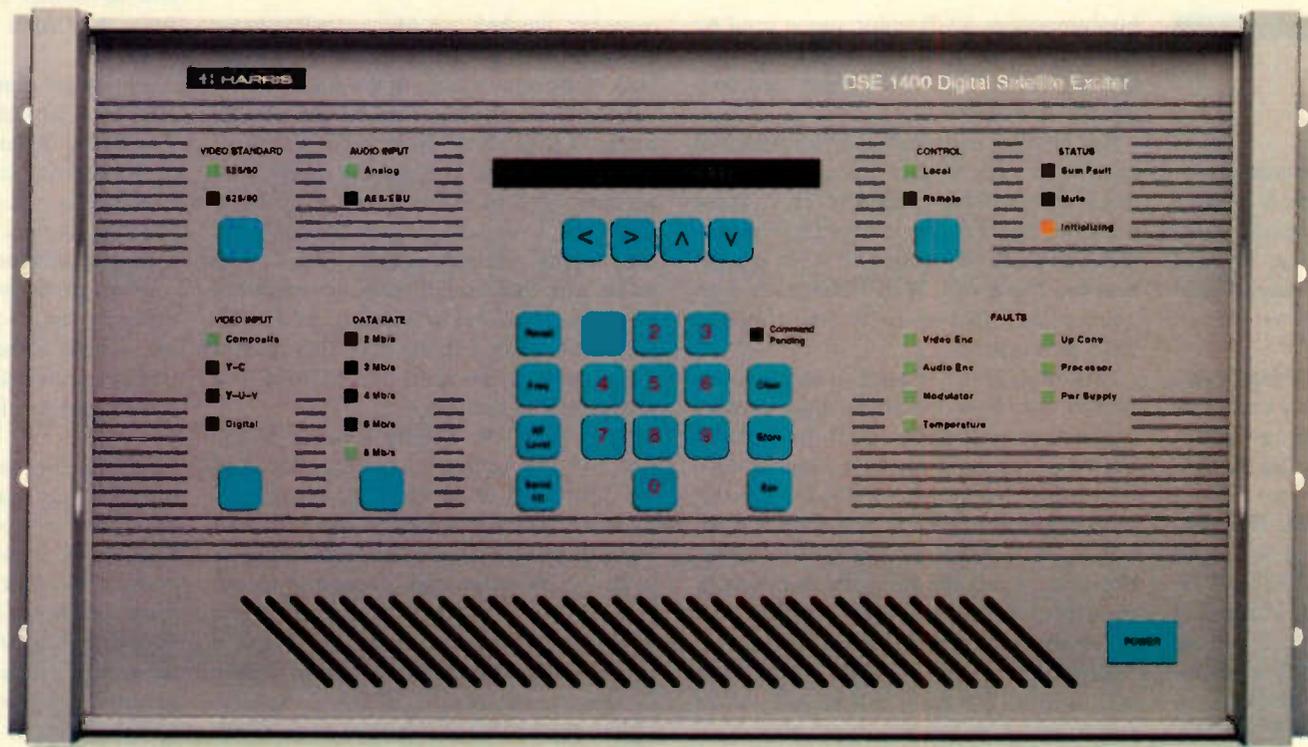
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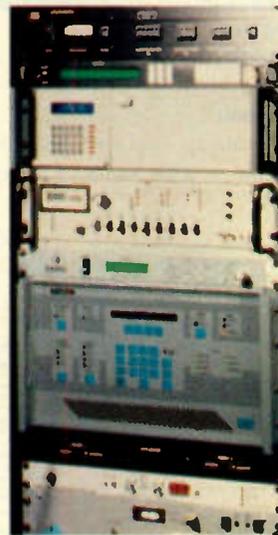
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USER REPORT

Abekas Puts Rhonda on Disk

by Loren Olson
Software Engineer
Rhonda Graphics Inc.

PHOENIX, Arizona

Rhonda Graphics creates computer-generated imagery for video and film. A primary concern for us is getting high quality video to and from our computers. Our favorite solution to this problem has been digital disk recorders from Abekas Video Systems.

Recently, Abekas introduced Diskus, a new disk recorder that improves nearly every category of performance for disk recorders. The Diskus integrates easily into our facility. In addition, it interfaces to our Silicon Graphics and Apple computers via Ethernet.

Diskus is equipped with serial D-1 input and output and simultaneous analog RGB and component Betacam output. The analog output is a great standard feature. If you are in a graphics suite, you can use it for monitoring. However, many people who will use Diskus may not have a digital edit suite or tape machine. An option board is available that provides component analog input and composite analog output.

A nice touch on Diskus is a 3.5-inch floppy drive that can be used for system updates and upgrades. To update the machine, you simply turn the Diskus off, throw a front panel switch, insert the system update floppy, and presto — the system software is updated.

Diskus can store 30 plus seconds of CCIR-601 digital video, which can be expanded to 60 plus seconds. Having more than 30 seconds of storage is important, as Rhonda Graphics does a large volume of commercial work.

A significant feature of the Diskus is that it stores images with 10 bits of data per component. Diskus is a CCIR-601 device, so the images are stored using YUV data, instead of the RGB data the computer world is used to. (Y is luminance information, U and V provide color information.)

This is important because the eight-

bit/component RGB color space used by paint systems is larger than the eight-bit/component YUV color space used by a digital video device.

This problem can result in artifacts such as banding in a subtle color gradient. The solution is to use 10-bit/component YUV. Those extra two bits may provide more information than you think. With eight bit, each component has 256 levels. With 10 bit, each component has 1,024 levels or four times as much information.

Although many digital video devices already use 10-bit data paths, most software applications only know about the eight-bit YUV data format. If you have a digital video board that does 10-bit YUV-to-eight-bit RGB conversion, such as SGI's Sirius video board, you can get the benefit of 10 bits. However, if you are using ethernet or SCSI transfers, current software may not take advantage of the new 10-bit data format.

Fortunately for the impatient, many products, such as Wavefront's Composer, allow you to add new features using plug-ins. I wrote a small plug-in for Composer that allows us to input or output 10-bit YUV images.

I anticipate software vendors will support the 10-bit data format in the near future. Diskus has all the nifty playback features of the previous generation of Abekas disk

recorders, the A65 and A66, including loops and segments. Loops allow repeated playback of the same section of the disk.

If there are multiple clips on the Diskus, segment lists allow them to be played in non-linear fashion. The user can specify nine segment lists, each consisting of up to 99 segments. A segment can individually be set for looping, variable speed and an event action when playback finishes. An event can be a pause specified in frames or a GPI trigger. When you put the disk in segment mode, the segments in the current list will be played back in succession.

Operation of the Diskus is similar to the A65 and A66. In fact, the machine has all of the capabilities of the older machines, with some new features as well. A big difference is the graphical user interface, which appears as an overlay on the analog output. A mouse is used to point and click through menu options and transport controls. This is a much more modern interface, which is easier for new users to learn.

Although the Diskus is built to sit on a desk or floor next to a computer, we chose to rack mount it in our machine room with the rest of our video gear. The result is the longest mouse cable that I've seen; more than 100 feet. The ethernet interface presents the Diskus as another computer on your network. Any machine can send or receive an

image at any time.

This is the easiest and most flexible way to use Diskus. The ethernet transfers are now faster than ever — only 1.25 seconds per frame. A 600-frame transfer to our old A60 took 50 minutes, 24 seconds. The same transfer to the Diskus takes only 12 minutes, 36 seconds.

For a single computer, even faster transfer rates are achieved with the Fast Wide SCSI-2 interface. Diskus also supports differential SCSI, allowing cable lengths up to 75 feet. Ethernet is our favored transfer method because Rhonda Graphics is a multi-user networked environment.

If you create graphics and animations for video, Diskus is a great tool for input and output. Greater capacity, faster operation, high quality, in a smaller, more affordable package — disk recorders have never been better. ■

Editor's note: Since 1988, Loren Olson has worked as an animator creating images for video, and as a software engineer creating proprietary software tools for the creative team at Rhonda Graphics. As a part of that team, Loren received a 1994 Rocky Mountain Emmy for the Phoenix Suns Arena animation. Loren received a bachelor's in computer science from Arizona State University, and is a member of the ACM and IEEE.

The opinions expressed above are the author's alone. For further information on the Diskus, contact Abekas in the U.S. (Telephone: +1-415-369-5111; FAX: +1-415-369-4777), or circle Reader Service 69.

USER REPORT

D-5 Rolls at U.K.'s Channel 4

by Peter Marshall
Engineer
Channel 4

LONDON

To many users of traditional analog machines, after years of being driven hair-

less by drop-out and head maintenance costs, the advent of the new digital formats must seem like a godsend.

And getting into component digital in a way which is compatible with the existing library is a very attractive route. If you have worries about 2:1 compression, you are told

by some companies that "it is good enough." This is a fair answer, but good enough for what?

CLEAR VIEW

At Channel 4 in London, we were not seduced by this argument. We had a very clear view about the value of our program library. Considering the cost of program production, we were not prepared to run any risk. Panasonic's D-5 format was clearly a modern-day replacement for D-1, giving 10-bit transparent recording for approximately half the capital and running costs.

The trouble with bit rate reduction is that you cannot easily predict where the problems will strike. EBU tests showed that equipment based on the discrete cosine transform (DCT) is wholly random in the ninth and 10th bits and that difficult scenes with fine detail, especially with movement, often only reproduce 5 or 6 bits with any accuracy. But more importantly, we realized we could not predict the performance of bit rate reduced pictures in downstream compression systems.

Indeed, our worst fears have to some extent been realized. We have had a number of occasions where pictures looked fine at the output of the station but have become suddenly and unexpectedly marred in our 34 Mbps distribution chain. In this case, investigation showed that the problems have been associated with the composite NTSC original standards converted to 625 lines, which is not a DCT problem.

This has frightened us and made us realize that serious artifacts can suddenly appear downstream. We are more than ever convinced

(continued on page 29)

28 BUYERS GUIDE

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INFORME DE USUARIO

Sony Realza Canales Argentinos

Betacam Digital de Sony Provee Lo Mejor de la Tecnología Futura

por Marcelo González
Gerente de Operaciones Técnicas
Corporación América Multimedia

BUENOS AIRES

Cablevisión (CV) es la primera empresa en Argentina que incorporó el sistema de televisión por cable. Un día frío de julio de 1981 se lanzó al mundo de la imagen electrónica, con su primera emisión de prueba. Sólo unos pocos pudieron disfrutar ese día de la película "El Barón Rojo". Si bien por aquel entonces se emitía una película al día, con la primavera comenzaron a regularse las emisiones a seis horas diarias.

Un año después de su nacimiento la zona de influencia de CV comprendía la Quinta Presidencial, la calle Roque Sáenz Peña de San Isidro y Avenida Libertador y Maipú.

En 1983, este canal se convirtió en el primero en dar servicio de cable en Capital Federal.

La tecnología actual para competir y colocarse como líder en la mente de la gente es ofrecer el más completo servicio y la mejor tecnología. Por ello es que CV y Canal 2 se han equipado este año con lo mejor de la era digital: el BetaCam Digital de Sony, un formato ya estandarizado en la industria televisiva.

Con dicho equipamiento esta gran empresa del cable obtuvo importantes beneficios técnicos y operativos ya que la BetaCam Digital ofrece al mercado la calidad de digital y la confiabilidad del BetaCam. Las máquinas de la serie DVW de Sony que adquirió Cablevisión permiten la edición múltiple y generación sin perder la calidad.

Además las VTRs tienen la capacidad de reproducir el material realizado en BetaCam SP. Esto evita la tediosa tarea de copiar el material en el formato de la reproductora. Su alta calidad de imagen permite explotar la capacidad de multige-

neración. De esta manera el usuario puede copiar y editar sin perder fidelidad, definición y calidad de la imagen. Según la opinión del departamento de ingeniería de Cablevisión y América TV, el equipamiento

cumplió con sus expectativas. Las VTRs BetaCam Digital Sony se usan en Cablevisión y en América TV para hacer noticias y en el caso de este último también para programación, puesta al aire y edición. Esto exige que el equipamiento que se utiliza asegure una alta calidad de imagen para la puesta en el aire, y además que sea confiable y consistente, pues en el mundo de televisión, un minuto después ya es tarde.

El personal de operación de la corporación ha recibido durante dos semanas cursos dictados por integrantes de Sony Broadcast Export Corp. (SOBEC), quien los capacitó en la operación para que ellos pudieran extraer todo el potencial del equipamiento digital.

tareas técnicas en CNEA, Comisión Nacional de Energía Atómica. Luego trabajó un año y medio en la NBC en Los Ángeles como jefe de técnica de efectos de video en el convenio con Industrial Light and Magic, luego integró las filas del Canal 13 de Buenos Aires, ARTEAR en el Area de Operaciones, siguiendo su trayectoria para por el Canal 9 de Buenos Aires, Telearte, y finalmente en el año 1992 pasa a integrar el equipo de Canal 2, el Canal de Aire de la Corporación América Multimedia.

Para más información acerca de Sony, comuníquese con Julio García o Dan Murphy al +1-305-448-7450; o marque el No. 84 del Reader Service.

También Cablevisión ha recibido el respaldo técnico y operativo del distribuidor local de Buenos Aires, Viditec, S.A.

Obviamente a la hora de invertir en equipamiento profesional es muy importante contar con este soporte. ■

Marcelo González se desempeña como gerente de operaciones Técnicas y sus antecedentes son: se desempeñó 10 años en

CONTINUED FROM PAGE 28

D-5 Rolls at Channel 4

that we should strive to avoid bit rate reduction systems in the preparation of the program master. There is just too much money tied up in the master to take any risks.

Tandem compression systems are likely to be a fact of life soon. The impact of digital acquisition, of hard disk-based on-line systems, and of MPEG 2 distribution will be felt in a matter of months rather than years; certainly within the sales life of many programs being made today.

RISK ASSESSMENT

So why risk it? Not, I would suggest, for the modest difference in capital cost. We do, of course, keep a close eye on the cost of ownership issues. Our view is that these have yet to be proven. Sure, a D-5 machine consumes tape at twice the rate of a DCT-based machine. If you want the cheapest solution, this may be important, but it is only one factor in the cost-of-ownership argument. At the end of the day, tape costs are a trivial part of the program budget.

In the U.K., Channel 4 is a national ser-

vice going to all regions of the British Isles. We have a single program stream, but commercial breaks are split into 6 geographic regions. Our commercial Panasonic MARC playout machines are earning the company the equivalent of around one million U.S. dollars per day. The operation is completely automated. We do have some ability to operate manually but really the 'machines' make a better job of it.

Our D-5's are great workhorses. We have 61 of them, and the station could not operate without them. Component digital quality is great and we look forward to the time when we can deliver digital quality all the way to the viewer in the home.

Editor's note: Peter Marshall has been with Channel 4 for a number of years.

The opinions expressed above are the author's alone. For further information, contact Panasonic in Europe (Telephone: +44-753-521-626; FAX: +44-753-510-705), in Japan (Telephone: +816-908-8173; FAX: +816-905-4048), or circle Reader Service 25.

...CV y Canal 2 se han equipado

**este año con lo mejor de la era digital:
el BetaCam Digital de Sony**

Ya ha pasado mucha agua bajo el puente. Hoy Cablevisión es el cuarto operador de cable del mundo (sin contar al padre de todo esto: los E.E.U.U.) y es el primero y más avanzado de Latinoamérica. Actualmente emite, entre todos sus canales, 1.300 horas diarias, recibe señales de siete satélites y su canal de programación se encuentra totalmente automatizado.

En este momento Cablevisión se encuentra en proceso de fusión con TCI Telecommunications Inc. de Denver, en los E.E.U.U., la más grande operadora de cable del mundo que cuenta con 12 millones de abonados.

Como todo buen negocio rápidamente surge competencia importante. Cablevisión hoy no es único en el mercado. Su estrate-

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JVC-X2 Camera, time code, batt chrg, soft case, 25 hrs, \$5995. D Waskowiak, 903-595-3822 or 903-663-6100.

Sony DXC-1820 Trinicon, exc cond, 10:1, 3/4" cable, hard case, \$500. C Berlin, Take 5 Inc, 313 S Congress, Austin TX 78704. 512-443-4477.

Sharp XC-700 3-tube Saticon camera, 10x Fujinon Zoom pwr sply, manuals, gd cond, \$1500; RCA TK-45A cameras (2), camera hds only, (1) Canon 20X200mm Zoom, (1) Angenieux 18X675mm Zoom, manual, BO. R Waverly, Desert West Productions, 1101 W Grant Rd #202, Tucson AZ 85705. 602-744-9402.

Toshiba TSC-200 3-CCD Hi-8 camcorder w/Canon 13:1 servo zoom lens, custom case, tripod adaptor, mint, only 40 hrs use, orig pkg, \$5400; Sony VX3-3 CCD Hi8, new in box, unused wty card w/receipt of purchase, \$2650. CJW Prod, POB 1849, Orangeburg SC 29115. 803-531-1662.

JVC KY-210 3-tube camera w/12 to 1 lens w/ 2x extender, excel cond, Porta-Brace case, JVC carrying case, Shotgun Mic, AC Power/Batt Chrg, 2-Camera Batts, Anton Bauer Batt Bracket, manual, \$1500. B Osborne, 317-253-8562.

Ikegami ITC-730AP (2), 1 complete w/9.5-143mm lens, 1 body, BO. J Kesler, 606-843-9999.

CAMERA ACCESSORIES

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Panasonic WV-AD37 RCU adapter, new, 200; Panasonic WV-PS03 AC adapter, excel cond, \$150. B Manke, 203-288-2222.

ITE studio pedestal & pan/tilt head w/access, \$2000/bo, BO; Vinten alrpad pedestal & ITE pan/tilt head w/arms, \$2750/BO; Miller sticks w/ITE pan/tilt hds & arms, \$750/BO. Terry, 800-748-4982.

Sachtler Video 14 fluid head tripod & dolly, excl cond, \$1200. N Coffey, NY. 315-443-5644.

Sony CA-3A (3) adapters w/manuals, exc cond, \$850/ea. Jim, MA. 508-478-1762.

J Lab adapters for Iki 79E (4), composite to component, BO; Ikegami 500 OP5 - 7" for SC-500 studio viewfinders, (2), BO; Cine 60 fast chrgs 5 pin XLRs, (20); Cine 60 BP 90 sngl chrgs, (20), BO. P Goldberg, NY. 718-224-3333.

Sony VA-5 adapter, PortaBrace case for BVV-5 coupled w/VA-5 adapter, Fujinon SRD-92 remote zoom cntrl, set of Tiffen Coral filters & Fog filters, both in series 9. T Kaufman, MD. 301-891-3009.

JVCP-HZFM15U (2) ctrl manual focus, new in box, \$445/ea; JVCP-HZZS13U (2) servo zoom cntrl, new in box, \$490/ea; JVCP-VFP 4000U viewfinder 4", new in box, \$545; JVC NBG1U (6) batts, \$100/ea; Bogen 3194 (2) tripods, \$550/ea. Bobby, 803-286-8412.

JVC HZ-110 10x1 servo zoom lens for BY-110 camera, excl cond, vlhrs, \$200. L Favand, TX. 713-442-5060.

Sony RM-M7G remote CCU, like new in box, \$800, other audio & video equip avail. Call for list, 804-747-9290.

12 V batt belt & charger, 12AH, gel cells, \$100. D Bailey, TX. 214-475-9796.

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Panasonic WJ-4600C special effects gen, \$1000. J Dore, CA. 408-553-2323.

Microtime 3D & 2D DVEs refurbished w/90 day warranty. 1-800-295-1571.

Ampex ADD 300 DVE w/perspective, digimat & rotation excel cond, \$18,900. Emmie, 305-581-0026.

Abekas A52 DVE w/A52 CP cntrl panel, \$7000. T Symanovich, 817-468-0070.

Grass Valley DPM-100CV525A component/analog DVE incl component input selector & recursive memory opts, all manuals, extender cards & custom Viking cases, \$12500. D Bell, GA. 404-242-3600.

Pinnacle 2110W/Prizm DVE w/perspective, rotations & 3D, \$10,000. G Buzzell, WSTR-TV, 5177 Fishwick Dr, Cincinnati OH 45216. 513-641-4400.

Showmaster colorizer & spec effects unit, generates color bars, gray scale, various colors & patterns for bkgrnds, also adds audio color to the beat of the music, \$250/BO. A Kohout, IL. 708-654-2700.

Quantel DPE 5000 SP digital video effects system (2) for parts, both w/remotes, pwr splys & extra brds, incl 10 framestore brds, BO. P Goldberg, NY. 718-224-3333.

Panasonic WJ-MX-50 like new, original box, 4 A/V inputs, 287 wipes plus Freeze, Paint, Mosaic & Strobe, chroma/luma key, GPI trigger, eliminates need for TBCs w/Toaster, \$2500. A Zimbard, NY. 914-723-6868.

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Sony RM-440 w/control cables, \$1000; Sony VO-5850 Editing Machine, \$3500. J Kesler, 606-843-9999.

JVC 800 editor, 500 source deck & cntrl in box, \$5600; Sony BK2018 serial interface, \$1600. E Stevens, PA. 610-889-9676.

Panasonic AG-1960 (2) S-VHS edit VCRs w/Panasonic AGA-95 edit cntrl & Videonics video equalizer w/built in audio mixer, mint, manuals & original pkg, \$2000. W Kramer, PA. 215-368-8235.

Convergence ECS195LM AB roll edit cntrl w/list mgmt for 3 Type-5 VCRs, \$1995. Ron, IL. 708-673-5400.

Panasonic AG-1970 (2) S-VHS edit systems w/built-in TBC & AG-A96 cntrl, like new in boxes w/manuals, \$2500. Ed, NJ. 201-955-0089.

Sony 2860 editor, Sony Feeder Deck & RM 430 controller, \$300 + shipping. B Kauffman, KCS Video, RD3 Box 570, Palmyra PA 17078. 717-838-3668.

Sony RM 700 editor w/RC time code, \$550. W Harris, CA. FAX: 619-262-3907.

Sony 5850, 5800 & RM-440 controller, dub cable & manuals, excel cond, low hours & original heads, \$4500. B Osborne, 317-253-8562.

Calaway CE150 6 machine editor, version 4.49 software, GPI option, A11 VTR protocols, HD & HD 3.5" drives, \$3600; EMC non-linear editor, version 5.3 software, (2) Sony magneto optical drives, 486 PC, full keybrd, 20" Mitsubishi monitor, \$6000. B Testa, NY. 212-686-7366.

Panasonic AG-A96 edit cntrl, \$250. Bobby, 803-286-8412.

Panasonic NV-A500 cuts-only edit cntrl, \$300. J Dore, CA. 408-553-2323.

JVC 3/4" edit system, CR-8250U, CR-5550U, RM-86U w/cables & all manuals, \$3995; JVC RM-70U remote control unit w/manual, \$250. K Fox, 615-754-2444.

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Sony RM E700 edit cntrl, new in box, \$500. CJW Prod, POB 1849, Orangeburg SC 29115. 803-531-1662.

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Lowel Softlight II, fluorescent light array, Variflector & more avail, all in almost new cond, call for list. 804-747-9290.

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Morton Soundmaster 16mm w/200' magazine, power supply cord, manual, no sound recdr, \$400; Moviescope for 16mm, \$150; Neumade Super X SPRX-2 power rewinds, \$350; Craig KE-16 project editor, \$40; Sound Reader/Precision 800 RL, \$100; Auricon-EB 10, \$25. Elaine, NVA, 200 Central Ave, Crescent City FL 32112. 904-698-1009.

Arriflex Arri-S 16mm w/12-120 Angenieux lens, 3 batts, varible speed motor, Pelican case, (2) 400 Mg's & more, in great shape, \$3000/BO. J Boyer, ID. 208-746-8335.

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TSG-3000GL synchronizing gen, \$500; 3M-101 switcher, audio & video, \$200; 10x1 stereo audio & video switcher w/looping A&V outputs, serveral avail, \$300. 800-606-8869.

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Panasonic WJ-KB50 character generator, \$350. Bobby, 803-286-8412.

VCR/VTRS/RECORDING MEDIA

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Sony BVH-2500 1" recorder with slo-mo, BVT-2000 TBC, overhead monitor bridge, excl cond, lw hrs. VTS, 404-448-0546.

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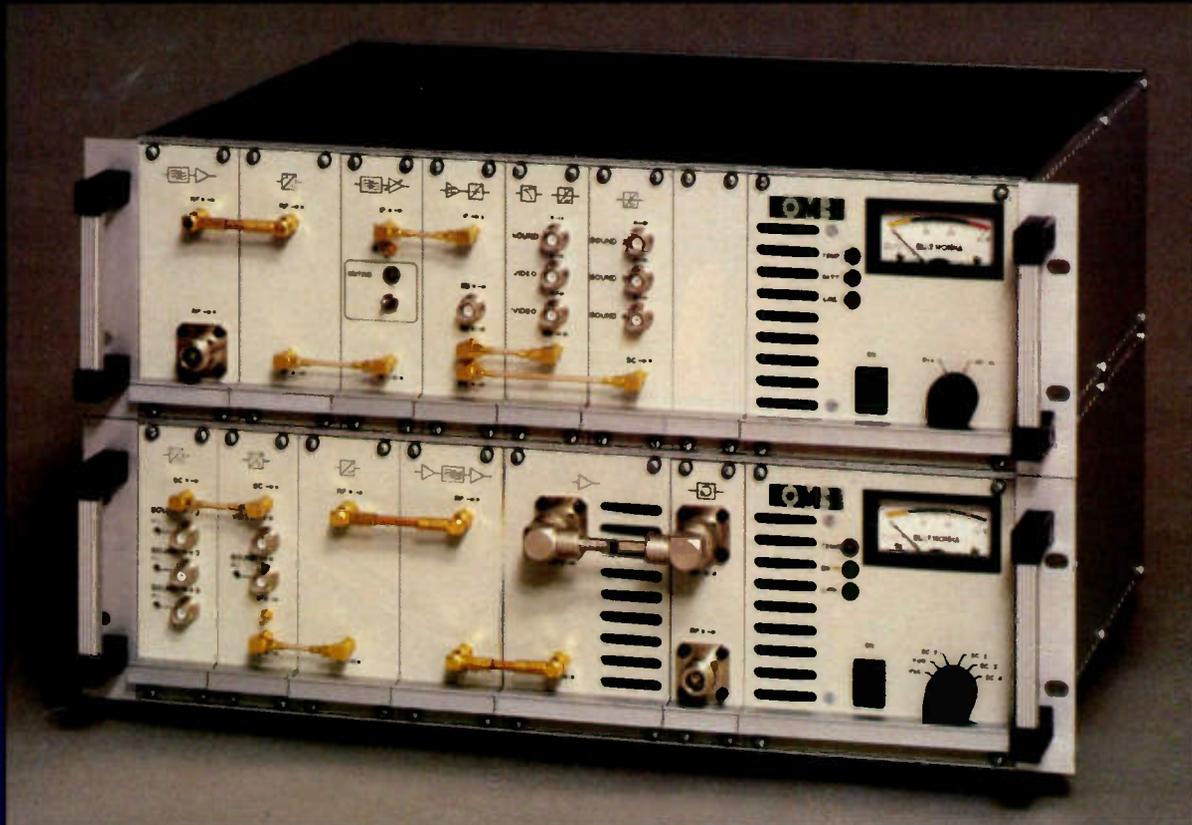
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