

TECHNOLOGY

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Wireless Cable Coming on Strong

Multichannel Multipoint Services Can Be Delivered Over the Air

by Andrew von Gamm

DIERSCHIED, Germany

Quietly and without public or government protest, a revolution is sweeping some parts of the world. It is called "wireless cable" and has already taken hold in the U.S. and numerous developing countries.

In Europe, however, it is still a novelty, but one that may have shattering repercussions for the established broadcast and telecommunications landscape.

While Europe has been squabbling over which digital system to use, and politicians have been warning that any new system will cost thousands of millions of dollars to research and introduce, an old friend, the microwave link, has undergone the most remarkable rebirth.

For most of those attending the IBC this fall, it was their first exposure to wireless cable. To many Europeans, multichannel

multichannel distribution service (MMDS), as it is officially known, must seem like a gift from God. Privatization of our telecommunications and the introduction of that dirtiest of all words that a government-owned cable and telephone system can hear, "competition," has left a gaping hole in European infrastructures.

By 1998, all communications systems (including cable and broadcast facilities) in Europe will have to allow competition. The biggest problem, say many, that the new companies are likely to face is the lack of the infrastructure that the old government monopolies took for granted. Government bodies can dig up the roads where and when they like. Private companies will have to apply for planning permission (a time-consuming operation) and pay to cross private property (a costly venture).

PROBLEM SOLVER

MMDS alleviates both problems. Under most configurations, a high-power microwave transmitter, operating in the GHz range, delivers a 30 MHz, or wider, signal to a waiting receiver, either directly or through a series of repeaters or "beam-benders." Even without compression, such services can deliver dozens of high-quality audio and video channels.

From its beginning in 1983 in the U.S., MMDS has now spread to some 40 countries. It is popular for both rural areas, where the cost of laying cable to remote locations is high, and affluent urban regions, where the cost and inconvenience of crossing thousands of houses and streets

has so far prohibited the introduction of any new services.

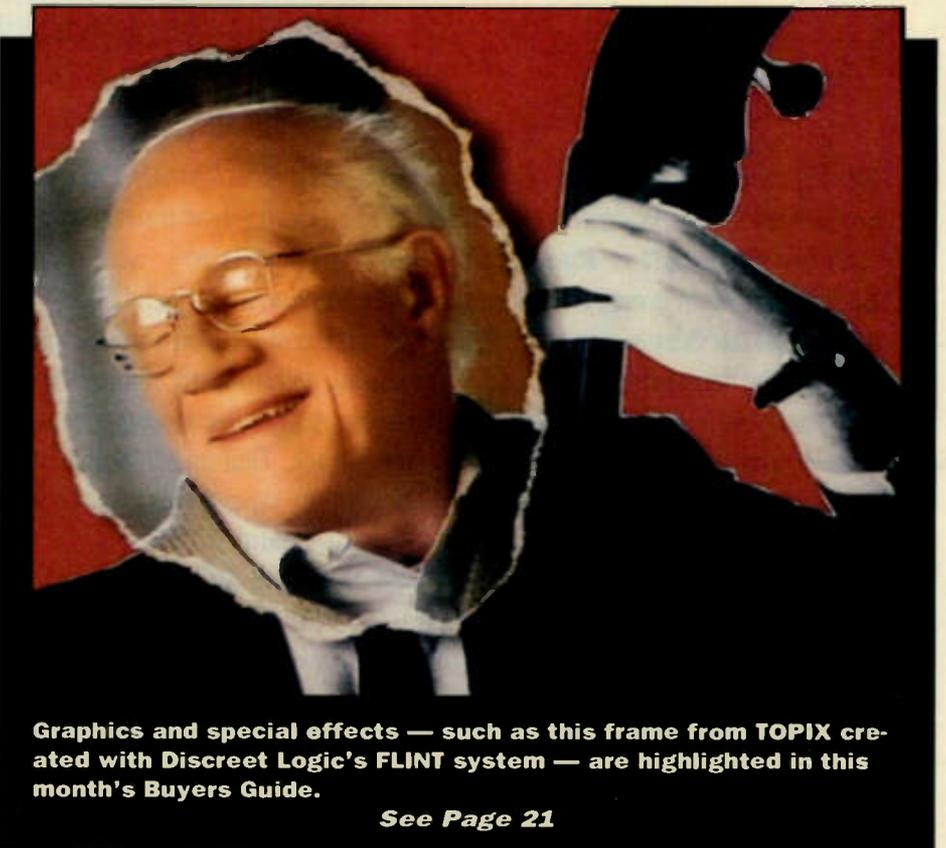
SMALL BEGINNINGS

Altogether six papers on the subject of wireless cable were presented at IBC '94. All speakers advocating the introduction of MMDS mentioned low start-up costs and

early returns on investment as two of the main forces behind the technology.

F. Lubbadah from Jordan Radio and Television Corp. offered a full account of the problems and costs involved in the installation of a new MMDS system in Amman, Jordan. This system was designed for cost-effectiveness, and Lubbadah listed total installation costs for

(continued on page 6)



Graphics and special effects — such as this frame from TOPIX created with Discreet Logic's FLINT system — are highlighted in this month's Buyers Guide.

See Page 21

China, Japan Spar Over Apstar See Page 5



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BUSINESS

MICROTIME BUYS GVG GRAPHICS UNIT

GRASS VALLEY, Calif.

Grass Valley Group has agreed to sell its graphics systems business to New Microtime Inc. for an undisclosed sum.

Pending the close of the deal, which was expected by the end of October, Microtime, a subsidiary of Andersen Group Inc., will merge with the new unit under the name Digital GraphiX Inc., headquartered in Bloomfield, Conn.

Meric Adriansen, general manager of GVG graphics, was slated to be named president and CEO of the new company.

Grass Valley is expected to continue manufacturing graphics products for Digital GraphiX for six months before turning over full operations. Digital GraphiX will service and warranty all products sold under the GVG name.

"Divesting our graphics business will enable us to focus our resources on our video production and distribution equipment business," said Dan Castles, GVG's president.

Even without its own graphics unit, Castle said GVG will provide Digital GraphiX devices as part of its turnkey systems.

"Electronic graphics will continue to be a valuable part of our total product offering, and for this reason, we have made arrangements to act as a distributor of the graphics products."

BUSINESS

AMPEX CLOSES HONG KONG FACILITY

HONG KONG

Ampex Corp. has closed its Betacam production facility in Hong Kong, putting an end to its sales of Betacam recorders and systems.

The closing is in line with Ampex's new global strategy of pursuing the high-volume data recording market, as opposed to its traditional based of video and audio equipment. Ampex will continue to "meet its contractual obligations" to existing Betacam customers, according to a company release, but will cease selling Betacam products as soon as inventories are emptied.

Ampex will continue to work with Sony for the supply of parts and services.

Ampex announced earlier this year that it was pulling out of most video-related markets, save for the post production interests in the company's DCT component digital format.

BUSINESS

ImMIX SOLD TO ISRAELI FIRM

GRASS VALLEY, Calif.

U.K.-based Carlton Communications has sold its ImMIX subsidiary, makers of the VideoCube non-linear editing system, to Scitex Corp. Ltd., a multinational printing and graphics company based in Herzlia, Israel.

Scitex purchased the company for \$21 million in cash and represents its entry into the professional video market.

"Scitex sees digital video as a key technology as we expand into a wider world of visual information communications," said Scitex President and CEO Arie Rosenfeld.

The sale came as a surprise to many in the video industry. Carlton launched ImMIX slightly more than a year ago and has built a base of more than 700 units.

"Scitex plans to take a leadership role in the video industry, and Scitex's support will increase our dominance of the digital on-line finishing market," said ImMIX President Randy Hood.

ImMIX will continue to operate from its Grass Valley headquarters and will keep its current management team intact, a company release said.

Scitex is known mostly for its electronic prepress systems, which consists of numerous lines of layout, design and packaging systems, as well as scanners, digital camera backs and digital printers, pagesetters and communications devices. The company has subsidiaries in North America, Europe, Hong Kong and Japan.

PEOPLE

MERRICK JOINS DYNATECH

SALT LAKE CITY

Less than a year after resigning his executive vice president post at Ampex Corp., George Merrick has been hired as vice president of Dynatech Corp. and president of the company's display business.

Merrick will be responsible for guiding the company as it seeks new markets based on the convergence of computers, television and communications.

"Dynatech has taken several steps to focus on the support of voice, video and data communications," Merrick said. "These actions promise to make it even stronger as markets and technologies continue to converge."

Dynatech's display business consists of the Video Division, which supplies products for video production, distribution and automation, and the Interactive Technology Operations division, which concentrates on computer hardware and software.

In addition to Merrick, Dynatech has also recently added John Aslett, formerly of Grass Valley, as European Sales Director, and John Lawrence, formerly of Abekas, as operations director of the company's Alpha Image subsidiary.

GRAPHICS

DISCREET LOGIC, SOFTIMAGE SETTLE PATENT DISPUTE

MONTREAL, Canada

Discreet Logic and SoftImage have reached an agreement on a long-running dispute over the rights to the Flame image

processing software.

Under the agreement, both groups have agreed that Discreet Logic owns the Flame system, and Discreet will continue its existing distribution of the product.

According to a press release from Discreet Logic, the settlement was agreed upon to avoid a lengthy lawsuit.

SATELLITES

JBTV LAUNCHES INTERNATIONAL SERVICE

TOKYO

Japanese Business Television Inc. has launched its first effort in global satellite broadcasting by opening an international operations center in Atlanta, Georgia.

The new service will provide digital satellite communications and network services to broadcasters, cable operators, educational and medical institutions and corporate users.

The system uses digital satellite encoders and decoders featuring digital compression, as well as software-based network systems for either standard or customized broadcast operations.

For further information, contact JBTV at +1-404-612-0070.

COMPUTER VIDEO

FIRMS DEVISE ALL-DIGITAL PC SOLUTION

TORONTO, Canada

Producers who have made the jump to desktop video production now have a completely digital solution for combining video and graphics on the PC.

At IBC, three leading computer video companies were showing the results of a joint effort to seamlessly unite their products. Miranda Technologies Inc. showed its Toccata-PRO with 4:2:2 (D-1) input and output for Matrox's Illuminator-PRO videographics card. Both systems were then integrated with Image North's Inscribe VMP character generator/DVE editor/still store.

The combined system allows for the combination of digital component video and true 24-bit color graphics and effects without signal loss.

For further information, contact Miranda at +1-514-333-1772, or circle Reader Service 29; Matrox: +1-514-685-7230, or Reader Service 36.

COMPUTER VIDEO

MATROX BUNDLES PINNACLE ALLADIN

SUNNYVALE, California

Pinnacle System's Alladin media printer will now come bundled with Matrox's lines of desktop video editors under a recent OEM agreement between the two companies.

Under the agreement, Pinnacle will develop a specialized version of Alladin to work with the Matrox Studio. In turn, Matrox has announced the Super F/X option for the studio designed to control Alladin from the Matrox Studio.

For further information, contact Matrox at +1-514-685-7230, Reader Service 86, or Pinnacle at +1-408-720-9669, Reader Service 42.

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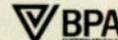
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Making Amends for Bit Errors

by David Strachan

GUEST COMMENTARY

The problem with digital television is that it looks too good. You cannot see anything wrong with it until it suddenly disappears.

A picture that may appear to be perfect to the eye might actually have deteriorated to the point where adding only 10 meters of cable can cause the signal to become totally useless. If you try to measure the quality of a digital television signal using conventional test equipment (after having passed it through a digital-to-analog converter, of course), you may find that it looks perfect. No deterioration in picture quality can be observed, even after the signal has passed through many meters of cable.

For this reason, a totally different technique must be adopted to check digital signals. It is necessary to look for "bit errors" in the signal, and this is where the Error Detection and Handling (EDH) mechanism makes its contribution to the digital world.

BAD WORDS

The use of EDH testing techniques in serial digital television installations is now recommended by the SMPTE in its document number RP165. A single error is defined as one

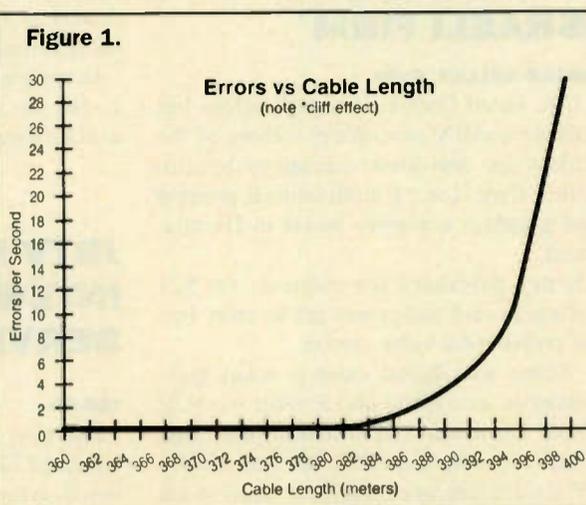
data word in which the digital value it represented at its source has been altered by the time it has reached its destination. Such errors may be caused by faulty equipment, bad joints or more probably by excessive cable lengths. Figure 1 shows how the number of errors increases dramatically as the length of cable is increased. It is this rapid increase in errors (known as the cliff effect) which must be of concern to video engineers.

Under normal circumstances, no errors whatsoever should be expected in the digital television environment, so the presence of any error may be taken as a sign that the transmission path is overstressed and in need of corrective action. This is even more important when the serial digital signal is carrying embedded audio, as noise due to bit errors is more disturbing to the ear than it is to the eye.

COUNTING BITS

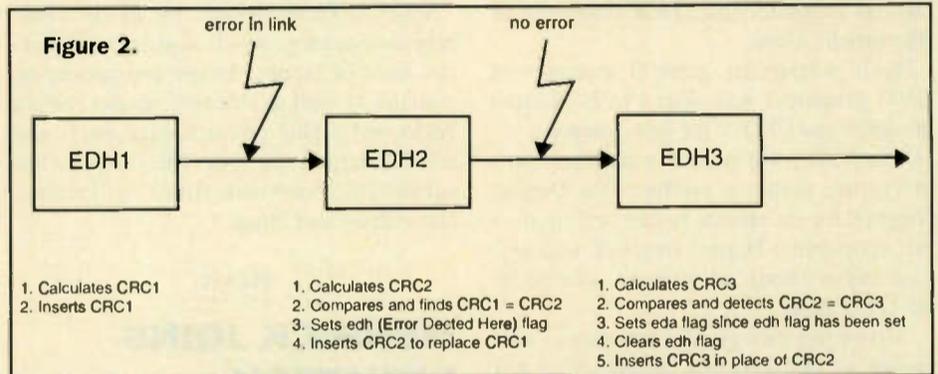
The principal of EDH is based on techniques similar to those used in digital communications. An EDH transmitter is located in front of the path under test, and an EDH receiver is located at the end of the path. The first EDH device "counts" the digital picture "bits" in each picture field and then inserts this information as ancillary data in the blanking interval of the following field. The complete signal, together with the inserted integrity checking data, is then passed on through the transmission path.

The second EDH device located downstream can repeat the same calculations to count the number of bits in the field and compare the result with the ancillary data contained in the signal. If the two numbers do not agree, then one or more errors have been detected.



Counting the bits in the field results in what is known as a checksum. It is calculated using the CRC-CCITT polynomial generation method (Cyclic Redundancy Code). In communications, the goal is to faithfully reproduce the original signal without any modifications, and a simple CRC checksum can be used with a high degree of reliability to spot any errors.

Unfortunately in television, someone always seems to want to change the picture.



Sometimes a producer wants to add a logo or message, and sometimes an engineer wants to add or delete VITS. When this happens, how does the EDH device distinguish an error from a desired picture change?

Well, maybe it can't, but it can raise a "flag" to tell the operator that there has been a change, and it can tell you if the change is in the active picture or in the blanking interval. It can also let you know if an error occurred in the last link in the chain or further upstream in the transmission path.

There are other things that the EDH device can tell you, and I will look at each of these things in turn. But before I get to that, I'd like to explain a little about the EDH device itself. In order to provide a means of checking the integrity of the serial digital transmission path, the SMPTE has issued a proposal for manufacturers to incorporate EDH circuitry in their serial transmitters and receivers. This circuitry is designed to generate and detect checksums aimed at identifying errors in the digital bit stream.

It has been left to the manufacturers to determine the best ways to handle the detection of the errors, although some new products have already emerged offering EDH signal insertion and detection capabilities. It is anticipated that as new integrated circuits become available, EDH techniques may be applied to the inputs and outputs of most signal processing equipment.

EDH examines three areas of the picture. CRCs are calculated for the Full Field (FF) and Active Picture (AP) areas, and a checksum is made for the Ancillary Data. In this way the EDH detector is able to identify if an error is in the active picture area or in the blanking interval.

For each of these three areas, the SMPTE

document provides for the optional use of five different flags to provide engineers with 15 different pieces of information. The five flags used in each checksum are edh (error detected here), eda (error detected already — further upstream), idh (internal error detected here — for use by equipment with internal data checking facilities), ida (internal error detected already) and ues (unknown error status — signifying that a signal as received from a device not offering EDH facilities).

If an EDH device receives a clean signal with EDH information but no errors, the checksums are entered as ancillary data on the following field, but none of the flags are set. If the signal contains no EDH information, the ues flag is set.

ACTIVE ERRORS

If, on the other hand, an error is detected in the active picture, for example, then the edh flag is set and the new checksum is recorded in the following field. The next downstream EDH device will set the eda flag and, assuming that no more errors have occurred in the vertical interval, it will reset the edh flag back to zero. A monitor at this point will know that there were no errors in this chain but that an error did occur in the vertical interval further upstream. The eda flag is never reset until the error is corrected. The

engineer can therefore quickly check the entire system by looking for the presence of an eda flag at the end of the chain. Leitch has come up with a simple and inexpensive solution to add EDH into multiple transmission paths. The technique is to incorporate on-board EDH circuitry in a serial distribution amplifier. The EDH-6800 distribution amplifier may be used anywhere a standard serial DA can be used. It has the same equalization and reclocking features, plus the ability to insert an EDH signal into all eight outputs.

A second EDH-6800, inserted downstream in place of another regular DA, does its own pixel count, and if errors are detected, an audible alarm will sound and LEDs will flash for each bit error. The LEDs indicate both full-field errors and active picture errors. An on-board switch may be used to "latch" the LEDs on, so that no errors will escape the attention of the engineer.

Once an error has been detected and recorded into the vertical blanking, this error is no longer detectable by EDH-6800 devices downstream, since the error is now considered to be part of the video signal and used in the CRC calculation at the EDH transmitter (EDH2 in the example given in Figure 2). The eda flag, however, remains set.

By using EDH units in critical path lengths throughout the digital television studio complex, engineers can be assured that they will be alerted to any bit error problems developing within their system. ■

David Strachan is director of marketing for Leitch Video International. He can be contacted at +1-416-445-9640; FAX: +1-416-445-0595, or circle Reader Service 31.

SHOW LISTINGS

10-12 JANUARY — INTERACTIVE TV '95

Paris. The Journal du Multimedia will present speakers and technology exhibits aimed at the future digital video market. For information, contact the organization at 2, rue d' Amsterdam, 75009, Paris, France; telephone: +33-1-4267-9380; FAX: +33-1-4053-8155.

21-24 JANUARY — MIDDLE EAST BROADCAST '95

Bahrain, Saudi Arabia. The second international exhibition for radio and television broadcasting and production will be held at the Bahrain International Exhibit Centre. For information, contact organizers at P.O. Box 20200, Manama, Bahrain; telephone: +966-973-550033; FAX: +96-973-553288.

1-3 FEBRUARY — IMAGINA

Monte Carlo. The 14th Imagina exposition, devoted to computer graphics and special effects, will be held at the Monte Carlo convention center and auditorium. For further information, contact Brigitte Saramitto, 31 avenue Hector-Otto, MC 98000 Monaco; telephone: +33-9315-9394; FAX: +33-9315-9395.

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 & 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.

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China, Japan Spar Over Apstar

by Marc Hagan

TOKYO

The skies over Asia are becoming a bit crowded these days, especially for communications satellites.

It seems that China and Japan are in the midst of a controversy over China's placement of its Apstar 1 telecommunications bird, which Japan argues is just a bit too close to a pair of its craft.

Japan's Nippon Telephone and Telegraph Corp. has two communication satellites (as different from broadcast satellites) in orbit over the equator: CS3A at 132 degrees and CS3B at 136 degrees. They were launched in 1989, making them pretty much "home-steaders" in the region. This is a very good

location for footprinting the entire Asian continent.

China apparently thought so too, for in July of this year they launched their own bird and parked it a 131 degrees, snuggling up to the CS3A craft within 1 degree.

TIGHT SQUEEZE

Understandably, this has unnerved Japan's Ministry of Post and Telecommunications.

"Ideally, for technical reasons, satellites should have about 4 degrees of separation to prevent ambient interference," said Akira Murakami, assistant director of the Ministry's Frequency Planning Division.

Apstar 1 is currently undergoing performance testing, and no problematic interfer-

ence has been detected, but the concern is when it goes into full operation. Apstar has 24 transponders, while the Japanese CS units have two wide-range transponders each.

According to Murakami, the Ministry feels that there was no technical reason to park Apstar so close to the CS birds. And even though Japan was notified in advance of the planned orbit, the ministry is still planning to take action.

That will come in the form of a request for corrective measures at an upcoming bilateral meeting of the International Telecommunication Union.

Murakami said there are three ways to resolve the issue: reduce the power of the Apstar's ground station, change its frequency or, the more costly solution, modify the orbit.

Speculation in and around Asia is that this is the first risky venture in terms of technology and revenue for the Chinese, and they simply needed the most ideal orbit possible. The bird was launched at a cost of about US\$130 million and has

already drawn the interest of several major Western programmers, including Time Warner/HBO Asia, CNN International, MTV, ESPN, The Discovery Channel and Hong Kong broadcaster TVB.

OLD PALS

Murakami said that China's and Japan's communications ministries are on friendly terms, and he is confident a reasonable

solution can be worked out. Their record has been amicable in the past, and China has a history of abiding by the rules outlined in the ITU charter.

Since the fall of Soviet communism — which many people in Asia attribute, at least in part, to

cross-border communication from the West — some governments have fought to enclose satellite communication from outside influence. They want their birds to footprint their own country and all their neighbors without their neighbor's birds crossing the borders.

This situation has led to this sort of elbowing and shoulder jousting, and it is likely this will continue in an increasingly crowded sky. ■

Marc Hagan is a Tokyo-based media consultant. He can be reached through TV Technology.

... even though Japan was notified in advance of the planned orbit, the ministry is still planning to take action.

Multimedia Networking Across the Pacific

by Tony Reveaux

SAN FRANCISCO

The tough tug-of-war between American and Japanese technology companies that has strained the U.S. into an imbalance of trade has been giving way to intimate strategic alliances that would have been improbable in the past.

Nippon Telephone and Telegraph Corp. (NTT) and Silicon Graphics Inc. (SGI) of Mountain View, Calif., have entered into a partnership where SGI will play a major role in building an interactive digital network (IDN) in Japan. Deployment is due in the last quarter of 1995.

IDNs can support an ever-expanding range of multimedia services, such as consumer video-on-demand (VOD), value-added advertising, retail distribution, location-based entertainment, security, defense, private medical networks and linking supercomputers across continents in research networks.

NTT is a 240,000-employee-strong giant that provides complete telecom technologies and services throughout Japan, invests heavily in R&D and has won consulting and engineering contracts in 40 countries.

MULTIMEDIA IN JAPAN

"NTT is clearly aiming to dominate the multimedia networking business before its competitors catch up," said Sheridan Tatsuno, analyst and publisher of Pacific Rim Media. The alliance will leverage NTT's rapidly expanding installed fiber optic network using Asynchronous Transfer Mode (ATM) with SGI's 64-bit MIPS microprocessor architecture, digital media servers, visually-based object-oriented network software system and the MIPS Technologies multimedia engine.

NTT, which has established a strong track record for developing and delivering business applications, sees this new collaboration as an opportunity to establish the network design and management technologies to win a greater market share in consumer services. It had

already begun to invest in the infrastructure of fiber to the home (FTTH).

With SGI's technologies, Japan can plan for the greater utilization of fiber-based CATV video transmission, video-on-demand, high-performance E-mail and data base services for private homes through optical subscriber bases such as electronic newspapers and other services, such as telephone, video communication and telecommuting.

"Japanese prefer real face-to-face communications," said Tatsuno. "So NTT is searching for new applications, such as multimedia business document transfer and corporate video-on-demand."

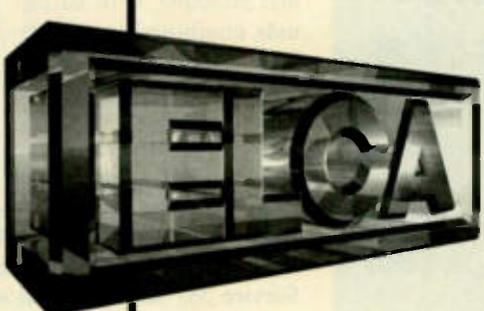
MICROSOFT DEAL

NTT has also negotiated with Microsoft Corp. to co-develop CD-ROM and network methods, and to cooperate on testing and developing interactive multimedia services in Japan. NTT will license Microsoft's server and set-top box software to distribute information and entertainment on NTT's FTTH networks.

SGI's alliance with NTT will be its largest in Japan by far, but it also has been busy with partnerships in semiconductors (with NEC, Toshiba and Sony); industry (with NKK, Toyota, Nissan and Hitachi); broadcast (with NHK and Fuji TV); and the volatile consumer entertainment market (with the Project Reality player project with Nintendo).

SGI barely paused for breath from these Far Eastern efforts as it entered into a joint venture with AT&T. This collaboration links SGI's computing muscle with AT&T's connectivity reach. Their new company, Interactive Digital Solutions, will develop and market networks and turnkey systems to help local telephone companies, cable systems and other network providers offer consumer and business IDN services. ■

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5 NEWS

Audio Finally Makes Itself Heard

by Kevin Hilton

LONDON

Audio-for-video has long been considered a secondary matter to most video engineers. Considering that for years television audio, regardless of its production and post production quality, was reduced to a tiny mono speaker in viewers' homes, it is no wonder that audio has taken a back seat to video.

Those days are changing, however, as set manufacturers have finally introduced such things as stereo separation and even five-channel surround sound features on consumer receivers.

STRONG IMPACT

The effect of this development on professional audio-for-video equipment is becoming increasingly clear. In September, for example, the IBC conference in Amsterdam presented a special area devoted exclusively to audio products, everything from mixing consoles and wireless microphones to digital workstations and processing gear.

Indeed, many manufacturers — especially those dedicated to video products — have begun their own campaigns to raise the profile of audio by realizing that there was a need to bring it nearer to video production. Among the dedicated vision companies doing this at IBC '94 were Lightworks and ImMIX, which both feature comprehensive audio handling on their workstations.

The Heavyworks One from Lightworks (Reader Service 16) has grabbed most of the attention for its real-time, multicamera operation, but it also offers a specially-designed fader box, which will ship in the first quarter of 1995.

CONTINUED FROM PAGE 1

Wireless Cable Interest Grows

the transmitter/repeater station using six 10-watt transmitters and all the auxiliary equipment (wave guides, couplers, antenna, cables, etc.) at just over US\$70,000. Receiver costs were slightly more than US\$200 per subscriber, including the inevitable remote control.

Patrick Keys of Off Air Electronics Ltd. in Dublin outlined some of the problems that his company had encountered in Ireland, including grass-roots opposition to the elimination of terrestrial pirate broadcasting to make way for MMDS. Anyone who drives through Ireland quickly becomes aware that pirate broadcasting has become quite the cottage industry there, and large parts of the population have come to rely on it for access to non-Irish broadcasting.

Another problem Keys encountered was fear of the cancer-causing effects of microwave transmissions, which has led to public protests. He suggested that service providers should avoid the word "microwave" when describing the system.

Still, for systems that do get off the ground, Keys said the rewards could be tremendous.

"Perhaps a new and exciting chapter will be written as digital compression and 2.5 GHz technologies merge in the not-too-distant future," he said.

One of the major technical difficulties facing MMDS is rain attenuation. A team from Sarah Clay & Partners Ltd., which has installed MMDS systems in southeast Asia, identified rain as a significant difficulty. Rain drops, as they fall through the atmosphere, tend to flatten and vertically polarize signals, causing a reduction in strength. Logically, horizontally polarized signals suffer more.

Not surprisingly, European suppliers did not have much in the way of off-the-shelf MMDS systems on the show floor. But if the technology gains in stature as rapidly as expected, it won't be long before it becomes a major presence at future events. ■

Andrew von Gamm is a free-lance journalist living in Germany.

Working as an editor's audio control console, it gives live audio mixing the ability to assign channels to fader groups, mute and solo buttons, and four-mode operation (playback, record, trim, and update).

ImMIX's VideoCube (Reader Service 115) is equipped with four stereo pairs and allows real-time processing, including reverb and equalization, all working on automated faders. ImMIX spokeswoman Helen Shortall said that the audio handling of the unit was on a level with the video, adding that some U.S. radio stations were using it for posting advertising spots.

... the IBC conference in Amsterdam presented a special area devoted exclusively to audio products.

Naturally, traditional audio manufacturers are also riding the wave of increased attention to audio quality.

Graham-Patten Systems, for example, (Reader Service 30) has launched the enhanced D/ESAM 820 digital edit suite audio mixer, featuring a master processor board, audio output module and an optional digital input card with integral sample rate converter.

The desk works on the virtual principle, with all signals combined in the on-board processor unit. It can also have several inputs assigned to one channel. Edward P. Hobson, vice president of marketing and sales, said that the console had been designed to be used by video editors.

Likewise, audio and routing specialist Pro-Bel (Reader Service 35) has introduced an extension of its established digital mixing cards by producing a complete user panel.

"It's ideal for video environments where you just need to move the levels about," said Product Manager David Ward.

The company also introduced the Compass Presentation Playout System, giving full automation, and a new range of AES/EBU digital audio modules.

Digital audio workstations continue to proliferate, as well. Best known for its music-oriented products, Akai (Reader Service 69) has now produced a dedicated broadcast/post production unit, the DD1500. Using magneto optical drives, the system supplies eight-track operation on a single, removable disk. Also new is the DR8 hard disk recorder, which, although fully digital, operates along the same principles as conventional tape-based equipment.

Digital Audio Research (DAR) (Reader Service 95) has made a move away from its core business of disk-based storage and editing units with the SoundStation Gold, an integrated audio production system. Based around a dedicated console, Gold offers four analog inputs, eight or 16 analog outputs, and eight AES/EBU digital inputs and outputs. It also features a built-in optical disk system with eight-channel playback, editing, direct recording, and on-line libraries, along with hard disk storage of up to 22 track hours.

Another editing/storage manufacturer at IBC, AMS/Neve (Reader Service 41), demonstrated the transfer of audio to an AudioFile Spectra directly from both Lightworks and Avid picture editing systems. Using the open media framework (OMF), this operation will also allow access of such equipment to the Logic range of digital consoles. This series has been expanded with enhancements to the compact Logic 3, which can now handle surround sound mixing, while also offering quicker operating speeds.

The number of computer companies at IBC signaled the arrival of "convergence" technology, a coming together of

computing, telecommunications and broadcasting. Recognizing this, Solid State Logic (Reader Service 66) expanded its SoundNet multisystem, multi-user network by introducing WorldNet.

Based on ISDN technology, this new family offers two products: one for complete projects, where entire ScreenSound Scenaria/OmniMix multitrack programs can be transferred between facilities; the other for low-cost, real-time digital links, where voiceovers need to be passed between different studios.

Sony (Reader Service 64), always a source of a huge amount of video product, is offering some significant audio releases this year. Among them is a new professional, recordable MiniDisc, the PRMD-74, which stores 74 minutes of digital audio on a 64mm disc encased in a rugged plastic cartridge. The unit's upgraded audio performance is said to extend to one million read/write cycles.

Other new MD units are the MDS-B3 MD recorder and

MDS-B4P player, which are new generation models with RS-232C serial control capability and digital audio interfaces, in addition to improved user features. A return to tape comes with the PCM-E7700 DATStation integrated portable DAT editor, which features RS-232C data transfer capability and a crossfade specification option.

At IBC, DAT specialist HHB Communications (Reader Service 21) gave a first showing to its Portadat, which has already stacked up around 250 sales since July. The PDR1000 and PDR1000TC (featuring time code) are being aimed at location recording work and are being marketed to challenge Nagra's hold on this

market. HHB was also showing the full range of Cedar audio reconstruction products, with the promise of a "revolutionary" new unit to be launched at the San Francisco AES.

MAKING TRACKS

Panasonic (Reader Service 117) has released a multi-audio processor that enables two full-quality and eight compressed audio tracks to be recorded alongside the video signals of a D-3 or D-5 VTR. The manufacturer is aiming this product at international program distribution and transmission applications, including sports programming with multilanguage commentaries.

Penny & Giles (Reader Service 82) has introduced its MM16 MIDI management system for broadcast and post production, and Soundcraft is touting the BVE100S compact audio-for-video editing console.

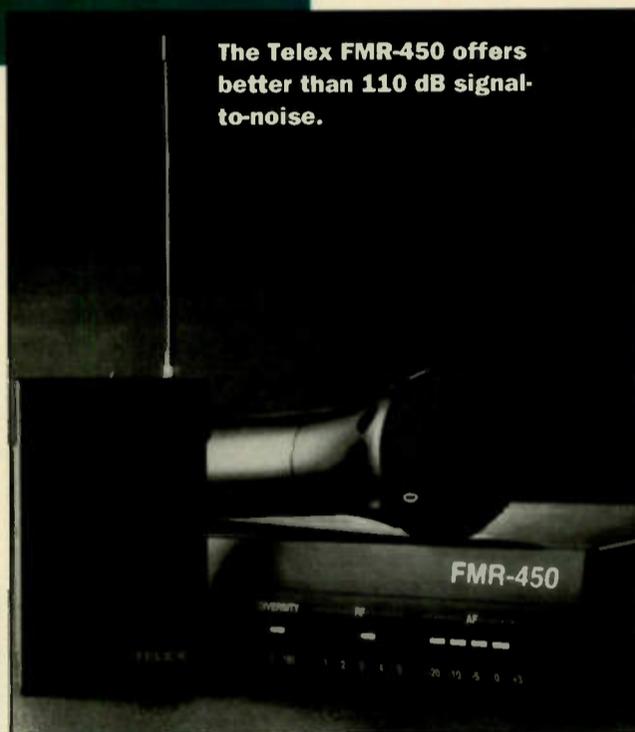
Manufacturers are also paying greater attention to capturing as much sonic quality as possible during initial recording. Telex, for one (Reader Service 27), has unveiled several new lines of wireless microphones, led by the FMR-450 unit with the company's patented Pos-i-Phase and Pos-i-Squelch, as well as a new compander design providing greater than 110 dB signal-to-noise.

For-A (Reader Service 9) has released an audio mixer card for its Symphony integrated linear/non-linear desktop editing system.

Philip Drake (Reader Service 22) has lined up behind a hard disk store device that, although aimed at radio, can also be used in TV as an audio cache device.

In monitoring devices, Wohler Technologies (Reader Service 48) has added the AMP-2SUR to its line. The unit is a surround sound monitor with separate input level meters and master and individual channel volume controls. ■

Kevin Hilton is a free-lance journalist living in London.



The Telex FMR-450 offers better than 110 dB signal-to-noise.



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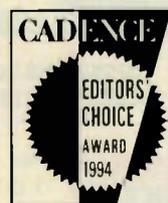
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Circle 98 On Reader Service Card

Slovenia Laments Small TV Market

by Charles Recknagel

LJUBLJANA, Slovenia

When Slovenia declared independence from Yugoslavia in 1991, it did so in the belief that small is beautiful.

But today, the new nation is finding that its small population of just two million people is making it difficult to build an independent and modern television market of its own.

Slovenia was the first of the former Yugoslav republics to declare statehood, and ever since a brief 10-day war to gain its freedom, the small nation that borders Austria and Italy has enjoyed peace.

STILL STRUGGLING

Like other ex-socialist countries in the region, it has begun transforming its once state-planned economy into a free market. But while many of its larger East European neighbors are rapidly developing commercial television industries, Slovenia's airwaves have changed little since independence.

The television market is dominated by two public television channels. Local and regional commercial TV stations have yet to launch a nationwide network. Making money in television here is so difficult that half the public television system's equipment is more than 15 years old.

"The big problem in Slovenia is that it has too small an advertising base," said Jernej Kos, a producer at Televizija



An operator monitors equipment in a control room at Televizija Slovenija.

Slovenija, the nation's public television system.

Slovenija is just 250 kilometers across. Its capital has just over a quarter of a million people, and its economy is only now emerging from a two-year slump as it retools for capitalism.

"With numbers like those, there is not much ad revenue at the end of the year for television stations to buy new equipment or to grow," Kos said.

At both private and public TV stations, both of which can air commercials, the lack of revenue has forced managers and engineers to make an art of extending their budgets by extending the life of their equipment. Televizija Slovenija — which operates one nationwide channel for 14 hours per day, a second for six hours per day, plus a regional channel for 18 hours per day — does 50 percent of its own production. Yet, Kos noted, the station's budget permits buying just one or two new cameras each year. The rest of the operation hinges on repairing, not replacing.

MUSEUM PIECES

"When we finish with a piece of equipment here, it goes directly from our studios to the city's technical museum," Kos said, half jokingly.

Still, the station recently sent the museum a mobile news unit dated 1983 after more than 10 years of service. In the station's studios, other equipment that should not be far behind for the museum, works side-by-side with modern units.

"We have a 25-year-old Philips tube camera working beside chip cameras, and we have some editing rooms with just a small tape recorder for sound next to Beta SPs," Kos said. "We cannot afford to upgrade a whole studio at once, so we do it piece by piece and keep the maintenance guys busy instead."

When it comes to upgrading, the station had developed its own strategy for dealing with limited resources. Over the past five years, the station has been moving from a predominantly Bosch-type format to a mainly Ampex C and Beta SP format.

"We start upgrading a studio by doing the video switcher first one year, then maybe audio the next," Kos said. "The last thing we upgrade is the lighting. Since it breaks down, it is not as disastrous as the other elements."

Today, the station is giving priority to building computerized editing facilities. It recently added a fully modern graphics studio with the purchase of an ATT video-cart and TrueVision software.

"Next, we hope to add 3-D capability," Kos said, adding that computerization of studio lighting has been only half-completed, to stretch the budget.

PLANNING FOR THE FUTURE

In all its upgrades, Televizija Slovenija buys equipment with an eye to keeping it compatible at least five years. When the station began moving to Beta format, Kos and others asked manufacturers how long they planned to continue making compatible parts.

"When they said 10 years, we said we would take it," Kos said.

Husbanding equipment comes naturally to public television here because it worked with a limited budget even under Yugoslavia's socialist economy. While many neighboring socialist states spent heavily on their station television systems, Kos claims Yugoslavia's more liberal socialist economy structured state television to pay its own way.

The station was supported by a consumer tax on television sets and ad revenues, and it received more supervision from the state than it did funds for new equipment.

"Everything we made above operating costs went to the government," Kos said.

The change to a free market should have brought new revenue, but to date, public television's budget has remained the same.

"We see a little more advertising than under socialism," Kos said, adding that 40 percent of the station's revenue comes from commercials, with the remaining 60 percent from the tax on television sets.

"But any increase is offset by a drop in the number of people who now pay their television tax," he said.

The drop in tax payments has come as state television shops — which under

socialism reported the names of all TV set purchasers to tax collectors — have increasingly been replaced by private stores that, in Slovenia's free market economy, are not required to provide sales information.

Today, Kos estimates that there are about 280,000 registered sets in Slovenia, for which the owners pay the US\$4 per month tax to support public

TV. Owners of an estimated 50,000 unregistered sets pay no tax at all. Legislative proposals to enforce tax collection by salary deductions have failed, and the Slovenian government continues to wrestle with how to solve the shortfall.

Kos predicts that Televizija Slovenija's revenue situation will improve as the economy heats up. The country, which was historically Yugoslavia's wealthiest region, is expected to benefit from no longer having to subsidize its poorer neighbors now that it is independent.

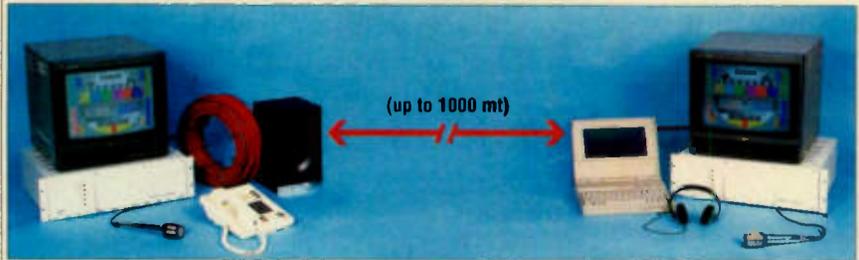
However, in the meantime, the station plans to continue doing what it has always done: make ends meet by making its equipment last. ■

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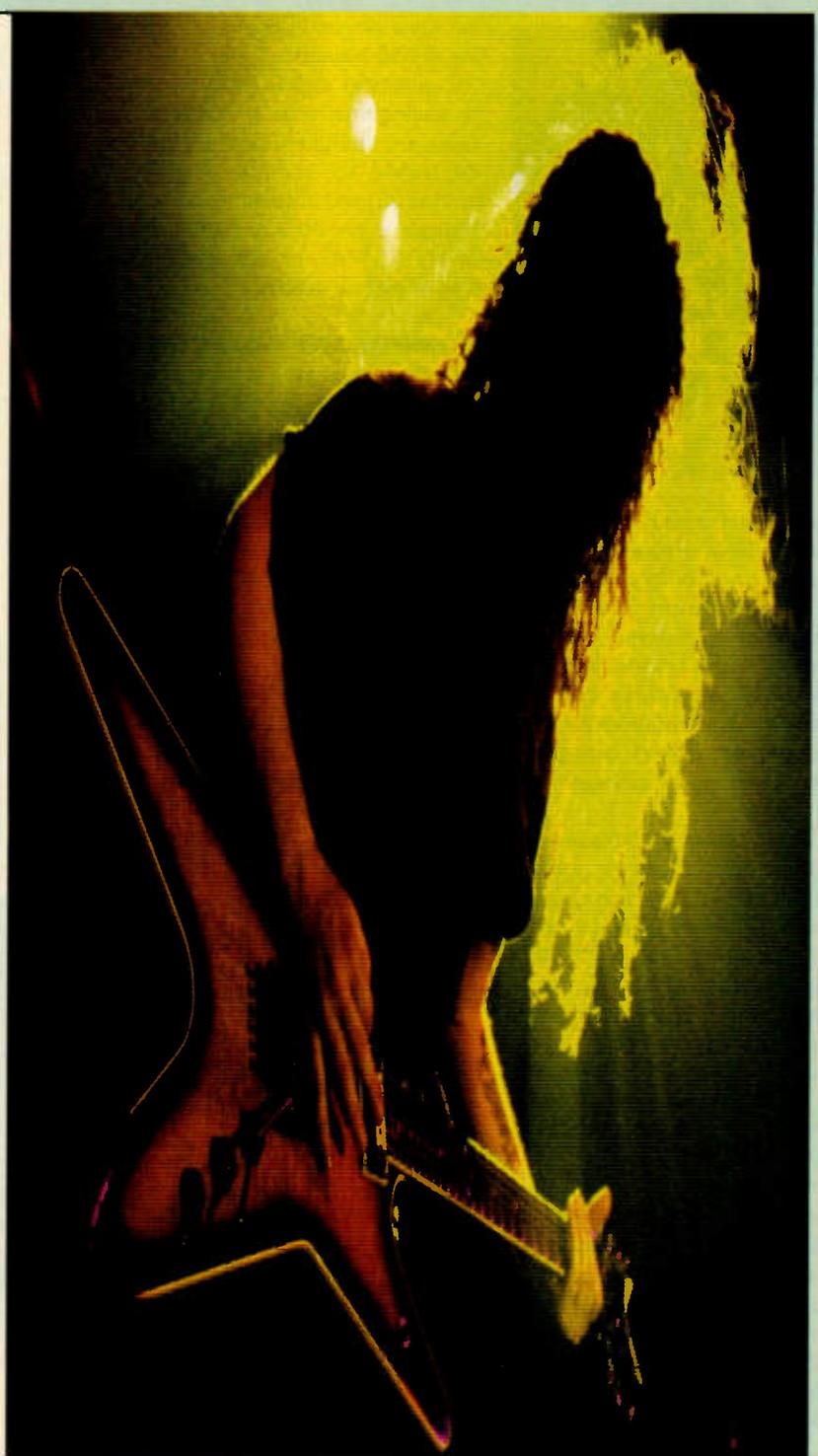


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Wading Through the A/D Mix

by Brian Flowers

ENGINEERING CORNER

Editor's note: Without a doubt, the rise of new broadcast facilities around the world and the increasing availability of programming and the equipment needed to exchange it is having a profound affect on the video industry. But as is usual, technology creates new difficulties along with new opportunities. And for video engineers involved in international program exchange, the technical challenges are many.

This month, TV Technology introduces a new column from Brian Flowers, project manager at the EBU's new Eurovision Control Center. With more than 30 years at the EBU, Brian is no stranger to program exchange, and he offers a wealth of information on how to prepare video facilities for the coming digital future.

As technological progress marches relentlessly forward, we hope Brian's guidance will help our readers embrace the future with confidence.

Television engineers are currently adapting to digital transmission systems. In many ways, digital signals are easier to deal with than analog signals. Digital signals are more rugged than analog and are not subject to cumulative noise and degradation.

Inevitably, however, the transition to digital transmission will take several years, so

ORION INKS SNG DEAL WITH STARBIRD

ROCKVILLE, Maryland

Orion Atlantic and Starbird Satellite Services have forged an agreement to provide international satellite newsgather services using Orion's Ku-band satellite at 37.5 degrees west.

Under the agreement, Starbird, a unit of Worldwide Television News, will use transponders from Orion, while providing video services to Orion's customers in Europe. The companies will then jointly provide international satellite news gathering services for contribution, backhaul and other operations.

Orion is an international satellite partnership that currently counts as members several multinational corporations, including British Aerospace, Martin Marietta and Kingston Communications.

The services will initially be analog, but will eventually be upgraded to digital.

we must presently deal with a mixed analog/digital situation.

Component digital codecs have composite analog interfaces, so studio interconnections are straight-forward. However, it is desirable to reduce the number of analog/digital interfaces to a minimum because every decoding and encoding step of NTSC, PAL or SECAM entails some loss of picture quality.

COMPONENT OBJECTIVES

Composite digital transmission systems avoid this interface problem, but these systems tie the broadcaster to the past, whereas the final objective is to deliver component digital signals to the viewer.

In the composite analog world, we measure many signal quality parameters, usually by means of vertical interval test signals (VITS). For digital signals, the most important parameter is the bit error ratio (BER).

Codecs operating at 34 Mbps (megabits per second) under the ETSI standard are required to show no video or audio degradation with a BER of 1/10,000. In practice, they can tolerate a BER of 5/10,000 without degradation. Bit errors tend to occur in bursts, so error protection is designed to



The AAVS S310 digital analyzer

cope with this characteristic.

A digital demodulator normally provides monitoring of the BER. It also indicates the received Eb/No (energy per bit/noise energy per Hz), which gives an indication in dB of the bit stream's signal-to-noise (S/N) ratio, and hence the available satellite link margin.

34 Mbps signals can be switched by a routing switcher designed to handle the C703 signal, a bipolar signal with a nominal amplitude of 2 volts. The signal will survive several hundred meters of coaxial cable or several kilometers if equalization is used.

Digital codecs also accept and deliver 270 Mbps signals, which can be recorded and replayed by Sony Digital Betacam or Panasonic D-5 component digital VTRs. 270 Mbps routing switchers are available from several manufacturers and serial digital signals can be routed via coaxial cable for at least 200 meters without problems.

ERROR TRANSMISSION

One important point to realize with this scenario is that a high BER on the compressed digital link will not appear as a high BER on the 270 Mbps signals, although the actual picture will be affected by the link errors. Clearly, the 270 Mbps signal will carry whatever the decoder delivers, blemishes included, but these blemishes will not be detected as errors in the 270 Mbps signal.

Nevertheless, the 270 Mbps signal can suffer from its own BER degradation, and test equipment is available to check the various parameters of 270 Mbps signals. Tektronix has developed the Error Detection and Handling system, in which Cyclic Redundancy Codes (CRCs) are generated and then checked by an analyzer further along the 270 Mbps chain. A very informative book entitled "A Guide to Digital Television Systems and Measurement" is available from Tektronix giving all details of the system. (*Editor's note: For a further examination of Error Detection and Handling, see this month's Guest Comment from Leitch Video on Page 4.*)

AAVS of Paris first delivered its S310 digital test unit for the Albertville Winter Olympic Games in February 1992. This digital video analyzer can check serial or paral-

ratio better than about 60 dB weighted, the decoder output S/N measurement may indicate about 80 dB.

This is because the noise signal has fallen below the resolution of the digital sampling circuit in the encoder, so the decoder produces a perfect black-level on line 22, where the noise level is that of the decoder's analog output circuitry only. Trying to measure S/N ratios in these circumstances is analogous to trying to look at atoms with an optical microscope. Of course, fundamental particles lead a very fuzzy existence anyway, as Mr. Heisenberg discovered about 60 years ago.

SHALLOW RAMPS

The solution to the noise measurement problem would be to replace the line 22 black-level by a shallow ramp (0 to 20 IRE units), which would oblige the codec to demonstrate its quantizing noise level on the decoder output.

The S/N ratio of the compressed signal

Component digital codecs have composite analog interfaces, so studio interconnections are straight-forward.

will vary with the entropy level of the video signal. The only way to measure the resulting S/N ratio is to insert a shallow ramp within the active picture area and use this for the noise measurement. Viewers would not appreciate a line across the picture, so this test can be carried out only in the laboratory.

In conclusion, I can reassure broadcasters that component digital transmission systems work very well, delivering clean, sharp pictures that are unaffected by cumulative noise and other shortcomings of analog transmission systems. However, we should avoid the temptation to compress too much on contribution circuits, otherwise the cascading of codecs will produce visible digital artifacts on fast-moving detail. It would be a pity to exchange the cumulative degradation of analog transmission systems for loss of resolution and blocky pictures on critical sequences when the action gets lively. ■

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Circle Reader Service 57

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.

Understanding Compression

by John Watkinson

VIDEO WATCH

Compression is a much debated subject, but it is also very misunderstood. On the development scale, compression today is where error correction was five or six years ago. Perhaps in another five years, compression will have become absorbed into the collective consciousness of the industry and informed decisions will be taken automatically.

Almost all technology can be considered on many levels depending on your outlook. This was once brought home to me quite forcibly by a prominent character in the music industry who said that the main thing Reed-Solomon coding did for him was to allow him to throw up on the medium. I imagine, in due course, a similarly basic anecdote will emerge regarding compression.

MORE FOR LESS

In a general sense, compression is a high tech way of getting more out of less. The sound and picture still arrive, but the required bit rate or bandwidth is less than if the signals are sent in their original form. From a purely black box viewpoint, compression is a financial officer's dream. Every process that relies on storing or conveying large quantities of data can be made more economical using compression. Existing processes get cheaper and new processes become possible. Digital Audio Broadcasting (DAB) and digital television would be impossible without it. Non-linear editors would be hopelessly uneconomic.

In fact compression has been around for a long time, but in other industries. The ubiquitous fax machine would be costly and slow without it. In fact, we can learn a lot about compression by looking at the characteristics of the fax.

One thing everyone knows is that the fax paper does not go through the machine at a constant rate. It slows down on detailed parts of the page and speeds up on the flat areas. The bit rate down the telephone lines is constant, but the fax transmitter is trying to achieve constant image quality, so the degree of compression that is possible varies with image content. The simple solution is to put a data buffer between the compression logic and the phone line. The content of the buffer controls the paper speed.

Just like the fax, the degree of compression which can be applied to audio and video for a given quality varies with content. However, in many applications audio and video need to be sent in such a way that they can be appreciated in real time, so the opportunity to change the timebase is denied. Instead, the compressed data rate varies for constant quality.

This is inefficient because data transmission systems prefer a constant bit rate. There are three ways around the problem.

If only a single channel is required, there are only two options. First, a large buffer can be used to absorb instantaneous variations and give a constant channel data rate. The delay has to be accepted. Secondly, the compressor can be forced to compress harder on detailed material so that the bit rate remains constant. The delay is reduced, but the quality varies.

The final option is available if many simultaneous channels are needed. Statistics tells us that the chances of the compression factors of several independent signals changing together are slim. Thus a single, constant-quality compressor will output a variable data rate, but the overall rate from a number of such compressors is nearly constant.

Another lesson our fax machine teaches us is that when a poor line is used, the received image can become unrecognizable. This is because compressed data is more sensitive to errors than uncompressed data. When redundancy has been eliminated, the remaining bits are more significant and so more information is lost if one takes a hit. As a result compressed data often need more powerful error correction systems to obtain the same performance down a real channel. Some of the coding gain of the compressor is lost in the extra redundancy added for error correction.

Data reduction is a flexible technology because the degree of coding complexity and the degree of compression used can be varied to suit the application. Video contains redundancy because typical images contain areas which are similar. The actual information in video is known as the entropy, which is the unpredictable or new part of the signal. The remainder is redundancy, which is a part of the signal that is predictable. The sum of the two is the original data rate. The degree of compression cannot be so severe that the new data rate is less than the entropy, as information must then be lost. In theory, all of the redundancy could be removed, leaving only the entropy, but this would require a perfect algorithm, which would be extremely complex.

INVISIBLE COMPRESSION

For production purposes, the compression factor should be less than this so that some leeway is available. This allows simpler algorithms to be used and, where necessary, permits multiple generations without excessive artifacts. Thus, production digital VTRs, such as Sony's Digital Betacam and the Ampex DCT, use only very mild compression of around 2:1, which also helps make the variable compression invisible. In consumer equipment, the compression factor will be higher, and some of the entropy will be thrown out in the compression process.

For production recorders, only redundancy within the field is used. No advantage is taken of the redundancy between fields, as this would compromise editing. If editing is not a requirement, a much greater degree of compression can be used, which will take advantage of redundancy between fields.

Compression algorithms intended for transmission of still images in other applications, such as wirephotos, can be adapted for intrafield video compression. The ISO JPEG (Joint Photographic Experts Group) standard is such an algorithm. Interfield data reduction, such as the ISO MPEG (Moving

Pictures Expert Group) standard, allows higher compression factors with infrequent artifacts for the delivery of post produced material to the consumer. With even higher compression factors, leading to frequent artifacts, non-critical applications such as videophones and games are supported where the data rate has to be as low as possible.

Higher compression factors are easier to obtain if advantage is taken of redundancy between successive images. Only the difference between images need be sent. Clearly with a still picture, successive images will be identical and the difference will be trivial. In practice, movement reduces the similarity between successive images and the different data increases. One way of increasing the coding gain is to use motion compensation. If the motion of an object between images is known and transmitted, the decoder can use the motion vector to shift the pixel data describing the object in the previous image to the correct position in the current image. The image

In fact compression

has been around for a long time,
but in other industries.

difference for the object will then be smaller. The differences between images will be compressed as usual.

VIDEO STUFFING

MPEG 1 is a simple system that gets over the computer industry's justifiable abhorrence to interlace scanning by throwing away every other field before compression begins. As the vertical resolution and the motion portrayal are effectively stuffed by this move, then for consistency the horizontal resolution is stuffed by the same amount in a filter. Thus, the compressor begins with one quarter of the input bandwidth and not surprisingly achieves a high compression

factor, even if the picture does look as if it had been in one of those hydraulic things the wrecking yards uses to crush expired automobiles.

Video CD uses MPEG 1 (sometimes laughingly called Motion Predicting Educated Guesswork) to allow a travesty of video to be recorded at the standard data rate of an audio compact disc. As this requires a compression factor of more than 100-to-1, it is hardly surprising that the results are poor.

Video CD has to work with standard CD players, which have no facility to vary the data rate according to the picture content. This works for cartoons or other animated programs, but on real video the artifacts take over.

MPEG 2 recognizes interlace scanning and other bizarre things, like fields, so it does not attempt such a high compression factor. As a result, the pictures are quite good. The HDCD (High Density Compact Disc) is imminent and uses developments in optics to boost the capacity and data rate of a disc by around six times. These discs will not play on a regular CD player, but they will be ideal for digital video. HDCD will probably use MPEG 2 in conjunction with a variable data rate so that the disc speed will change dynamically with picture content. This should result in a subjective picture quality that is comparable to analog laser disks, although such comparisons are difficult because the artifacts of compression are quite unlike the artifacts of analog recording. With any luck, it will bury the unfortunate Video CD without trace. ■

John Watkinson is an independent consultant in digital audio, video and data technology and is the author of seven books on the subject, including 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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A Quick Review of Digital Formats

by Jay Ankeney

**FOCUS ON
EDITING**

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Are you like me and tend to spell "digital" beginning with "duh"?

This month, in response to numerous inquiries, I am going to review the current catalog of digital formats competing for our post production attention. It's about time, too. With D-1, D-2, D-3, D-5, DCT and Digital Betacam already competing for market share, it won't be long before D-6 is upon us.

As a final bonus, I am also going to reveal the absolutely true, authoritative answer to the mystery of the non-existent D-4.

Let's begin with the first practical digital tape format, D-1. Sure, there had been some impressive demonstrations of digital recording technology back in the middle 1970s, most notably from the BBC, but it was in early 1982 that Sony asked the SMPTE (Society of Motion Picture and Television Engineers) to form a committee to formalize the specifications for a component digital signal (CCIR-601) and a component digital recorder, D-1. Sony eventually announced its first D-1 unit at NAB 1986 and then brought out a market-ready recorder a year later.

The D-1 format utilizes a 19mm tape, painting a record track width of 40 micro-meters recording a 4:2:2 signal (which, by the way, means four parts luminance and two parts each of the chrominance difference signals; it's a shorthand way of describing Y, R-Y and B-Y in terms of component digital video). In addition, D-1's four channels of digital audio at 48 kHz were eagerly greeted by mixdown-weary editors.

The D-1 format was defined by committee before a functioning recorder was actually completed. Technical choices — such as D-1's use of gamma ferric oxide tape (850 oersteds coercivity) as opposed to the then-still-new metal particle tape (1500 oersteds coercivity), as well as its use of randomized NRZ as a channel code, guard bands between tracks and starting a field in the center of the recorded track — suggested to some that the D-1 recording process was not as proficient as some of its subsequent brethren. Without a doubt, though, D-1 has been a tremendous success and is still the benchmark digital standard in many post production facilities.

COMPONENT PRODUCTION

It has always struck me as curious, though, that in a world centered around composite video, it would be a component process that first met the challenge of digital production recording.

"Extremely high-end graphics and production people were the only ones who could afford the price of the first digital videotape recorders," said Joe Pistacchio, marketing manager for broadcast and production video recorders at Sony. "Remember, the first D-1 machines cost over \$120,000. These visual artists were already dependent on component signals, so it just made sense that our first digital decks would adopt the component path."

The next digital format, cleverly called D-2, reverted to the more plug-compatible composite video approach thanks in part to its origins as the core of a sophisticated cart playback system.

"The first conceptual showing of D-2 was at NAB 1986 as part of the ACR 225 spot

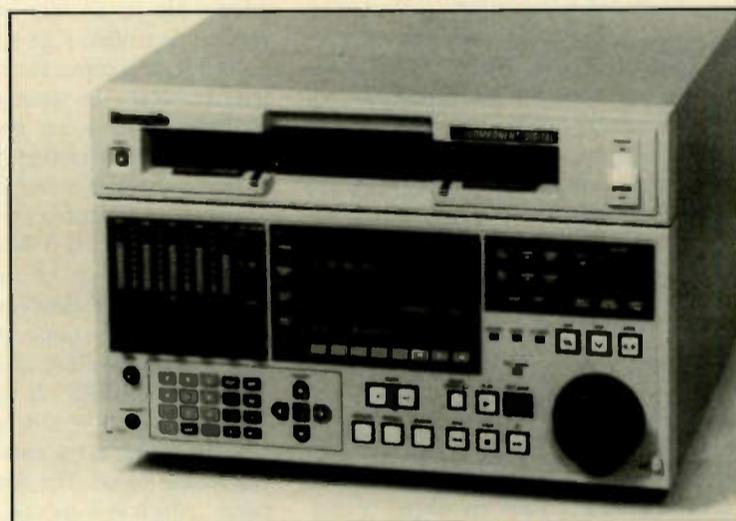
recording/playback system," said Bill Carpenter, product marketing manager for DCT tape drives at Ampex. "Our solution to the problem of playback conflicts deriving from spots that were either on the wrong tape or too far apart was to dub the spots to a standby tape using a transparent recording process employing composite digital video. This was the origin of the D-2 format."

CHEAPER VIDEO

The marketplace took note of this cheaper, simpler digital video recording approach. Interest in adapting this technology as a general purpose production format encouraged Ampex to offer its digital composite format to other recorder manufacturers. By December of that year, together with Sony, Ampex submitted its completed format description to SMPTE (politely bypassing the committee stage), and D-2 was

to the tape. Then, similar to video confidence, they read from the tape and compared it to the buffer. Any time the off-tape information does not match the buffer, error sensing circuitry set up a flag and the information is recovered.

"This approach powered Ampex's next move into digital video recording: Digital Component Technology, or DCT, which was introduced at IBC 1992 and then NAB 1993," Carpenter said. "Specifically optimized for post production applications, DCT uses discrete cosign transform technology with a 2:1 compression algorithm to record a component digital signal in a system that, with Ampex's data handling and error correction experience, offers remarkable recording integrity. While other formats measure the number of uncorrected errors on a per frame or per second basis, DCT requires concealments only a few times per hour.



Panasonic's D-5 half-inch component machine

officially born.

"By 1988, both Ampex and Sony had D-2 recorders on display at NAB," Carpenter said. "D-2 uses the same digital audio track parameters and the same cassette shell as D-1, but there the similarities end. The composite D-2 format specifies a 19mm metal particle tape holding a 39 micrometer record track, azimuth recording (150 offset between tracks) to eliminate guard bands, the Miller Squared coding process and the same range of speeds (+3X normal to -1X reverse) that Type C editors had become accustomed to. And it is considerably less expensive than its component precursor. Even early D-2 machines sold for nearly the price of high-end one-inch decks."

At the time, Ampex was also developing a data recording system that presented different challenges from handling video. Video's primary concern is continuity, but data lives and dies by integrity. Video recorders can compensate for a fleeting dropout, but if a tiny bit of data is lost in a customer's bank account, the result is disaster. Ampex had the idea of first bringing information into a buffer, then writing from the buffer

"We know that there will be basically two acquisition formats that will create most of the source material for many years to come: Betacam SP and film," he continued. "So we designed our DCT format as a mastering medium, and one that overcomes some of the interchange problems that some other digital formats have shown. For example, if you want to change an insert edit on a D-2 tape in a different edit bay from the one in which it was created, the best procedure is to make a clone of the tape and do the changes on the copy."

"DCT — because of its recording track width of 39 micrometers, its stainless steel lower edge tape guide, and its 'Auto Edit Optimize' sub-routine — is designed so each DCT tape will be compatible with any DCT recorder. We are so confident in the interchange reliability with DCT that soon we will be marketing pre-blacked DCT tapes."

By now, other players had already entered the digital arena. Steve Mahrer, engineering manager of Panasonic's Product Marketing and Engineering unit, brings us the D-3 and D-5 stories.

"Panasonic Broadcast started out in 1980 with the M format," Mahrer said, "which is a half-inch component analog format that actually preceded Betacam by a short while."

Then, in 1985 Japanese broadcast giant NHK drew up specifications for a new format to replace their old two-inch quad machines. Matsushita responded with the M-II format, still in the analog realm, but now using metal particle tape, four channels of audio and second generation tape transports. U.S. network NBC adopted the new format in 1986, buying 2,500 machines and standardizing its network productions on M-II.

M-II DESIGN

D-3 is a composite digital format designed around the M-II transports, using half-inch metal particle tape.

"D-3 was designed to be a post production workhorse," Mahrer explained, "benefitting from the experiences of D-1 and D-2. D-3 was first used in the 1992 Olympic games in Barcelona, Spain, where almost all the tape production from the host broadcaster RTO, the British BBC, Canadian CTVC and of course NBC, used it. It has a similar tape path to the M-II machines, with a track width in NTSC of 20 microns, and enhanced error correction. D-3 was always intended to be part of a family, but we had also been looking forward to a component version, eventually to be called D-5, right from the beginning.

"D-5 was shown in an engineering demonstration forum at NAB 1993 and as a production prototype at NAB 1994," Mahrer continued. "Panasonic started shipping 625 line versions in Europe last October and has just made the 525 version available in the U.S. this June. We

designed the two digital formats to be carefully linked together. They both use the same width of tape, the same type of heads and the same 8-14 channel coding. This 8-14 channel coding turns an 8-bit number (28 or 256) into a 14-bit number (214 or 16,384), which lets us pick the values that have little or no DC from unwanted adjacent numbers so

A cultural affairs representative of the Japanese Embassy in Los Angeles confirmed that the number 4 in her language is pronounced "shi," which means death.

the signal can fit into a smaller bandwidth. Eight to 14 also gives you a higher recovery in terms of lower error rate and less sensitivity to mistracking.

"Component recording requires just over twice as much data per second than a composite machine," Mahrer added, "so the bit rate requirements of D-5 are about 2.3 times that of D-3. We solved that by simply doubling the number of record heads in the D-5 machines and, although we keep the same drum rotation, doubling the actual linear tape speed.

The trade-off, of course, is that D-5 can record a maximum of two hours on the same cassette on which D-3 holds four hours. In the future, the tape formulation for each format is being merged so that soon both D-3 and D-5 will utilize exactly the same tape stock."

"An important point about D-5," Mahrer said, "is that it is an uncompressed CCIR 601, 4:2:2 recording process in a choice of either 13.5 MHz or 18 MHz sampling,



In addition, it is a true 10-bit recording approach, as opposed to the eight bits other systems such as D-1 use. This makes four times the resolution of 8-bit recording available, resulting in cleaner keys, sharper graphics and better film transfers. In fact, because the SMPTE 259 serial digital composite/component interface standard always called for a full 10-bit specification, most component digital video equipment can already use a 10-bit signal."

DIGITAL LEAP

This brings us to Digital Betacam. "We took a real leap with Digital Betacam," said Sony's Joe Pistacchio. "It was announced at NAB 1993 after a PAL preview at IBC the year before. Digital Betacam began shipping in October of 1993, and although it has been in the field for less than a year, over 4,000 units have already been sold worldwide. Digital Betacam uses half-inch metal particle tape, recording a 10-bit, 4:2:2, component digital signal with 2:1 bit rate reduction on a 14 micron videotape, providing a two-hour load in a single cassette.

"Some models are also capable of Betacam and Betacam SP playback, so an estimated 100 million previously recorded tapes are upwardly compatible with this new format recorder/player. You can even get a component digital output if the original recording was analog,

thanks to the high-quality inboard analog-to-digital converters.

"In addition, there is now a digital Betacam camcorder capable of a 40-minute load, making this the first component digital production format. And we think it is important to note that whereas most of the other digital formats run at over \$100/hour just for tape costs, Digital Betacam costs around \$40/hour. This could be significant, as the market makes future choices in the digital video recording sweepstakes."

Will there be a D-6? Word has it that Toshiba and BTS are working on it as a possible HDTV format. Scan for sightings at next year's NAB.

WHITHER D-4?

Finally, as promised, whatever happened to D-4? It turns out that in Asian cultures, the number 4 is a major taboo. A cultural affairs representative of the Japanese Embassy in Los Angeles confirmed that

the number 4 in her language is pronounced "shi," which means death. An

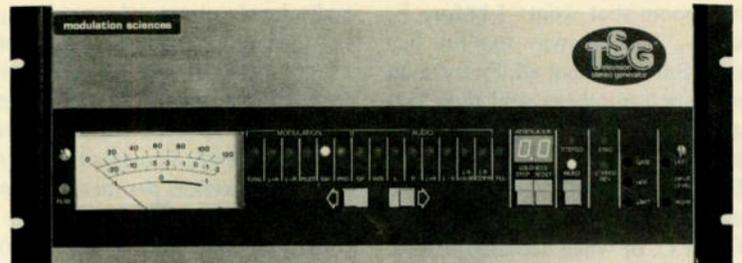
executive officer of SMPTE who dealt with this question told me this belief had actually delayed the standardization of D-3 and D-5 until they bypassed the tainted integer.

There is a similar taboo for the number 9, pronounced "ku" in Japanese, which means "suffer." So we probably should not expect a "D-9," if the cycle gets that far. Just when we think the crystalline genius of technology has banished the demons from our superstitious ids, the reality of our human foibles gives us a nudge in the ribs.

But then again, as an American, I don't know if I would want to see a D-13. ■

Jay Ankeney is a staff videotape editor at KTTV in Los Angeles. Write him at 220 39th St. Upper, Manhattan Beach, CA 90266.

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Some Rules Are Made To Be Broken

by Mario Orazio



SOMEWHERE OUT THERE You might not have noticed that some rules are never supposed to be broken; safety rules for instance. Never, ever dangle over a parapet to get a good shot without having safety lines on both you and your camcorder.

Yes, I know, you can look pretty silly with a rope tied around you, and you will look even sillier dangling from said rope if you lose your balance. But my mother always taught me there is nothing sillier than a premature death.

Anyhow, I did not tickle my computer out of its stupor this month just to offer tips on how not to kill yourself or someone else, even if that is probably a better topic than what I had in mind. What I do intend to write about is the opposite of the above rule: If some rules are never to be broken, that means others are.

BACK TO SCHOOL

Remember elementary school? Spelling? That idiotic poem that went "I before E, except after C..."? Right away, that rule has an exception. But that is not all. Pretty soon you learn to spell numbers, and then you start wondering where the letter C is in the word eight.

Lo and behold (and I still don't know how to lo), the rule poem gets longer: "I before E, except after C, or when sounded like A, as in neighbor or weigh." Maybe that works for the McGuffey Reader and "Dick & Jane Go to the TV Studio," but somewhere around the time you open your first history book you have to start wondering where either the A-sound or the C is in a word like seize (and don't give me any sass about how seize sounds like it starts with a C; so does siege).

"No worries," says your spelling teacher. "That's the exception that proves the rule."

What? Can you run that one by me again? The exception that proves the rule? I don't know. Somehow my math and logic teachers skipped that section. And some people wonder why I spell funny (or, to be grammatically correct, funnily, but funnily looks and sounds stupid, so I guess that is another exception that proves a rule).

In the land of television technology, I think the exceptions are the rules. For instance, if this esteemed publication were to lose from its circulation lists every single reader who records the recommended SMPTE leader sequence on videotapes, I don't think we would save much paper. In other words, there is a SMPTE rule for which the exception is practically everyone.

In another example, just about everybody in the NTSC world abides by a rule that does not even exist: RS-170-A. There is no such animal, there never was, and probably never will be. But since most people seem to have a pretty good idea of what it would

be if it did exist, we do not have the SC/H problems that led to the U.S.'s blanking panic of the late '70s.

(A quick refresher on the blanking panic of the late '70s: RS-170, which does exist, does not say anything about subcarrier-to-horizontal-sync phase relationship [SC/H] because it does not have any subcarrier at all; it is a black-and-white standard. VTRs lock to house subcarrier regardless of what is on the tape. If the house and tape do not match, horizontal blanking increases. At some point, this exceeds U.S. regulations. The U.S. Federal Communications Committee did not say anything for a while because there was nothing anyone could do about it. That was until a company called Vital introduced the Squeezoom — an ancient ADO — and the FCC commenced enforcement, resulting in an ensuing panic.)

Here is another example while I ransack what is left of my feeble memory trying to figure out what my point was going to be this month. Do you have any idea what audio level you record on your tapes? I am not talking about dBm or dBu or dBV or VU or PPM or any other alphabet soup from the electronic domain. I am talking about what is recorded on the tape. And that, my friends, is magnetism, not electricity — nanowebers per meter, not millivolts.

Just for fun, you might want to compare something like ANSI/SMPTE 20M, paragraph 3.4, with what is really on your tapes. I have a feeling that somewhere in the vicinity of half of you to whom the standard applies are going to be surprised. I won't spoil the fun by giving away the ending, but I will give you a hint: Sometimes manufacturers do not follow rules, either.

SAFE AND SORRY

So, what was the point of all this? Oh yes, rules. Let me see. You have your safety rules, which should never, ever be broken for any reason other than saving someone's life or limb (or internal organ — it's an expression). Then you have things like government regulatory rules, which are to be broken only under penalty or if you are fairly certain you won't be caught. (It is my suspicion that most of you are violating color encoding rules. But who can tell?) Then you have your just-plain-stupid rules, which are just crying out to be broken.

Return with me again to the U.S. of the 1970s and the thrilling days of the blanking panic.

The reason for the blanking rules in the first place was so TV set manufacturers could build the little darlings in such a way as to allow viewers to do their thing without black bands sneaking in from the edges. You actually have to violate the rules fairly severely for such encroachment to be visible. But during the blanking panic, people started blowing up their pictures in DVEs or

surrounding them with colorful borders or taking other steps to mess up the imagery in order to comply with a stupid rule.

I was not there, but someone attending a camera maintenance class where 90 percent of the questions were about blanking told me a non-American in the class burst out laughing. When asked what was so funny, he said, "It is just that in my country, we are more concerned with the part of the video signal you can see than with the part you cannot." Amen.

ON THE LEVEL?

I think I have spouted off here in the past about how we seem to be relying on a Kell factor from the 1930s in today's 1990s. Well, so what? At least the Kell factor is not dictating how to make pictures or sounds. That sure is not true of gamma and audio level standards.

They tell me the gamma of an NTSC TV set is supposed to be 2.2. Well, maybe my grandmother's first TV set, back in the days before the electric light, had a gamma of 2.2; modern sets are so far from that number that it is not even funny. Still, camera and chip chart manufacturers continue to cling to a stupid rule.

The best video operators (or vision controllers, if you happen to speak English instead of American) never, ever set up

The best video operators (or vision controllers, if you happen to speak English instead of American) never, ever set up cameras according to the rules.

cameras according to the rules. They look at the pictures. The very best not only look at the pictures in the control room, they also watch them at home.

The best way to ride video is by looking at the pictures and ignoring what any rules say about gamma, APL and all the rest. A good video operator with a trustworthy picture monitor can make lovely pictures without a waveform monitor or vectorscope. If you reverse the situation — give someone a camera that has been set up for textbook gamma, a waveform monitor and a vectorscope — you will find trouble.

In audio, I have heard from some people how VU meter peaks are supposed to just nudge the zero, while others say they should peak in the red, but not bang the pin. People seem more definite about PPMs. Peaks must never, ever exceed the limit but should be way up there.

Have we completely lost the fine art of listening? Let me be the very first to admit that peaks that are too high do such nasty-sounding things as FM splatter and digital "no-such-number" clipping. That is why someone invented limiters, and as long as you monitor through such processing, you can let peaks fall wherever they sound good. Heck, everything should be mixed so it sounds good — good in the home as well as the studio.

By the way, have you ever noticed that cable TV systems have wildly different loudnesses on different channels. Might I suggest that someone make some adjustments, at least until every TV set contains its own CBS Labs Audimax and Volumax?

As long as I am spouting off about signal processing, here is another rule ripe for

breaking: Do not process original recordings. Okay, so that is not exactly a stupid rule. Whatever you do up front, you probably will not be able to undo down the line. But there are many times when you should process the original recording.

There is not a post production effects device yet invented that will duplicate the look of panty-hose material stretched across the rear end of a lens. And for making someone sound like she's talking with her hand over her mouth, there is nothing like recording her talking with her hand over her mouth.

I remember when a satellite earth station was 100 feet in diameter (30 meters for those of you too smart to stick with English units), with a 16-ton counterweight hanging off the back. How did they shrink? Someone broke the rule. People did not launch newer, more powerful satellites or use improved LNAs (I am not talking about the 18-inch systems; I mean the earth stations at TV stations, cable systems and backyards). These developments came about when someone just said, "I do not understand this rule that says there can be only a handful of Intelsat Standard A earth stations."

Directors, I find, are great for getting me to break rules. And the less they know about TV the better. I had not even realized how almost all camera mounts are designed to

get lenses from maybe waist level on up until one such directing-type individual explained to me how he wanted a toe-level moving shot. I know that the rules say you are supposed to use a panning head on a mount, but you are not going to get a lens down to toe level on a

nine-inch panning head.

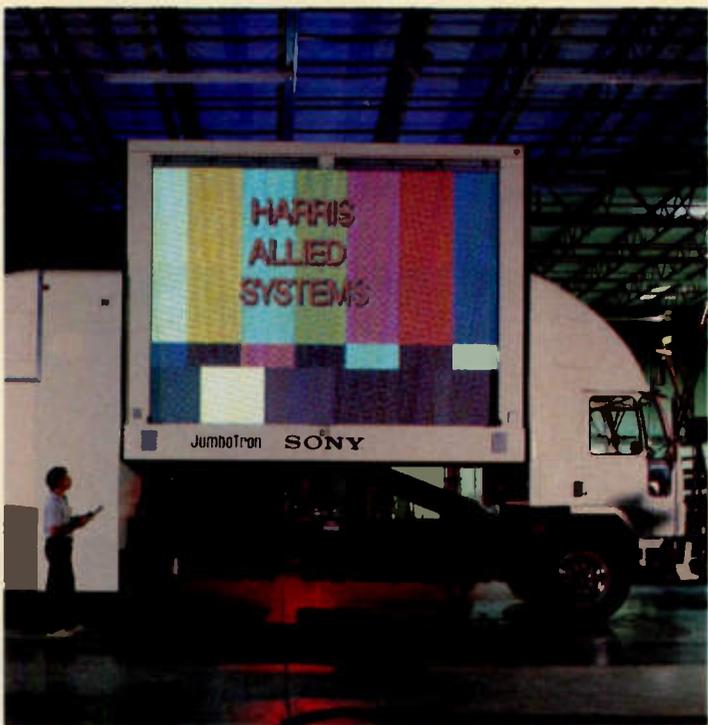
THE OLD DAYS

Back in tube-camera days, I used to have lots of fun intentionally misregistering cameras for a drunk effect, misbeaming them for psychedelic colors, and jabbing audio into their scanning for wavy "dream" effects. The rules say you are not supposed to do that stuff. But you are also not supposed to wind tape backwards over a capstan and pinch roller for precision reverse play.

There is a lot of commotion these days (too much, if you ask me) about aspect ratios. Camera manufacturers are trying to figure out how to get to 16:9, and some cinematographers say that is too narrow. So I was real interested to see how the people at the Toronto SkyDome fill their unbelievably widescreen Jumbotron. They just mark the viewfinders of 4:3 cameras with grease pencils and throw away the parts of the picture they are not using. The rule that says the camera has to match the aspect ratio is a stupid one that cinematographers themselves threw out about 40 years ago.

"But, Mario, how do you know which rules are stupid and which are good?" I am glad you asked. Every time you are faced with either a rule or the potential breakage thereof, you just have to ask yourself one more question: Why? ■

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.



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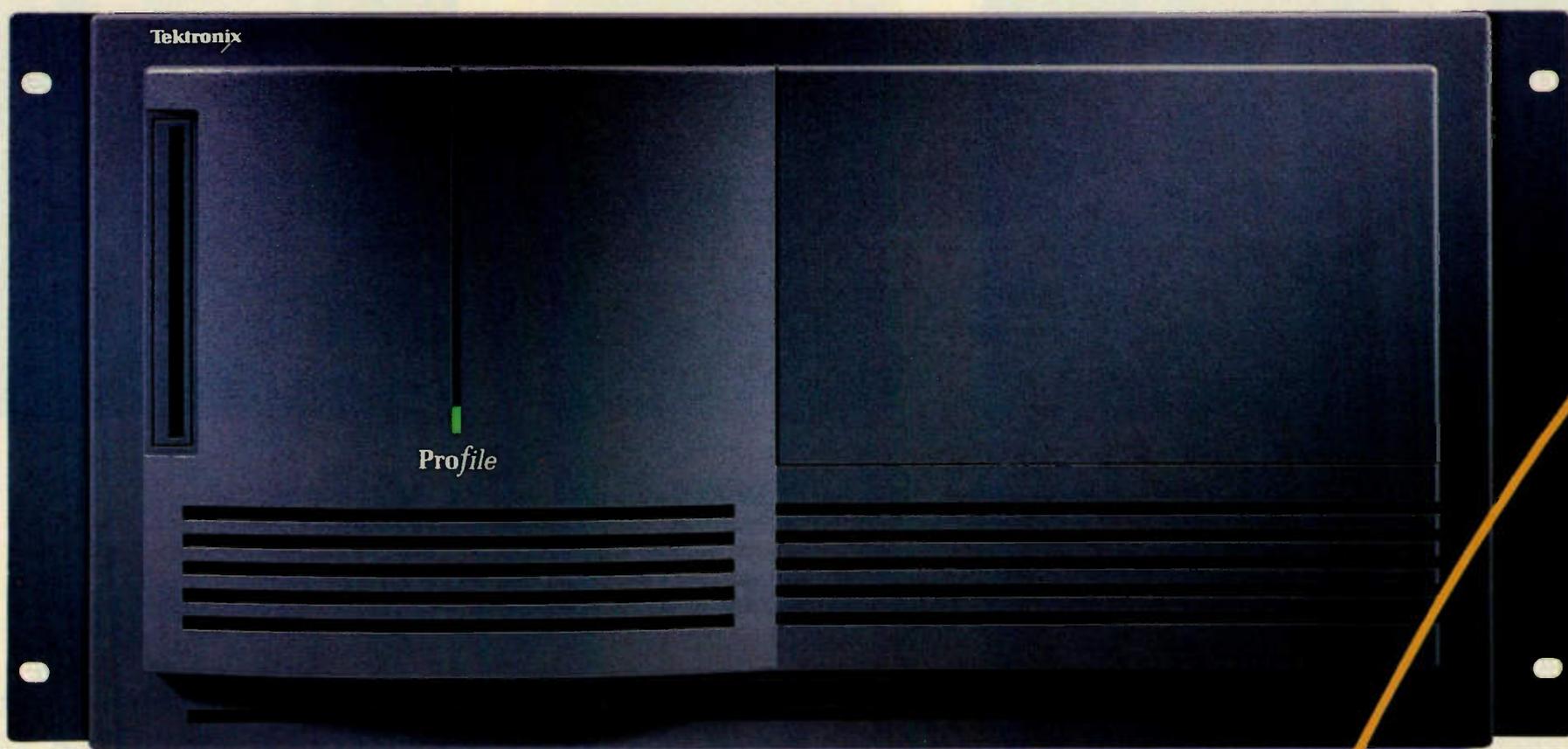
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IBM Touts News On a PC

by Andrew Von Gamm

AMSTERDAM

IBM and the ITN news network have combined to produce the world's first stored video news-on-demand service for the PC. Subscribers in Europe are able to recall video clips, sound, accompanying text and graphics and store them automatically for future use.

Premiered at the IBC, the service, known as Desktop-News, combines the use of the PC with IBM's IN SatConnect network and the huge library of video and information available from ITN. The result is what IBM claims to be the first ever news-on-demand

service that is truly up and running.

Because packaging, video content and text information is delivered separately, most of the usual technical constraints of having to transmit a constant stream of high-grade video with synchronized sound are bypassed.

BUILDING BLOCKS

The system uses four existing building blocks: the IBM digital video ActionMedia software and capture card, the IBM Desktop Builder user interface, the IBM TCP/IP network and the IBM Desktop Player.

The IBM ActionMedia package allows the

video to be compressed 200:1, which gives "near-VHS" quality. Ideally the system requires 1.5 Mbps (megabits per second) using a VSat receiver linked to the IBM network. It can, however make do with two ISDN lines, which give it a total of just 128 Kbps.

The system adapts automatically to the data transfer available. The user defines how often video frames are to be refreshed: the default setting is 15 frames per second. All frames are measured as the difference to the base frame. This means that, given a set 'refresh' frequency, the speed of difference-calculation is also fixed, and the only variable is the attainable quality.

If there is little change in the source material and the user requires a low refresh rate, the quality improves. At 15 frames-per-second, between 3 and 10 megabytes of data are required for one minute of material.

Because it is built on modules, improvements can be incorporated into the system. IBM is working on MPEG 1 and JPEG applications, and as software payback improves, it is expected that a variety of formats will become available.

The Desktop Builder is the tool used by the service provider to assemble the information into a multimedia presentation with a tailored menu suitable for the target audience.

SATELLITE CONNECTION

The IBM IN SatConnect Service forms the heart of the system and connects the service provider (ITN) to the IBM uplink station in Warwick, England. The IN SatConnect provides prioritized multi-way connections of up to 2 Mbps, but the Desktop system was not designed with satellite communications as its only source.

"We expect the IBM Desktop Television Service to move to an ATM platform as soon as terrestrial prices in Europe become more closely related to costs," said George Mitchell of IBM UK.

The Desktop Player user-interface permits the user to determine video picture size and scroll the text. The index menu is similar to most multimedia programs and also provides searches based on single words or general topics. The search facility can produce a series of matches between linked subjects.

The Desktop Player can also be used for peer-to-peer video-conferencing throughout a network. In-house performance testing from IBM suggests that 10 users can access the digital video across a 16 Mbps network without effecting other applications.

The Desktop is part of IBM's push into multimedia, which will involve the next generation of the OS/2 operating system acting as a multimedia platform for news-on-demand and peer-to-peer multimedia networking (i.e. video conferencing and data exchange).

We are told that IBM also has a prototype all-in-one machine called 'Simon' that looks like a high-end cellular telephone, but integrates the PC, video-on-demand and the digital cellular telephone to provide multimedia directly to the user.

The Desktop is part of the world-wide rush into corporate multimedia and, although IBM may be the only company to have a fully operational system up and running at the moment, Intel has already staked out a major claim on the hills of corporate desktop with its new deal with CNN to develop a similar system based on the CNN news gathering service.

"The biggest problem, even in the U.S., is to get the PC linked up to the communications infrastructure," said Ron Wittier, head of Intel's research and development. ■

For further information:

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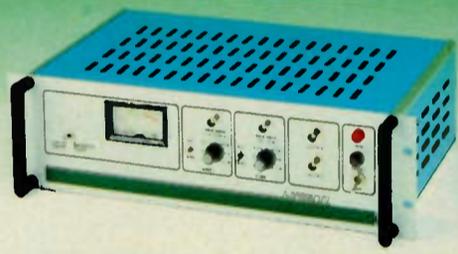
Andrew von Gamm is a free-lance journalist living in Dierscheid, Germany. He can be reached c/o TV Technology.

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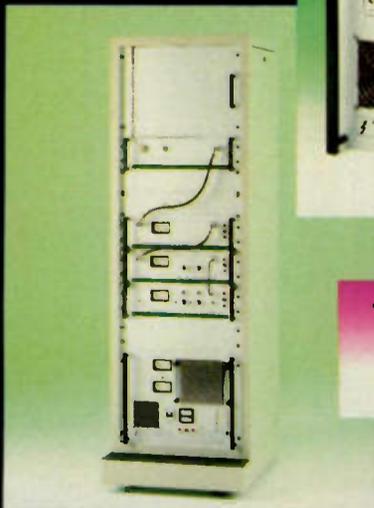


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Take Care In Choosing Jobs

In Contract Work, a Company's Location Says A Lot About How Smoothly a Project Will Go

by Brian Kelley

CONTRACT ENGINEER

Editor's note: As international trade and commerce continue to heat up, opportunities for free-lance audio and video engineers are on the rise. This is especially true as newly deregulated or privatized broadcast operations set up shop. In many cases, these operations are desperate for technical know-how and are constantly on the look-out for experienced engineers to help them get started.

To offer some insight into this growing market, TV Technology is introducing a new monthly column, Contract Engineer by Brian Kelley, intended to guide engineers through the sometimes murky waters of international contract work. Although Brian currently works in international program distribution from his base in Germany, his experience in dealing with foreign markets should have tremendous benefit for the technical side of the industry as well. We wish all of our readers success in venturing onto the international stage.

Globally, there are tremendous opportunities for the television industry. This has become so evident recently that working globally has

become something of a marketing mantra.

Clever manufacturers and service providers now realize that the world at large is no longer a place to dump material once its shelf life in the original domestic market is used up. Successful products and services are designed from the bottom up with the international customer in mind.

But global planning alone only gets you halfway there. People do not live globally. They live, work and trade locally. For television professionals looking to break into the international market, it is therefore necessary to think globally and work locally. And to do this, we need to know how the locals themselves think.

ATTITUDE IS EVERYTHING

When it comes to signing with an international company as a contract engineer or employee, the single most important thing to know about a company is its attitude about itself and about what it can do. This is not to say that a company must fit a specific profile, but without at least some knowledge about its goals and outlook — even if you rely on intuition — the results of international cooperation will not be all they can.

In this column, I will examine some of the emerging markets of the world in an attempt to provide some guidance on the pitfalls and rewards of working internationally.

There are important items to consider when trying to discover a company's "attitude":

Location — where the company is situated and the location of most of its activity.

Ownership — who makes the decisions, and what is this person's level of personal risk and investment in the company?

Relationships — who knows whom, especially related to contacts with government

officials, the domestic industry and international partners.

Communication — can company officials be reached? And when they are, do they have anything significant to say?

In emerging markets, a location — and by this I mean the physical spot where a company is headquartered — carries great significance, much more so than in developed markets. Location is helpful to make an educated guess about what to expect about a company's attitude. However, in many emerging areas, particularly in the former Soviet bloc countries, location becomes a less effective tool. Eastern Europe has not been well understood in the West for decades. Even a short while ago, for example, we determined changes in political positions by the order in which government officials stood at parades.

Still, there are some general conclusions that can be drawn based on a company's location. I liken many areas of the world to runners on a starting block, each more or less prepared to race toward the finish line

... the single most important thing to know about a company is its attitude about itself and about what it can do.

of economic success.

In certain Eastern European countries, for example — most notably the Czech Republic, Hungary, Estonia, Poland and Slovenia — there is a movement to catch up with the West. International investment is higher here than in countries in the other groups. Perhaps not coincidentally, they also border Western nations and are trying harder to emulate the material successes of capitalism. This group starts the race with

good racing shoes of an unknown brand.

In the remainder of Eastern Europe, the political scene is either less stable, as in Bulgaria, at war, as in the former Yugoslavia, or so poor for so long, as in Albania, that more time is needed to make any real progress. Sections of these countries that have greater international contact tend to have a more optimistic viewpoint and act accordingly. This group starts with a blister on one foot, but perhaps covered with a good bandage.

HALF A GLASS

Of Russia and several of its former states — such as Ukraine and Kazakstan — it can be said that the glass is either half empty or half full. People here are quick to talk about difficulties (a favorite Slav word seems to be "problem"), and they do not think we understand their situation, which is probably true. Years of rigid control have produced a lack of drive because so much has not gone well in the past. Still, contact with the West is seen as attractive, so there is reason to be optimistic. This group starts the race with shoelaces partially untied.

Arguably, the most difficult region to pass judgement on is Asia, largely due to the vast cultural differences between East and West. Many Asian nations are experiencing the first independence most have ever had, and there is no tradition of democracy or personal freedom. Contact with the outside world is still very limited, with even some wars getting little mention in the international press. This group starts the race with no shoes at all but with very tough feet.

To be sure, however, all areas of the world have the potential to produce financial windfalls to people who invest the proper time and effort.

But having a read on the attitudes before beginning business contacts is helpful because it provides realistic expectations and helps to evaluate whether the effort is worth the result. ■

Brian Kelley is director of Germany's New Life Network, an international distributor of family and educational television programming produced around the world.

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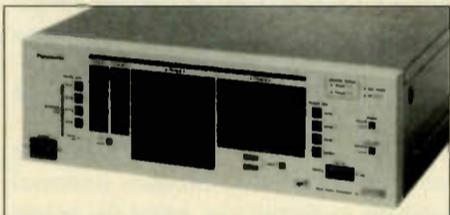


MARKETPLACE

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AUDIO PROCESSOR

Panasonic Broadcast & Television Systems Co. has announced a Multi-Channel Audio Processor (MAP), a standalone A/D and D/A converter as well as a 4:1 bit rate reduction device for audio applications.



The MAP quadruples the AES/EBU digital audio channel pairs of Panasonic D-3 composite and D-5 component digital VTRs. It acts as a processor between studio audio components and a digital audio/video recorder.

Applications for the MAP include broadcast of multi-language programming, international cassette distribution or single cassette protection archiving.

For more information, contact Panasonic Broadcast Europe in the U.K. at telephone +44-753-692-442; FAX: +44-753-512-705, or circle Reader Service 90.

PROMPTING SYSTEMS

The BDLAutoscript Plus is a family of three digital prompting systems: NewsPlus, StudioPlus, and LocationPlus. At the core of each system is Plus software, which runs on any DOS-based computer to provide dual-screen editing without the need for additional cards.

NewsPlus features a template configuration system to interface with electronic newsrooms, such as Basys systems; a run order download facility; and networking capability.

StudioPlus allows the user to edit anywhere in the text without disturbing the prompt output.

LocationPlus features dual-screen editing with laptop, notebook or palmtop computers.

For more information, contact the company in the U.K. at telephone +44-71-538-1427; FAX: +44-71-515-9529, or circle Reader Service 40.

DIGITAL DECODER

Innovision's DX210 digital comb-filter decoder provides digital component output compatible with CCIR 601, D1, D5, DCT and Digital Betacam. The DX210 features

serial and parallel digital interfacing, as well as process controls for video gain, chroma gain, NTSC hue, black level, chroma retiming and horizontal picture retiming.

The unit also offers automatic standard detection for PAL, NTSC, and PAL-M sources (plus PAL-N analog only), and 10-bit ADC with 27 MHz sampling for analog composite inputs.

For more information, contact the company in the U.K. at telephone +44-628-667705; FAX: +44-628-664435, or circle Reader Service 125.

COMPOSITING SYSTEM

Chyron Corp. has introduced Jaleo Composite, a video and audio editing and compositing system. Designed as an open environment, Jaleo edits and composites video and sound elements from videotape, disk recorders, 2-D and 3-D graphics systems, and 2-D and 3-D animated images.

Jaleo's user interface has color-coded bars and multiple video windows for real-time display. The system supports CMX, Sony, and Grass Valley Group EDL formats.

Chyron announced a worldwide distribution agreement with Comunicacion Integral Consultores, a Madrid-based production company, for the exclusive distribution rights to its series of digital workstations.

For more information, contact Chyron in the U.S. at telephone +1-516-845-2000; FAX: +1-516-845-5210, or circle Reader Service 118.

LEVEL METER

Model 953 1 GHz signal level meter by Leader Electronics Corp. covers VHF, UHF, and CATV channels. The LCD-display spectrum analysis function detects



interference components. Up to 128 channel levels can be displayed on the LCD with +/- 2 dB accuracy or better.

The 953 is designed for periodic measurements using the data logger function, as well as C/N, hum, and stability measure-

ments based on CATV regulations. This unit features a large-capacity memory (512 screens for 27 channels, 100 screens for 128 channels) so that measurement time can be saved when collecting various data for installing a CATV system.

For more information, contact the company in Japan at telephone +81-45-541-2123; FAX: +81-45-544-1280, or circle Reader Service 97.

SOLID STATE RECORDER

The Solid State Recorder by Prime Image is a fully controllable, fully solid state unit capable of 1.5 minutes of frame-by-frame or real-time recording. It provides playback at speeds from 0 to +/- 10X with no data compression. The SSR also features a built-in time base corrector and gen-lockable synchronizer.

For more information, contact the company in the U.S. at telephone +1-408-867-6591; FAX: +408-926-7294, or circle Reader Service 129.

OPTICAL TRANSCIEVER



The Canon Optical Beam Communication System, Canobeam, comprises the HS-10B optical beam unit, the CA-1N transmitter control unit, and the CA-2N receiver control unit. The standard Canobeam system can transceive up to four channels of video and nine channels of audio signals.

Because the Canobeam communicates using a high-speed modulated optical beam, it is not affected by radio interference or by restrictions such as frequency allocation, and multi-channel, bi-directional transmission is possible.

For more information, contact Canon in Japan at telephone +81-44-733-6111; FAX: +81-44-711-2317, or circle Reader Service 70.

FLUID HEAD

The Cartoni C40 S is a heavy-duty fluid action head designed to support studio EFP configurations or 35 mm cameras. The C40

S employs Cartoni's fluid drag control system for both pan and tilt functions, allowing the damping levels to range from "0" for free-wheeling to "7" for maximum drag.

The counterbalancing system, activated by an eight-position selector, works with three reinforced groups of helicoidal high-sections springs. This mechanism, combined with a 60 mm sliding base, allows the camera person to fine-tune an extremely wide range of cameras.

For more information, contact the company in Italy at telephone +39-6-4382002; FAX: +39-6-43588293, or circle Reader Service 135.



CHARACTER GENERATOR

Oz's Prima Supe presentation and information manager is an Inscrber-compatible software offering full-feature character generation. With Prima Supe, a user can import Inscrber layouts and turn mutable data into Prima variables. Updates can be made by simply typing in raw text. Prima Supe merges it to instantly produce a modified layout.

Often-used logos, backgrounds, images, and frequently used names can be stored and assigned for quick retrieval.

For more information, contact the company in Iceland at telephone +354-1-620362; FAX: +354-1-610362, or circle Reader Service 52.

SOFTWARE UPGRADE

Data Translation has released Version 1.3 of Media 100. Media 100 1.3 adds three new features to Media 100: improved picture quality, QuickTime audio export, and Power Macintosh compatibility.

For Quadra 8400av, 800, and Power Macintosh 8100 users, Version 1.3 improves Media 100 NTSC output picture quality with 65 kb, 70kb, and 75 kb settings.

The new Quicktime audio export feature allows the user to export both QuickTime video and audio files from Media 100 to any QuickTime application, such as Adobe Premiere.

For more information, contact the company in the U.S. at telephone +1-508-481-3700; FAX: +1-508-481-8627, or circle Reader Service 44.

TV PRODUCTION SYSTEM

Designed for TV production, the Elset system by VAP Video Art Production GmbH places actors in front of a blue background for separation into any synthetic scene where set components might cover the actors partly or fully.

Elsat encompasses the four steps involved in this process: data acquisition, virtual scene construction, scene preprocessing, and sequence generation.

For more information, contact the company in Germany at telephone +49-40-414130; FAX: +49-40-445835, or circle Reader Service 28.

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

USER REPORT

Sony DME-3000 Effects Device Adds Some Zip to Posthaste TV

by James Cawte and Tim Bolt

Graphics Operators
Posthaste Television

BRISTOL, U.K.

Posthaste Television and Broadcast Film and Video are twin companies that operate an edit facility for customers mainly involved in broadcast programming. However, commercials, corporate production and promos make up a significant proportion of our business.

We made the decision to switch to a digital operation in early 1993. At the time, there was more talk than product, and we had the benefit of a long timescale in which to make our choices. With digital products, excellent video quality is a common virtue, but the integrity of the control interface is less certain. Sony already had excellent working systems in the DVS-8000 switcher and the DME-5000 effects unit. The second generation products, the DVS-6000C and DME-3000, seemed to provide exactly the right mix of power and features for our facility.

TOOL BOX

In its standard form, the DME-3000 comes with a full range of three dimensional effects, as well as additional options providing a key channel and recursive effects, an internal wipe generator, combiner and lighting functions and non-linear effects. Everything is packed into a tiny 5 rack-unit frame with slots for future upgrades.

The DME-3000 can connect directly to the auxiliary system of Sony DVS series switchers, allowing one-bus sourcing for video and key. An auto-select key function allows smart pairing of keys and fills as soon as the DME's key channel is turned on.

A "Dem-Wipe" facility, which has long been available to DVS-8000/DME-5000 users, is about to be implemented for the DVS-6000/DME-3000. This allows transitions such as push-pulls and page-turns to be controlled directly from the switcher T-bar as if they were wipes or keys.

The DME-3000 has a dedicated control panel, a 10-inch high-resolution color display and an optional mouse. The picture manipulations are made by a track-ball and a Z-Ring. The trackball handles X and Y movements while the concentric ring, which runs on a beautifully smooth bearing, deals with Z functions such as rotation and zoom. Finally three soft knobs provide for all the analog-type adjustments.

There has long been an acceptance that all digital effects devices cause picture degradation. However, those days are gone. The question now is how much can you re-size? The answer is: more than you would ever have thought possible.

With the DME-3000, we have managed to do things that would be unthinkable with previous systems. For the BBC's "Human Animal" series, the director was thoroughly unhappy with both the start and end framing

of a long walking shot. We applied at least 30 percent zoom to each end of the shot and re-framed dynamically during the walk. The shot edited seamlessly into the final program.

The standard DME-3000 comes with a full range of 2-D and 3-D effects, plus the usual, border, crop, mosaic, and so on. All of these functions work beautifully and there are no annoying omissions from the feature list other than corner pinning, which we hope will be implemented in a future upgrade.

An optional card provides a key channel and a "target frame store." The key channel can be spliced into the switcher path absolutely transparently. Separate controls are provided for softening or defocusing the key and video.

The recursive effects provide the expected strobe, montage and trail functions with or without "diamond dust," "packs of cards," "concertinas," and so on. Motion decays

tial to get the best from effects like page-turn, sphere, and so on. In the DME-3000, these are good flexible lights with variable patterns, color intensity and positions.

The combiner option actually offers numerous useful features, including a keyer and the ability to use a second image for borders, backgrounds, etc. Flat colors can be used on the reverse of page-turns and rolls. A neat effect called dim and fade allows the image to melt away or darken at a certain point in 3-D space. If you have two channels, the combiner allows Z axis keying with intersecting planes and so on. Plus, you get free lighting effects.

The non-linear editing option on the DME is a feature that many people get excited about, and rightly so. For a mid-priced effects unit, the DME-3000 allows a lot of things that have traditionally cost serious money. The effects can be broadly divided into four groups. First, there are wavy effects, such as Wave, Glass, Flag and Ripple. Glass in particular allows a quite extraordinary range of distortions for those with time to browse through the many levels of tweaks.

Next, there are the "break-pictures-into-bits-and-chuck-them-about" types of effects. These are Rings, Bars, Slats, etc. Again, an astonishing range of tweaks are provided.

Next come the novelties: Page Turn and Roll, Lens, etc. Some of these are established effects, while others are brand new. Character Trail in particular provides a dazzling way to introduce text onto the screen via extreme extrusion. (This is also good for elongating the noses of favorite politicians.)

Finally, there are the clever shapes: Sphere, Cylinder, etc. These are great demos, but real life applications are rare.

Non-linear effects are certainly the crowd pleasers, but underneath the obvious stuff, there is a wealth of subtlety. A recent effects sequence required that pictures appear to be projected onto softly moving silk. Three passes with pre-read using small increments of Flag and Ripple produced a convincing result in little time.

The whole of a DVE is that it produces real-time results, which inevitably means compromise. But the DME-3000 tool box has a superb array of functions of great subtlety and flexibility.

The trick nowadays is often to create effects that are not apparent as such to the viewer. And this is where the DME-3000 excels. ■

Editor's note: James Cawte and Time Bolt have worked in the professional video industry for a number of years, specializing in broadcast and corporate video productions.

The opinions expressed above are the author's alone. For further information on the DME-3000, contact Sony in Europe (Telephone: +44-256-550-011; FAX: +44-256-475-585), in Japan (Telephone: +81-462-30-6104; FAX: +81-462-30-5160), or circle Reader Service 119.



The Sony DME-3000 offers a full range of 3-D effects, as well as key channel, a wipe generator and non-linear options

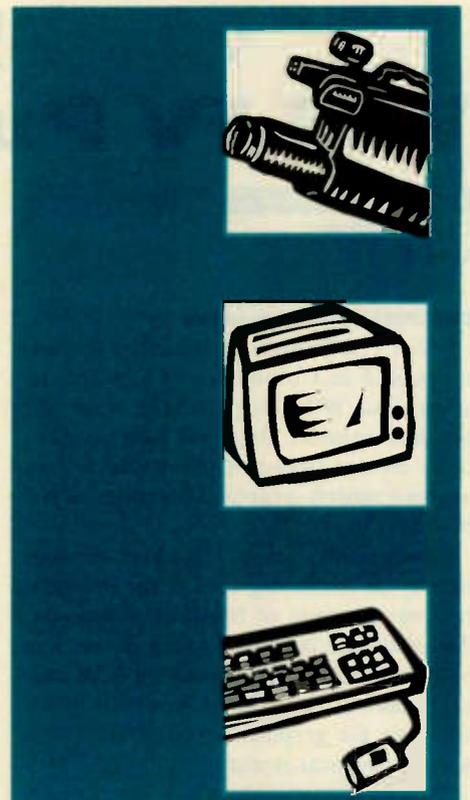
and blurs are also available. A neat film-mode allows the picture to be progressively de-interlaced until it refreshes at frame rather than field rate. This simple function is a big favorite with our clients.

Sony has a habit of putting two unrelated options together on one card, which can be annoying to the buyer. In this case, the channel and axis cursors, plus alignment grids (graphics option), are coupled with the wipe generator. It has to be said that these functions are superb, but they really should be a standard feature on the main picture manipulator. At the very least, a basic axis cursor should be standard.

BEHIND THE SCENES

The wipe board puts a wipe generator upstream of the DME. The generator is of equivalent power to the switcher's M/E to allow shapes with boarders, selectable inner and outer softness, etc. At first, this sounds like an excuse for a lot of gaudy game-show effects, and it certainly can be used for that purpose. But it is also a very powerful generator capable of subtlety as well as flash. A useful feature is the ability to use the wipe shapes to mask many other effects, such as mosaics.

In the combiner and lighting package, Sony has done it again: if you want lights, you have to buy the combiner and vice-versa. The lighting package is very essen-



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U S E R R E P O R T

WIS-TV Puts Halo on the Air

by John Augustine
Chief Engineer
WIS-TV

COLUMBIA, South Carolina

WIS-TV, a Cosmos Broadcasting station, is located in Columbia, S.C. In the 10 years since WIS last purchased electronic graphics systems, there has been tremendous advancement of the technologies around which graphics systems were based.

Concurrently, on-air graphics continues to play an increasing role in the competitive environment of broadcast television. The challenge in configuring a system was to incorporate new technology with past experience to establish an even more effective role for graphics through the 1990s and into the next century.

The selection process was a lengthy one. Not only would we be changing the way

we were going to operate, we also involved WIS station management, creative talent and engineers from other Cosmos stations in the decision process.

The event that finally brought us to a conclusion was a live, half-hour satellite televised demonstration of the Halo graphics systems from Digital GraphiX, a former division of Grass Valley Group (*See related story, Page 3*). Two Halos were SCSI networked with a Presto character generator and a videoDesigner PC-based paint system. The telecast culminated in a live teleconference question-and-answer session between the on-line Cosmos stations.

Our heightened awareness of production needs showed that "floating" graphics and linear key signal capability were mandatory ingredients for effective on-air presentation. A wide range of interfaces were required to ensure future expansion of data storage and networking. This would also

enable other devices to be connected to the core system for capabilities beyond the scope of the graphics system itself.

SYSTEM CONFIGURATION

The software runs on standard hardware, such as hard, floppy, and optical disk drives, as well as CRTs, keyboards, etc. The computer capabilities include all the functions of a character generator, a stillstore, a paint system with 3-D animation, and a weather system. The computer operating system allows files and images to be shared between applications and, if necessary, different operator positions. Help menus and tutorials are provided on-line.

The Halo system internal processing conforms to the CCIR 601 standard for component digital video. An open-architecture SCSI bus interconnects our three Halo systems and disk media, including a 2.2 GB

hard drive. File transfers are easily and quickly accomplished. We plan to use fiber optic "SCSI stretchers" to overcome the otherwise limited distance between devices on a SCSI multiplexed system.

The system supports a broad range of graphics file formats such as Targa, TIFF, GIF, BMP and Video Toaster. For weather graphics production and on-air presentation, Halo interfaces to image data services such as WSI or AccuWeather. Radar and high resolution satellite images, temperature updates and forecasts are all handled by the weather system software module that was custom-configured for WIS-TV.

The Halo stillstore capability incorporates a four-field digital frame buffer that typically imports pictures from cameras, VTRs or other graphics systems. Sophisticated motion suppression software eliminates the field or frame jitter commonly associated with a high resolution four-field "grab." Prior to use, images can be browsed and selected for assembly into a sequence or running order for replay into a program.

The Halo Dimensional Typography character generator provides text graphics for news, sports, weather and all other on-air and pre or post production work. In addition to the 200 bezier font masters, the Halo system offers complete font scaling and typestyle attributes such as edging, kerning, positioning and justification.

A standard library of real-time special effects includes full page slides, row pushes, row slides, and wipes. Programmable function keys and Halo's own "K" macro programming language allow otherwise complex operations to be reduced to a single keystroke.

MEETING EXPECTATIONS

Halo paint system capabilities include all of the features one would expect of a current technology imaging system. A touch sensitive stylus and tablet are the primary user interface for digitally compositing complex graphics utilizing software features such as cut/paste, crop, 3-D perspective, rotate, scale, variable opacity and mirrored images. The 16 million color palette is augmented by a variety of brush styles and sizes.

A small scaled-down special purpose character generator is installed in our master control area. It displays bulletins and other data, not the least of which are weather alert bulletins that originate from NOAA and come into the station via the dedicated Contel weather wire service.

The computer searches the incoming data for bulletins affecting counties in our station's viewing area. When an alert occurs, the computer automatically generates a crawl message, which in most instances is displayed automatically.

The system can be set up to observe tallies from the WIS studio or spot play machine to prevent "watch" alerts from being aired over local news programming or locally originating commercial spots. In the event of a "warning" alert, the crawl is automatically inserted in the station's program output regardless what it is aired over. ■

Editor's note: John Augustine has 22 years of broadcasting experience, including 12 years with WIS-TV (including nine as chief engineer) and 10 years at WAVE-TV in Louisville, Kentucky.

The opinions expressed above are the author's alone. For further information, contact Digital GraphiX (Telephone: +1-201-845-8900; FAX: +1-201-845-0693), or circle Reader Service 47.

U S E R R E P O R T

TV by Design Backs Compositium

by Jay Cordova
Graphic Designer
Television by Design

ATLANTA, Georgia

The Microtime Compositium essentially integrates a four-layer component digital switcher, a single channel DVE and a powerful paint system into a single unified system. With the addition of several or more component digital DDRs and videotape machines, you create what amounts to a highly integrated and fully functional D-1 environment.

The true integration of paint, DVE, switcher and MDL (Master Decision List) not only enables the highest quality output but provides the ability to save an entire control room's worth of information with one effect. The Compositium is a PC-based system running on the Windows platform. But don't be fooled — extensive custom hardware enables all of its operations, including color correction, to be implemented in real time.

4:4:4:4 PROCESSING

The paint system is robust and very comparable to the Quantel Paintbox in function and layout, with some exceptions. The Compositium paint system is entirely 4:4:4:4, manipulating and storing images with full bandwidth chrominance resolution as well as full bandwidth alpha channel. In addition to all of the normal paint, graphic and cut and paste functions you would find on most high-end paint systems, this system will do roto-scoping, exceptional soft shadows and glows, five-way and radial graduations, extensive paint and palette functions and full access to the system DVE as a paste option.

All functions can be performed on the alpha and the image independently or simultaneously. Naturally, any images recalled while in compositing mode bring their ever-present alpha with them, and those of us who have dealt with mattes as "separate entities" can especially appreciate having the matte as part of the basic image. The alpha key channel permeates not only the paint system, but the entire system, and this kind of integration is still hard to come by in anything other than an "all in one" system like the Compositium.

The system DVE is called the FX. As a user of high-end Ampex, Abekas, Grass Valley and Sony DVEs, my opinion is that the FX holds up pretty well upon comparison. It is frame-based and has all the characteristics and parameters of the high-end DVEs: global and local channel control, axis select, source aspect, locate, rotate, etc., target and source space control, trails, defocus, a nice warp plus an offset drop shadow if you want one. DVE motion is spline-based with keyframe control of tension, bias and continuity, as well as linear or

hold motion. The system DVE gets a little pixelly with extreme magnification but not much worse than with other systems.

FOUR-LAYER SWITCHING

The Compositium "switcher" is composed of four image layers (live or library images), a static masking stencil, a live mask, and the FX, all with 4:4:4:4 internal processing. Each layer contains either an external video source or a library image and performs a variety of functions: mix, luma key, external key, chroma key, color correction, FX wipe (wipe using system DVE as pattern) and stencil and masking functions.

The system also does what it calls a "matt" key, which incorporates a non-additive mix of the key layer for the cleanest possible digital key with no black edges whatsoever. Compositing essentially gives you keyframe animation over every aspect of a four-layer switcher, a DVE and an editor/controller.

Everything in the compositing mode is choreographed through the Master Decision List. I think of the MDL as a fancy integrated editor that controls and choreographs every aspect of the compositing system: what pictures are loaded, what tape machines with which reels are rolling, timecode values, keyer settings, fader settings, DVE motion and settings, signal routing — in short, everything, all programmable on a keyframe-by-keyframe basis.

Down sides? Yes, there are some. The airbrush is a little grainy in an otherwise exceptional paint system. The system can be a little sluggish and sometimes rough with tape machines. Software bugs can be a nuisance. The bad news with the bugs is that there are indeed annoying bugs and peculiarities, and software is sometimes released without being fully tested and de-bugged. The good news is that Microtime support is strong, and software improvements and fixes are frequent.

In summary, the Compositium offers a lot of bang for the buck. It is a high-quality, high-end, real-time component digital 4:4:4:4 environment. The thorough integration of the library, paint, DVE and compositing systems, all of which are of high-end quality, makes the Compositium a very flexible and powerful alternative to the traditional, less-integrated component digital environment. ■

Editor's note: As a graphics designer, Jay Cordova creates numerous special effects and presentations for the television industry.

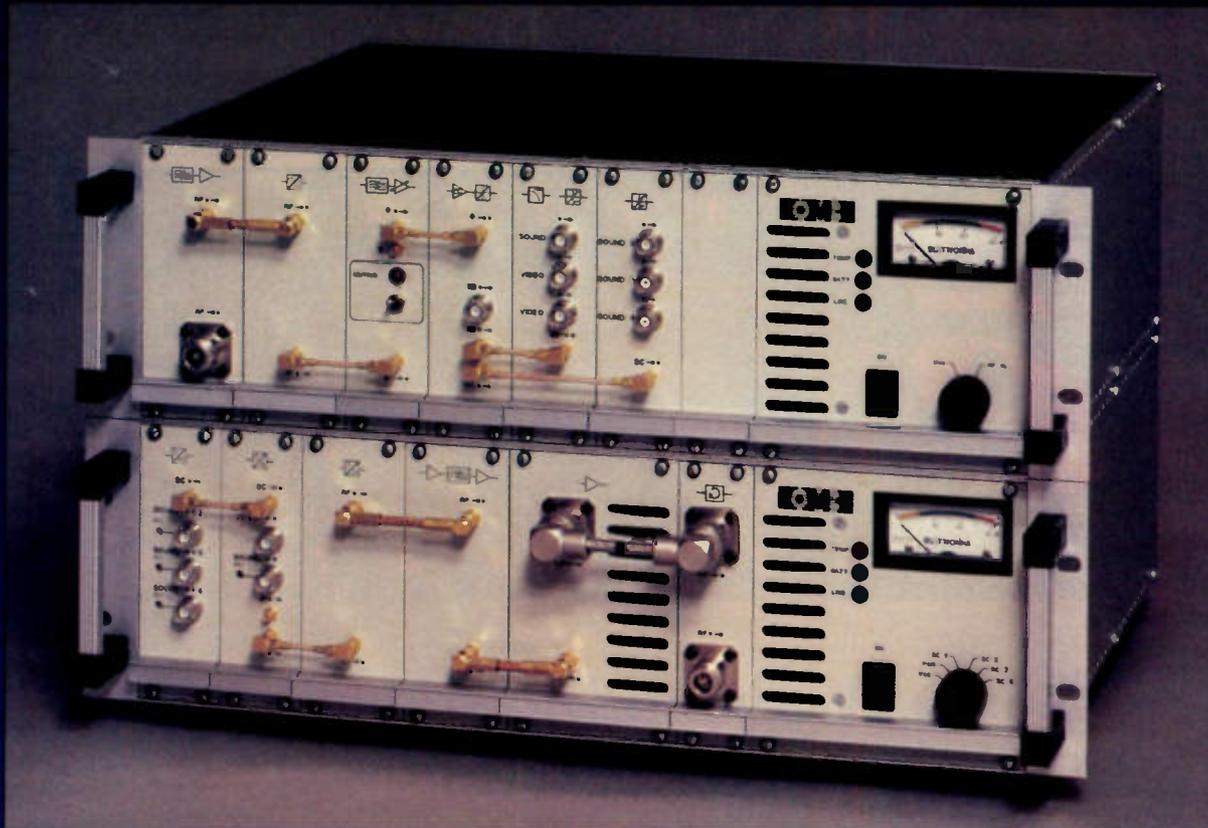
The opinions expressed above are the author's alone. For further information on the Compositium, contact Microtime (Telephone: +1-203-242-4242; FAX: +1-203-242-3321), or circle Reader Service 23.

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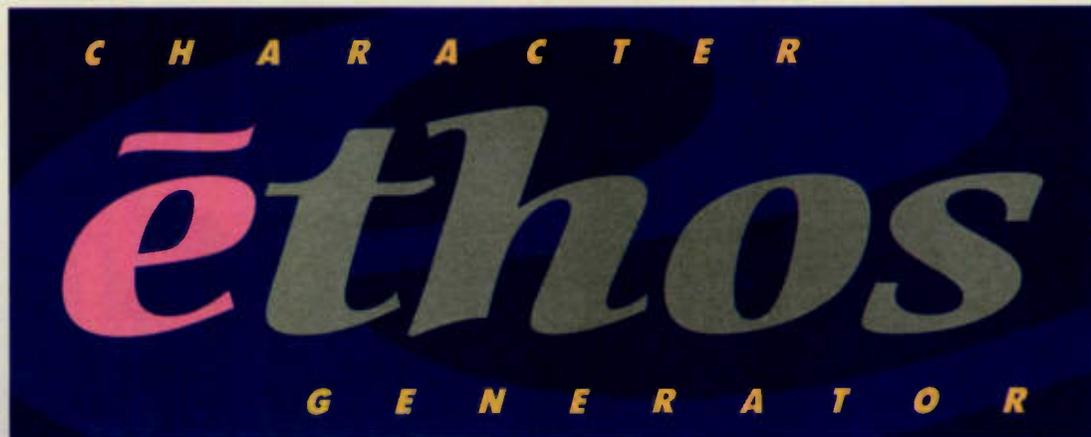
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ē'thōs *n.* 1. the ultimate dual channel character generator inspired by the Aston Motif and ESP, having innovative features and speed of operation second to none. [*esp. for live applications*]

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USER REPORT

DPS Puts Mirashade in Motion

by Barry McCarthy
Art Director
Mirashade

READING, U.K.

The Personal Animation Recorder from Digital Processing Systems is a add-in card and software package that enables a PC to play back 24-bit animations at 24 or 25 frames per second in full PAL or NTSC. Basically, that is Beta SP quality video, running directly from a hard drive. An added benefit is the ability to grab from video at the same rate.

Technically, the PAR uses an IDE drive with its own custom interface and formatting software to provide a dedicated storage space for animations and video. The animations and video are compressed with PAR's own compression algorithm that provides the high quality output.

GROWING REPUTATION

Most dedicated Amiga — and now PC — users will have heard of PAR by now. When I first read about it, it sounded like every animator's dream come true. It also sounded highly unlikely, but the people at DPS swore that it worked. Then one day I saw the real thing actually working at an Amiga experts seminar in London.

Now, to me, the PAR is a major break-through, not only for what it does, but that it actually does precisely what DPS says it does. I know this does not sound unreasonable, but how often have hyped products been a disappointment?

At Mirashade, we use an A4000/040 with 18 MB RAM, 500 MB IDE and the Warp Engine accelerator from MacroSystem U.S working with the PAR card, the AD3000 capture card and a 1.7 GB Micropolis IDE drive. We also have a Sony Betacam suite, a Sony broadcast camera and a VHS/S-VHS camcorder and VCR.

Installing the PAR card and the AD3000 was not really a problem. It is a bit tight in the Amiga 4000 but it all goes in.

To install the software, simply put the disk in the drive and double click on install. You can then log onto the DPS bulletin board service (BBS) with your modem and immediately update the software to the latest version (currently 2.28 on the Amiga). DPS seems to update the software every week or two. Not only that, the reaction to feedback on the board is extremely efficient.

Now all that is left to do is run the software and learn it. The manual is generally very good and very clear, although some of the new additions and changes to the software are obviously not mentioned. Supposedly, a decent disk-based manual will be released soon on the BBS.

The only tricky part about the

PAR is the quality setting and how to adjust it. There are two controls. The block size control sets the physical size of each block of data being used to store your animation.

This is limited by your hard drive, so it is wise to get the best you can afford. In my experience, Micropolis provides the best.

Q FACTORS

The other control is the Q factor, which is literally the quality level of each frame set in a range from

1 to 23. On playback, it can quite happily sit at 23, but you will need to adjust it to around 10 to 12 for grabbing. The best compromise depends on a combination of the two controls and a bit of trial and error. It took me about a day of fiddling with Q factors and block sizes to really say that I knew the system well.

In an average professional setup, the ideal is to have a permanent link from the PAR to a Beta SP machine or other high quality deck running in component video. This requires a total of seven BNC leads: three for output, three for input and one for sync. This will provide the ultimate in quality and convenience.

The first thing I did was create a GFX showreel using a number of my backed-up animations. All I did was set the PAR to Anim import with the Chroma Filter on, Q factor at 23 and the block size, in my case, at around 220 to 250.

When all the frames were converted onto the PAR drive, it was time to record them to tape. This is when I realized how terrific the PAR is. I simply set an edit "in" point and pressed play on the PAR whenever I wanted it to start. If an animation was 30 seconds long, it took 30 seconds to lay it down to tape.

Had I been using a frame con-

troller and a batch of image files, a 30-second animation could have taken around four hours to lay to tape. At Beta hire rates in the U.K. of around £150+ per day, that works out at about £150, or slightly less if you are lucky. That makes each job more costly for your clients, or your profit margin has to go down.

The other advantage of the complete PAR system is its ability to capture video in real time. Yes, it really works, but there are limitations.

To compress and save each frame of video to the PAR drive, it is first necessary to manually set the Q factor and block size for every capture. I found that a Q of 10 and a block size of 250 worked for most video clips, although this depends entirely on the amount of movement and scene-changing there is in the video and how long the recorded clip is. The longer and more complex the clip, the lower the quality.

The PAR offers numerous possibilities for creative video-making. It can be used to timelapse with a camera. Just point it out a window and by nightfall, an entire day has been animated. It also provides manual grabbing of images. Each time the mouse button is pressed, another frame has been grabbed. This is excellent for promotional and "MTV-style" creations.

It is also possible to reverse video or play in variable slow-motion. However, I would suggest play back in field mode, not frame mode, to avoid jitter. Also, with reverse animations, all the interlaced lines are turned the wrong way around, causing an odd flicker. The PAR offers the facility to

reverse the fields, but only when the entire clip has the same Q factor throughout. Sometimes it does; sometimes it doesn't.

The system provides advanced luma keying capabilities. A scene of a jet fighter flying through a grassy valley, for instance, can be made up of live video footage of the valley and a computer-generated, animated model aircraft. The two sequences can be digitally combined using the PAR, the 3-D package LightWave and an image processor called Art Department, including anti-aliasing and such effects as lens-flares, exhaust, jet streams, smoke, fire and transparency rendered over the video background.

For more complex productions, several layers of video and computer animation can be combined into one, and there are no limits to the number of layers you can mix. If you film live against a blue screen, there is a digital chroma-keyer in LightWave. This adjustable clip will allow you to put live video on top of your animation with various areas of video showing through.

As an example, a band filmed against blue screen can be combined with a swirling fractal animation created in a paint or fractal generator package, along with a set of 3-D characters developed and animated in LightWave. To do this, the three sequences are loaded into the digital recorder,

combined within LightWave and output back to the PAR for transfer to tape. The final video shows the band playing against a crazy fractal animation, while 3-D computer generated objects and characters dance past in front.

The PAR can also provide such things as digital wraps, in which still pictures, video and animations are wrapped onto 3-D surfaces. Once animations or treated video are saved on disk or on the PAR, they can be used as image wraps in any 3-D program. Imagine a fluttering flag with your animation playing on it.

BATCH PROCESSING
The PAR also provides batch processing and 3-D layering. This can be used to take live video into the PAR and process the sequences directly from and back to the PAR without taking up disk space. Moving oil paintings can be created with other animations layered on top or underneath. And how about a variable double exposure of two animations? There is no real limit to the number of layers that can be used as long as you plan it well before you start.

These are just a few ideas for mixing 2-D and 3-D animations, the rest is up to your imagination and experimentation.

On the whole, grabbing from video is good, but not quite as good as the playback quality. It seems to be equivalent to high-band U-Matic.

Although it is an advanced animation recorder, the PAR is not a non-linear editing system. It would need a JPEG board for that. The PAR saves each frame of animation or video as one frame in an animation. Each new frame is saved as delta data. That is, only the differences between the last and current frame are saved. This

(continued on page 28)



A recent image recorded by Mirashade on DPS's Personal Animation Recorder

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U S E R R E P O R T

FLINT Adds a Spark to TOPIX

by Sylvain Taillon & William Cameron

Producer
Director/Designer
TOPIX Computer Graphics

TORONTO, Canada

TOPIX Computer Graphics and Animation of Toronto is a leading animation house that uses Discreet Logic's FLINT digital editing and compositing software for both commercial design and in-house compositing.

TOPIX specializes in character animation and special visual effects. We serve commercial advertisers, feature film and broadcast design markets, working with major clients across North America.

TOPIX operates a large variety of software and hardware. In addition to FLINT, we have Wavefront and SoftImage 3-D systems, Side Effects Mojo on Silicon Graphics Inc. (SGI) workstations and extensive in-house code. We use Adobe Photoshop, Fractal Design Painter, TIPS and 3D Studio on several Pentium PCs, plus a Power Macintosh for design work.

FLINT JOBS

TOPIX acquired the Discreet Logic FLINT system in December 1993. To date TOPIX has used FLINT on over 20 commercials for clients such as Coca Cola, Nescafe, Kraft General Foods and Campbell's Soup.

We use FLINT on an SGI IRIS Indigo2 Extreme workstation with 128MB RAM and a four-minute Discreet Logic disk array. We use an Abekas A60 digital disk recorder for video output at full frame rate and bandwidth CCIR 601 (D-1).

FLINT is one of the few software tools we operate that offers instant feedback in real time at low resolution. This means we use it a lot for experimenting with new looks and ideas. Compositing in FLINT is a good illustration of the power of a well-

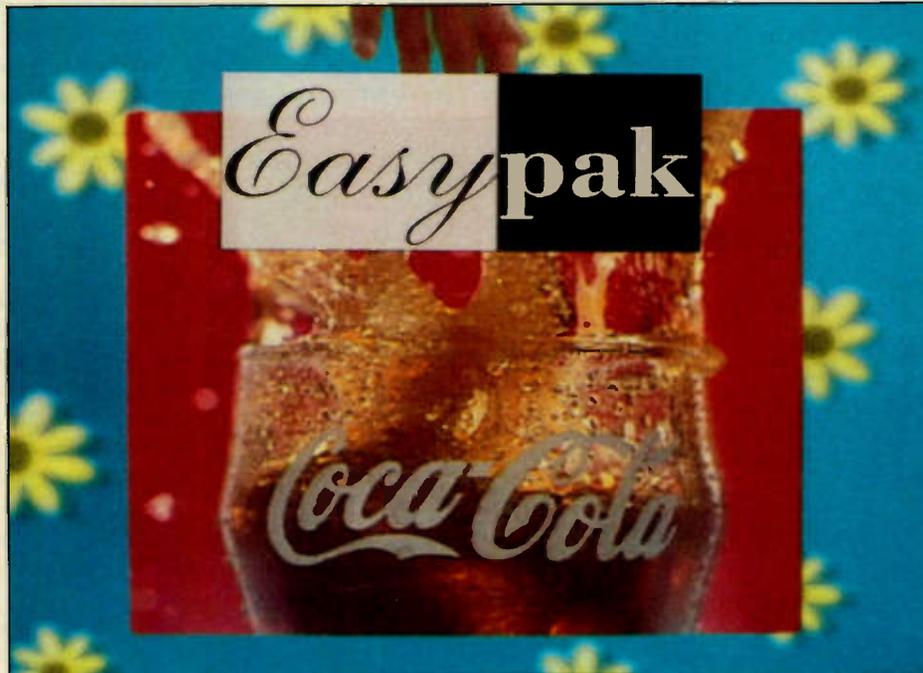
integrated system.

Discreet Logic has precise keyer technology, which lets us work in RGB, YUV or HLS color spaces. And the integration with paint, the color corrector and other tools enhances its accuracy. FLINT's openness also lets us provide innovative ways of using tools together. For example, we might use motion path data from the stabilizer and tracking tools in conjunction with 3-D DVE moves to create animations.

before we see results, so we want to emphasize the benefit of FLINT's real-time preview. This gives us an accurate sense of the timing of effects while we work.

EFFECTS IN ACTION

We use FLINT for a lot of 3-D DVE-style effects. With the Action module in FLINT V. 2.6, which we have just installed, we now have integrated motion blur, color correction, keying, lighting, perspective match-



TOPIX uses FLINT for much of its commercial work, as shown in this image created for Coca-Cola.

We like the instant feedback FLINT provides, along with added scope for experimentation and strength in compositing. We benefit from the fact that every tool in FLINT can be key-framed because the animatable parameters provide intuitive creative control. We also like FLINT for its 3-D DVE effects and its stabilizing and tracking tools.

On 3-D systems, we may render all night

ing, 3-D DVE-style moves and animation in one place. FLINT has numerous tools for treating different layers — distorting them, pinning their corners, manipulating them by applying interactive lighting from a spot light or multiple light sources, and so on.

Discreet Logic's keyer technology is very precise. It can process keys in RGB, YUV or HLS color spaces with 13 independent

parameters as controls. There is also a pre-process stage for filtering and artifact removal, a precision matte extraction stage, a post processing stage that allows us to shrink, equalize or soften mattes, and a masking stage for combining key mattes with animatable free-form garbage mattes.

Also, there is integrated access to the color corrector for integrating foregrounds and backgrounds. We can use full plate or localized color correction techniques.

It is probably worth buying FLINT just to get the Discreet Logic Stabilize & Stable Matte technology. In addition to being able to eliminate jitter in footage and track objects together, it also has some unique capabilities, thanks to all the animatable parameters in these tools. For example, we can stabilize a shot, make it longer with time warp, do keys and mattes, and set up an animation to put the panning motion in a shot with the computer.

Stable Matte allows us to keep the moves of a foreground element and a background element in sync automatically. We can combine these tools in various manners with the DVE to come up with complex layered animations.

The way this system is integrated also takes most of the drudgery out of rotoscoping. In Paint, we like the reveal effect as a creative tool. We also have smear, wash, shade, stamp, clone, fill and filter, plus impressionist effects and a wide array of user-definable brushes and brush sizes.

BOILING OVER

Discreet Logic has created some good warp and displacement effects tools as well. On a recent series of commercials for Nescafe, we used the warp tool to create a boiling effect along the torn edges of pieces of paper for a nice organic feel.

The color corrector in FLINT is practically a package unto itself. Using the animatable parameters, we can make endless adjustments or use it with other tools to create effects.

Finally, FLINT provides the basics of short form editing, and this tool set gets more robust with each release. Other related tools, notably time warping, are indispensable.

We are also looking forward to FLINT version 3.0, shipping in early 1995, with on-line 3-D. This new feature will enable us to import 3-D models and apply texture and environment maps, as well as light, animate and interact with 3-D models in a 3-D environment within the FLINT system. According to the manufacturers, we will be able to manipulate 2-D, 2.5-D and 3-D effects elements in one place and output fully integrated and rendered composites.

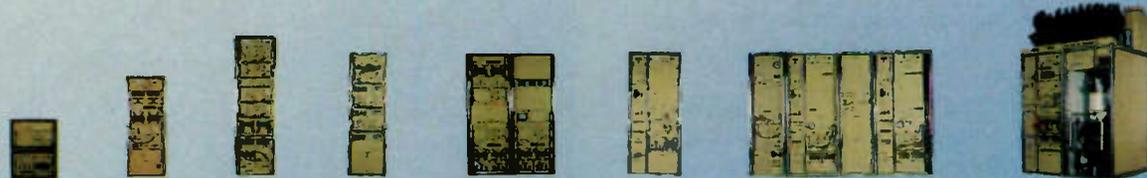
On the shortcomings side, we think the FLINT system needs to provide better clip management and D-1 archiving. Discreet Logic tells us they have these items in the works for an upcoming release. ■

Editor's note: Sylvain Taillon has been a producer at TOPIX for three years. With a degree in communication and film production from the Universite de Quebec, he has been working as a post production director and on-line editor in Canada for 10 years.

William Cameron joined TOPIX in 1989 and has a background in film, video and the theater. He was educated in Toronto, Los Angeles and Nice, France, and holds a degree from the University of Western Ontario.

The opinions expressed above are the author's alone. For further information on FLINT, contact Discreet Logic (Telephone: +1-514-272-0525; FAX: +1-514-272-0585), or circle Reader Service 75.

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USER REPORT

Polygone Studios Grows With Questech Charisma

by Paul Englebert
Senior Editor
Polygone Studios

BRUSSELS, Belgium

I originally trained as a sound engineer, but after a year of theater work and a short spell at RTBF (the French speaking Belgian TV network), digital video started to make its first appearance in the form of effects units.

It was clear that the evolution of video was going to be much more exciting than sound, so I joined Polygone, which at that time was a small company and just about to become the proud owner of the first Betacam edit suite in Belgium.

I tried the Ampex ADO but didn't like it. The local distributor was not slow to give us a demo of the first ever Questech Charisma, and although it was only a prototype, it was obvious even then that the machine was not only able to do a lot more than its rival but also worked in a very clever way. We placed our order accordingly and duly received the third machine ever built.

We had very good contact with Questech, and through our discussions extended the product further than they believed possible. In this case the manual followed some time later — after we had shown the company what a powerful tool they had built.

I then proceeded to make countless demos and trailers for French-speaking Belgian TV, Luxembourg TV and numerous Dutch clients. After two to three years, Polygone was able to purchase the first D-1 video recorders in Belgium, and unlike many others who delayed their purchase due to the lack of a reliable digital mixer, we were completely happy with our decision to go for digital component. The reason was that we knew we could use the internal mixer within Charisma.

This technique had a further benefit in that it was very easy to program. This in turn made our clients happy when they saw how they could save time and money in the edit suite. We have always found it easier to program than a standard mixer. It just seems to be the way to do things — a single keyboard able to execute numerous functions.

Two years ago I was fortunate enough to win the Charisma Users Group award for the most effective use of a DVE. With the award, we purchased what was then the new CLEO Level 4 (we had continuously upgraded our system), and this provided a dramatic increase in the flexibility of our DVE. It now meant that I

could draw my own curves for the DVE on the humble Amiga computer and quickly see very fast mapping of 3-D objects. It still does not replace a 3-D machine of course, but where speed and accuracy are required it is very brilliant. We now have a big digital edit suite with two channels of Charisma and can mix three different sources as well as use the on-board keyer.

Polygone itself is now a facili-

ties house with three edit suites (two are D-1, and one is Betacam) together with a sound studio. Up to 70 percent of my time is spent working on commercials for clients, and we are renowned for our special effects work. We also use a Colorado from Thomson in Edit 1 and yes, we still use the Charisma as our digital mixer.

We also co-produce TV programs with national broadcasters such as Channel 4 in London, as

well as many mainland Europe broadcasters. Here we specialize in larger programs, and we recently completed a documentary for ARTE depicting Belgium in the early 1900s. The show featured nothing but graphics edited on the Charisma accompanying the text of the commentary. The DVE allowed us to animate the graphics in a more interesting and engaging way.

Our final business area is in high definition TV where we are able to fully use an HD van purchased from BTS, along with six LDK 9000 cameras and two bit-rate-adapted D-1 machines. The latter allow us to record widescreen high definition pictures on four lots of 625 line sequences. These programs are cut in Edit 1 by pro-

cessing each of the four different parts of the picture with the same effect. The result is an HDTV production mixed and keyed successfully within Charisma.

Polygone has grown and matured alongside Charisma for the past eight years, and we look forward to many more years of happy and profitable collaboration. ■

Editor's note: As senior editor at Polygone, Paul Englebert oversees the facility's three edit suites and sound studio.

The opinions expressed above are the author's alone. For further information on Charisma, contact Questech (Telephone: +44-1734-787-209; FAX: +44-1734-794-766), or circle Reader Service 104.

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U S E R R E P O R T

Videola Shines with AVS Elite

by Jason Yardley

Senior Editor
Videola

LONDON

At the beginning of the year, it became apparent that our existing caption generator had passed its prime, making it necessary to find a replacement. We needed a unit that was not only suitable to use in our Beta on-line suite, but also affordable.

Since we had been using our existing character generator for more than five years, we naturally looked to the same company for an upgraded version. However, price ruled this out, and a used model that we tested offered good quality but showed disappointing performance and a lack of speed.

CHANCE MEETING

We were beginning to despair when I had the good fortune to be chatting with a colleague who had just visited the Video Show in London. He had no hesitation in recommending the AVS Manuscript Elite, which he described as a high-end character generator positioned between the AVS 500 and the AVS Junior. And most importantly, it was priced very competitively.

The next step was to see if we could orga-

nize the loan of an Elite for a trial period. We wanted to avoid falling into the trap of making an initial capital outlay only to be later disappointed by the equipment. But as it turned out, the results were outstanding.

Installation was very easy. The Elite has RGB and YUV inputs and outputs that can be easily changed in a very clear engineering menu. Once in place, the operation was easy to learn, fast and powerful. We were quickly hooked on this new toy.

Unlike some other systems, the Elite does not hinder the editor with long delays while the system processes pages of captions. The Elite easily copes with most captioning requirements quickly while the client looks on. The number of bored and irritated clients who get fed up with waiting for processing to finish has been dramatically reduced since we installed the Elite.

The Elite comes with 10 character typefaces preloaded, and there is an option to access more than 250 that are already on the system. The menu selections that appear on the screen are clear and easy to understand. One impressive feature is its facility to resize characters very easily using just a couple of keys. With the Elite, all we need to do is select a letter and then hold down the resize key at the same time as the up/down arrows. A simple menu asks whether we want to

alter a word, a line or the entire page. A single "change" button allows this.

The system's operation uses a combination of pop-up menus and dedicated function keys. Selections are made within the menus with the up/down arrow keys, and editing takes no time at all. A good example of this is when we are running crawls or rollers. The speed can be changed by using the plus or minus keys during operation to either speed up or slow down the crawl.

Page transition effects are comprehensive on the Elite and are easily created. These include rollers, crawls, pushes (left/right) reveals, wipes (all directions), zips, etc. While not endless, the list is impressive. Most of these effects can be produced instantaneously with the exception of the crawls, which must first be pre-assembled.

One of our very few criticisms is the time it takes to edit a crawl. Once it has been changed, the crawl must be re-assembled before it can run again. Having said that, our previous character generator's transitional effects had to be carried out using a channel of the DVE, and it was only possible to trigger them using the DVE's own built-in GPI. Now, we can use the Elite's own built-in interface, leaving our DVE channels free. This means that captions can quickly be included during an on-line edit with a minimum of fuss and delay to our clients.

Letter spacing is automatically arranged, but this can be overridden and arranged manually to suit individual requirements. Characters can be mirrored, shadowed, given outlines and rotated through 360 degrees.

The keyboard is laid out logically with standard keyboard functions indicated in black and sub-options shown in red, blue and green. This is an important feature in terms of aiding the speed of operation. After a very short familiarization process, the locations of the various functions had become very intuitive to us.

WORDS OF WISDOM

An additional and much appreciated feature of the Elite is the manual. This is extremely well-written and very simple to understand. It is a rare thing to find a manual that is so user-friendly, and that in itself has saved hours of time and frustration. The tutorial chapters are particularly helpful, making it easy to become familiar with the system. As anyone who has ever changed from one type of computer to another will tell you, it is sometimes necessary to spend hours becoming accustomed to it. But using the Elite, we were able to continue work for our clients with minimal disruption simply by following the suggested simple exercises presented in the manual.

We believe the Manuscript Elite is an excellent value. The advantages far outweigh the disadvantages.

Without going so far as to say we liked the system so much we are thinking of buying the company, let me just say that we believe we made the right choice. ■

Editor's note: Jason Yardley is a senior editor at Videola, an eight-year-old facility located on Wardour Street in the heart of London's post production area.

The opinions expressed above are the author's alone. For further information on the Manuscript Elite, contact AVS Graphics (Telephone: +44-252-717-151; FAX: +44-252-717-703), or circle Reader Service 20.

CONTINUED FROM PAGE 25

Mirashade Impressed By DPS Recorder

is how it can work so fast, by not having to shift so much information around. This is also why complex animations may fail to play properly, without reducing the quality factor. The more the difference between successive frames, the more delta data there is and the more information the hard drive has to save every 25th of a second.

Because PAR essentially creates animation files (in its own format, of course), any editing of the files, such as cut and paste, requires those edited animations to be rebuilt. This all takes time and negates the use of PAR as a non-linear editor.

TIME SAVER

As a labor-saving tool, however, the PAR is wonderful. It save an abundance of time and money and creates a far more professional and efficient set-up. The software and hardware are easy to use and are simple, quick and bug free, with constant updates and useful help at the end of a phone.

Output and playback quality is very clean indeed. Is it as good as Beta? I would have to say that it probably is not. It never slows down, but in some cases, if you look very close, you can see slight distortion where compression has occurred. This is acceptable as far as I am concerned or until my clients tell me otherwise. But if you are very fussy, you might want to think again.

Also, you will need to think carefully about your rendering software. Good anti-aliasing and the ability to use field rendering are essential here.

Of course, there are a few minor problems that I think DPS should address in the future. SMPTE time code support is a big omission at present, but I understand that a major upgrade may add this at a later date on the PC. Also, there should be field flipping for all reversed clips, and slow motion should come with blurring.

On the positive side, there have been several beneficial improvements in recent updates. There is now transparent loading and saving to the PAR. This means that any program can now load any PAR frame or save to the PAR without having to support it directly.

The system will also have VTR emulation shortly. This will be software and a serial cable to attach to an edit controller. The PAR will then be treated just as another digital VTR. ■

Editor's note: Barry McCarthy is art director and co-founder of Mirashade, a video production and animation company specializing in digital video, 2-D and 3-D animation, illustration and morphing. Barry has taught animation and written numerous articles for the past five years.

The opinions expressed above are the author's alone. For further information on the Personal Animation Recorder, contact Digital Processing Systems (Telephone: +1-606-371-5533; FAX: +1-606-371-3729), or circle Reader Service 56.

BUYERS
BRIEFS

Aston Electronic Designs has introduced the Ethos dual-channel character generator featuring two broadcast quality outputs and unparalleled speed.

The system offers full color capability and virtually unlimited manipulation of typefaces and logos.

For further information, circle Reader Service 38.

AVS Broadcast has released the Freeform si, the latest upgrade to its Freeform DVE system featuring 3-D curvilinear effects that can be created on-line in real time.

The system also features shape interpolation, in which a flat video surface can be shaped into a sphere or cylinder in real time.

For further information, circle Reader Service 120.

Chyron Corp. has introduced the TVSTOR option for converting its iNFiniT, MAX and MAXINE graphics systems into full color, high-resolution stillstores.

With the TVSTOR option the systems will provide full linear key signal functionality in either analog or digital CCIR 601.

For further information, circle Reader Service 58.

The new software release for For.A Corp.'s MF-300P 3-D effects processor includes rear page-turn highlights and an expanded effects library as well as component input and 4:2:2 processing.

The company's MF-3200P processor offers dual-channel 3-D effects, such as cylinders, zippers and quadrants.

For further information, circle Reader Service 71.

The PRiMA SUPE character generation package from Iceland's Oz is an Inscribe-compatible system that offers full-featured character generation on a PC.

The system offers 50 Power Templates for easier layout and multiple ways to modify typefaces.

For further information, circle Reader Service 26.

Parallax Graphics Systems has launched Version 5 of its Matador 2-D paint and animation software.

The new version features a dual-mode color corrector for component or isolated operation, as well as image stabilization and motion tracking.

For further information, circle Reader Service 85.

Pinnacle Systems has introduced 16:9 capability to its Prizm video workstation. The upgrade brings Prizm's blend of 3-D image manipulations, montage, stillstore and flying linear keys to the widescreen.

In addition, Prizm also touts new refractor shapes for creating cylinders, exploding tiles, magnifying glass and melt-downs.

For further information, circle Reader Service 34.

EQUIPMENT EXCHANGE

TV Technology's Equipment Exchange provides a FREE listing service for all broadcast and pro-video end users. Brokers, dealers, manufacturers and other organizations who sell used equipment on an occasional basis can participate in the Equipment Exchange on a PAID basis. All free listings run at the discretion of the publisher. Call 1-703-998-7600 for details. Submit your free listings on your letterhead and state the make, model number, a brief description, sale price and complete contact information and mail it to: TV Technology, PO Box 1214, Falls Church VA 22041

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Sony BVW-40 with Canon lens, mint, manuals & case, new APR chip block, PB adaptor, O'Connor 50, \$37K; Sony BVW-200 with Canon lens, mint, manual & case, PB adaptor, O'Connor 50, \$16K. Armour Productions, CA. 714-538-5811.

Panasonic WV-V3 3-tube camera & hard case w/10:1 zoom lens, battery, charger & VCR cable, very good cond, \$900/BO; JVC 4400 port 3/4" VCR with AC charger & 2 batts, new heads, works good, incl Kangaroo case, \$500/\$1250 for both. Marty, 805-489-4591.

Sony DXC-M3 fresh tubes, Fuji 12X w/2X, access, avail w/BP-60s & BC1000, \$1750/\$1950. P Kennedy, 702-847-9847.

JVC KY210 750 lines, 3-tube, 14x, \$900; Hitachi SK70 (4), full studio, DCUs, \$1800/ea. G Larson, NV. 702-264-7065.

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JVC KY210 750 lines, 3-tube, 14x, \$900; Hitachi SK70 (4), full studio, DCUs, \$1800/ea. G Larson, NV. 702-264-7065.

Panasonic WV 250/AG7450 chip camera w/docking S-VHS deck, excellent condition, \$4500. M Ziegenbein, 404-564-7987.

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Videonics video title maker, used 2 summers, \$285. K Krohn, PIOV Ltd, IA. 515-842-4934.

Panasonic AG A750 editor/controller, excellent condition, \$1000; Panasonic WJ MX 12 A/V digitalmix effects, excellent condition, \$1500; (2) Sony BVE-9000 loaded with extra 9006's, color display, \$15000/ea. M Ziegenbein, 404-564-7987.

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Paltex Abner A/B roll controller, CPU-based edit controller works with virtually any VTRs, cables for Panasonic & JVC incl, others available, \$2000/Best Offer; Paltex R-SID (2), allows use of serial decks with Abner controller, \$500/each. S Green, WI. 608-274-9944.

Sony VO 2860 edit deck with VO2600 feeder & RM 430 editor with cables, needs work, \$475/Best Offer; Panasonic NV9100, \$175. B Kauffman, PA. 717-838-3668, FAX 717-838-5817.

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Kodak film splicer 8mm & 8mm, cranks, viewers, splicer, baseboard, film leader & press, 7 tab cards, \$130. K Krohn, PIOV Ltd, IA. 515-842-4934.

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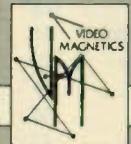
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Sony BVU-850 (2) U-Matic SP VTR, time code, time code recovery mod, manuals, Dolby C audio, vgc, \$5000/ea. D Stewart, MRI Video, OH. 216-696-1122.

Hitachi HR-310 1" studio full edit VTR, air compressors, jog/shuttle, time code, vgc, with or without controller, dynamic tracking, \$4000. Ugly George, 212-969-0240.

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Sony VO 2011 3/4" player, \$400; Sony BVU 110 3/4" port with Kangaroo case & TC Card, \$600; Panasonic NV 9600 3/4" editor & NV 9240 3/4" source with NV-A500 edit controller & cables, \$1500. Philip, 817-467-9650.

Panasonic AG-7500A S-VHS editor (4) excellent condition, \$2500/each; Panasonic AG-7510 S-VHS player, excellent condition, \$1800; DPS-270 (2) digital TBC Y/C TBC, \$800/each; AG-A500 cuts controller, \$500, Patlex Abner A/B controller for Panasonic/JVC, \$2000; Ampex VPR-2 1" editor with TBC-2 TBC & roll about rack console, AST slow-mo, \$7000/Best Offer; Sony 4800 3/4" port with power & battery, \$400. S Green, WI. 608-274-9944.

JVC BR-S622U 10 hours, min edit time, 10 months young, excellent condition, \$2950; Sony VO-4800 TelPak, service manual, AC340B, BP-60s, good condition, \$450. P Kennedy, 702-847-9847.

Sony VO-4800 3/4" port, PortaBrace, PS, good but intermittent ejecting problem, \$75. Steve, 608-251-8855.

Panasonic AGDS850 S-VHS edit VCR, digital slo-motion, TBC, time code generator/reader, Best Offer. 607-687-0545.

Sony VO-7600 3/4" player/recorder, practically new, \$2100/BO. Shaun, 707-826-8933.

Ampex VPR2/TBC2, slo-mo, excellent condition, \$6500; Sony VO 5600 3/4" recorder/player, \$950; Sony VO 4800 3/4" port, \$350; Sony VO 2800 3/4" edit source, \$300; Sony VO 2610 3/4" recorder/player, \$250. G Larson, NV. 702-264-7065.

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 E. Cable TV P. Educational TV facility
 G. Network/group owner Q. Recording studio
 J. Broadcast consultant K. Other (specify): _____
mfg, dist, or dealer

2 Job Function (check one)

A. Corporate mgt D. Prod/oper mgt or staff
 B. Engineering/tech mgt E. News mgt or staff
 C. Engineering/tech staff G. Training
 F. Other (specify): _____

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Use this section to receive free information about products or services advertised in this issue. First fill out the contact information to the left. Then find the Reader Service number printed at the bottom of each advertisement you are interested in, and circle that same number below.

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004	019	034	049	064	079	094	109	124
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006	021	036	051	066	081	096	111	126
007	022	037	052	067	082	097	112	127
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009	024	039	054	069	084	099	114	129
010	025	040	055	070	085	100	115	130
011	026	041	056	071	086	101	116	131
012	027	042	057	072	087	102	117	132
013	028	043	058	073	088	103	118	133
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- | | |
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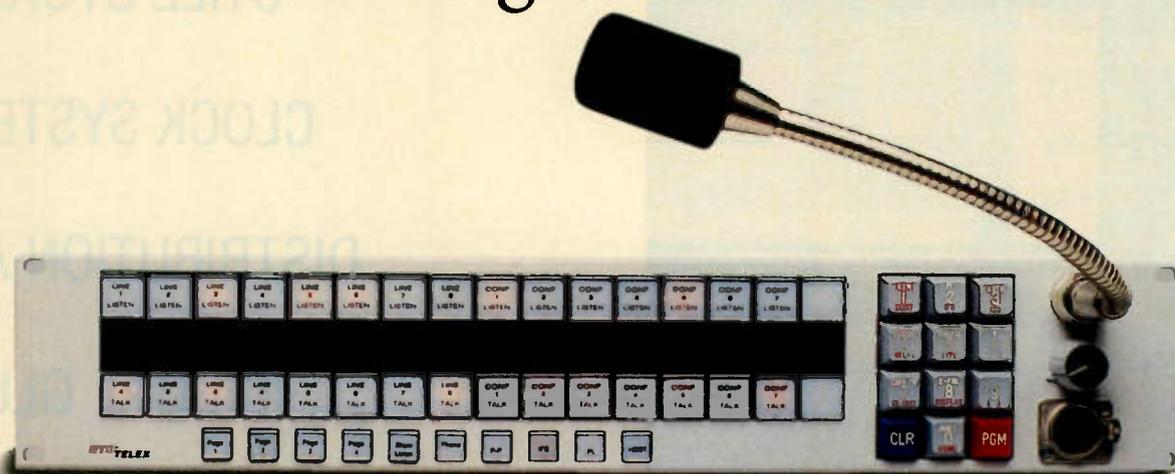
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30 EQUIPMENT



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