

TECHNOLOGY

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ITS: Weighing the Good and the Bad

Delegates And Exhibitors Ponder Their Future Trade Show Plans

by Chris Dickinson

MONTREUX

The 1995 International Television Symposium was a grand success, providing access to leaders of the video industry and hands-on demonstrations of the latest equipment. But then again, it was a miserable experience not worth the cost and aggravation of attending. It all depends on who you talk to.

Now that there are two European television shows in every odd year, opinions seem to be polarized as to which one offers the most value. While many delegates praised ITS for its scenic location and informative technical program, others chastised the event for its confusing convention center, lack of hotel space and even the abysmal weather.

"A well-respected symposium with technology demonstrations attached," was how

one exhibitor — who asked not to be named — described the future of the ITS. Other views, ranging from "hate it" to "a great success," were bandied about among exhibitors and delegates.

MAINLAND INTEREST

Attendance was down compared to two years ago — standing this time at around 26,000 — with the biggest representations from Germany and France. The U.K., perhaps inevitably given the British roots of rival show IBC, was particularly down.

For the record, ITS organizers say delegates from 121 countries attended. Some 300 exhibitors set up shop, and already there are 68 bookings for 1997. One happy consequence of the reduced attendance was the ability to get a table for lunch in one of the restaurants along the main strip. But for anyone wandering around the exhibition proper, what was most striking was the lack of new or surprising equipment.

There were, of course, some highlights — such as Avid/Ikegami's CamCutter, which took the IABM's Peter Wayne Award this year, and the sheer size and exuberance of the Sony stand, which took up virtually one entire floor of the exhibition hall. But on the whole, what was new to Montreux had already been shown at NAB — even if a lot of people did not make it to Las Vegas in April.

One exception was the amount of widescreen production equipment available and the interest shown in 16:9 by delegates. (See related story, this issue.)

The future technology area, set up origi-



The U.K.'s Countrywise Communications moves up to non-linear off-line with Dynatech-EMC.

For a review, turn to page 31.

nally in 1993, also had some interesting demonstrations, both of transmission systems and future products.

However, the true value of the show was the technical sessions held mostly in a revamped conference block on the shore of Lake Geneva. Although some presentations drew rather sparse audiences, it was evident from the presentations and questions from the floor that Montreux drew the leading experts in any number of fields.

BITS AND BYTES

Discussions of digital TV formed the heart of the symposium sessions, with discussions ranging from the control of condition-

al access systems for satellite to the speed of building the information superhighway and the parameters for the European terrestrial TV standard within DVB.

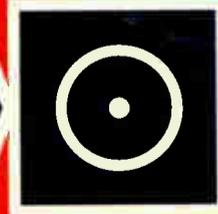
The show's keynote address was given by Ervin S. Duggan, president and CEO of the Public Broadcasting Service in the U.S. Perhaps choosing his metaphors unwisely.

(continued on page 9)

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Karl Paulsen Delves into SCSI Technology
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CONTINUED FROM PAGE 1

The Good and the Bad at Montreux

Duggan compared terrestrial broadcasting to a rich old uncle, lying ill on his sick-bed while his young heir (the cable industry) was throwing a party to celebrate his imminent demise. He said terrestrial TV was challenged from three directions: competition from cable and satellite; new technology, whereby digital TV is about to turn single- or dual-channel broadcasters into multichannel providers; and politics, with public service broadcasting under attack as "no longer relevant."

However, he suggested that despite these threats, terrestrial broadcasting still has life in it yet.

"A mature industry would, after converting to the new digital technology, suddenly become a young industry — not unlike an old uncle jumping out of bed after drinking some miracle tonic, joining the party downstairs and competing with his astounded nephew on the dance floor."

Duggan was particularly scathing about politicians, whom he blamed for most of the catastrophes of the century and warned could still make a mess of the new broadcasting era.

"I have greater faith in the power of leaders in business, science and technology to do good things than I have faith in the power of politicians," he said. "It is on this point — the political point — that I see the greatest danger of dulling the sharp cutting edge of terrestrial television."

Other speakers sidestepped politics and concerned themselves with facing the new world of broadcasting.

DIGITAL DILEMMA

Michael Starks, controller of digital broadcasting projects at the BBC, acknowledged that digital terrestrial broadcasting depended on politicians granting licenses, but he added that the BBC would only go for such services if they could be shown to be commercially sound.

"The BBC is primarily a program service provider," Starks said. "The BBC has done a feasibility study on digital and it is not something we could or would do on our own. The BBC would only go ahead if (digital) happened across U.K. broadcasting as a whole."

His pragmatic approach was supported by Tony Gee, manager of the digital terrestrial broadcasting project at NTL, who said the introduction of digital terrestrial television (DTT) should be coordinated across Europe.

"The benefits of its introduction will not be limited to those countries which are early adopters," Gee said. "The increase in demand for new domestic equipment will benefit manufacturers across the (European) Community, and the increase in program outlets provides scope for program makers."

For this to happen, he added, the Digital Video Broadcasting (DVB) group should agree to a terrestrial digital standard as soon as possible.

Gee also opened up a potential split within DVB about the exact parameters of the DVB standard. He expressed doubts about the commercial viability of a proposed 8,000-carrier FFT transmission subsystem. (See related story, this issue.)

There were a number of demonstrations of DTT in the future technology section, one by DVB and another by NTL. Both showed

how the signal could be split to accommodate four separate channels and allay any fears about the ruggedness of the pictures.

For the situation in Japan, Shigeru Yamazaki of NHK's research and development labs said broadcasters do not intend to launch DTT services. Instead, they are more interested in digital satellite channels.



Although many new products had already been shown at NAB, Montreux was the first chance most Europeans had for a hands-on demo.

"It should be noted that those who eagerly want to set up the satellite channels in Japan are mainly the terrestrial broadcasters themselves, differing from the situation in the U.S.A. or European countries," Yamazaki said.

For the U.S., Richard M. Smith, chief of the FCC's Office of Engineering and Technology, said the Grand Alliance digital terrestrial standard would be finalized later this year.

"To remain competitive and to ensure that they can continue to serve the public, broadcasters will need the technical capa-

bility to upgrade the quality and nature of their services," Smith said.

He listed three goals for the Grand Alliance standard: 16:9 widescreen pictures; a picture resolution comparable to 35mm film; and five-channel digital audio.

Not to be outdone by the terrestrial broadcasters, representatives of the cable and

satellite industries were busy defining their own future.

Pierre Meyrat, director general of the SES satellite system, emphasized that cable and satellite companies were interdependent with each other, and both depended on what the consumer would pay for. In particular, he said, satellite operators wanting to charge for new services would have to use existing infrastructure provided by cable TV operators to overcome consumers' reluctance in parting with their money.

"The consumer does not want to buy technology nor does he wait anxiously for new

unknown services," Meyrat said. "An average consumer is very price-sensitive for unknown goods and services. Therefore, using existing infrastructures and providing future-proof end-user equipment at the lowest possible cost which is easy to handle is the only way of making multimedia a mass market product in the short future."

CABLE HONORS

Perhaps in acknowledgement of the growing importance of cable and satellite, the ITS was moved to award its 1995 Montreux Achievement Gold Medal to Ulrich Reimer, professor in communications engineering at the Technical University of Braunschweig in Germany and chairman of the technical module of the DVB project.

Elsewhere the debate about the conditional access system for digital TV continued. Andre Kudelski, president of Swiss firm Nagra-Kudelski, summed up the two systems being developed:

"These two concepts are known as Multicrypt and Simulcrypt. Multicrypt is based on an open decoder with a common conditional access structure while Simulcrypt relies on a private conditional access system with real-time 'descrambling' compatibility between different Simulcrypt systems."

The debate is between companies such as BSkyB and Canal+ on the one hand, both of whom want to protect their market positions with a Simulcrypt system, and the more traditional broadcasters who want equal access through a Multicrypt system.

Another area of work that came to light at Montreux was the beefing up of the MPEG 4 standards group. MPEG 4, originally designed as simply a solution for video phone applications, is now the main focus of the MPEG committee and will incorporate both the MPEG 1 and MPEG 2 standards.

Cliff Reader, associate director of Samsung Electronics in the U.S. and chairman of the MPEG 4 subgroup, said MPEG 4 would be the storage and transmission standard for "interactive TV."

He added that the committee planned to finalize the MPEG 4 standard by 1998. ■

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Are These Bits Really Necessary?

by Brian Flowers

ENGINEERING CORNER

In previous articles, I have referred to conflicting opinions about how much digital compression should be used on satellite contribution circuits.

On the one hand, accountants want to use the lowest bit-rate possible, thereby reducing space-segment costs, whereas engineers insist on the need for a higher bit-rate to provide some quality headroom on signals that may be subject to various kinds of downstream processing.

SATELLITE BITS

In the case of the EBU's Eurovision satellite network, 8 Mbps is already in use for SNG feeds, whereas 34 Mbps (ITU-T J81) is foreseen for the main network where full contribution quality is required.

Fortunately there may be a solution that

requires only 20 MHz per channel.

This means that three channels of 34 Mbps, instead of two, can easily be accommodated in a 72 MHz satellite transponder. You lose about 3 dB of satellite link margin by using 8PSK instead of QPSK, but since the Eurovision network earth-stations were dimensioned for analog signals, the remaining link margin is quite adequate.

The EBU has just started using 8 Mbps digital transmission for news feeds via satellite for Sarajevo.

When the first 8 Mbps transmission was due, the color bars sent by Sarajevo were not received at EBU Geneva. The demodulator was adequately locked to the incoming signal, but the decoder gave only mid-grey output, corresponding to no input signal.

As a long shot, I selected "inverted spectrum" on the demodulator and up popped the color bars from Sarajevo. An upconverter or downconverter will invert the spectrum if its oscillator is set above the carrier frequency instead of below it. A modulator can also be set to produce an inverted spectrum, which was the case at the Sarajevo transportable earth-station.

The advantage of digital transmission, compared to analog transmission for satellite links, can be easily demonstrated by comparing the C/N (Carrier/Noise ratio) required to give a good picture in the two cases.

An analog FM needs a received C/N of about 14 dB to enable the demodulator to

Figure 2 shows the E_b/N_0 plotted against the BER for the 8 Mbps modulator and demodulator. The E_b/N_0 corresponding to a BER of 10^{-4} is 5.25 dB.

The E_b/N_0 giving a BER of 10^{-4} for a 34 Mbps modem using QPSK and 3/4 FEC is also 5.25 dB, as would be expected. With 8PSK and 5/6 FEC, the corresponding E_b/N_0 increases by 3 dB to 8.25 dB, as pre-

An engineer at the European Broadcasting Union for 33 years, Brian Flowers is the former head of service and project manager for the EBU's Eurovision Control Center in Geneva. He was recently transferred to the Transmission Technology sector at the EBU. He studied engineering at the University of Southampton and served for two years in the Royal Air Force before

Figure 1.

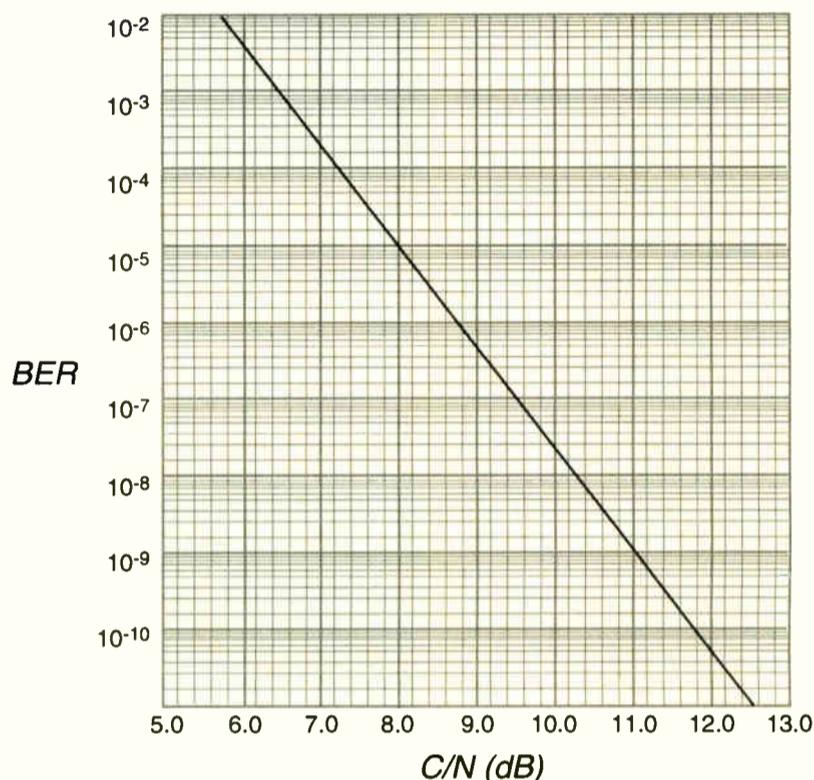
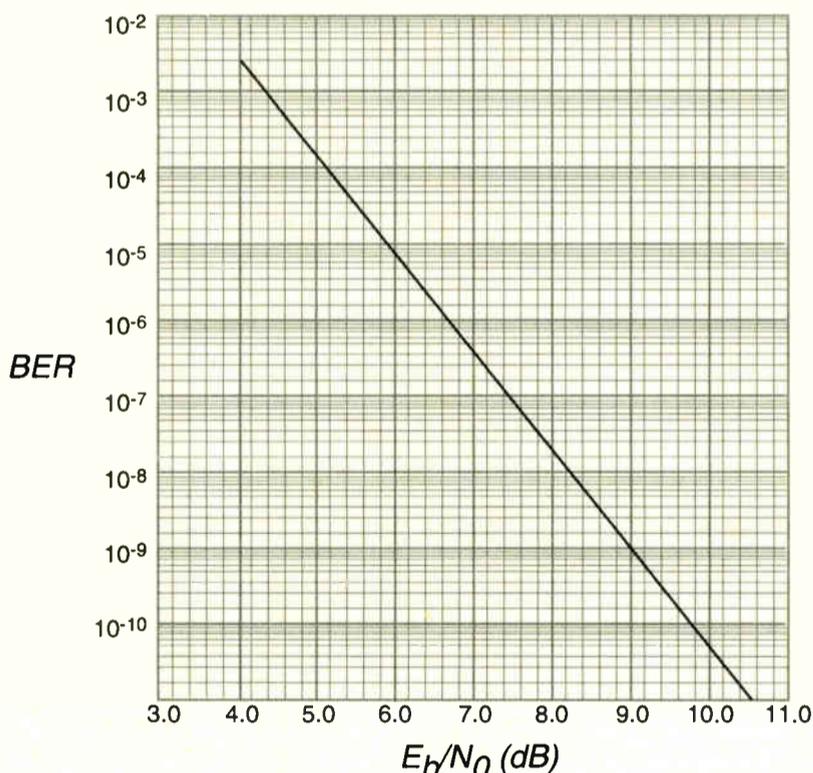


Figure 2.



would satisfy both the accountants and the engineers, namely 34 Mbps with 8 PSK (phase shift keying) modulation.

The EBU was recently provided with a modem that transmits 34 Mbps using 8PSK. The forward error correction can be set to 2/3 or 5/6. Reed Solomon error correction with 4 to 1 interleave can also be included, but since 34 Mbps codecs already include Reed Solomon with 6 to 1 interleave, adding Reed Solomon with 4 to 1 interleave in the modulator would be like wearing a Stetson and a Sombrero simultaneously.

34 Mbps using QPSK (quadrature phase shift keying) and 3/4 FEC requires about 32 MHz of satellite bandwidth per channel, whereas 34 Mbps using 8PSK and 5/6 FEC

deliver a baseband video signal with a weighted signal/noise ratio of 54 dB.

I recently carried out some laboratory tests on an 8 Mbps modulator and demodulator using QPSK and 3/4 FEC. The results are shown in Figure 1.

An 8 Mbps decoder will give a good picture with an input signal having a BER (Bit Error Ratio) of 10^{-4} . It can be seen from Figure 1 that this corresponds to a C/N of only 7.25 dB. The demodulator may lose synchronization at a C/N of about 5 dB.

This means that in Geneva we can receive the 8 Mbps signal perfectly well with a 3.7-meter dish, whereas an analog signal requires a 7.6 meter dish to achieve a good baseband signal/noise ratio.

dicted by theory.

We have encountered one problem with our 3.7 meter Gregorian dish, which the maintenance manual does not mention.

The local crows were convinced that the feed horn enclosure contained something to eat, so they pecked through the waterproof cover, whereupon rain ran into the waveguide and soaked the low noise block (LNB). Consequently we replaced the original thin cover with the plastic lid from a tin of emulsion paint, which seems to be crow-proof.

The British film industry produced a number of comedy films in the 1960s entitled "Carry on Nurse," "Carry on Sergeant," etc. One of my colleagues, who shall be nameless, suggested they should make a film entitled "Carriion Crow."

Another colleague, Jim Smith, developed a "crown of thorns" consisting of a ring of spikes around the feed horn, which is sometimes used to deter birds from attacking feed windows. However, I do not favor this approach for the EBU crows.

BOW BELLS REVISITED

I am proud to be a Londoner, born and bred. My father was a cockney, since he was born within audible range of Bow Bells, which were destroyed during World War II. Fortunately the BBC had a recording of Bow Bells, which was often played during pauses between radio programs after the war.

If you have visited the Tower of London, you will know that ravens have been in residence there for several centuries. It is said that if ever they leave the Tower, it will signal the end of the British monarchy.

Similarly I suspect that if the crows ever leave the EBU buildings in Geneva, it will signal the end of the EBU. ■

joining the BBC. He is a member of the Royal Television Society and was recently accepted as a member of the IEEE.

IN TOUCH WITH REED

Interleaving Reed Solomon error protection is a technique that prevents noise bursts from causing an irretrievable loss of information. The basic principle can be explained as follows:

Consider a bit sequence from 1 to 48, which is fed into the modulator and written into a memory as shown below. (px represents a group of parity bits, px being a function of the preceding six bits).

| | | | | | | |
|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | p1 |
| 7 | 8 | 9 | 10 | 11 | 12 | p2 |
| 13 | 14 | 15 | 16 | 17 | 18 | p3 |
| 19 | 20 | 21 | 22 | 23 | 24 | p4 |
| 25 | 26 | 27 | 28 | 29 | 30 | p5 |
| 31 | 32 | 33 | 34 | 35 | 36 | p6 |
| 37 | 38 | 39 | 40 | 41 | 42 | p7 |
| 43 | 44 | 45 | 46 | 47 | 48 | p8 |

The data is then read out in columns, which gives the following bit sequence:

1 7 13 19 25 31 37 43 2 8 14 20 etc.

The demodulator performs the opposite procedure, which restores the original bit sequence.

Suppose a noise burst occurs in the transmission path, which affects the bit sequence 13 19 25 31. In the demodulator, this would corrupt only one bit in each of the four lines concerned, which the corresponding parity bits could correct. ■

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Keep an Eye on Loose Screws

Not Everything On a Worn-Out Piece of Gear May Be Ready for the Scrap Heap

Here is a warning, something that is gospel to the truly cost-conscious engineer: Never throw out good parts.

When it does become necessary to dispose of an aging piece of equipment, remove potentially useful parts first. Screws can be a valuable salvage item. Special-style screws are of particular value if you still have equipment that uses them. New equipment comes with a full set of undamaged screws, but time, abuse and neglect will result in lost or damaged screws. Salvaged screws are an affordable

solution to this problem.

Sorting the screws into Metric and U.S. containers is obvious. Sorting into Panasonic, Sony and JVC is useful, although not as obvious. These are all metric screws, but different manufacturers may use unique screws. A non-standard screw for Brand XYZ is more easily found in the XYZ container than having to sort through the ALL BRANDS container.

But while it is wise to save useful parts, remember to be selective in what you save. Do you really need any more octal tube sockets?

In addition, if you still have items of the same make and model in service, it is easier to keep the whole thing for parts. Remove parts only when needed. When still attached, all items are pre-sorted by make and model.

▼▼▼
This may come as a shock to those of you who follow this quasi-regular series of Tech Tips: I am going to suggest that you spend money. Even more shocking is that you will not be buying the cheapest possible solution.

Spending moderate amounts of money on recurring basics can improve productivity and reduce stress in your shop. Worn tools can reduce productivity and cause frustration when used. Dull drill bits, worn screw-

by Larry Albert

TECH TIPS

drivers and dull saw blades are the targets of this column. These are neither endangered nor protected species, so spend and replace them without problems.

Dull drill bits reduce productivity and frustrate the user — replace them. Bits only get dull if used; therefore, some sizes are seldom used and will not be dull. Buy a high-quality set of 1/16- to 1/4-inch bits to replace the old ones.

For larger sizes, replace any that are regularly used and dull. If you have and use wire gauge bits for drilling tap and clearance holes, replace the bits required for the screw sizes commonly used. Remember, both the tap and the clearance sizes probably need replacement.

Worn, bent or otherwise damaged screwdrivers are more likely to slip out of the screw. This may cause damage to surrounding areas, in addition to frustrating the user. So do yourself a favor and replace all damaged screwdrivers. Buy at least one good hardened-tip screwdriver in the #2 Phillips style. Most shops have a collection of old,

Spending moderate

amounts of money on

recurring basics can improve

productivity and reduce

stress in your shop.

cheap and worn screwdrivers of this size. One good one is better than 20 bad ones. Throw the old ones out and then they will never give you any more problems.

In addition, saw blades get dull and should be replaced. Carbide-tipped blades for your "Skil" saw cost a bit more than other blades. The carbide blade will cut an occasional nail and still be functional, so spend the extra money. Sharp blades aid in the use of saber saws and hack saws also. Be sure you have some new ones.

If you often use files, how old are they? The common practice of tossing the files into a drawer without anything to prevent its cutting edges from hitting other files causes them to become dull. Buy a new file in your most-used size and discover how much better a sharp new file cuts.

The cost of replacing worn tools should be a regular expense, just like the cost of replacing printer ribbons or videotape. If you do not spend the money, is it really saved? ■

Larry Albert is the television engineer at Murray State University's MSU-TV. Albert believes cheap engineering is an acceptable term and is a self-professed "cheap-skate."

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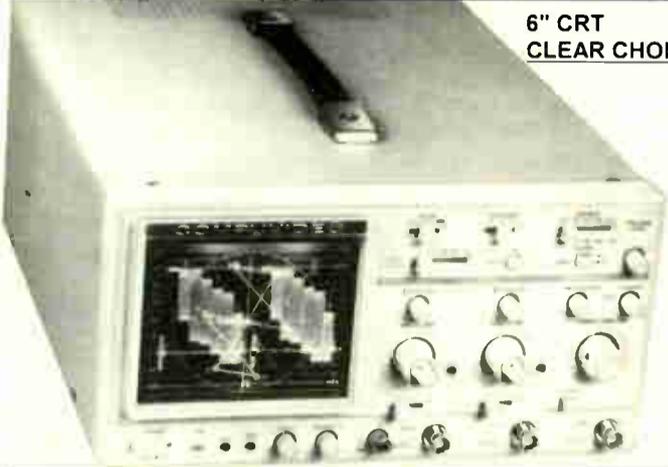


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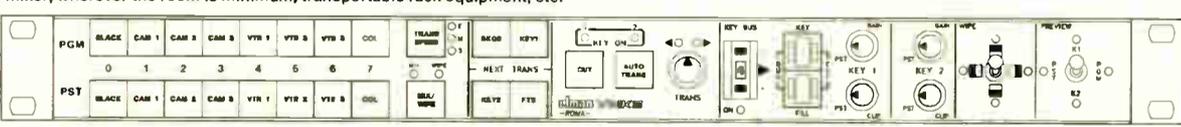
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Let's All Join the ISDN Bandwagon

by Mario Orazio



SOMEWHERE OUT THERE You might not have noticed that DVCPRO was not the most important thing at Panasonic's NAB booth this year. It was not even the most important product with a camera attached. I know this incontrovertible fact will not meet with agreement from the many thousands of people who crowded around the working DVCPRO stuff (as for the mock-ups, let's all chip in so Panasonic can hire a genuine model maker, OK?), and it also probably will not sit well with all the Panapeople. But the single most important item at Panasonic's booth was the VisionSeries of videoconferencing devices.

Why? Well, I will not tell you just yet. I cannot give everything away at the front of my column. Okay, you forced it out of me: ISDN, Integrated Services Digital Network.

DVCPRO AND D-5

Yes, I know, there were many other nifty products to see at the Big P. Not only did they present DVCPRO, but there was also D-5, for those of you who were starting to place bets on the duel of the Ampex and Panasonic legal/marketing staffs. Here's a recap, in case you were unaware:

It seems Ampex ran an ad not too long ago saying it had the king of VTRs. Panasonic sent a letter saying (in effect): "You better stop that now, because we have the world's best VTRs." In response, Ampex ran the Panasonic letter in a two-page ad, the other page challenging D-5 to pistols at dawn, or something like that.

Personally, I would not dream of descending to the level of these mud-slinging manufacturers, and I will not even reveal that I think Ampex's DCT is, without doubt, the finest VTR transport that has ever been built. Nor would I deign to acknowledge that you just cannot find a VTR that will record a better 525- or 625-line video signal than D-5. Wild horses could not get me to divulge my opinions on the subject, so don't even bother to ask.

So much for high-quality video. High-quality video is what your ultra-high-priced computer graphics system squirts out. Then you squash it with a big NTSC footprint, throw in a little transmitter group delay, some ICPM, some multipath — and this is just on the way to the cable headend or the satellite antenna farm. (Yes, I am talking about off-air signals being uplinked. I'm not that dumb.)

Real video is what the poor suckers — er, viewers — who ultimately pay your salary watch at home, and it can get pretty bad. I mean, suppose there was a black-and-white surveillance camera outside the Oklahoma City federal office building, and it was feeding a nine-picture splitter input to a poor-quality time-lapse VHS recorder with dirty

heads. You can bet your sweet patootie that those awful pictures would have been the most watched worldwide a few months ago. When you have to see something, quality is not an overriding concern.

I mention this because there is no magic in this business — and precious few miracles. D-5 records more than a couple hundred megabits a second. That is a heck of a lot. A 56 kbps digital phone connection is not quite that much; it's about a couple hundred megabits a second less. Let me put that another way: one is around 4,000 times more than the other.

I think that puts Panasonic's VisionSeries into the category of one of the precious few miracles: 30 fps color pictures through a circuit with something on the order of one four-thousandth of the capacity of D-5. No, you don't get D-5-quality images; you get barfola-quality images, but it is amazing how fast you can get used to barfola quality when the price is right, and the price is sure-enough right.

First of all, there is Panasonic itself. For under US\$15,000, the company gives you a color camera with remote pan & tilt and autofocus, a 20-inch color monitor, an audio conferencing system with mic and speakers, a videoconferencing codec, a handy remote control and three BRIs (basic rate interfaces), of which more later. You also have to convince someone else to shell out similar cash or buy two systems yourself.

ONE MORE STEP

Of course, even with all your hardware, you are not done distributing dollars just yet. You now have to call your local phone company (or more likely, the organization that used to be your local phone company but is now bent on becoming your local cable company), and tell them you want at least one ISDN BRI.

ISDN is supposed to be the integrated services digital network, which is supposed to carry anything from anyone anywhere to anyone anywhere else at anytime. While this may be a bit overstated at the moment, it is not too bad at connecting folks at 64 kbps in some parts of the world or 56 kbps in the good old U.S. of A. — where you can get it, anyhow.

A phone call has less than 4 kHz of bandwidth, so Uncle Harry Nyquist says you can sample it at 8 kilosamples per second. It also does not sound all that good, so

eight bits per sample is fine. If your calculator batteries are not oozing electrolyte all over the keypad, you probably figured out that a phone call gets digitized at 64 kbps. So far, so good.

Now, what is the simplest channel code? High for one, low for zero. So your stockbroker calls and tells you that he thought he would put everything you had into Barings Bank securities, and the Papuan who was not ever going to sneeze (a common securities value indicator) did. So the broker is sorry to deliver the bad news, but you do not have a cent to your name, and, by the way, the call is collect.

Now, there is dead silence on the line. That equals a whole lot of zeroes, which means the digital bitstream is flatlining, and pretty soon the receiver at the other end is going to lose clock lock. Errors start flying all over the place, and in addition to being flat broke, you also just lost the connection.

So it was that an AT&T genius came up with a neat idea: always jam one bit of the eight to a one. What you lose in SNR you make up in locked clocks. Another AT&T genius came up with an even neater plan, B8ZS (binary eight-zero substitution, where every eight zeroes in a row get turned into a unique code and you don't get stuck with just seven working bits). But it

was too late. There are enough jam-bit booby traps out there that 56 kbps is all you can usually count on.

A BRI is two 64/56-type channels (B-channels) plus another 16 kbps (D-channel) just for good measure. It might show up on an RJ45 jack or a plain old RJ11 (a Mario tip: an RJ11 plug will fit just fine in an RJ45 jack, and they are not using the extra wires anyway).

I do not make a habit out of calling local phone companies from Iuka, Mississippi, to Angle Inlet, Minnesota, so I cannot tell you what your BRI will cost, but it probably won't be much more than a regular POTS (plain old telephone service) line or two. Calls on said line tend to cost about what any other phone call would cost, plus a penny a minute or so.

But anyway, with all this hardware and your ISDN lines in place, you have an on-ramp to the real information superhighway where you can send and receive actual color pictures. And, if you are sending stills, they don't even look that bad.

OK, I admit it: At 56 kbps, nobody's codec, not Panasonic's nor anyone else's, gets much beyond extreme barfola for moving pictures. That is why there are three BRIs. At 384 kbps, the pictures are, well, tolerable. If you want better, spend a lot of money for a broadcast-quality (whatever that means) 45 Mbps DS-3 link and a pair of high-end codecs.

Of course, the other alternative is to spend less. The reason I am picking on Panasonic this month is that it dared to show an ultra-cheapo videoconferencing system at NAB. For that, I offer congratulations. There are plenty of other videoconferencing system makers in the world, but most of them did not come to the Big Show. I am glad Panasonic had the courage to let the NAB

multitudes know there is more to video than network sports. The other bizarre camera product it showed was the Galileo Media Explorer, which can feature, besides the camera, a musical keyboard, a CD-ROM drive, and, lest we forget that all consumers are deaf, a hyper-mega-ultra BassBooster modules.

But maybe you do not need videoconferencing. Maybe you would just like an ultra-cheap way to get a high-quality voiceover from your announcer, who is currently on vacation on the other side of the world.

There are a lot of manufacturers of 56 kbps audio codecs, and they all did show up at NAB — sometimes in a single booth. BSW stuck codecs from AEQ, CCS, Comrex, Gentner and Telos in a single rack. Give them a call at +1-206-565-2301, if you need some unbiased opinions. Otherwise, if you think Ampex and Panasonic are having a war, you should hear what CCS and Telos have to say about each other.

MIRACLE OF MIRACLES

In my humble, worthless and totally biased opinion, they are all pretty miraculous. You have a measly 56 kbps circuit that is barely up to dealing with a 3 kHz bandwidth phone call at just seven bits. To this you are hooking up a not-particularly-costly audio codec. You dial the number and at approximately the same nanosecond that your index finger leaves the last key, you are connected, and that could be from Australia to the United States or just about any other two ISDN points on this planet.

Maybe it takes a little more to impress you. OK, I don't mind a challenge. How about a commentator-quality circuit on just one 56 kbps line? How about 20 kHz stereo on a single BRI? I am not making this up, and folks with better ears than I swear by it.

And it is just as simple as tapping out a phone number — after the ISDN nightmare phase, that is. The nightmare phase starts with trying to find the right person in your local phone (er, cable-TV) company to speak to when placing an order. It then continues with the order getting lost, the installer not knowing how to install it and repair service not knowing how to test it.

Once it is in and working, you get to play the compatibility game: What kind of telco switch? What kind of ISDN? What SPID numbers? And on and on. The first day with your new ISDN numbers and gear definitely is not much fun, unless you are the type who enjoys putting together solid-color 3D jigsaw puzzles in which each piece is almost the same shape as every other.

But, from the second day on, it is fun, fun, and more fun, and the cost is peanuts. Let me put this another way: Do not finish reading. Pick up the phone. Order a BRI line. Even if you do not have the cash for a codec, get the line anyway. Itinerant freelance journalists are starting to pack them with their toothbrushes. And if you are planning on surfing the Internet, there is no better way to slip through than an ISDN connection.

Maybe you cannot yet afford an HDTV-ready, 10,000-hour video server. Maybe that four-chip studio camera with the 70:1 zoom lens is not in this year's budget. But I don't know anyone who cannot afford an ISDN BRI. Just do it. ■

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.

Making a Play for Still Video

by Terence Dyke & Paul Smolen

DESKTOP VIDEO

The Video Peripheral of the Month for August has to be a strange and wonderful little box called Snappy Video Snapshot from Play Inc. It grabs stills from just about any video source and plugs into the parallel port of your PC. And yes, batteries are included.

To use Snappy, you plug in your camera, TV, VCR or even Nintendo box, wait until you spot the picture you want to save, and then click on the "Snap" command in the Windows-based operating software. Snappy then freezes a frame (or a single field if it's moving video) and stores it in an internal buffer. Click on "Save," and the 24-bit color image goes to your hard disk in the format of your choice: GIF, PCX, BMP, TIFF or JPEG. To aid in the acquisition, there is a video out connector that lets you preview the image.

THE HEART OF THE MATTER

At the heart of the device is Play Inc.'s custom HD-1500 chip that the company characterizes as "the world's first High Definition video capture chip." The claim of 1500 x 1125 resolution has sparked a certain amount of skepticism, particularly in a pocket-sized device that sells for US\$199.95. Not to mention the fact that a full-resolution picture requires more than 5 MB of storage — is there really that much RAM in that little box?

It turns out that the claim is not too extravagant, if you put a couple of asterisks after it. According to one of the software engineers at Play Inc., the chip has a 35 ns sampling resolution, which gives it a "true" 1,500 samples per line. By looking at multiple fields (up to eight), Snappy can acquire more than 480 lines. When acquisition is set for maximum resolution, the PC-based software uses an interpolation algorithm that boosts the number of lines to 1,125.

True, this might seem like a trick, but it is a useful trick. If you have ever seen the images output by a scan-doubler, for example, you will appreciate where this is going: a scan-doubler merely repeats each line that it sees, and yet dramatically improves the visual quality of the image. Interpolation, on the other hand, does not just repeat lines, but rather looks at pairs of pixels and figures out what the missing pixels in between should be, based on a kind of averaging process.

In addition to the operating software, the Snappy package also includes Fauve Matisse software for paint, retouching and titling, plus Gryphon Morph 2.5 for morphing, warps and special effects.

Snappy is the first commercial product from Play Inc., which was formed last August out of a three-way merger that included Digital Creations, Progressive Image Technology and a group of eight

senior staff members from NewTek. Among the latter are NewTek co-founder Paul Montgomery and marketing spokesperson Kiki Stockhammer, who over the years acquired a cult following among trade-show attendees and a legendary ability to pitch the Video Toaster for eight and 10 hours nonstop at NewTek's booth.

Progressive Image Technology's credits include desktop video hardware going back to the pioneering days of the Apple and IBM systems of the early 1980s, while Digital Creations has been a leader in graphics software and paint programs for the Amiga.

Obviously, though, all that talent was not assembled just to produce a better, smaller frame-grabber, nifty though it may be. They have been hard at work on the idea of the "complete" desktop video system.

Trinity is billed by Play Inc. as "The World's First Real-Time, PC-Based, Open Architecture, No Compromises, True Broadcast-Quality, All D-1 Digital Video Production Studio."

The Trinity specs are certainly impressive: 10-input digital switcher, dual digital effects engines with real-time transitions, dual channel still store, timeline editor with machine control and all the amenities, audio mixer, character generator and a full-featured paint/compositing/animation software package. Also included is the innovative VideoNet, a 330 Mbps network that allows Trinity and other peripherals to be interconnected to PCs in a production environment. The announced price for the system is US\$5,995, which includes two composite plus Y/C input modules and one composite

plus Y/C output module. Additional input/output modules will be available.

There are also some optional add-ons for Trinity. The Predator non-linear editor, priced at US\$4,995, includes two D-1-quality on-line audio/video channels. It requires the addition of a pair of SCSI hard disks. At US\$7,995, the Warp Engine real-time 3D digital effects system, described as a "massively parallel video supercomputer," is capable of mapping video streams onto any 3D shape — scaling, stretching, flipping, whatever — all in real time.

PC POWER

To run Trinity, you will need a Pentium PC with Windows 95 (itself not yet officially shipping) or Windows NT 3.5, 16 MB of RAM, a PCI slot, a double-speed CD-ROM and 75 MB of hard disk space.

We were able to get a look at some of Snappy's handiwork by visiting the Play Inc. World Wide Web page and downloading some sample images. These included two classic cars, a lobster posing with some glasses of wine, a vase with flowers and a couple of glamour shots of the indefatigable Ms. Stockhammer. They were relatively small compressed JPEG files, but the images looked really good. Hair detail, metal highlights, floral intricacies and crustacean knob-biness were all faithfully portrayed.

These were carefully set-up studio shots, of course, presumably in eight-field "still" mode. But clicking further along the Web, we found some single-field "motion" mode shots — some of them grabbed from an 8mm camcorder — that looked just fine.

If you are set up with an Internet connection that supports World Wide Web access, point your browser to <http://www.calweb.com/~tpabon/> and get a first-hand look.

Perhaps the best-known and comprehensive "directory" site is Yahoo (<http://www.yahoo.com/>), which allows you to do word searches that retrieve lists of pointers to sites that have information on the topics you have requested. There is a small but growing number of such sites cropping up on the Web, some of them more specialized than others.

Our compadre, Clay Leben of the Austin ITVA, recently directed us to one of these sites that is particularly worthy of mention. It is called OMNIBUS:EYE, mounted by Northwestern University's Department of Radio, Television and Film (<http://www.rtf.nwu.edu/links/links.html>). This searchable list contains more than 700 links to other media-related Web sites that host such things as on-line journals, images, QuickTime movies, graphics software and discussion groups, just to name a few. ■

For further information:

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The Knack of Sound Editing

by Ken Hahn

AUDIO FOR VIDEO

We are in the midst of the evolution of disk-based random access editing of pictures and sound. This method of editing has many advantages over its tape- and sprocket-based predecessors. This month I want to address one of these advantages, although it is one that can have a detrimental side effect on the audio portion of the program if the proper precautions are not followed.

As one of the owners of a busy audio post production facility, I am exposed to a sizable number of projects. With the proliferation of disk-based random access picture and sound workstations, we have witnessed a transfiguration of the post production process.

As each client, project and their associated technical aspects are different, they usually have some commonality. Of late the most commonly asked question goes something like this: "Because my _____

(insert the name of your current workstation here) has digital audio, is there any reason why I cannot do the audio editing with it and just provide you (the audio house) with the tracks to mix?" If you have ever been tempted to ask, have asked or had someone ask you this question, read on ...

The notion behind this is to avoid the task of reconfirming (editing) the audio tracks after they have already been edited in the disk-based sound and picture editor. The picture must be conformed because the quality presently available on these systems does not meet acceptable release standards. But the audio portion (digital audio with a sampling frequency is at 44.1 or 48 kHz) does meet professional audio specifications. Here lies the nature of some possible problems.

INTERNAL AUDIO

The disk-based editor handles audio internally in a digital format. I assume that by now most of us are familiar with the advantages that digital audio possesses. But what about the rest of the audio chain — the parts that distribute the audio to and from the editing system?

The quality of the audio tracks loaded (recorded) onto the disk-based systems' hard drives must be maintained throughout the post production process. It begins with the proper handling of the source audio tracks. The importance of this critical first step cannot be overstated.

The edited audio tracks, prepared for use at the final mix, must not be corrupt-

ed or they will not represent the original audio recording. Audio that is distorted or degraded as it is transferred into the workstation can never be rejuvenated to its original quality. The only recourse is to reload and re-edit it.

In the interest of streamlining the course of post production, many productions are attempting to shorten the traditional methods of assembling and editing the source audio elements. Some of the tools needed to accomplish this are in place, but some key components are not up to par. In addition, the personnel asked to perform these services may lack the knowledge and training required to handle master quality audio. This is a new technology finding its way into an already existing system.

The quality of the ancillary audio products (which interface the editor to the outside world) is critical. Every link in the audio path needs examining. The audio mixer, patch bay, speakers and mixer all need to be of the same high standard as your editor. And do not forget clean power, good grounding and shielding to prevent ground loops, hum and buzz.

How might the audio get corrupted? How can this be avoided? Starting next month I'll discuss some practical techniques to supply clean, high-quality audio tracks. ■

Ken Hahn is co-founder of New York's Sync Sound and has received three Emmy awards and 12 ITS Monitor awards for his work. He may be reached care of TV Technology.

Consign your animation tape problems to history

DPS have a PAR system that takes the aggro out of animation.

The DPS Personal Animation Recorders permit the recording and real-time playback of computer animation sequences directly from a hard drive.

For PC applications

The DR-3100 plugs into a 16-bit ISA bus expansion slot in any IBM compatible computer. It supports direct rendering from animation programs such as Autodesk 3D Studio and can also be used to build sequences from pre-rendered TARGA files. Once recorded, animations can be easily copied, trimmed, joined, appended and deleted. A variety of slow motion playback speeds are also supported.

When used in combination with a DPS AD-3000 Video Capture card, the DPS Personal Animation Recorder can perform real-time video capture for rotoscoping, time lapse recording and other special effects. AD-3000 operational features include full proc amp controls, freeze frame and freeze field. Maximum recording time varies, depending on image complexity and hard drive size, but six to nine minutes is typical for a 1 GB hard drive.

Captured video sequences can also be easily converted into TARGA files.

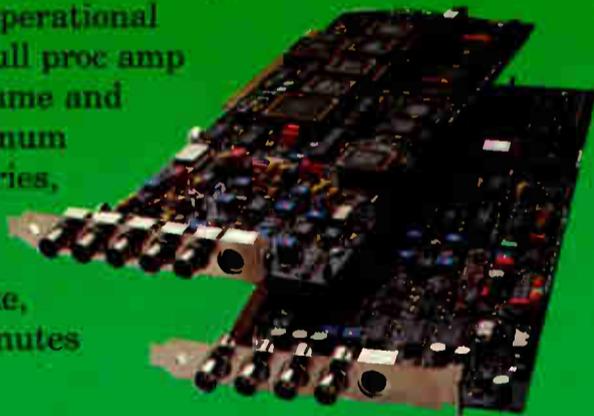
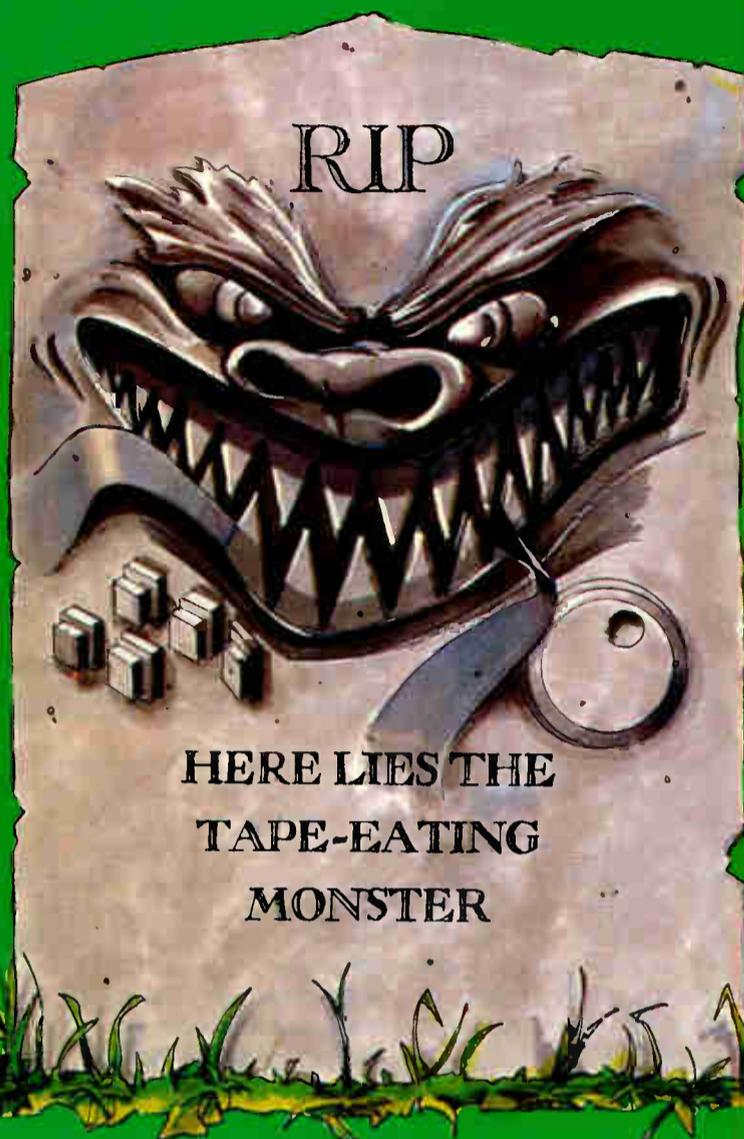
For Amiga applications

The DR-3150 card plugs into an Amiga expansion slot and replaces both the record VCR and the single frame controller. A dedicated hard drive (not included) and component digital recording techniques are employed to enable the recording and real-time playback of full resolution animation sequences. Bad edits, missed frames, dropouts and other mechanical glitches common to traditional VCRs are a thing of the past with the DPS Personal Animation Recorder.

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The LightWave 3D package is a full featured 3D graphics and animation system. It is renowned for its easy to use interface

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Razor Pro

Razor Pro features infinite video and audio tracks, an easy to use project management system, organic and customizable transitions, as well



as the ability to apply transitions to multiple tracks.

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DIGITAL
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Mixing Up the Old and the New

by Brian Kelley

CONTRACT ENGINEER

According to a recent survey by the German B.A.T. Freizeit Forschung Institute, almost 50 percent of the population of Germany sees the age of telecommunications and multimedia as a threat. Even in the 14-29 age group, which is generally considered more open to innovation, the figure is an astonishing 36 percent. And this is in Germany, long known for its ability in engineering and R&D.

What does this say about the rest of the world? It says people are afraid of a brave new digital world they feel they understand less and less.

Yet, in spite of this, technology continues to modernize and digitize in ways that are changing the way we all live, and it is radically altering the TV industry. In fact, it is nearly always true that technological advances outpace the ability of users to adapt to the changes that come with them.

KNOWLEDGE GAP

In our industry we are concerned about getting necessary bandwidth (like closet space, you can never have enough) to deliver video-on-demand and still leave room for interactive feedback. However, most of the viewing public is concerned about what the red button on the remote control unit does. It is the nature of the

beast that there will always be a discrepancy between what is possible on the engineering level and what is marketable to the masses. There is clearly a gap felt by society between what we know we can do and what we feel we should be doing.

The distance between today's reality and tomorrow's bright future is great, but this gap is being filled in some unique ways. This is being done by companies that are realizing the need to use existing technology — the kind that people have grown accustomed to — in ways that approximate, and therefore train users to deal with, the future.

I like to use the term "in-between technologies" to describe the use of current

conditional broadcast video manner, it also uses existing technology and stretches its capabilities. The signal can even be recorded onto normal VHS tape including the LP mode that consumers so love.

Granted, a transmission speed of 26 kilobytes/minute is not blazingly fast and is nothing to get very excited about, but this is only true if the only alternative is to pay money for a telephone call to receive the same data that can be gotten for free.

Those living in North America take for granted the benefits of a local telephone service. Until I moved to Europe, I did not even know that telephone service could exist any other way. In North America, local telephone calls incur no additional

who invest in new technologies. These are the top 1 to 3 percent of the people who must have the newest equipment regardless of cost. The rest of us live in the real world where there is still some relationship between price and speed. Costs mentioned above give room for the creative to invent new uses for in-between technology.

Videodat is a perfect example of an in-between technology. It features hardware and systems that are already generally understood to deliver new things that future technology will deliver better. The key is that it is finding a mix between what is possible and what is palatable to the end user now.

SMALL STEPS

For example, the hardware used is universal — the TV, the VCR and VHS tape. Also, the existing capacity of the TV signal (the upper lines) is being used, so it is easy for broadcasters to implement and in fact adds value to their spectrum. There is no "vaporware" here.

In addition, consumers can anticipate the future by becoming accustomed to the transfer of digital data. What's more, the price is right because it offers free transmission to the end user and the price/speed trade-off is acceptable to the masses.

But still, this relates only to a limited few who want technical information. What about the rest of the world that is harder to please and wants more than computer software? In-between technology is not just for the electrical engineers of the '90s. Increasingly, it has been finding its way into the mainstream offerings of large broadcasters.

When we speak about interactivity, most of us have in mind something very technically specific. We can see that the industry still has a very long way to go toward this goal. In Germany, for example, there are currently six pilot projects in the cities of Berlin, Hamburg, Munich, Nurnberg, Stuttgart and Leipzig.

The Stuttgart project, which uses a combination of fiber-optics and copper coaxial

(continued on page 23)

Interactivity does not have to be digital, even if that is what it will be eventually.

widely known technologies in ways that foresee what the future will offer. One of the best examples is a new service in Germany known as Videodat.

Who says that data must be transferred to the consumer via telephone lines? Not some innovators who have been working with a technology in which data is carried on the top portion of the screen — a visible area in the edit suite but far beyond the scrutiny of the home viewer.

Germany's largest regional station uses what is known as Videodat to transmit binary data alongside its TV program "Computer Club." During the 45-minute broadcast, 1.2 megabytes of data are transferred, including software, graphics, help files, product information and anything else that can be digitized. All of this not only serves to accentuate what is seen in the tra-

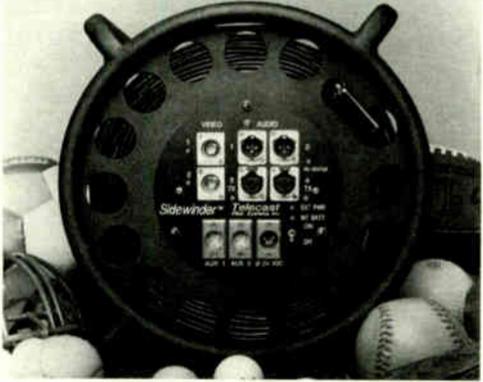
surcharges above the monthly service fee. This has enabled, among many other social benefits, the rapid growth of commercial on-line services. Logging on is basically free of telecommunication charges. Getting information is not just easy, it is also extremely cheap.

The same technology also exists in Europe, but the same telephone pricing structure does not. Besides monthly fees, those you pay regardless of usage, each and every call has attached to it a charge. In Germany, a local call costs the equivalent of 16 U.S. cents for 12 minutes. Calls to a city farther away than 50 km run between 25 and 50 cents per minute. Beginning in 1996, these rates are scheduled to actually go up by 108.7 percent.

In marketing terms, innovators make up the left-hand side of the bell curve of people

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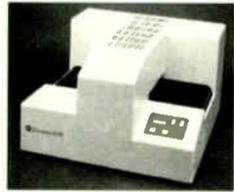
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22 FEATURES

Zeroing in on Antenna Design

by Phil Dubs

VIA SATELLITE

The antenna is everything in the satellite business. Therefore, before venturing out to the local satellite antenna store, it would be wise to learn a few things before you pick one out and haul it back to the farm ... antenna farm that is.

Like in many other aspects of life, bigger is better. The bigger the antenna, the more gain, and consequently, the more signal there is to direct down the feed line to your receiver in the rack. This is true to a certain extent, which brings up another metaphor: All antennas are NOT created equal. So, this month, we will look at the basics of satellite antenna design and take a quick field trip to Comtech Antenna Systems in St. Cloud, Fla. Tom Christy, Comtech's vice president of marketing, will walk us through the manufacturing steps of the company's fiberglass antennas, pointing out how high-quality satellite antennas are put together.

BASIC TRAINING

First, a little basic training on antennas. Satellite antennas are simple devices. With a reflector, a feedhorn and some type of mounting structure, the antenna can be aimed at a specific satellite or group of satellites. The reflector is based on the curvature of a parabola. Parabolic reflectors concentrate the signal from the satellite and bounce it back to the focal point, where a collecting device, the feedhorn, captures the concentrated signal and passes it to the first stage of amplification in the LNB or LNA.

The reflector area is a factor of the diameter as well as the parabolic shape. The larger the reflector diameter, the more area is available to capture the signal, and consequently, the higher the gain. Gain is also a factor of operating frequency. The higher the frequency, the higher the gain for the same size antenna. Therefore, the same antenna provides more gain at Ku than at C band.

One dimension overlooked by many installers is the F/D, or focal distance to diameter. This ratio is the distance from the center of the reflector to a point just to the front and at the opening of the feedhorn. It represents where the lens action of the parabola concentrates the most signal. Focal distance varies depending on the design of the parabolic reflector. Deep dish antennas have an F/D of 0.25 to 0.31. An F/D of 0.375 to 0.45 is considered shallow.

Antenna gain is fairly predictable on paper. Antenna gain is just one part of the true figures on which we base all of our link budget calculations. What provides a better picture of the performance of an antenna system is the G/T, or the ratio of antenna gain to antenna noise. Once again, bigger is better. Use G/T as your comparison of one system to another. The G/T takes into account antenna gain, LNB/LNA

noise and the noise generated by the antenna.

Satellite antennas have all the same elements; the reflector, the feedhorn and a mounting base. However, feedhorn mounting and types of feeds do vary from design to design. You are probably aware of both the prime focus and cassegrain feed systems.

It is the reflector construction that varies most obviously from antenna to antenna. Three types of reflector construction make up the majority of satellite antennas: mesh, stamped metal and fiberglass. What we strive to do in reflector design is keep the parabola a parabola. Staying true to form allows the most gain for a specific size reflector.

On a recent trip to Comtech Antenna Systems, located only a stone's throw from Disney World, the mystery of fiberglass antenna manufacturing was exposed. Tom Christy provided me with a first-class tour of the company's 32,000-foot facility, where fiberglass strands go in one end and satellite antennas pop out the other.

Comtech is not new to the satellite business. Since 1964, the company has had its hand in some form of microwave products. With an initial start in Troposcatter products, it still manufactures various electronic components for that industry, as well as the familiar Comtech fiberglass antennas you find in just about every cable and broadcast antenna farm.

Fiberglass satellite antennas have many advantages. Near coastal areas where corrosion is a concern, the problem is practically non-existent on a fiberglass antenna. High durability, moderate cost and excellent side lobe specs make it the first choice among satellite veterans.

The first thing required to build large fiberglass antennas is a very large open building. Comtech's manufacturing plant is just that. From the very high ceilings hang electric winches to hoist and move around full-size antennas. If you ever put together a Comtech antenna, you know that most come in three pieces. Tom pointed out that it is very difficult to ship the antennas in one piece, and that they are broken down strictly for shipping purposes. But in the manufacturing process they are molded and built in one piece.

SPRAY ACTION

Full-size molds of various sizes are scattered around the manufacturing area. Comtech manufactures 1.8-, 2.4-, 3.0-, 3.8-, 5.0-, and 7.3-meter round reflector fiberglass antennas that can be used for both receive-only or certified for transmit applications on both C and Ku band.

To start with, the full size inverted (feed side down) molds are first sprayed with white GEL COAT. The GEL COAT is the first layer and faces the satellite on the finished

antenna. Next, the conductive material is layered directly on the GEL COAT. A product called Romhoglas is used as the reflector material. It looks like steel wool in



A properly shaped antenna allows the most gain.

very large sheets but is actually aluminum-coated fiberglass. The Romhoglas is carefully laid out and the mold is wheeled over

to the fiberglass spray booth.

Originating in large boxes, the fiberglass at this point is a continuous strand fed to the fiberglass application gun. The gun chops the continuous strands into small pieces, adds the resin and is blown over the Romhoglas; the silvery mold now takes on the familiar shape and look of a satellite antenna. Layer upon layer is applied until the desired thickness is reached. The mold and all its fiberglass are allowed to cure before moving to the next step.

Shipping even a small, 3.8-meter antenna could pose a challenge in getting it to the destination in one piece. So to make our job a little easier, Comtech slices each reflector into three bite-size pieces. A unique design provides for the pieces to go back together once they arrive at the destination earth station. Two seams that mate together with anodized aluminum strips and lots of hardware account for the very solid look and integrity of the re-assembled reflector. Comtech assured me that the reassembled reflector takes on the same overall strength as an uncut version. ■

Phil Dubs is director of operations and engineering for Gems Television. GEMS TV, a programming service of International Television Inc., of Miami, provides two network feeds, serving 18 Latin American countries, Mexico, the Caribbean, and the United States. He can be reached via the Internet at PhilSat@AOL.com

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New Services Should Mix The Old and the New

for the return loop, has alone cost more than US\$59 million for a trial audience of a mere 4,000. This is the largest project in the nation. Other projects actually cost more with less result.

Technical problems have been plaguing the other trials, slowing mass entry to the marketplace. Even in the U.S., things are not moving as rapidly forward as first expected. In Orlando, Florida, interactive test-spot for Time-Warner, a mere 6C households are connected.

BACK AND FORTH

Interactivity does not have to be digital, even if that is what it will be eventually. To be interactive one only needs a comfortable way to respond to what is being delivered, and this is happening now using the more common, time-tested telephone.

A few broadcasters are even experimenting with what they are calling interactive Videotext. In some cases the significant event is a game. The player grabs the phone and places it strategically so the call can be made while viewing the proper Videotext page. The caller competes for prizes by answering questions with the telephone keypad.

Another station has a variation on the theme. An insurance company offers prospective clients their own very personal price quote using the combination of telephone and Videotext. The system actually works. Is it a gimmick? Perhaps, but the broadcasters are cleverly, maybe unknowingly, training the

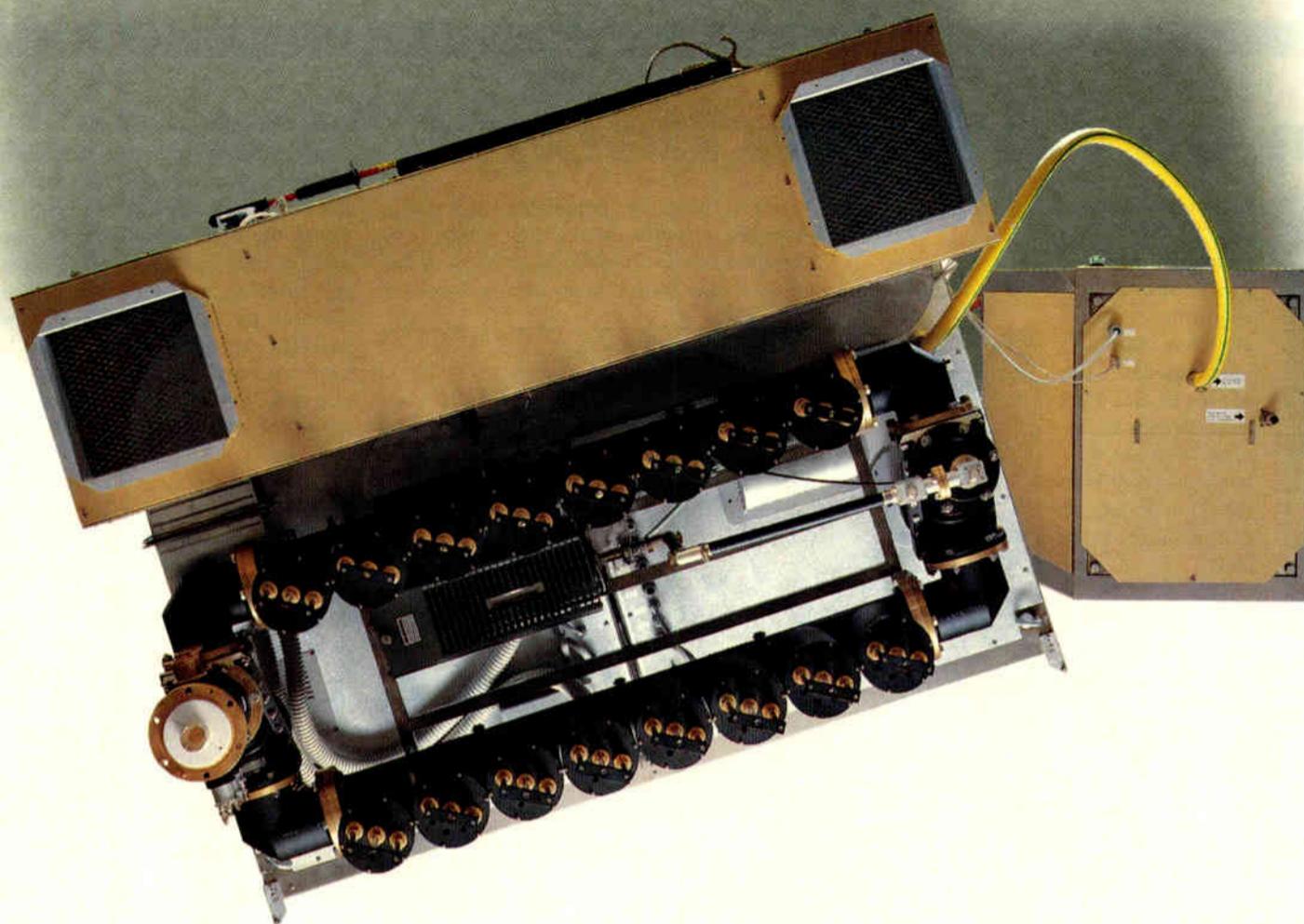
audience to deal with a new technology that is on its way. They do this in incremental steps.

We may consider these examples to be only half-interactive, but even a conversation is interactive. At the end of the day, technology alone is never enough. There has to be both a reason to use it and an understanding of how to operate it. What needs to be done today is not only the invention of a better mousetrap. We need to be sure there are mice to catch.

Let's go back to this fear that people have about the technology driving the TV industry. We can pretend it does not exist, but chances are slight that denial will make it disappear.

People need a hook upon which they can hang that which they do not understand. Technological innovations have been described in "hanger" terms for decades. A radio was first called a wireless; the automobile was a horseless carriage. Each is described in terms of something familiar and tangible, and as a result each is made more understandable. The same need exists today. People want the feeling that they are hanging on and not getting hanged. ■

Brian Kelley is director of Germany's New Life Network, an international distributor of family and educational television programming produced around the world. He can be reached via e-mail at nltnet@webcom.com or at http://www.webcom.com/~nltnet on the World Wide Web.



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The Highs and Lows of SCSI

by Karl Paulsen

MEDIA SERVER TECHNOLOGY

Working in the desktop video, publishing or multimedia arena requires continual peripheral reconfiguration, typically with any number of various SCSI-based devices. Those familiar with the Macintosh and Silicon Graphics (UNIX) operating systems have been dealing with external SCSI interfaces since their inception.

However, the desktop IBM-class PC has until recently only touched upon SCSI-based peripherals and systems. For the PC, SCSI was generally associated with the internal aspects of connecting a CD-ROM from a sound card to the physical drive itself. But as non-linear editing systems, media servers, storage arrays, DDRs and the like become more common, a new, more thorough, understanding of the many facets of SCSI is warranted, regardless of the computer platform.

BODY AND SOUL

SCSI (or "scuzzy"), an acronym that stands for Small Computer Systems Interface, is actually both a logical and physical scheme. At the high level, it is a logical protocol used to communicate between computers and peripherals. At the low level it defines the wiring scheme to connect these physical peripherals.

SCSI is about 10 years old. It gained prominence in early Apple Macintoshes, albeit in a non-standard form, as a means to connect (either internally or externally) the computer processor bus to storage and peripheral devices. SCSI technology now extends into video-on-demand, mass storage and media servers, as well as a variety of disk-based storage systems for computers, non-linear editors and other mass media or video operations.

The SCSI high-level communications protocol includes support for various peripherals, including scanners, CD-ROM and tape- and disk-drives, as well as media changers such as optical and tape libraries. The low-level physical transport layer of SCSI communications consists of narrow 8-bit or wide 16-bit parallel data transfer. There are also 32-bit systems, but those are more common in higher-level computer interconnects.

SCSI's primary function is to isolate the physical properties of hardware from the logical properties of data. SCSI communications and interconnect protocols have evolved through SCSI-1 (approved in 1986) to SCSI-2 (approved in July 1992), which is what most current implementations conform to. In November 1994, the third generation of SCSI protocol was being defined. Dubbed "SCSI-3," this protocol would extend SCSI applications into several important directions, such as serial communications and real-time multimedia support. SCSI-3 specifications include downward

compatibility with SCSI-1 and SCSI-2.

Great flexibility is permitted in the internal SCSI interface implementation, with most of these interfaces embracing some form of intelligence heavily based upon the actual attached device. However, the external parallel SCSI interface limits its efficiency. This is due in part to a relatively short bus length unless differential or SCSI serial converters and extenders are in place.

Bandwidth, data transfer performance and the number of large blocks of data being transported are all considerations for improving SCSI performance. While desktop, multimedia and video applications continue to grow, the need for implementation of enhanced bus performance becomes

crucial. As SCSI transfer rate performance increases, more applications will be brought to market, and the success of media servers for multimedia, non-linear editing and video applications will soar.

Industry tests are already showing substantial improvements in the newer and faster SCSI system protocols, especially as the block (or file size) transfer rate increases. Of course, performance still depends upon the application being run.

The SCSI standard has grown from narrow SCSI, with a data width of 5 MBps, to fast SCSI at 10 MBps, to fast-wide SCSI-2 where "wide" is a 16-bit implementation and total data bandwidth is 20 MBps. The Serial Bus Protocol (SBP) in SCSI-3 allows

for up to 1 GBps transfer rates on a serial-based fiber interface. This protocol, also called SSI (for SCSI Serial Interface), is now being promoted by such manufacturers as Texas Instruments (Apple calls this FireWire); IBM, with its SSA system developed from the company's mainframe technology; and Fibre Channel, which has developed a widely accepted primarily PC-based system.

Familiarity with nomenclature is important in system design and specification. Some of the technoid definitions that make up the more familiar SCSI protocol and are included in the SCSI-3 protocol are: "fast" SCSI, such as 8-bit synchronous data transfer at 10 MBps; "fast-wide" with 16-bit data transfer at 20 MBps on one "P" cable; and "fast-wide" 32-bit data transfer of 40

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CONTINUED FROM PAGE 25

A Quick Tour of SCSI Systems

MBps on two data cables.

Consideration must also be given to cabling, with some implementations requiring specialized connections like high-density SCSI-2, Centronics-50 or the higher density 68-pin SCSI-3 (P) cables. For serial transport, provisions for low loss cabling and connections, hot pluggable devices (employing varying pin lengths in connectors) and even higher data rates have now become part of this distributed and dynamic environment.

In the new SCSI-3 standards document,

also known as ANSI X3T10/1071D, there is another improvement in synchronous data transfer rates. A new form of SCSI, UltraSCSI (also referred to as Fast-20 and DoubleSpeed SCSI) effectively doubles the transfer rate to 20 Megatransfers per second (Mxfr/sec). At the same time, compatibility with current synchronous and asynchronous protocols is maintained.

Note that "megatransfers per second," referring to millions of transfers per second, is irrespective of bus width or word length. Instead, this is newer terminology applicable

to disk drive and data bus performance or representation. Further, "UltraSCSI" will remain synonymous with Fast-20 and DoubleSpeed SCSI throughout this article.

For the next generation hard disk array, UltraSCSI is being utilized for transfers at for up to 40 MBps, which appears to be more than adequate for full-bandwidth video transfers in real-time. The protocol is completely backward-compatible, with the UltraSCSI device automatically determining the interface and adjusting for speed and data rate.

However, operating at 40 MBps requires

peripheral devices that can run at that speed. Currently, most manufacturers believe that this is only achievable using RAID technology because most small form factor drives still operate below 10 MBps for a single disk configuration. RAID, with its parallel combination of drives, makes these higher 40 MBps rates achievable.

SCSI has been interpreted, and consequently confused, to include broad generalizations in the protocol. Some still equate fast SCSI with fast-wide SCSI and Fast-20 SCSI. One should understand that all three of these schemes are different from one another in terms of speed, bandwidth and performance. Compared to a fast SCSI bus, for example, the Fast-20 scheme equates to a doubling of the data rate.

FASTER AND WIDER

If a narrow 8-bit SCSI bus is operating in fast mode, data burst rates can reach 10 MBps. Boosting this to Fast-20 means data can burst at up to 20 Megatransfers per second (where 20 refers to the number of million transfers per second, i.e. 20 Mxfrs per I/O operation). Recalling that 16-bit SCSI means wide, then fast-wide can burst at 20 MBps and a Fast-20 bus can therefore reach up to 40 MBps. It is also possible to adopt a Fast-40 system, with potential peak burst rates of 80 MBps.

To get Fast-20 systems to operate effectively and reliably, many crucial signal parameters have been tightened or modified, nearly all in hardware components. Power supply tolerance, something unspecified in SCSI-2, is set at +/- 5 percent in Fast-20. Single-ended characteristics are tightened, termination is strictly specified (i.e., the 220/330 ohm network is prohibited in Fast-20), and the characteristic impedance is set at 90 ohms (+/- 6 ohms on the REQ and ACK signals and +/- 10 ohms on all signals) instead of 84 ohms (+/- 12 ohms) for all signals in the looser SCSI-2 standard. Ground offsets for Fast-20 should also be less than 50 mV.

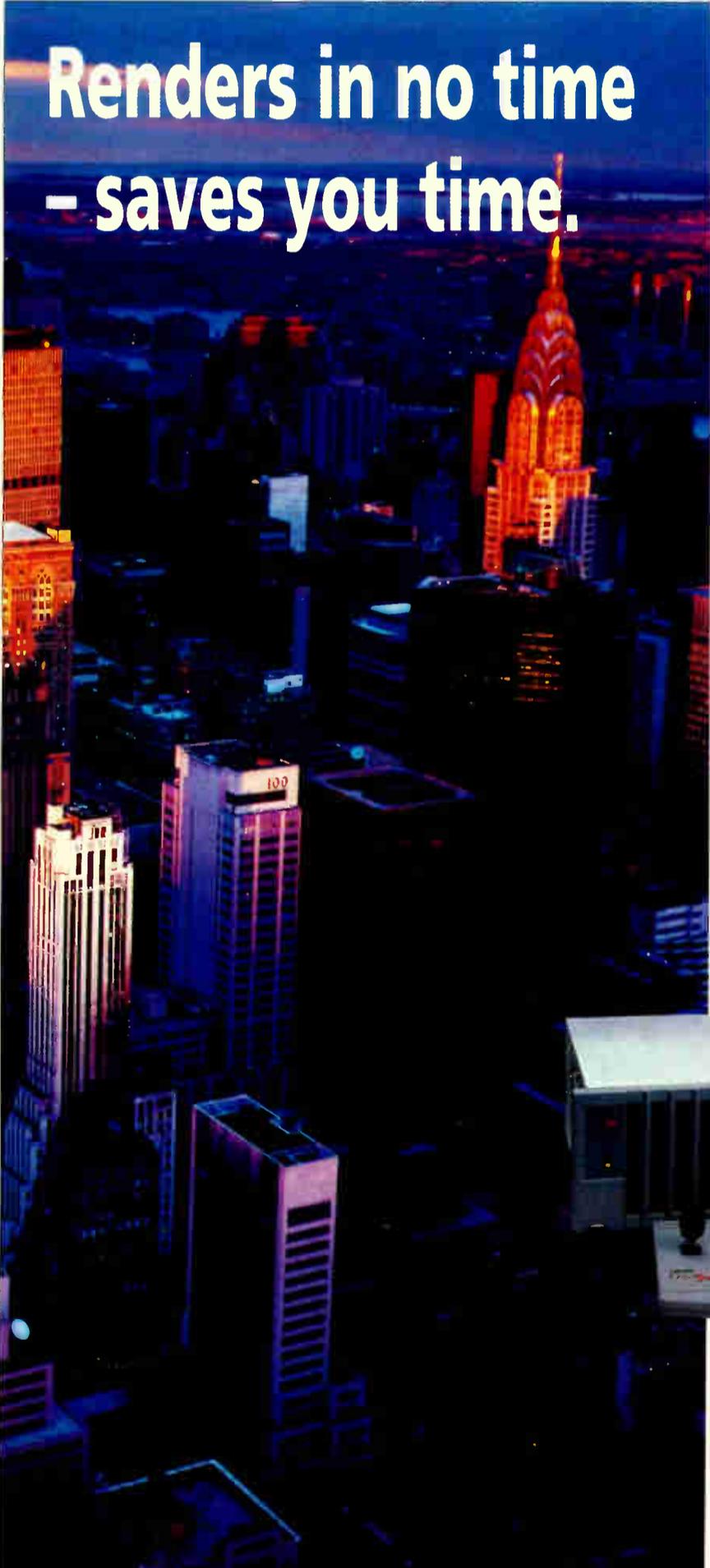
Other SCSI bus timing parameters have been severely tightened, as one might expect in doubling the data transfer rate of any system. Internally connected drive arrays usually follow the recommendations on cable stub length and spacing. However, most external system problems that occur in moving to Fast-20, such as timing slew errors and improper hold times, result from poorly made cables, the use of passive instead of active termination, data transfer errors or other electrical problems. Still, implementing Fast-20 essentially requires only a hardware change consideration.

Single-ended SCSI devices have a different set of rules than differential systems. In a single-ended application, four devices (i.e., host-plus-three) are permitted as long as the overall cable length is three meters. When using eight single-ended devices, this cable length reduces to one-and-a-half meters. Even spacing of devices is required, and a stub length of 0.1 meter is the limit.

Differential SCSI, typically used for remote storage and improved system reliability, allows for eight devices over 25 meters, while the stub length increases to 0.2 meter. When moving from differential fast or fast-wide SCSI to differential Fast-20, with the one exception of synchronous data rate transfer adjustments, practically nothing is changed in the differential mode. This makes the migration from higher end, differential fast-SCSI to Fast-20 almost transparent.

Drive array and component manufacturers, even though aware of the requirements for various SCSI configurations, may use short

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IBC? ITS? How About Disk or Tape?

by John Watkinson

VIDEO WATCH

Until last year, the major television show in Europe alternated annually between the International Broadcasting Convention (IBC) and the International Television Symposium (ITS) held at Montreux. IBC was held for many years in Brighton, England, but grew out of the place and went to Amsterdam.

For whatever reason, IBC decided to go annual and this year there will be an IBC in Amsterdam in September, hot on the heels of ITS in Montreux. In a sense then, this year's Montreux ITS was a make or break event because a poor attendance by exhibitors or attendees would cast a shadow over the future. While this piece was written before the figures were available, my impression was that the show was a success. The hall was full of stands with no obvious empty areas, and there were plenty of people looking at them. As ever, the air conditioning was marginal and some areas were quite sweaty; a good indicator of attendance.

PROS AND CONS

Comparing Amsterdam with Montreux from the viewpoint of a conference-goer is quite difficult. The Amsterdam RAI conference center is physically better, more spacious, better cooled. Amsterdam airport is a short cab ride away, so it is genuinely possible to visit IBC for a day from virtually anywhere in Europe. In contrast, the Montreux conference center is cramped with low ceilings keeping the heat in. Montreux is a couple of hours from an international airport, making a one-day visit out of the question.

On the other hand, RAI is in an unlovely part of Amsterdam and everyone gets as far away as possible when the show finishes for the day. In this aspect, Montreux wins hands down because it is difficult to imagine a nicer part of the world. The show is right in the center of town and everyone stays around after closing time. In my experience, you can meet the whole television world by standing on the main street of Montreux, which you cannot do in Amsterdam.

The show itself is a shop window, but the really important events take place behind the scenes. When everybody who is anybody is in town, it can be very useful to be able to find the person who knows what you need to know. In that respect, Montreux also wins.

If an analogy is needed, Amsterdam is a hard disk: fast access but a low information density. Montreux is a tape; the access time is longer but there is more information there. The imminent death of tape has been much exaggerated and of late it has become obvious that it is not going to go away. Practical systems need both disk and tape.

This was clear at Montreux. After all the hype about hard disk servers taking over the world, it was good to see that the economic realities of disk technology are starting to reflect in systems people are actually building.

The strengths of hard disks are that they allow rapid access to data and multiple access to the same data. In applications where such access is critical, disks are essential. Therefore, in compiling commercial breaks or in editing, disks are an obvious solution. In Near Video-on-Demand (NVOD), the same movie is transmitted on several channels, but with staggered starting times. Here, the multiple access ability of the disk drive is put to good use. Note, however, that playing a movie is linear.

PLAY BACK TIME

There are plenty of applications in which rapid random access is not essential. These include playout to air of television programs and movies and archiving. With the exception of the content of commercial breaks and news programs, most broadcast material has a content which is decided some time in advance. Playout to air is, by definition, linear. These are obvious applications of tape.

In a practical playout system, both disk and tape storage can be combined. Pre-recorded programs and movies come from tapes stored in a robotic silo. Commercial breaks, jingles and news come from hard disk. Using the hard disk for random access just for these short-duration services is excellent economy because the amount of storage required is quite low. Assembling commercial breaks from disk also dramatically reduces the workload of the tape system, which will see around a tenth of the robot activity. The tape system may well be able to operate with fewer tape drives, making it cheaper.

In a simple system, the playout schedule decides what medium incoming material will be stored on as a function of its length. Short clips go on disk, programs go on tape. Provided the scheduler remembers where to put what, there are no problems. Such a system will work with any tape format, including analog. Playout systems have to work reliably and in real time. You cannot broadcast an egg-timer while you access the picture.

In editing systems, rapid access is important, but as editing is not an on-air process, an occasional delay is acceptable as long as most accesses are fast. In non-real-time systems, it is the average access time which is most important, not the absolute access time. For example, if an hour-long edit session makes 100 accesses and each one is served instantly, that is great. However, if one of those accesses takes a minute instead of a second, your hour's edit session has been lengthened by a minute; an insignificant amount.

The most cost-effective editing system can be built by combining disk and tape using the cache principle. The disk subsystem has much less storage capacity than the tape. Input data to be stored is buffered in RAM. The RAM is accessible by disk, and tape subsystems and input data are written to both. In the case of the tape, new data is written in a new location, but in the case of the disk, it will be necessary to overwrite earlier data because the disk capacity is relatively small. The overwritten data will be that which has been accessed least recently. This decision is taken by a control system

that keeps track of data on both disk and tape. This method, in which all input data is recorded directly to tape, is called write-through.

UNDER CONTROL

When accessing data, the control system will check to see if the data is on disk before initiating a tape access. Statistically, most access is to recently recorded material, so the disk will be found to have the required data more often than not. In this case, the data is supplied by the disk with consequent rapid access.

In the event that the data is not on disk, they will have to come from tape and the access time will be longer. However, in addition to sending the required file to the user, the system will also copy it onto disk. As a result, the next request for that data will result in a disk speed access.

It became clear at Montreux that disk caching with robotic tape silos is the way to go to get the best price-performance mix. However, it also became clear that the tape silo will not necessarily use a VTR format.

Today's digital VTRs do not fully deliver the advantages of digital video because they are effectively digital copies of analog VTRs. While that approach was fine for D-2 or D-3, in which the goal was to replace analog recording in an analog environment, it is not at all smart for the long term.

The advantage of tape is high storage density, which keeps the cost per bit down. In today's digital VTRs, the storage density is much lower than necessary because of the requirement to edit to field accuracy. Tracks have to be wider to allow for mechanical tolerances, and more redundancy is needed because the coding cannot spread over more than one field. Azimuth recording is an efficient way of recording and playing very narrow tracks, but it is incompatible with the requirements of

insert editing.

A digital VTR that does not edit was until recently a pretty useless item. But with the advent of disks, that is no longer the case. If a system combines disk and tape, editing can be performed on disk and the tape no longer needs to be able to edit to field accuracy.

The result is that the tape system only holds files containing many fields, and editing as such only takes place at edit gaps between them. The full power of azimuth recording can then be used to have very narrow tracks. The error rate will go up, but error correcting codes along the tape are now possible, allowing greater correction with less redundancy.

So what kind of tape format is this and how long will it take to develop? Just an everyday computer industry robotic tape silo on sale now from your friendly mass storage company.

So tape is not dead — far from it. Tape will be around for the foreseeable future, but not in the traditional form. Except for field acquisition where disks are unwieldy, the conventional digital VTR is doomed. It is not fast enough to compete with disks and not dense or cheap enough to compete with tape silos. ■

*John Watkinson is an independent consultant in digital technology and is the author of seven books on the subject, including *The Art of Data Recording* and *The Art of Digital Video*; acclaimed as definitive works. He is a Fellow of the Audio Engineering Society and is listed in *Who's Who in the World*. Based in England, 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 working on a video fundamentals book. John can be reached at +44-734-834-285.*

CONTINUED FROM PAGE 26

Getting to the Heart of SCSI Technology

cuts in construction. Thus, the end user, when not taking into consideration the additional external interfaces, may find unexplained system problems. For example, in considering Fast-20 bus construction, nearly all single-ended Fast-20 designs are typically within the host drive array chassis. Differential mode Fast-20 should be used for external bus and peripheral interconnections. Furthermore, mixing wide and narrow Fast-20 systems is also not recommended.

This advice and information is given primarily as a background for configurations, system trouble-shooting and design consideration. Many operators and technicians are now facing non-linear editing system maintenance, re-configurations and repairs that inevitably might require equipment substitution or swapping for any number of reasons. The mixing of Centronics-to-DB25 and high density with differential connector schemes is not uncommon in environments where drive swapping and CPU changing is a regular affair. Care and

understanding of what is available now and coming down the pipe in the future are crucial to system planning and re-configuration in today's desktop, server and non-linear/multimedia facilities.

Next, we will take an even more in-depth look into the electrical configurations, specifications and applications of the various levels of SCSI peripheral and drive array interfaces.

Special thanks to those at Ciprico Inc., a prominent disk array manufacturer, for their assistance in researching this article. A future review of the Ciprico line of next generation UltraSCSI drive arrays will also be forthcoming. ■

Karl Paulsen is vice president of Digital Post & Graphics, Seattle, and a consultant specializing in television production and digital media systems design. He is an SBE Certified Senior Broadcast Engineer and presently chairman of the Pacific NW Section of the SMPTE. Contact him via e-mail on the INTERNET: karlp@dpg.com or via COMPUSERVE: 72303,2112



MARKETPLACE

HIGHLIGHTING THE LATEST PRODUCTS AVAILABLE TO PROFESSIONALS IN THE VIDEO INDUSTRY.

PLUG-IN AUDIO MODULES

Telecast Fiber Systems Inc. has launched two miniature plug-in modules to enhance its Viper system, expanding it to eight audio channels, plus two channels each of auxiliary intercom, data and switch closures on one optical fiber.

The TX/RX280 transmitter and receiver modules digitize analog audio signals and multiplex them with auxiliary intercom and data signals from the AUX submodule.

The TX/RX380 modules digitize and add two audio channels at a time, acting as slave expansion units to the TX/RX280 modules. The AUX submodules digitally expand the system with intercom and data signals.

For further information contact the company in the U.S. at telephone: +1-508-754-4858; FAX: +1-508-752-1520, or circle **Reader Service 91**.

AUDIO EXTRACTOR & EMBEDDER

The MW21 digital audio extractor and MW25 digital audio embedder have been introduced by MetaWave. The MW25 embeds 20-bit AES/EBU digital audio signals within the SDI video path to eliminate the need for audio-only components. The MW21 reverses the process by separating the embedded audio signals from the SDI path.

A key feature of both the MW21 and MW25 is the error data handling (EDH) option enabling accurate system diagnostics and maintenance. Additionally, an external AES11 audio



reference option allows the user to synchronize the audio output of the MW21 with either incoming video datastream or a separate AES11 audio reference.

For further information contact the company in the U.K. at telephone +44-01635-299-000; FAX: +44-01635-299-299, or circle **Reader Service 14**.

POWER SUPPLY ASSEMBLY

The OP-177/U power supply assembly from Frezzolini Electronics provides energy to re-charge 12 and 24 volt lead acid and nickel-cadmium batteries. In the field, sunlight is converted to electric energy with solar panels, and mechanical cranking is converted to

electrical energy with a DC generator.

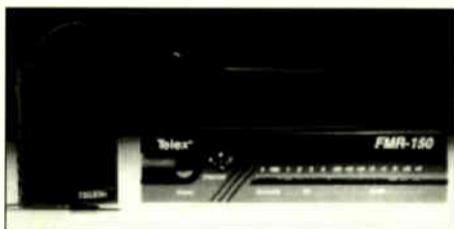
Where AC power is available, a power converter provides selectable voltages and currents, combined with selectable timer settings.

The OP-177/U features a compartmentalized storage design, and weighs 25 pounds for easy transportation and deployment.

For further information contact the company in the U.S. at telephone +1-201-427-1160; FAX: +1-201-427-0934, or circle **Reader Service 89**.

MICROPHONE SYSTEM

Telex Communications has unveiled the FMR-150 crystal-controlled wireless microphone system. The system features



three crystal controlled RF oscillators with frequencies that can be selected from anywhere in the operating range of the receiver, allowing for a signal-to-noise ratio of greater than 104 dB.

Additionally, the FMR-150 includes Telex's Posi-Phase Auto-Diversity circuitry to minimize dropouts and noise ups, and Posi-Squelch III auto suppression for tone code plus circuitry.

For further information contact the company in the U.S. at telephone +1-612-884-4051; FAX: +1-612-884-0043, or circle **Reader Service 1**.

RF AMPLIFIERS

ABE Elettronica has developed a new line of solid-state amplifiers for VHF and UHF bands using MOS and bipolar transistors biased in class AB. The RF amplifiers feature static or static/dynamic linearity correction techniques integrated into the transmitter or translator equipment.

For further information contact the company in Italy at telephone +39-363-351-007; FAX: +39-363-50756, or circle **Reader Service 30**.

COMPOSITOR

Zydeco, a new compositor from KUB Systems, features animation, frame store and machine control capability, and seamless

integration with Macintosh applications.

Analog component inputs and outputs are



standard to Zydeco with serial digital I/Os available as options. S-VHS and composite outputs are also standard.

The Zydeco also includes a graphical user interface, as well as an effects view and track editor for simultaneous visualization.

For further information contact the company in the U.S. at telephone +1-415-572-6140; FAX: +1-415-572-6155, or circle **Reader Service 100**.

AUDIO CODEC

FieldFone from CCS is the first POTS (Plain Old Telephone Service) codec in the world, and works world-wide without ISDN. FieldFone is bi-directional, eliminating the need for encoders, decoders, or return cue lines. The codec also features Musicam HQ digital audio from CCS.

For further information contact the company in the U.S. at telephone +1-908-739-5600; FAX: +1-908-739-1818, or circle **Reader Service 3**.

S-VHS CAMCORDER

JVC Professional Products has introduced the GY-X2B (X2-B), a full-size 3-CCD integrated S-VHS camcorder, featuring new CCDs, Lo-Lux low-light performance and a contoured shoulder pad.

The X2-B has a sensitivity of $f/80$ at 2,000 lux and a 62 dB signal-to-noise ratio with 750 lines of horizontal resolution. The digitally-controlled camcorder also features Continuous Auto Black (CAB), a quick-response mechanism with Full-Time Auto White, and Automatic Level Control for continuous shooting in varied lighting conditions.

For further information contact the company in Japan at telephone +81-426-60-7560; FAX: +81-426-60-7569, or circle **Reader Service 120**.

VIDEO CASSETTES

Digital betacam video cassettes from Maxell Europe employ advanced ceramic armor metal particles, a special backcoating and an engineered cassette shell. The cassettes have both studio and ENG/EFP applications and meet archival capabilities of longevity and stability.

Maxell's SW (smooth winding) reel is featured, as is a surface base film for reduced error rate. The video cassettes are available



in recording times of 6, 12, 22, 32 and 40 minutes in the small cassette, and 34, 64, 94, and 124 minutes in the large cassettes.

For further information contact the company in the U.K. at telephone +44-01923-777-171; FAX: +44-10923-777-710, or circle **Reader Service 27**.

CONVERSION SOFTWARE

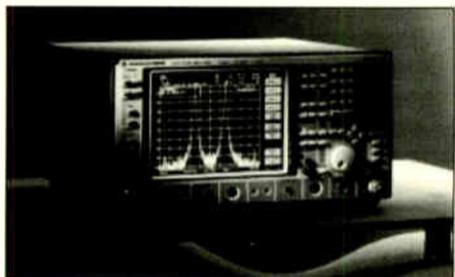
Imagine Products Inc. has released version 2.0 of the Executive Producer (MS-DOS) and new Macintosh and Windows versions of the logging and conversion software for use with non-linear editors. The upgraded software for DOS features direct import/export of ASCII Tab-delimited files and non-linear log formats. Support of Media 100 PowerLog and VideoCube formats are included on the list generation menu options.

For further information contact the company in the U.S. at telephone +1-317-843-0706; FAX: +1-317-843-0807, or circle **Reader Service 105**.

SPECTRUM ANALYZERS

Rohde & Schwarz has launched a FSEA series of spectrum analyzers. The frequency coverage for the FSEA 20 is 9 kHz to 3.5 GHz, and 20 Hz to 3.5 GHz for the FSEA 30.

The FSEA feature a minimum full-span sweep time of 5 ms with synchronized sweep; a zero span sweep time; and can deliver up to 25 screen updates per second.



The analyzers have eight active markers, an adjacent channel and occupied bandwidth measurement capability, as well as a frequency counter with selectable resolution and limit lines.

For further information contact the company in Germany at telephone +49-89-4129-3553; FAX: +49-89-4129-3555, or circle **Reader Service 10**.

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

USER REPORT

Stealing Scenes with Dubner

by Hardy Tasso
Free-lance Producer

HAMBURG, Germany

Video film production has certainly become more computerized lately. In production, we are working traditionally with film or videotape. In post production nowadays, we are using numerous types of computer-based technology.

To edit the final program, the footage must be processed, if it is film, and then viewed to find the relevant elements in the queue of all the shootings. Next, each take must be listed in an edit decision list (EDL) and then assembled together.

THE OLD DAYS

In the past, viewing the footage required the film or Betacam tape to be duplicated on a VHS cassette with burned in time code. This was a time- and cost-intensive process. The VHS tapes were viewed scene by scene so I could write down the in- and out-points. Therefore, I used a high-tech consumer VCR that cost me about DM2,500. With my hand-written edit list, I would go to the production studio where the editors had to punch in all my numbers.

Once they moved up to a non-linear computer system, the editors still had to manually digitize the footage in a time-consuming way. So I had to spend a lot of time and money even before the first edits were made.

Producers like me make documentaries or feature films at our own risk and then sell the final product to a broadcaster or an institutional organization. This makes it necessary to maintain highly efficient production and post production processes and use the proper tools that help preserve our often small profits.

Today, I use a truly fine product that helps me prepare for post production. A friend of mine, video technique specialist Erwin W. Lissy from PTV in Henstedt-Ulzburg introduced me to the Scene Stealer from Dubner International Inc. It is a tape-logging system for standard Windows PCs that automatically grabs video and audio material on the disk. Every scene change is detected

can spare the transcoding of sequences you wanted to view but which did not make it into the film.

With a sound card installed, the system digitizes audio as well as video. The time code can be fed in different ways. If you use a VTR that supports the Sony remote protocol, Scene Stealer will read the time data via the serial PC port. If your VCR can provide you only with simple LTC, it is necessary to use an internal or external LTC reader. But you also can normalize internal generated time code to the original data.

During the logging process, I use a portable Betacam player and a multistand-

to scrub in the audio waveform and define with a mouse click the real in-point. Then play further to the end and click again for the out-point. After cutting the footage in different clips, the save function will automatically write down all possible EDL formats that an editor might require.

PICK A FORMAT

Scene Stealer offers EDLs for CMX, Sony, AVID, Lightworks, VideoCube, D/Vision and Fast VideoMachine non-linear systems. However, it also offers plain text files that can be exported to a word



Hardy Tasso at work on the Dubner Scene Stealer.

ard VHS deck to play the tapes. I control the picture quality and the scene contents on a normal video monitor. Through the use of a pause function that puts the system on hold while I disable the proper commands, the system allows me to grab only the scenes I intend to use.

DATA-SAVER

An important advantage of Scene Stealer is that it requires little memory. The pictures on the PC are black and white in a 200 x 100 pixel window. With 8-bit digitizing, every single picture occupies only 16

processor. In addition to text, the grabbed pictures can be imported or exported to a database for archiving, for example, or other devices.

To modify the EDL in the order you want for the film, Scene Stealer has another fantastic function called "storyboard." This allows operators to pick up a scene with a mouse click from any reel you open on the screen and drop it down in a new story reel of your choice. Scene Stealer plays this self-created EDL as a rough cut (no fades or wipes are possible) on the PC monitor with the accompanying audio. This makes it possible to have a look at the film layout before you do any editing.

Now that I have been using Scene Stealer for six months on a wide variety of projects, I think the program is a wonderful tool to prepare my footage for post production. It gives me the flexibility to work in my office, the security to have the right sequences ready for editing and the ability to reduce production costs for any project I use it for. And the editors in the studios love my pictured storyboards with the necessary timecode information and even the text commentary.

In my long year career as a producer, I have never invested so little money in a production tool that has brought such excellent results so fast. ■

Editor's note: Hardy Tasso is a free-lance television journalist and film producer with more than 18 years of experience.

The opinions expressed above are the author's alone. For further information on Scene Stealer, contact Dubner International Inc. in the U.S. (telephone: +1-201-447-9365; FAX: +1-201-447-9342), or circle Reader Service 60.

**It is a truly easy software system
to learn and it allows me to enter post production with
an individually generated EDL.**

and stamped in the automatically generated tape logging list.

It is a truly easy software system to learn and it allows me to enter post production with an individually generated EDL. Batch digitizing on non-linear systems is available at the touch of a button, and even on-line editing has no problems with questions like "Where is the correct in point?" or "Which tape do you mean?"

I know very little about computers, but the installation of the video grabber board and the Scene Stealer software was not very difficult. After a few minutes, my PC was ready to run the tape logger. The video board accepts any video standard, which is very helpful if you use different format material, like I did in my last production entitled "Hiroshima: 50 Years Later." You

kB on disk. The system's setup menu offers a selection of the number of frames per second that the system should grab. This allows me to store many 30-minute Betacam cassettes on a standard 540 MB disk.

After logging and digitizing, the operator then calls the play program and opens a film-like sequence of footage on the monitor. In this Windows program, it is possible to open as many reels of film as necessary. Pictures that correspond to a scene-change are marked with a red border, and a text window is used for written comments about the scene. However, it must be remembered that the first frame of a scene must not be cut as the in-point.

Scene Stealer offers many ways to alter previous cuts. An easy way to do this is



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USER REPORT

WAAY-TV Finds JVC Precision

by Jeff Raker

Chief Engineer/Cameraman
WAAY-TV**HUNTSVILLE, Alabama**

WAAY-TV, an ABC affiliate in Huntsville, is a growing station servicing the Huntsville market, which falls within the U.S. top 80 markets. However, we put so much equipment into the field that we are really comparable to a station in a Top 50 market. How do we do it? Several years ago we began a transition to S-VHS as part of an overall re-engineering plan.

Viewers across the country want to see more local news coverage and less network programming. To survive in this marketplace, it is necessary to satisfy the viewers. To do so, we needed to upgrade our antiquated 3/4-inch U-matic system to a higher level for our newsgathering purposes. We looked at Hi8, Beta and S-VHS. During the Gulf War, several people in the field touted Hi8, but soon found that while it was okay for acquisition, it fell short from an editing standpoint as an everyday ENG format.

COST AND BENEFITS

After a careful review, we chose JVC's S-VHS as the format that best met all of our criteria in terms of quality, flexibility, reliability and ease of maintenance, mobility and service. Cost was also an important factor for a station our size.

Today at WAAY-TV, all news is shot, edited and aired from S-VHS. The Huntsville station also operates out of two news bureaus. We have a staff of 53 with 35 cameras on the streets — all S-VHS. Imagine how expensive that would have been with Betacam.

With so many cameras in the field, we need additional editing facilities to produce the finished product. JVC's 22 Series is a high quality, affordable product line that helps us not only do more, but provides us with better editing.

At WAAY-TV, we now have eight edit bays that feature the JVC BR-S822U editing recorder and BR-S622U player/recorder, as well as the BR-S525U feeder/player with variable tracking. Our sports department relies heavily on the BR-S525U for its slow motion capabilities, which is ideal for field sports production.

The greatest advantage of the "22 Series" is its flexibility. Because of its easy interface with our previous system, the station is capable of archiving 15 years of valuable footage stored on the old 3/4-inch tape in our news library.

The open architecture of the 22 Series allowed us to custom design a system to meet our own specifications. We were able to easily interface the recorder with other editing equipment through its optional Y-688 dub, a built-in 9-pin RS-422A serial remote interface, and inputs/outputs for composite and Y/C 358 signals. To simplify set up and customization, the BR-S822U incorporates a new menu display with built-in memory that allows simple dial setting and switching of more than 70 different functions ranging from hi-fi recording to TC and TBC modes.

The total flexibility of this equipment is beneficial to us whether we are doing "cuts only" or A/B roll editing. This flexibility



The JVC BR-S822U editing recorder

makes it easy for us to produce what we want, the way we want it. For desktop editing, we have two Matrox A/B suites that

interface with the 822 and 622 for on-line news production. This set-up enables us to produce dynamic, eye-catching promos

along with a variety of special news series.

Most broadcasters are extremely concerned with service and parts. It is important that the manufacturer responds quickly to our particular needs — especially after the sale. For example, we were having an RF problem, created by our transmitter's location on a mountaintop. JVC sent an engineer to help us eliminate this problem. JVC service representatives have been more than responsive to our particular needs.

Overall, WAAY-TV is proud of its successful transition to a new format — S-VHS. The result is that we can get more crews on the street to capture quality video to satisfy our viewers, while staying within a reasonable budget. ■

Editor's note: Jeff Raker has overseen engineering matters at WAAY for several years.

The opinions expressed above are the author's alone. For further information on the 22 Series, contact JVC in Japan (telephone: +81-426-60-7560; FAX: +81-426-60-7569), or circle Reader Service 21.

USER REPORT

ImMIX Makes Animation Magic

by Randy Jackson

Graphic Artist
Abracadabra Animations**COS COB, Connecticut**

The ImMIX VideoCube has completely changed the way we make video and produce 3D animations at Abracadabra, as it has opened another profit center for us as a post facility.

A client of ours once said it best: "What I like about editing with the VideoCube is that it is on-line."

Initially pitching 3D animations, our company's founders realized animation work is an integral part of production. Soon they were producing complete videos with 3/4-inch SP equipment. I was hired both to create computer graphics and run the computer department; therefore, I participated in one of our first previews of the VideoCube.

INCREDIBLE IMAGES

In preparation, we brought 10 PICT images on floppy disks from a morph we had created. After our dealer made them recognizable as PICT files to the Macintosh, the demo VideoCube imported them.

We then saw something incredible — a full video resolution, real-time morph play of 10 individual video clips — each a single frame long.

In practical experience we have found it is possible to compress the same video about four times before the quality loss becomes objectionable. Why compress the video more than once? Layering.

The VideoCube offers two video tracks, four stereo audio tracks and one title track.

To show a picture-in-picture with separate title, the full-screen video clip would reside on the background track while the PIP would reside on the overlay track and the title would reside on the title track. Essentially three layers may be adjusted and modified in real-time.

Note that the VideoCube offers real-time effects. It is analogous to having two decks feeding video through a hardware switcher,

with a character generator downstream.

In fact, while video is playing, one can modify its size, transparency, rotation, skew, positioning, wipes, edge softness, border, brightness, contrast, tint, saturation and key settings — all literally while video is playing.

Of course, audio works the same way. Adjustments to levels, reverb and EQ all occur while it is playing. Effects rendering is a foreign word to ImMIX.

It is amazing how many times we shift the position of the video or put a patch over an element, which would all be impractical if tens of seconds worth of video had to be rendered. With that understanding, we can see how easy it is to produce effects formerly only considered with D-2.

Abracadabra produced a video that followed a time-line concept. Graphic elements representing different features of the product were to drift up the screen, along with titles and shots of the product.

This is a relatively simple matter. Position an element at the bottom of the screen when it should come on; position it at the top when it should run off. That is all.

To run three or more elements of different rates and sizes, simply build the former elements to disk to be used as background video. Our VideoCube builds to disk approximately one second of video each minute. This may include all tracks: the two video, the title and four audio tracks. It is also possible to simply record the section to tape and record it back in, but this requires you to go down a generation.

Another capability we use extensively at Abracadabra is importing PICT files and QuickTime movies. All animations, morphs, warps, 2D and 3D animations generated on our Video Toaster systems are loaded into the VideoCube digitally. No more single-framing to videotape.

Similarly, video clips may be exported as QuickTime movies and then texture-mapped or otherwise affected with other graphic software. We have rippled footage and used video clips in our 3D animations.

We have also used the video as refer-

ence to produce animations that were subsequently keyed over the video. The VideoCube's keyer is amazing. Lumakeying, chromakeying (any color), and alpha channel keys (for graphics on the title track) are all available and must be seen to be believed.

BACKING AHEAD

Lastly, I must mention one of the most important aspects of any professional work: backups. Several archive devices are available for the VideoCube. At Abracadabra we purchased the first, which stores the video footage to computer DAT tapes. There is now a faster tape backup available that is close to real-time. Not only can we create multiple first-generation master tapes, but when returning to a program a year down the road, all of our source footage may be restored (including takes not used in the original program).

All in all, ImMIX has provided incredible support with a toll-free tech line used to respond to the critiques and wishes of users.

At Abracadabra, we keep abreast of the technical changes that may benefit us. We had one of the earliest Video Toasters and our VideoCube was on order before it was ever shown at NAB. At this point, I can honestly say that there is no other video editing system offering as much capability for the price as ImMIX's VideoCube. ■

Editor's note: Randy Jackson became involved in video production through his company, Applied Multimedia Corporation, which sold Video Toaster systems. Finding greater profit in using the Video Toaster to create 3D animations, he joined Abracadabra to run the computer systems, create 3D animations and 2D effects, and now, edit with the VideoCube.

The opinions expressed above are the author's alone. For further information on the VideoCube, contact ImMIX in the U.S. (telephone: +1-916-272-9800; FAX: +1-916-272-9801), or circle Reader Service 106.

USER REPORT

EMC Travels the Country Road

by Josephine Rogers
Director
Countrywise Communications

WILBY, U.K.

Countrywise Communications is a relatively young U.K.-based media production company specializing in quality video training and communication for the agricultural, food and rural development sectors. Our worldwide client base ranges from small private U.K. companies to multinationals, from charities to international development agencies and from the United Nations to non-governmental organizations.

In May of 1993, Countrywise Communications made a sound investment in EMC, having previously been off-line on a traditional VHS suite. The move to a non-linear system was inevitable as the production load increased, with perhaps 12 or 15 productions in progress at any given time and half a dozen at the rough edit stage. I needed a flexible system that would allow me to change from job to job at any stage.

ONE AND ONLY

We researched the different systems available on the market for six months but EMC was the one that offered the degree of flexibility we needed as a production company, rather than a system that would work for a facilities company.

For rough edits, we run the EMC at resolution four every other frame, which gives a slight blockiness on the picture because of the digitizing effect. Our clients happily accept this level of picture quality when viewing a rough edit, and the benefit of being able to see where dissolves and effects occur means they can have a very clear idea of how their video will flow.

As a team, we have always been disciplined and accurate regarding logging tapes before any off-line edit. It proved to be great preparation for the arrival of EMC, which seems to work at its best in an organized environment. Pre-logging with EMC is blissfully easy and the benefits are endless. Logging before we input anything (and remember that someone else can always be editing at the same time) means we can pre-select from our log and input as much relevant footage as possible. Admittedly, the system has improved drastically since we invested in 1993, but EMC has always been an uncluttered, simple system to work with.

While we were only using EMC for off-lines, it was essential that the edit list we took to the editing suite was accurate and problem-free. The less time spent in the edit suite, the better for us and our clients. EMC has always been reliably accurate with edit lists, and the only problems I have ever encountered have been due to human error rather than computer error.

At the start, I was a little skeptical about EMC's on-line system. But in September of 1994, we purchased one from Dynatech in the U.S. and have been pleasantly surprised and pleased with the results. For the majority of the programs we are producing, the quality is perfectly acceptable. But it is essential to view it realistically. To a great extent, we have to assess the most cost-effective way of using the EMC PrimeTime — just because it can do something does not always mean we would be using the system or our time to best advantage.

With the support structure and helplines in

place, there is not a moment we cannot get help and back-up if we need it. Another source of support in the U.K. is the fraternity between companies that currently run EMC.

FROM THE FIELD

The newsletters and the European trade shows are also useful sources of information where developers are available to listen to suggestions and offer advice. With every new software release, user suggestions have been incorporated, which is always encouraging.

Our only problem is that we run only one system. There remain certain special effects

for show reels that I would still go to a traditional on-line edit suite for. My main request is for component inputs and outputs be made available as soon as possible.

By way of summing up my thoughts on EMC, I will give you two examples of productions I have made that would have been frightening to edit without the system. The first was "Hoofprints," a magazine program for horse-lovers. Countrywise Communications was not involved in the filming and we were only supplied with rough logs. I built up and trimmed the video in such a way that would have been unthinkable without EMC.

The second production was a very detailed training package called "Humane Slaughter — Taking Responsibility." The subject matter was animal welfare in the meat industry and the film lasts one hour and 25 minutes. The program won a Gold Medal at the 1995 IVCA Awards. ■

Editor's note: Josephine Rodgers was trained at the London-based TV and Radio Training Centre before obtaining a degree in agricultural science. She founded Countrywise Communications in 1985 after working as an assistant producer in the Agricultural Training Board's video unit.

The opinions expressed above are the author's alone. For further information, contact Dynatech in the U.S. (telephone: +1-801-328-8872; FAX: +1-801-328-3668), or circle Reader Service 64.

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USER REPORT

Postport Moves Up to Quantel

by Linda Morrish
Partner
Postport

TORONTO

Postport was the first production facility in Canada to purchase Quantel's Editbox system as part of our acquisition and initiation into the CCIR-601 digital editing domain that began late last year.

Postport is a Toronto-based post production facility that finishes a wide range of broadcast and industrial productions. We also have a very strong graphics and animation division with LAN connections to edit rooms.

MOVING UP

In late 1994 we decided the time was right for a move into CCIR-601 digital systems. The question was whether we should begin with a linear configuration with an upgrade path to non-linear or leap straight into a non-linear room and pioneer this type of acquisition in Canada.

Digital linear solutions did not appear to offer the upgrade path to a non-compressed random access environment that we felt our clients would soon be expecting. Our non-linear system choices were limited to either Quantel- or SGI-based software systems. Given our graphics experience, the software options were attractive but did not offer the speed and editing capabilities essential in an on-line session.

The Editbox is a powerful self-contained editing, paint and effects system that, following our demonstration, was very hard to resist. Eventually we purchased a 4000 configuration with three effects layers, Quantel paint and MAX options. Each layer incorporates a chroma/luminance

keyer to manipulate a 3D grid by picking and pulling points on the x, y and z axes and was added to the DVEs.

Our Editbox provides all of the on-line capability that we need, and it has the fastest auto conforms we have ever seen, along with excellent keying and lots of



Editbox provides Postport with high-end on-line capability.

keyer, color corrector, filters and three dimensional DVE, similar to a Henry. Rotoscoping, painting and sophisticated matte work can be applied to still images or video clips with the Paintbox. MAX allows

effects. The clincher was a significant saving in the engineering, installation and tape drive costs. It enabled us to put more money into hardware rather than wiring and peripherals.

The edit and machine room connections were set up prior to delivery of the hardware. When the mainframe and Dylan arrays arrived they were popped into the racks and connected. Quantel's engineer ran the remote diagnostics and we were up and running. It was a simple and fast installation.

SONY ON DECK

We use a single Sony Digital Betacam as both a source and mastering tape drive. An external 601 character generator gives us video and matte into the Box and acts as a gateway for graphics files from our other systems via an ethernet.

Digital audio goes to and from either the Digital Betacam or a time code DAT. A loop out from the Box to a digital EQ was installed, as were D/A converters for monitoring.

Since its installation, the system has been very stable. Remote diagnostics work very well and the service support is excellent.

Working in this environment takes some getting used to, both from the editor's point of view and the client's. We are basically doing the same job, with a significantly different tool set. It changes the way we approach the edit as well as the final look of the finished production. There is no doubt we can do more, and we can do it quicker.

The interface is remarkably intuitive, but the learning curve is steep. Until you are thoroughly familiar with all the tools, deciding on the best approach in each circumstance can take time. Some recent edits illustrate different benefits of our Editbox 4000 non-linear random access system.

A half hour television show needed to be conformed from 64 source tapes. The off-line EDL was provided on disk in CMX 3600 format. There were 420 video events in the list, as well as two channels of

checkerboarded audio. The auto conform, from start to finish, was completed in under two hours.

With a series of car commercials recently completed, the original 35mm material was transferred to Digital Betacam, off-lined on an AVID and the CMX 3600 list arrived on floppy. The spots consisted of multilayered cut-outs of cars, each one driving away to reveal the next. At the end of the last car reveal, a woman runs in, picks up the car and runs off the screen.

The car cut-outs had been shot on white and were problematic. Some of the backgrounds had to be replaced along with re-sizing of the woman. We also had to replace wheel rims, door handles and side view mirrors on the cars. The auto conform was straightforward and completed in five minutes. All subsequent keying and compositing of new backgrounds, repainting of cars and matte generation were accomplished in the Editbox. Although this was a difficult job, any good linear system could have done it, but it would have required moving a lot of elements into an external paint package for rotoscoping, laying off and rebuilding other elements. We were able to accomplish everything without B-rolls or caches.

IN THE VAULT

The archive of an edit maintains all of the set-ups and information necessary to re-create the layers, shadows, color correction or any aspect of the on-line. The saved information is instantly retrievable, allowing us to change any effect, title, scene or element at any time. For example, if we want to replace a title on a commercial done six months ago, we simply do it. It is not necessary to re-engineer all of the set-ups. Furthermore, the archive feature of the Editbox is the same as, and therefore transportable to, other Quantel platforms.

Some of the comments we have received so far from both our editors and clients illustrate the new way of thinking and working with the EditBox. The first surprise is the absence of a room full of machinery. A tablet, monitor and keyboard replace a whole room of equipment. Our editors have come to value the seamless interface of this sophisticated tool set. With a keyer, color corrector, image processor and DVE in every layer all the power needed for multilayered effects, resizing, repositioning or color correcting images is available. They do not have to worry about TBC set ups, how many channels of DVE are available or if they have enough VTRs or DDRs to do a particular effect.

Recording directly to the drive arrays makes a complicated build painless. With the non-linear aspect, the logistics of 18 layers are much easier and give the editor a greater opportunity to get more involved creatively. More time is devoted to the visual rather than the mechanical aspects of an edit, and that is what really matters.

It is a new way of thinking and working, but it is the future. ■

Editor's note: Linda Morrish co-founded Postport, a division of Producers Optical Services Inc., in 1979 with partner Michael Evans. Morrish has served corporate, commercial, post production and broadcast organizations with her skills in multi-image, animation and videographics.

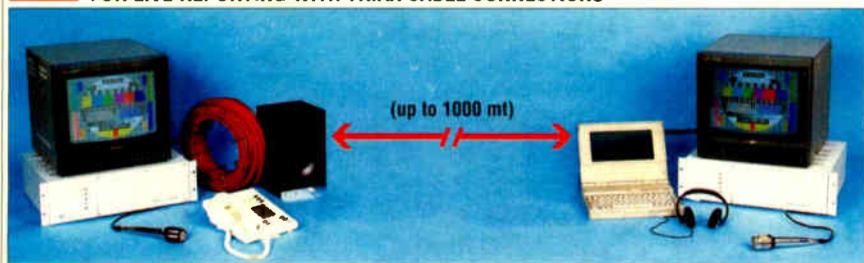
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USER REPORT

Carlton Cuts on Lightworks

by Mike Mulliner
Supervising Editor
Carlton U.K. Productions

BELPER, U.K.

I first encountered non-linear editing systems in early 1991, during the planning phase for "Peak Practice," and, to be honest, most that I saw were more than a little "Heath Robinson." By contrast, the original Lightworks Editor was from the outset quite obviously the right way to go — so we chose it for "Peak Practice" and have stayed with it over three series, nearly four years and through several software upgrades.

That makes for a very comprehensive bench-test, and my assessment of the system falls in two parts: a view of the system and its features as an operational tool and, more broadly, as a key component in the overall creative and production process.

With a regular audience of 14 million, I should explain that "Peak Practice" — which producer, Michele Buck, likes to describe as "Feelgood TV" — is now a major undertaking. For several months of the year the entire team decamps from the air-conditioned luxury of the Television House in Nottingham to an old mill at Belper up in the Peak District. So we not only film but also edit on location.

Typically we operate on a 10-day turnaround for principal shooting per episode, with two days available as a "safety net"

tional trim bin. Meanwhile, the "Stripview" feature (which I think of as a virtual reality pic-sync) shows the edit as a "time line," and all adjustments, changes, wipes and dissolves are in made in real time.

My current version of the software (3.02) is wonderful, with a rock-steady picture and core features that are well worked out and implemented. Such facilities as track labelling are pretty useful. Other facilities appear — at least in my context — superfluous: so "waveform" looks good but is probably most useful for dubbing editors.

Of course, there are minor gripes, such as

a sometimes jerky mouse, occasional difficulties with the "unarchiving" feature and something that must be a generic problem with any non-linear system: the need to sit in one place for hours on end where, traditionally, in a film-cutting room you did move round a bit.

I also have a "wish list" for the system. When trying to lip sync a character in long-shot, I would, for example, occasionally welcome higher-resolution picture quality (such as the 10 minutes per Gigabyte available in later versions such as Heavyworks, as opposed to the optimum 40-minutes per

Gigabyte on our original Lightworks Editor). Similarly on the audio-dubbing side, it would be useful to be able to export a non-linear picture for the dubbing session in order to minimize the time that is wasted waiting for VTRs to run up to speed.

Looking to the future, I'm personally a little skeptical about future networking solutions, if they involve working at home; we rely on the practical need to work and blend together as a team.

This aspect is central to our own on-location experience with The Lightworks Editor and, indeed, our enthusiasm for it. For example, from a producer's perspective, Michele Buck sees it as an invaluable tool that enables her to test ideas that financial cost or time cost would have ruled out historically. With a non-linear

(continued on page 36)

As a working editor,

what I like most about the

Lightworks is the user

interface.

for second unit. Film is processed at Denham, then telecined at Central Broadcasting in Birmingham. The tape is digitized and then assembled as we shoot. Operating on Lightworks, we usually achieve a good rough cut in line with the end of shooting, which is then followed by about two weeks of fine cutting (eaten into by screenings, music recording sessions and dubs), including three to four days with the director.

FILM-STYLE CUTTING

As a working editor, what I like most about the Lightworks is the user interface. In effect, it emulates classical film equipment, meaning that any film editor can, or should understand it intuitively.

This is particularly evident in the Steenbeck-style "console." Replacing the computer keyboard for most purposes, it incorporates variable speed shuttle control with jog facilities, play-stop buttons and a number of designated functions (such as mark, replace and delete).

This film-style approach also extends to the free-form cutting-room style screen, where material may be viewed as "tiles" or file cards, and a simple search function allows for work in the equivalent of a tradi-

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U S E R R E P O R T

Video Newsreels Taps Matrox

by Keith Yallop
Co-Owner
Video Newsreels

BERKSHIRE, U.K.

Video Newsreels is an international video production company based in Berkshire, England close to London and Heathrow Airport. The company is a major producer of corporate, sales promotion and

training videos for companies in the computing and information technology industry. Many of the clients are American-owned multinational companies with offices in the Thames Valley — England's own Silicon Valley.

Video Newsreels aims to provide a wide range of video production services to support multinational organizations such as

Hewlett-Packard, ICL and Microsoft. The company also has experience producing programs for U.S.-based Dow Chemicals, Shell International and FMC, and frequently provides support for American crews and productions in the U.K.

The company is owned by Gerry Clarke and myself and has been in the media business for more than

25 years, with roots in 16mm film production. We were one of the first British companies to purchase a Betacam edit suite and camcorder, and are therefore no stranger to being in the vanguard with new technologies.

A TIGHT REIN

In the mid-1980s, we decided the cost of running an in-house

on-line edit suite was becoming prohibitive for a small production company. Just keeping up with the latest effects machinery could cost thousands of pounds.

Soon after Gerry and I teamed up, it was decided that the cost of maintaining an up-to-date Betacam edit suite was becoming prohibitive. We decided it would be sensible to sell the on-line suite and replace it with a U-matic off-line. All of our on-line editing could then be taken to the London facility houses. We also updated the location equipment with the latest Sony CCD camera and Betacam SP recorder.

At the beginning of 1995 a new revolutionary concept in post production emerged — desktop computer editing — and non-linear became the buzzword in the industry. For a fraction of the old price we could now purchase a Betacam edit suite with similar facilities to what we had been previously hiring. Then at the start of this year Sony introduced the low-cost UVW Betacam range, which really made owning our own suite a possibility again. It was time to re-appraise our edit requirements and cost of ownership.

The non-linear route would only replace our existing off-line with a more sophisticated and costly animal. Even though this method was within the restrictions of our budget, the on-line quality of these suites was still suspect. Add to that the fact of laying off the rushes onto disk before commencing the edit, and you have a longer period of preparation while loading the material. It seems the non-linear suites have a major role to play in the off-line field and in the future will be the way we accomplish on-line work. This is especially true when camcorders have disk drives or flash cards, and the memory storage capability is improved.

The computer-controlled on-line suites with all the effects, titling and graphics seem to be particularly aimed at the corporate market with many of the manufacturers claiming broadcast standard. Most of the suites could store EDLs and then autoconform a second master, which would mean that you could have an off-line and on-line suite in the same package. Some manufacturers were well down the route of offering a hybrid version that would convert these suites into non-linear, allowing the choice of disk or tape. It will suit us to update the suite in the future when digital storage systems are improved.

After studying the latest equipment available on the market, one system came out ahead of the rest. It met all our criteria and stayed within our budget — the Matrox Studio.

The brochure advertising the Matrox suite claims broadcast quality on-line, component input and output, five layers of video/graphics mix effects, two multilayer compositors, hundreds of transitions, three channels of

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2D DVE, the availability of 3D DVE, superb keyers, caption/titling generator, graphics/paint software, 10-channel digital audio processing and storage, and CMX-compatible EDL.

Matrox provides both linear tape-based (Personal Producer) and non-linear (Personal Producer Xpress) editing facilities, and runs on a standard PC/Windows computer. The suite comes in two versions, the System 2200 and the 2300, both of which can be upgraded to non-linear.

I then took a closer look at the Sony UVW Betacam SP VCRs. Sony does not claim broadcast standard for the UVW range but suggests they are aimed at the top-end of the corporate market, which is exactly where Video Newsreels pitches its business. The Matrox is of broadcast standard and manages five layers of video at one pass; therefore it should not be necessary to bounce the picture too often.

We ordered the extra channel of Miranda Titania 3D DVE to replace one of the channels of 2D. We were surprised to discover the Matrox suffers from audio delay of 1.5 frames. To correct this we had to purchase an audio delay system at an extra cost of £800. Surely this problem, common on most edit suites, could have been solved within the computer program.

ON THE MOVE

The decision was made and financing was arranged, but not without some trauma. Only when finance companies recognized Matrox Electronics as a multimillion-dollar Canadian company and a major player in the industry worldwide was financing offered.

When we installed the system in September our first impression was how sparse it looked. With three tape machines, a PC screen and keyboard it might be difficult educating our clients to the awesome power of this edit suite. Since then more equipment has been installed and this difficulty has been overcome.

A totally new way of editing needs a lot of innovative skills. People who believe they can install a PC-based edit suite on a Friday and be operational on the following Monday are fooling no one. Our first month passed as we burned the midnight oil completing our first internal production. Another month passed before we could call ourselves a credible facility.

The suite came with the latest software, version 2.0, plus a beta version of Miranda Titania 3D DVE, both of which had all the usual bugs of new programs. We had a number of corruptions and a hardware failure in the early days. But Matrox's response time could never be called into question. Within an hour someone from the company came to our aid and fixed the fault. The company was always supportive and helpful. After the initial problems were solved and the software updates were installed the system became very reliable.

Inscriber/CG (captioning software) was included in the original purchase, but was found to run very slowly. Image North, Inscriber's developer, has released a new version that makes the program run much faster. In addition, we've upgraded our computer RAM from 16 MB to 32 MB to improve performance. It is worth mentioning here that like all Windows-based systems, the speed of the computer is very much related to the number of Windows you have open at any one time. The speed of the PC can be maintained by minimizing, or closing, any Windows that are not needed.

The audio system, while not up to the

standard of the video side, is still good. We have the option of patching the audio through a conventional mixer to give us more flexibility. I would recommend this option to any new user.

BIG BONUS

We have installed a graphics software program that is very useful. Complex captions or graphics can be produced with this software, and they can be easily transferred around the system using bitmaps or targa.

Photographs and slides can be captured via camera into Personal Producer and then transferred to the graphics program for alteration. They can then be transferred to Inscriber for captions to be added. This flexibility is one of the big bonus points for the edit suite.

The non-linear upgrade version 3.0 is due

for release very shortly and we have placed an order for the first one in the U.K. The range of features available with this package is very wide indeed. We look forward to editing on a system that will be virtually transparent between the off-line and on-line.

Good video editing is a balance between operator skills and the creative abilities of the editor. The Matrox system allows creative ability to flourish. However, it is difficult to say if it is faster than a conventional suite. Because the Matrox is so versatile one is always tempted to take more time and be more creative.

In conclusion I would have to say there is no doubt that we are able to create in-house, and to our own time scales, a wide range of video effects and achieve a level of quality comparable with anything except

a handful of expensive facilities.

Having mastered the skills of editing with the Matrox system, Video Newsreels has been contracted to become the Matrox Instruction Centre for the U.K. and overseas, a role that we are looking forward to with enthusiasm, as we believe the Matrox Studio system has a great future in our business. ■

Editor's note: Keith Yallop was an electronics engineer when, 20 years ago, he decided to move into video production. He is a camera/lighting expert and video editor.

The opinions expressed above are the author's alone. For further information, contact Janet Matey (telephone: +1-514-685-2630; FAX: +1-514-685-2853), or circle Reader Service 12.

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USER REPORT

Avid Jumps In Head First

by David Head
General Manager
Head First

LONDON

I started Head First in 1990 as an off-line company with eight U-Matic suites, each with an EDL system. We purchased our first Avid Media Composer 18 months ago.

Before the end of 1994, we had four of them — one an on-line version. Our three off-line machines are Media Composer 400s upgraded to 800s and our on-line machine is a Media Composer 1000

upgraded to a 4000. We have been adding a new Media Composer every two months, and I expect to get another three this year.

EDITING MOVES

When I was contemplating the move to non-linear editing, I went to all the shows — namely NAB, IBC and Montreux — to look at what was on the market. None gave the flexibility that Avid's range of products offered. They are more flexible than anything else I saw, and as Avid Technology has progressed and expanded its range of devices, I realized how much more advanced the company is with the off-line and on-line Media Composer, as well as AudioVision and now Spectrum. Users have the ability to take in material and access it across all these systems.

An example of the benefits of this flexibility and transparency between Avid systems was the work done on the BBC TV/Mosaic Pictures documentary series "Russian Wonderland." Post production took place on three separate Avid systems across London. It is a series of documentaries about the state of modern Russian, shot on Hi8 by Russian film makers.

Hundreds of Hi8 tapes were off-lined by Trevor Williamson on an Avid Media Composer at Mosaic's offices. We took in the edited sequences to our on-line Media Composer straight from the Hi8 tapes. Then Peter Hodges at Arena did the sound dubbing on his Avid AudioVision.

The series was shot on a whole variety of different Hi8 cameras — some three chip, some single chip, most of different ages. All the Hi8 tapes were stripped with time code and a working copy of each made on S-VHS to feed into Mosaic's Media Composer for the off-line edit. They used this method rather than digitizing from the Hi8 tapes. There was so much footage that they did not want the danger of shuttling the Hi8 tapes in the off-line and risk stretching them.

We were asked by Mosaic to do the on-line and I did tests taking the signal direct from the Hi8 master tapes as S-video, straight into the Avid, which kept crisp, sharp images inside the machine.

MATCHING COLOR

We also tested color correction on the Avid, which is essential for the programs since so many different types of cameras were used. This is really where the Media Composer excelled. Normally I take such pictures to a mixer and color corrector, but that process softens the image. There is no softening with the Media Composer. I just put a color effect on or tweak the colors. It is a transparent process, which is the system's biggest advantage.

The difference is quite phenomenal, and Mosaic was very pleased as we were able to keep virtually first generation quality Hi8 all the way through to laying off to Digital Betacam. Keeping that level of quality also included the sound dubbing process as we decided to do it on Avid AudioVision. I made an OMFI composition list of all the audio tracks, put it onto an Avid 3 GB hard disk and walked it up the road to Arena. Within 10 minutes they were working on the material.

We decided to take the whole disk because it is quite easy to transport. All the audio came off the Hi8 tapes, and again it

meant that we did not lose any generation quality and maintained easy access to the audio sequences. We always bring in two- to three-second audio handles, extra bits on either side of the cuts so the audio editor could give a little ramp up to audio over picture once it is in his own system. It is the sheer flexibility of Avid systems that makes all this possible.

suites have removable drives, so it is a seamless operation to transfer work from the off-line to the on-line Media Composer. It is a transparent process, and I am sure we will continue to expand this method of working because it offers a lot more than conventional post production systems.

As off-line, we generally edit at AVR3, which is fast, then on-line at AVR27. This advantage of the Avid on-line is that if the client comes in two minutes before we lay it off and says he wants to change something in the middle of the program, there is no problem. That is the beauty of working this way.



Head First takes advantage of Media Composer's flexibility.

They finished the off-line and sent tapes to us, which we autoconformed. In fact sometimes they were still cutting so they would send us a rough cut. When a new version came through to us at 5 p.m., we just loaded in the new sequence and the system adjusted the pictures and sound to this new cut within seconds.

Our business at Head First consists mostly of long form work, broadcast drama and documentaries, although we do some commercials, music promos and corporate productions. All of our Avid

We will certainly be phasing out our remaining U-Matic suites and getting in more off-line and on-line Media Composers. ■

Editor's note: David Head founded Head First five years ago and has since built up a facility largely centered around the Media Composer.

The opinions expressed above are the author's alone. For further information, contact Avid in the U.K. (telephone: +44-1735-655-999; FAX: +44-1735-654-999), or circle Reader Service 111.

CONTINUED FROM PAGE 33

Carlton U.K. Posts On Lightworks Editor

system such as the Lightworks, we can try the "what ifs."

CASE IN POINT

This ability to experiment was demonstrated to good effect when shooting the latest series. A combination of new writers — and even tighter schedules — meant that we had to carry out a lot of the practical finishing work actually in the cutting room, and it's doubtful whether we could have succeeded without the Lightworks non-linear facilities. Similarly, it's unlikely that we could achieve the simultaneous editing of two episodes quite so effectively.

However, as a veteran of the conventional approach, I must admit that there is a trade-off and I sometimes regret the passing of the darkened theater and the ability to work in isolation without interruption. Today's informal team approach means many more can be

involved (definitely a benefit), but the editor has to work harder to maintain the overall feel of the piece. Nonetheless, I do wish I'd had the Lightworks capabilities a few years ago when I was cutting musical documentaries that had multicamera coverage of orchestral performances. ■

Editor's Note: Mike Mulliner is supervising editor for Central TV's hit drama "Peak Practice," which has now completed three series, with a fourth scheduled to begin shooting this month. After 13 years with the BBC, Mulliner joined Central (now Television House) where he has been responsible for "Chancer," "The Guilty" and a wide range of documentaries.

The opinions expressed above are the author's alone. For further information, contact Lightworks (telephone +44-171-494-3084, Fax: +44-125-279-4099) or circle Reader Service 95.

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USER REPORT

Panasonic Is a Hit on Campus

by Bob Head

Executive Director
McCamish Broadcast Center

WALESKA, Georgia

Reinhardt College in Waleska, Georgia, is a four-year liberal arts college 60 miles north of Atlanta. Regardless of our rural address, we believe that Reinhardt's McCamish Broadcast Center is better equipped than several of the commercial television stations in the Atlanta market.

As evidence, it was at the McCamish Broadcast Center that the Hon. Newt Gingrich, Speaker of the U.S. House of Representatives, has for the past two years produced his widely publicized series, "Renewing American Civilization" which has provided 80 hours of instructional material that was made available to colleges and organizations nationwide.

FULL-FLEDGED STUDIO

In addition to our academic mandates, the center functions as a full-fledged television production center that has produced more than 350 local and regional commercials and 70 one-hour programs per year for an off-campus clientele.

The Center has been using three Panasonic AU-65 M-II EnHanced Series studio recorders and an AU-63H M-II EnHanced Series studio player with dynamic tracking in an A/B/C roll editing system utilizing the AU-A950 edit controller. Earlier this year, we acquired an AJ-D350 D-3 studio recorder, which is likewise under the serial control of the AU-A950.

The AU-950 is a versatile production tool for D-3, M-II and S-VHS formats. It offers RS-422 direct control (four sources, one record) of up to five VTRs and has 10 GPI outputs and two GPI inputs. The internal memory of the AU-A950 can store up to 2,000 lines, and CMX and CMX 3600 compatible lists can be stored and recalled via the controller's industry standard hard drive and 3.5-inch floppy-disk drive.

The AU-A950's preset-MEM control will read, store and write to memories in

switcher devices; EDL will store memory setting, allowing perfect retrieval of effects. The controller facilitates A/B/C roll editing, with toggle A/B after edit and auto tag source after edit. Pre-read editing, four-channel audio editing, variable memory editing, fit and fill editing and temporary recording are available.

At the center, the AU-A950 has direct serial control of all M-II and D-3 recorders and players, as well as a two-mix effects video switcher, three-channel digital effects and a Lightwave 3D animation system. I

use the GPIs to trigger management of many peripherals not under direct serial control. For example, the AU-A950 triggers rolls, crawls and page changes on our Orion S-E character generator. It also controls CD players, DAT players and reel-to-reel tape machines.

One of the reasons we invested in the AU-A950 two years ago was that it was one of the first editors with pre-read software built-in. As a result, I can now take advantage of one of the most useful features of the D-3 recorder.

Obviously, we make maximum use of the

editor's versatile control of equipment. I also like the fact that it utilizes a dedicated keyboard, as opposed to an ASCII II version — a small detail, perhaps, but it allows me to plug in a US\$75 PC keyboard to make the ample notes in my EDL that let other operators easily recreate the programming. ■

Editor's note: Prior to joining Reinhardt College in 1992, Bob Head accrued more than 26 years of experience in television news and commercial production working with Gannett Production Services, Christian Broadcasting Network, NBC, CBS and ITN.

The opinions expressed above are the author's alone. For further information, contact Panasonic (telephone: +816-901-1161; FAX: +816-908-5969), or circle Reader Service 46.

USER REPORT

Chyron Rolls into JSP Post

by Saiful Bahar

Editor
JSP Post

SINGAPORE

When I first received Jaleo version 2.0 beta software, what caught my attention was the user environment. It is exactly what I feel a true non-linear environment should be.

The workspace can be customized to suit the style of each user. There are tear-off dialogue boxes that allow users to edit and create effects easily. By opening the DVE and FX windows, I can now access all of my parameters without changing modes or accessing additional windows. This makes the user interface more streamlined.

In the Jaleo environment, I can view my clips in full frame without changing my workspace. I can load unlimited clips into the reel and view them instantly. In fact, there is no limit to the number of monitors I can use at a time.

Moving clips in the reel is just a matter of "click-and-drag." The movement within the reel is not limited to linear movement. In some other systems, there is only one monitor for playback, which requires a new full page canvas. Thus, in other systems, rendering and monitoring within the reel is not permitted.

Jaleo's editing tools have improved tremendously since the first version 1.7. The new version 2.0 introduces a familiar set of edit tools: mark in, mark out, insert and overwrite edit, trim and extend using keyboard commands, slip sync, multiple clip editing from the Gallery, and most important, unlimited undo. The keyboard equivalents allow quick editing.

CLEAN KEYS

Jaleo's keying power is very impressive. I can do a clean key very simply. The Time Editor allows all parameters to be independently adjustable over time. Jaleo can do chroma keys that include Pick Color, Color Difference and automatic FastKey Blue and Green. Additional filters have been added to grow and reduce the key and also null the key edges.

Using Jaleo to create effects using the DVE and image processing is very direct and intuitive. The parameters of the effect can be easily adjusted in the Time Editor and viewed instantly in the monitor. Changes are quick and easy. The monitor displays the change in the quarter-resolution

images in real time. Real-time full resolution will be available on the Onyx.

With the independent nature of processing and software architecture, I can replace any source clip and the processing is instantly applied to the new image. This allows clients to change their minds without losing the minds.

Grabbing clips from digital video or digital file formats are easily imported through the Input/Output module. There is a Gallery to display clip images, and many Galleries can be used to organize images.

I feel that Jaleo's flexible user interface combined with the many post production suite-like features make it the most appropriate tool for the digital artist. Indeed, it is about time. ■

Editor's note: Saiful Bahar has been an editor at JSP for three years. The facility specializes on high-end commercial work.

The opinions expressed above are the author's alone. For further information on Jaleo, contact Kimberly Bone at Chyron (telephone: +1-516-845-2026; FAX: +1-516-845-3985), or circle Reader Service 7.

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EQUIPMENT EXCHANGE

CAMERAS

Want to Sell

Sony BVP-330, BVU-100, tripod head, batteries, chargers, cases & manuals, \$3500. Shaun, 303-779-9578.

Sony DXC537 with Canon 15x9.5, CA537, case, plate, manuals, cable, very good cond, \$6500. AVPS, 703-527-1200.

Panasonic EV-E550 3-CCD DSP camera, unopened factory carton with full warranty, \$4250/BO. Bob, 617-734-7305.

Sony BVP-30 camera, CA-30 adapter, no lens, \$2600. Porembki, 305-759-1916.

Sony DXC-537 3-CCD with CA537 adaptor, 26 & 14 pin camera to VTR cables, case, tripod plate, manual, 4 NP-1 batteries, mint conditio, \$7000. A Williams, 702-367-7893.

Hitachi SK-91, monitor 23-1 chone, A/C adaptor & NiCad batt, \$1500. N Kent, 904-446-0602.

Panasonic AG-455U S-VHS profine camcorder, built-in VITC generator, hi-fi audio, low light capable, compl with spare battery, case & tripod, excellent condition, very low hours, \$1500. 614-847-0424.

Panasonic AG-450 camcorder with A/C power supply/charger, battery, line adapter, manual, hard shell case, excellent condition, low hrs, \$800. Jim, 508-478-1762.

Panasonic WV-F250 (2) docked to AU-410 MII rcd, Canon 15x7 lens with 2x extender, Anton Bauer AB-13 battery bracket, extras included Thermodyne hard case, Porta-Brace Quick Draw case & rain slicker, mic, tripod adapter, less than 100 hours on both & recorder, \$10,000/ea. D Irvine, Pronghorn Productions, 1070 McDougall St, Lander WY 82520.

Sony DXC-537AL with CA-537 back & Canon YJ17X lens, less than 10 hrs, like new with new warranty, \$7995. Harvey, 603-228-0412.

Sony DXC-M7, great condition with Porta-Brace case & rain cover, Fujinon lens, \$5900. 315-445-0979.

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Hitachi SK70 cameras (4) with CCUs, studio configured, 12x1 lenses, cases, manuals, extender boards, \$5000; BVW 3, BVP 3/BVV-1A, 14x1, Betacam camcorder, \$2700. G Larson, 702-264-7065.

CAMERA ACCESSORIES

Want to Sell

Sony BVW-35 with case, \$7400; Fujinon Pegasus III 14x8.5 with 2x extender, \$5500; Sony RM-M7G remote mini CCU, \$750; Sony AC-500 power supply, \$450; Sony BCW-1A charger, \$260; NP-1 batts, great condition, BO. 315-445-0979.

Anton Bauer Quick charger, \$400; Anton Bauer SQ-13 batteries (4), \$900; Miller syst 25li fluid head/tripod with Porta-Brace case, \$1000. D Irvine, Pronghorn Productions, 1070 McDougall St, Lander WY 82520.

Buhl, Kodak 200mm slide projector lenses, all lengths, BO. P Goldberg, 718-224-3333.

COMPUTERS

Want to Sell

A4000-040, 8 MB RAM, 240 MB HD, \$2600; A2000, 17 MB RAM, 105 MB HD, GVP G-Force 33 MHz 040, \$1750; A2000-020, 5 MB RAM, 40 MB HD, bridgboard, \$650; A3500-Tower, 10 MB RAM, 240 MB HD, \$900; A3000-25, 6 MB RAM, 40 MB HD, \$600; A3000-25, 6 MB RAM, no HD or keyboard, \$400; CDTV, \$100; A500, \$200; A600, no hD, \$250; A2091 SCSI card, \$65; Amiga multiple serial port card, \$75; Hydra network card, \$175; A2065 ethernet, \$150; DKB multi start II with 1.3 & 2.0 ROMs, \$75; Diga-view with BW camera & Digi-Paint, \$125; 1084 monitor, \$100; 1084 touch screen, \$300; Amax IV with ROMs, \$325; GVP multi IO, \$50; GVP SIMS 32/4-60s (3), \$130/ea; Commodore 25 MHz 040, \$250; GVP IV24 with component transcoder, \$500; OpalVision, \$200; DCTV, \$150; A2320 flicker fixer, \$75; Perfect Sound digitizer, \$25; Miracle Piano, \$150; Epson printer, \$25. Dave, 302-654-9763.

GVP 4 MB SIMM for G-Force '040; AD516/Studio 16; Tocatta/V-Lab; Amiga driver for Canon BJC-4000. Steve, 608-635-7170.

AT&T 7300 Unix/DOS 8086, 1 with 20 MB, 1 67 MB HD, monitor, mouse, keyboard, BO; AT&T 6300 8086 & 286 computers with keyboards & monitors, BO. P Goldberg, 718-224-3333.

Amiga 4000 loaded for animation or Toaster host, O.S. 3.1, Buster 11 chip, 18 MB RAM, 40 MHz Warp Engine accel with Fast SCSI II controller, 120 MB & 540 MB IDE HDs, Picasso II display board with TV PaintPro software, other software including Lightwave 3.5, Imagine 3.0, AdPro 2.5, Pro Page 4.0, Pro Draw 3.0, Deluxe Paint 4.0, Pixel 3-D, Easy Ledgers Accounting 2.0, Final Copy II 2.0, AmiBack, all manuals, including keyboard, Boing optical mouse & spare daughterboard, \$6500; SunRize Ind AD516 16-bit sound card with Studio 16 3.0 edit software, almost new, \$750. B Jones, Digital TV Productions, Pullman WA, 509-332-5858.

Amiga 2000HD with 8 MB RAM, Mega Chip 2000, Super Gen, 1084S monitor & programs, \$1500. D Irvine, Pronghorn Prod, 1070 McDougall St, Lander WY 82520.

Mustek CG-8000 24-bit, 16.7 mil color hand scanner, software & manuals included, excellent condition, \$200. 614-847-0424.

A4000 with Toaster 4000, 8 MB RAM, 500 + 250 MB HDs, 1084S monitor, ADPro, Morph+, DP4, \$3500/Best Offer; A2000 with Toaster 4000, GVP G-Force 040/33 MHz, 16 MB RAM, 270 MB HD, Syquest 44 MB, 1084S monitor, WB 2.1, software, \$2700/Best Offer; GVP Impact Series II SCSI with MB RAM, 105 MB Quantum, \$225; IVS Trumpcard SCSI with Syquest 44, 1 cart, \$150; Magni 4004 genlock with 4010 remote control box, PVP, BT2, \$250; Summagraphics MM1201 12" hi-res scalable drawing tablet, Amiga driver, DP4, \$250. Steve, 608-635-7170.

DIGITAL EFFECTS

Want to Sell

Ultimate 4, perfect, BO. P Goldberg, 718-224-3333.

Videonics digital video EQ with built-in audio mixer, enhances video sharpness, contrast, color, tint & brightness, excellent cond, manual including, \$200; Videonics TM-1 digital titlemaker, creates titles, backgrounds, outlines, boards & FX, excellent cond, \$200; Sima FX video ED/IT 4 digital special FX edit & audio mixer, adjustable wipe/fade speed & color, barely used, \$75. 614-847-0424.

EDITING EQUIPMENT

Want to Sell

Panasonic AG-1970P S-VHS pro recorder edit decks (2) with built-in TBC, less than 1 year old, excellent condition, manuals included, Future Video EC 1000PRO edit controller, compatible with S-VHS, 8mm, Hi-8 & Beta, fully auto assemble & insert edit with 9 scene edit mem, excellent condition, manual included, \$2500. 614-847-0424.

Ives II A/B roll TC controller for JVC, Sony Panasonic, TC gen/read, BB/sync generator, capstan bump, auto fades, GPI/Take, mem, EDL print/serial, audio mix/amp with 3 interfaces & monitor, \$875/BO, additional interfaces, \$75/ea. Steve, 608-635-7170.

For-A EC-780 w/U-780EX2 option, like new, \$2500; For-A PAM-300 post-prod 8-chnl audio mixer, interfaces to EC-780, like new, \$2500. Harvey, 603-228-0412.

Pride Integrated Video 2001 A/B roll edit control system for Amiga, Integrated Toaster control, included all cables & latest software, all but new, \$500/Best Offer; DPS Personal TBC III full-frame TBC card for Amiga or PC, full proc amp controls, color correction, monochrome mode, frame or field freeze, strobe, excellent in Toaster set-up, \$650/Best Offer. B Jones, Digital TV Production, Pullman WA, 509-332-5858.

Panasonic AU300 M for mat edit decks, working/not working, BO; Sony SMC-20, all options incl genlocker, digitizer, manuals, BO; Polaroid Freeze Frames (2), RGB & composite in/out, remote cntrl & 35mm camera adapter, BO; Panasonic AUJ10 multi-source adapters, BO; Crosspoint Latch 6403 edit-switcher interface, programmable, BO; Convergence 104 serial parts (3), parallel (1), TC rdr, BO; Sony 5800/5850/440 edit syst, mint condition, BO; CMX The Edges (2), many interfaces, BO. P Goldberg, 718-224-3333.

TAO Editizer, A/B roll edit, like new, comes w/386 leading edge computer, all cables & documents, 4 GPIs & works w/all machines, \$2000. Craig, 970-845-7611.

Panasonic A95 edit cntrl, \$175; Future Video edit cntrl, \$325. Clark, 518-561-8178.

Convergence 195 A/B roll edit controller, printer, 3 Sony 5800 I/F cards, DD200 dual disk drive, all manuals, works great, \$600/BO. G Phipps, 419-991-8433.

LIGHTING

Want to Sell

Arriflex Fresnel kit with 2x650 & 2x300, stands & heavy duty travel case, mint cond, \$1750; Arri C-stands, grip heads & Gobo arms, Best Offer. 315-445-0979.

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Want to Sell

Arri 16S with Berthiot 17-70 zoom lens, mat box, 2 mags, variable & constant speed motor, sound meter & accessories, battery belt, case, \$3500; Moviola M79 (Moviola Jr) 16mm viewer with 3 sound & 1 pic, motorized, \$2500; Neumade rewinds w/break, \$150; 16mm hot splicer, \$300. I Martin, 415-965-9919.

SIGNAL PROCESSING

Want to Sell

DPS TBC III, including Amiga & MS-DOS control software, appropriate jumper cables & manual, hardly used, mint condition, \$600/Best Offer. J Belotti, 508-456-3707.

Tektronix SG-130 signal generator, \$800. D Irvine, Pronghorn Production, 1070 McDougall St, Lander WY 82520.

GVG borderline downstream video keyer, like new, remote panel 4 video key/source select, competel package, \$500. G Phipps, 419-991-8433.

Harris rcd EQ & diplexer EQ, Best Offer; Townsend dual ICPM pulser correcter chassis, BO. G Kenny, 417-451-1440.

JVC SA-T22U TBC board for 22 series decks, comes with component out panel, like new, \$250; CCI Electronics 810 video dist amp, transcodes complete signals to Y/C (S-VHS, Hi-8) signals, 3 outputs, luma, chroma, Y/C delay controls, like new, \$350. Jim, 508-478-1762.

SWITCHERS

Want to Sell

Cross Point Laych 6109 10-input switcher, 7209 Convergence edit controller, I/F internal proc amp, 2 ME, DSK, manuals, cables, still on-line, \$500. G Phipps, 419-991-8433.

TRANSMITTERS/EXCITERS

Want to Sell

RCA TT-10AL amtr mica & teflon insulators & capacitors, Best Offer. SASE to Benchmark Communications, 4700 SW 75 Ave, Miami FL 33155.

Harris UHF visual exciter, tuned to your channel, Best Offer; Townsend visual & aural exciter & 10 W amp, Best Offer; some parts for RCA TTU-2B 2 kW UHF, Best Offer. G Kenny, 417-451-1440.

LDM 1024 PYE VHF TV xmtrs (2), 10,000W, 2 plus 10 KHz offset, 15 yrs old, \$5000/ea. D Newbury, 604-662-6064.

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Sony BC-210 battery charger for BP-90s, like new, \$200+shipping. T Asher, Idle Minds Production, 176 Woodland Ave, Lexington KY 40502. 606-291-1205.

Sony BVU-110 3/4" bdct port VTR, Porta-Brace, manuals, works, \$450. G Phipps, 419-991-8433.

Sony BVW-65 broadcast DT player, \$22,700; Sony PVW-2800 edit R/P, \$14,000; Sony PVW-2600 player, \$9200; Sony VO-9850 3/4 SP edit R/P with additional TC rdr/generator, mint condition, very low hrs, \$7700. 315-445-0979.

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Sony VO-5600 3/4" VCRs, good cond, \$500. AVPS, 703-527-1200.

Panasonic AG-1830, digital FX, "S", \$500. Clark, 518-561-8178.

JVC 4400 3/4" port, no p/s, \$100. Steve, 608-635-7170.

Sony VO-6800, low hours, like new with Porta-Brace, camera cable & 5 NPI batteries, \$1000. Craig, 970-845-7611.

JVC CR-850 3/4" edit recorder, \$2500/BO; Sony BVU-150 3/4" SP with BKU150 TCR/G & Porta-Brace case, included 2 new Anton Bauer ProPac 90 batteries & Lifesaver single charger, \$3500/BO. B Jones, Digital TV Productions, Pullman WA, 509-332-5858.

Sony BVW-50 Beta-SP field deck with TBC, low hrs, \$13,900; Sony BVU-50 & BVU-110 3/4" field decks with TC, jangaroo & shgp cases, \$750. Shaun, 303-779-9578.

Ampex CVR-1A Betacam recorder, dockable, 250 hours, excellent condition, \$1500; Ampex VPR2/TBC2 1" type C VTR, AST slo-mo, good heads, excellent condition, \$5000; JVC 3/4" edit system with CR600, CR 850 & RM 86 controller, excellent condition \$5000. G Larson, 702-264-7065.

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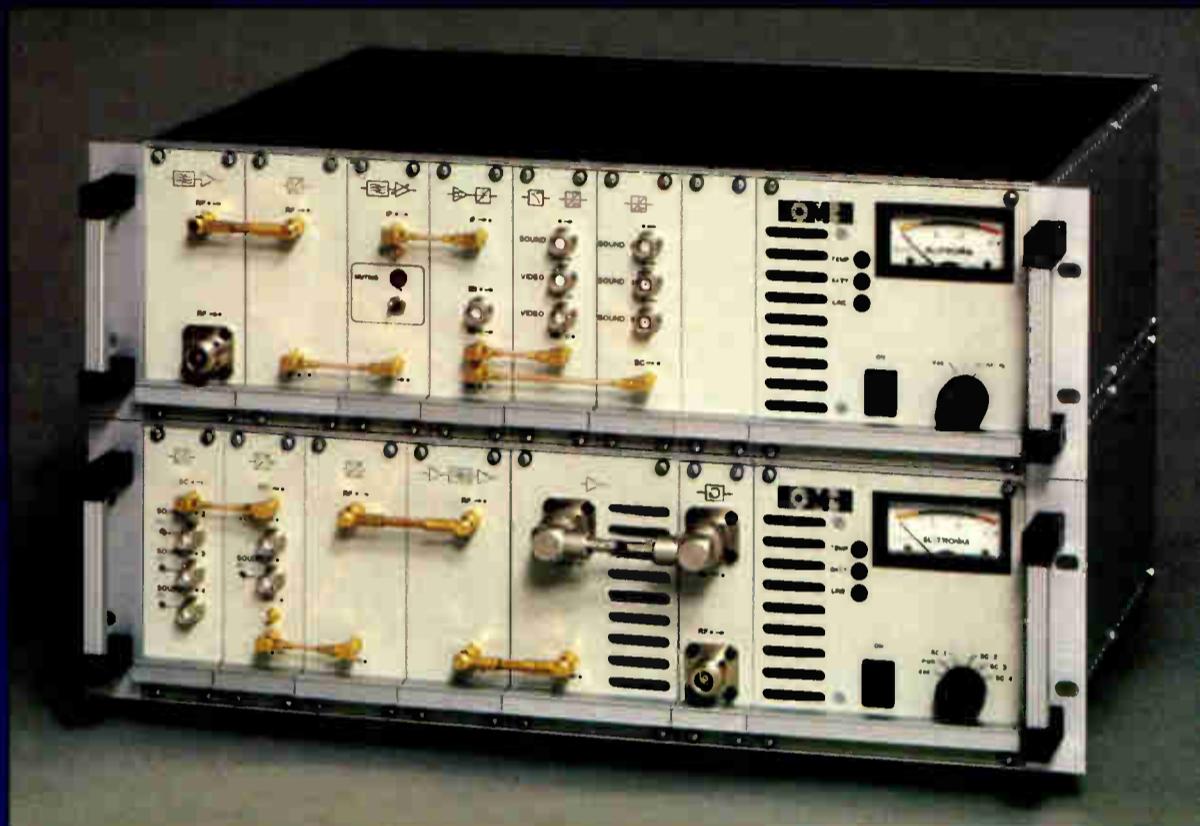
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