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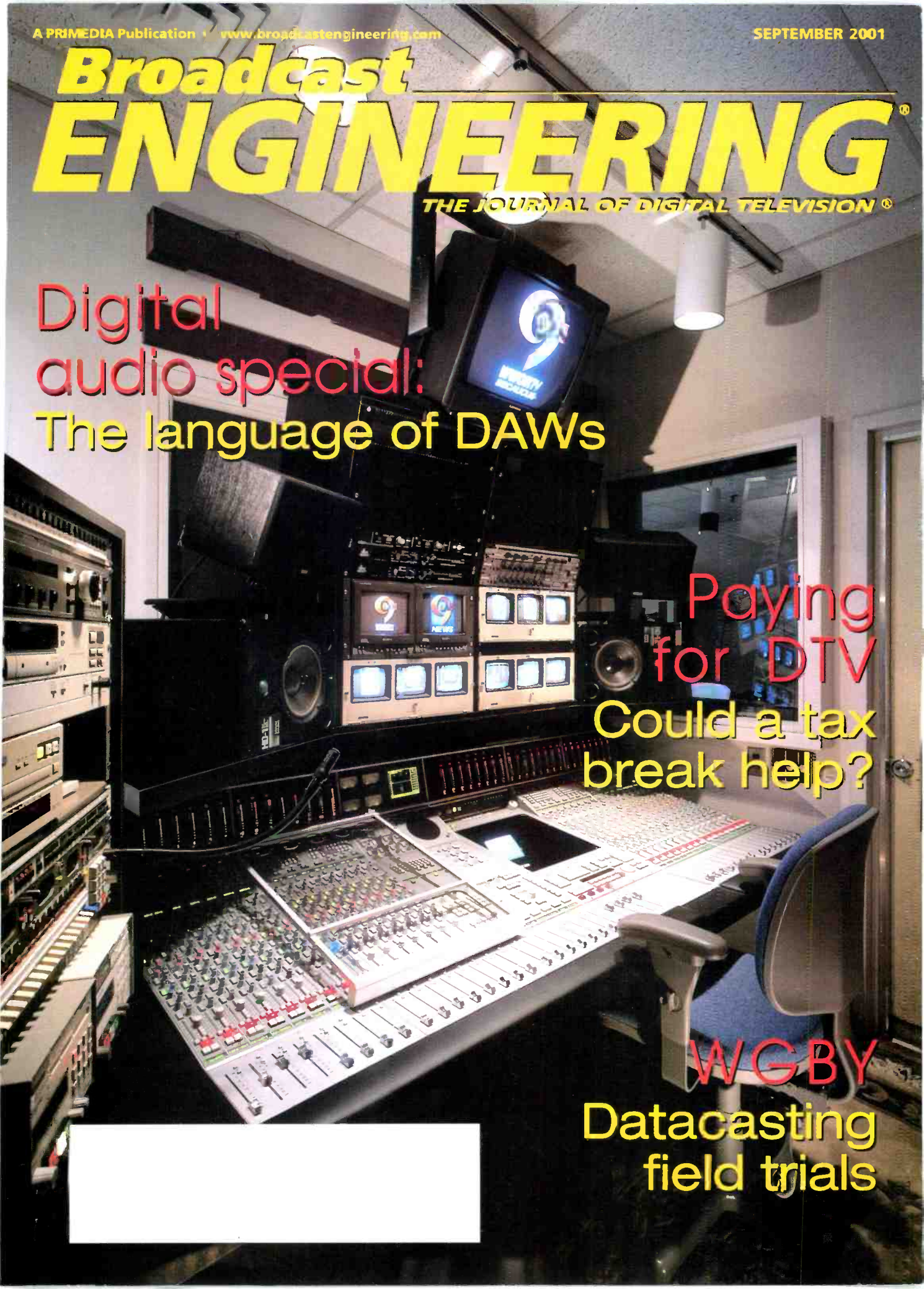
Broadcast ENGINEERING®

THE JOURNAL OF DIGITAL TELEVISION®



Digital audio special: The language of DAWs

Paying for DTV Could a tax break help?

WGBY Datacasting field trials

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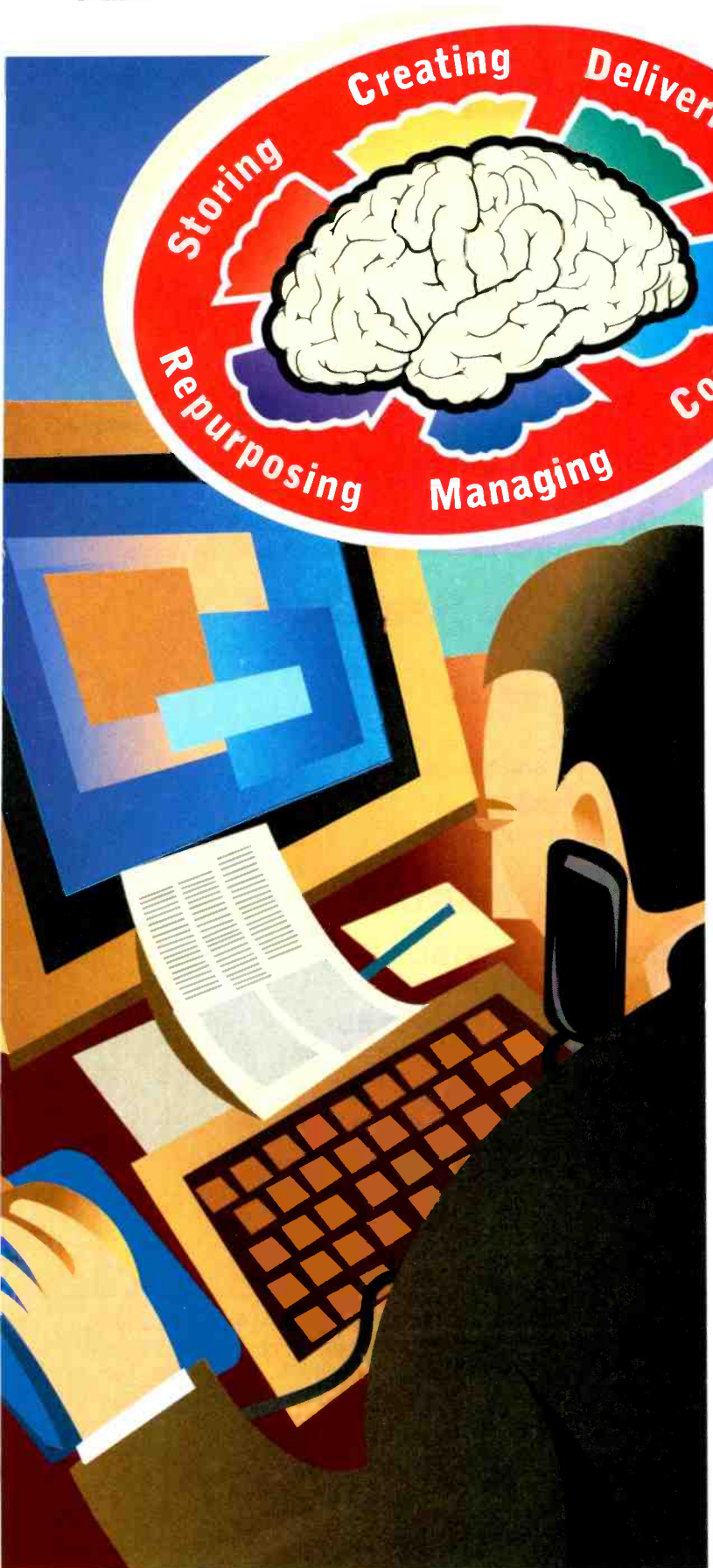

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ON THE COVER: A Solid State Logic Aysis Air digital broadcast console recently installed at WWOR-TV, the United Paramount network in New York. Photo courtesy Solid State Logic.

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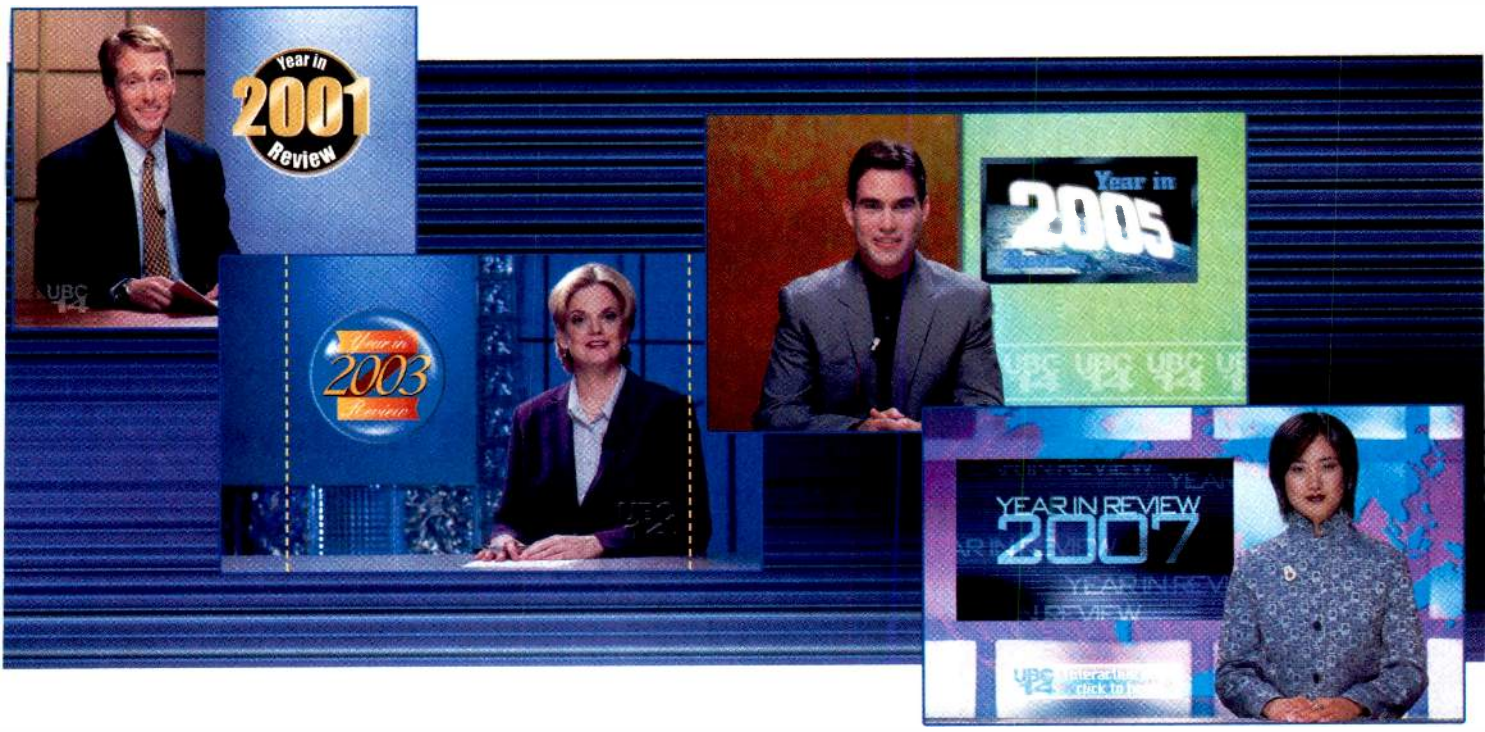

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DEMO ROOM

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FREEZE FRAME

A look at the technology that shaped this industry

VTRs and VCRs

In 1982, two companies promoted a hybrid VTR using "attachable VCRs" mounted on standard (non-recording) ENG cameras. The VCR used a ½-inch VHS-C recorder. These units were considered an alternative to the VRC ENG units just released. Name the two companies. Hint: The companies involved were not camera manufacturers. Enter by e-mail. Title your entry "Freezeframe-September" in the subject field and send it to: editor@intertec.com. Correct answers received by Nov. 1st, 2001, will be eligible for a drawing of *Broadcast Engineering* T-shirts.

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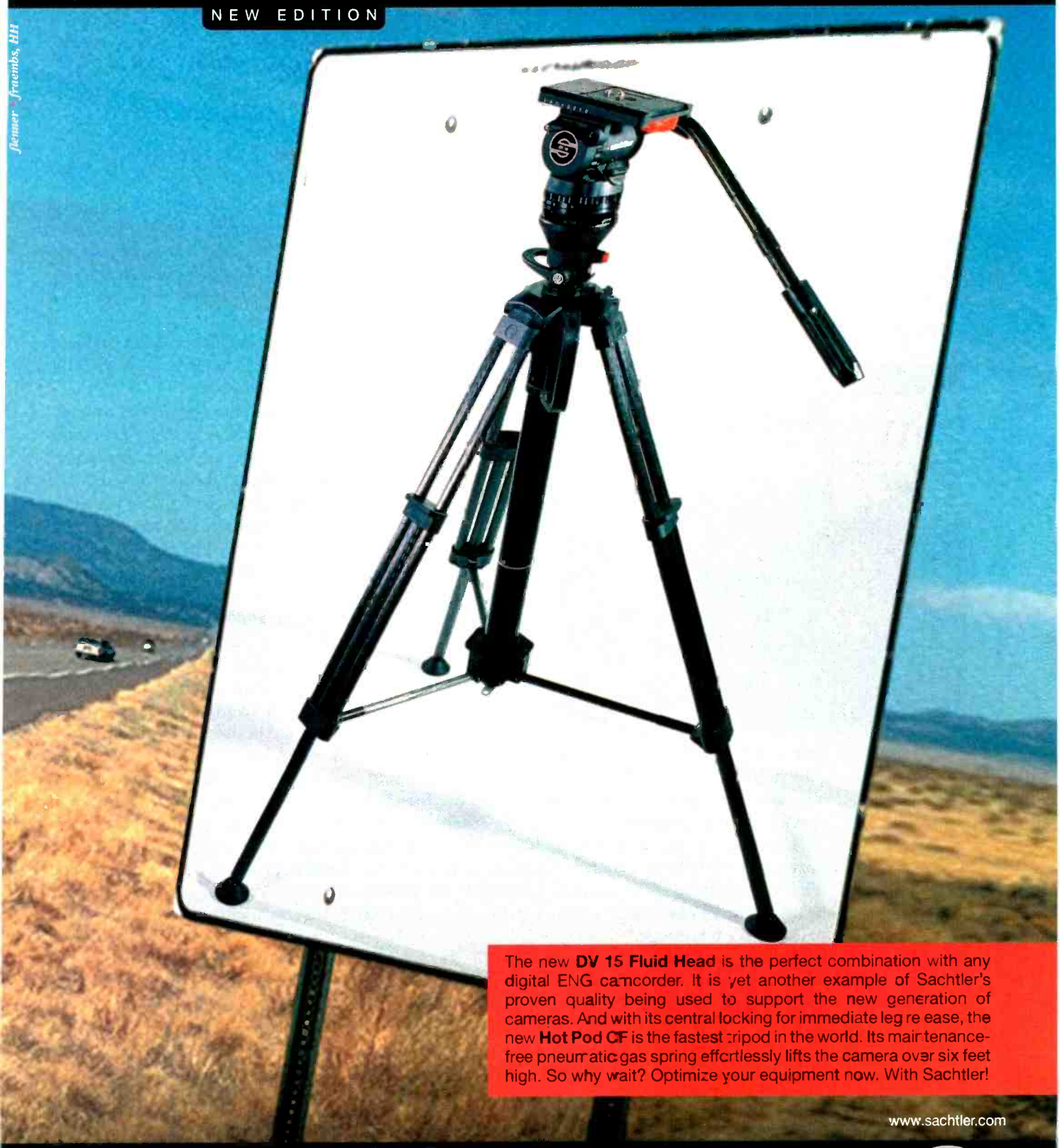

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Editorial

Make the switch by 2006

This month's issue of *Broadcast Engineering* provides readers with a truly unique and important article regarding our industry. For years now, stations have struggled with the imposing deadline of 2006, when their NTSC transmitters must be turned off and the spectrum surrendered. Consumers are facing the same deadline — they just don't know it yet.

In both cases, the issue hasn't been that digital TV isn't a "good thing." Rather, it's been that "it's too expensive." The issue all along has been how to pay for it.

Way back in 1997 this magazine suggested that some form of governmental support was needed to help broadcasters make the transition to DTV. We now have a specific solution to offer.

Let me ask you a question. If I could show you a way to spend $1,000,000 on DTV equipment and effectively get "paid back" $1,500,000, would you be interested? I'm not talking about sleight of hand. No monkey business or financial mumbo-jumbo. Hard cash, the kind you can take to the bank, invest or return to shareholders. Now are you interested?

In this month's article *Paying for DTV*, consultant Don Stendal describes in detail his plan, which would allow stations to build their digital facilities knowing that they'll get an immediate return on their investment in the form of a tax credit. A tax credit that not only carries forward, but also backward. If you've already built your DTV facilities, you get the same benefit as the station that's just getting started. This plan is so unique, flexible and innovative, that even if your station is strapped for cash, you'd be able to use the proposed tax credits to obtain loans to begin the process.

Even noncommercial stations benefit. They could sell their (in effect) tax credits to commercial stations. Those stations could bid for the extra credits, using them to build their own facilities, simultaneously creating revenue for the noncommercial stations.

But that's only one-half of the solution. How about the viewers? How can we help them also invest in DTV? Under Stendal's program, consumers also could apply for a tax credit based on their investment in DTV products. Television sets, STBs, even antennas could qualify as legitimate DTV reception equipment. Dollar-for-dollar expenses would then be used as a tax credit on the individual's tax return.

The plan's description begins on page 72. Read it. Then log onto the *Broadcast Engineering* website at www.broadcastengineering.com and register your vote for the plan.

Then contact your Congressional representative and express your support for the DTV funding plan. Full contact information is provided on the website. Help support this innovative plan. First vote at the *Broadcast Engineering* website. Second, contact your elected representatives. Be a part of the DTV solution by supporting the Make the Switch by 2006 program. We'll all benefit.

Brad Dick

Brad Dick, editorial director

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Reader Feedback

I love HDTV

Dear Editor:

I thought you might be interested in how I am promoting HDTV. I got the tag after I helped my second station with their conversion to HDTV, both early adopters. I have since worked with 5 other stations on their conversions.

Ry Alford
Atlanta, Ga

Calibrating the LFE channel

Dear Editors,

I am always pleased to see BE addressing audio topics, especially new-subjects such surround sound, and the June article *Mixing for Surround* was a worthy treatment.

I however must take issue with the calibration procedure described in the article. Surround array calibration is poorly understood and often done incorrectly in homes as well as production environments. Quite frequently, it is the .1 (or LFE or boom) channel that is set incorrectly.

The objective is to set the in-band level of the LFE channel for a level 10dB higher than the in-band level of the main speakers, as required in the 5.1 specification. This precludes the use of pink noise for two reasons.

First, the bands involved are different sizes and therefore even perfect loudspeaker/room combinations will give different readings on pink noise. Second, speakers and rooms are not perfect and the lumpy response they provide will give inaccurate indication of the in-band level. This last part is especially important in the lower frequency ranges where the main channels are most likely not delivering the lowest octaves at all and the room's resonant modes radically warp the response curves.

Complicating things even further is the fact that, very often, the main channels are not really full range even if driven discretely. Therefore the subwoofer often does double duty by reproducing the main channels' deep bass as well as low frequency effects via bass management.

Admittedly, all this was not the focus of this otherwise fine article. Only one paragraph was devoted to calibration. Still, if you have only oneparagraph then the following points should be stressed.

First, it is crucial to have the system properly calibrated. Along with all of the old reasons, surround has additional factors that were never encountered in mono or stereo. Second, calibration is not trivial and cannot be done by ear or with simple test signals and equipment. If you don't have the gear or the expertise, then by all means hire someone who does.

John Monforte

Dubbing from tape to CD

Editor:

I ran across your discussion of how to get audio DAT to CD and Dazzle Movie Star may be the program that the writer was looking for.

My problem is a little different in that I just want to transfer reel-to-reel audio to my CD burner. The computer has audio inputs but no software. Can you make any suggestions?

Patrick McGean

Steve Oppenheimer, the editor-in-chief of Electronic Musician, *a* Broadcast Engineering *sister publication, provides the answer.*

Transferring unedited mono or stereo audio from the open-reel deck to a computer and burning a CD is very easy. Obviously, you start by connecting the audio outputs of your open-reel deck to the audio inputs on your computer.

Many CD-burning programs handle stereo recording chores as well as noise-reduction and CD burning, so if your needs are simple, you should be able to do the whole thing with one inexpensive program. Make sure the software you select supports your CD-R drive.

If you look around, you will find plenty of choices. For most CD burning jobs, I like the latest versions of Roxio's Toast 5 Titanium for Macintosh and EasyCD Creator 5 for Windows can record stereo audio and burn CDs. Both programs include noise-reduction tools and several other useful features, support virtually every CD-R/RW drive on the market, and are relatively inexpensive. There are "lite" versions of both programs, but if you are doing a lot of transfers, you probably will find the extra features in the full versions are well worth the price. You can get more info at www.roxio.com. (More free advice: if you want Toast info, you will find it fastest via the roxio.com site map; the home page is not the greatest.)

If you want to do more advanced editing, you will need higher-level software such as BIAS Peak and TC Works Spark for Macintosh or Sonic Foundry Sound Forge and Steinberg WaveLab for PC. These products are extremely powerful, but you pay for that extra capability.

Steve Oppenheimer
Editor-in-chief
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News

New 8VSB solutions

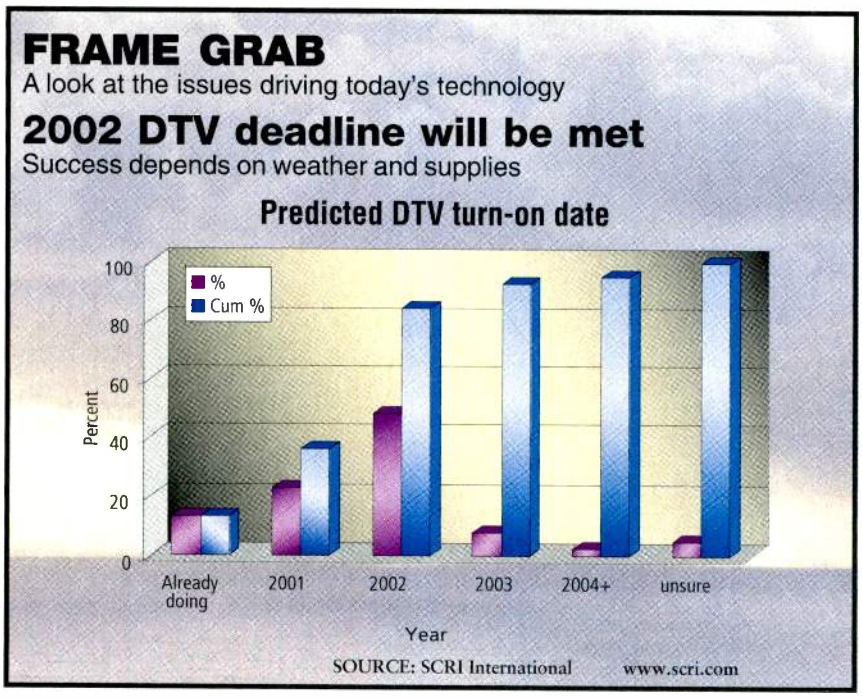
BY LARRY BLOOMFIELD

One of the major issues plaguing the acceptance of digital television is its inability to cope with multipath signals, often called ghosting. In analog, ghosts have little effect on reception, if you discount the fact that they can be downright annoying. When signal conditions are poor, you can still see faint pictures with fading sound. Unlike analog, with DTV you either get full service quality pictures and sound or nothing. Demultiplexing circuitry often cannot decode the correct packets at the correct time when multipath is present.

The industry has been hard at work attempting to solve this problem, since some of the blame for less than robust sales of digital sets has been placed on poor reception traced to multipath issues. In an effort to kick-start DTV set sales, Panasonic has developed a single-chip vestigial sideband (VSB) demodulator IC for digital terrestrial broadcast receivers.

The criteria set forth in the development of this new IC was quite simple: to reduce multipath interference and enable wider and more stable indoor antenna reception using a single chip of the large scale integrated (LSI) circuit type. The Panasonic chip reduces both dynamic ghosting, caused by reflection from moving objects, and static ghosting, caused by reflection from a static object. While a conventional LMS algorithm can cancel static ghosts, it will not handle dynamic ghosts.

While a conventional LMS algorithm can cancel static ghosts, it will not handle dynamic ghosts.



New LSI chip from Panasonic shown above. Set manufacturers hope reducing multipath interference will kick-start sales of DTV sets.

The Panasonic chip uses a newly developed architecture called simplified variable step LMS (SV-LMS) to reduce multipath interference. This approach passes the dynamic ghost signal through a conventional analog automatic gain control (AGC) amplifier and a response digital AGC amplifier in order to eliminate interference before decoding.

The new chip, which carries the designation MN88432, has approximately 3.2 million transistors, integrates most digital and analog front-end circuitry, and includes detection circuitry, a 10-bit A/D converter and PLL circuitry. Only the tuner is off-chip. The chip takes up just one-fourth the mounting area and can be produced for only one-third the cost of previous Panasonic LSIs. In addition, its overall package size is only one-fifth that of most conventional products.

Power-wise, the chip dissipates 0.6 watts, almost a fifth of its predecessor, due to clock control technology, the reduction of international voltage to 1.8V and the use of a four-layer 0.18-micron CMOS process. The part is housed in a 100-pin leaded chip-scale package that measures 12 mm².■

SEND Send questions and comments to: larry_bloomfield@primediabusiness.com.

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Remote control inventor honored

When it comes to inventors, names like Thomas Edison, Alexander Graham Bell and the Wright Brothers almost immediately come to mind, along with their respective contributions to our society. Mention the name Robert Adler and it probably draws a blank. Were it not for the Chicago Television Academy's recent induction of the 81-year-old inventor into their prestigious Silver Circle for the year 2000, chances are few people would connect Robert Adler with his invention.

Today's remote control has its origins in the original mechanical remote control shown in Robert Adler's left hand, which used aluminum rods cut to different lengths to produce ultrasonic tones to allow viewers to change the channel without leaving their seat.

Yet hardly a day goes by that today's television viewers don't make use of Adler's invention. It can be found on chairs, tables and couches in most households with TVs. More than any other item you'll come across, Alder's invention has contributed to increasingly sedentary television viewing.

So what is it that Adler invented? Robert Adler is the engineer who invented the first practical wireless remote control device for TV sets, dubbed the "Space Command," at Zenith Radio Corp. back in 1956. Adler's device used ultrasonic tones to actuate stepper motors in a TV set to turn the set on and off, change the channel, and adjust the volume. ■

Digital Rights place broadcasters at crossroads

BY CHARLES WALTNER

The development of digital technologies such as personal video recorders, video-on-demand and HDTV is forcing the creation of new content and advertising rights contracts.

Honey Berman, vice president of programming and licensing for SeaChange International, says broadcasters face the most complicated rights issue of the digital era.

Broadcasters, unlike movie companies or many cable networks, do not own most of the content that they produce, nor do they have direct control of many of the ads they run. On top of it all, cable operators now manage the broadcasting technology a majority of consumers use to watch local broadcasts.

"Broadcasters are caught in the middle," Berman says. "For the most part they're just re-broadcasting signals, and they have a lot of people they depend on for their businesses."

Local broadcasters have to work out new deals with content providers to account for the new digital technologies. Ironically, broadcasters have been mostly content to let cable operators and movie studios hash out the first deals.

Such a passive approach could prove dangerous. Digital manipulation of content will only become more prevalent as computing power and software sophistication increase. Broadcasters need to actively find the best ways to take advantage of this technology. If they don't, cable operators and satellite TV vendors certainly will.

Dan Sheeran, a senior vice president of worldwide sales and marketing at nCube Corp., Foster City, CA, says companies such as his can now deploy personal video recorder (PVR) capabilities into cable head-ends. In this way, broadcasters can gain at least some control over how consumers manipulate programming and possibly earn some revenue for providing the service to consumers.

This would require broadcasters to provide cable operators the rights to record and store their programming. Sheeran notes that broadcasters are afraid of such arrangements because PVRs make it easier for viewers to skip over ads. But he notes that if broadcasters do not opt for such a service consumers will simply use a TIVO or other similar device, which would take the process completely out of broadcasters' control.

Sheeran says that server-based PVR systems could let broadcasters encrypt digital signals as well as inserting code to prevent viewers from erasing ads.

To make use of such technology, broadcasters have to work out rights issues with cable operators and other content providers.

Even if broadcasters do not act to control PVR use, they will need to face the digital music sooner or later. Michael Ledwich, director of special development at Encoda Systems Inc., Denver, CO, notes that content providers are leery of HDTV. The crystal clear digital signal would be a pirate's dream. Without sophisticated signal encryption technology and farsighted rights negotiations, HDTV could languish without content.

The crystal clear signal of HDTV would be a pirate's dream.

Movie studios simply do not want their content broadcast over such technology without stringent pirating protection. Though HDTV is still years away from widespread use, such copyright protection issues need clarification now so the technology can be free to develop. Equipment with full encryption capabilities needs to be made as soon as possible, including the TV sets, Ledwich says.

Broadcasters face the huge task of reworking almost every aspect of their businesses to accommodate new digital technology. The sooner they get started, the better. ■

Charles Waltner is a freelance journalist headquartered in Seattle.

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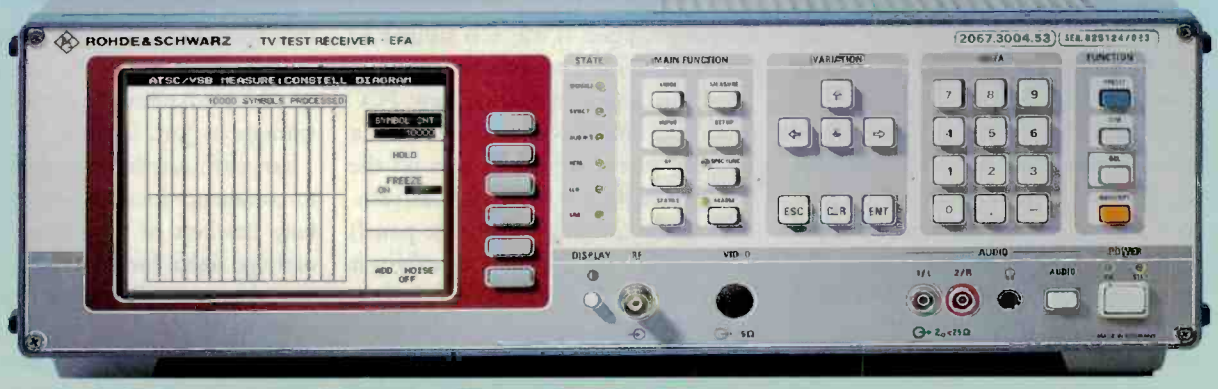

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EEO rules down but not out

BY HARRY C. MARTIN

The U.S. Court of Appeals in Washington has for a second time struck down the FCC's 2000 version of the EEO rules. In 1998, the Court found unconstitutional an earlier version, finding that those rules pressured stations to grant preferences to minority applicants by requiring them to compare the percentages of minorities on their staffs with the local labor force.

In 2000 the FCC adopted completely new EEO rules, offering two options. Option A was a complex set of recruitment requirements that did not specifically reference minorities. Option B allowed licensees to design their own recruitment plans, but required record keeping on minority applicants and hires.

In January of this year, the U.S. Court of Appeals struck down Option B because it focused more on results than efforts. The Court held Option B was unconstitutional, and stated that it was impossible to sever Option B from Option A in order to allow Option A to remain in place. The Court explained that the reason the FCC provided for adopting Option B was too similar to that for Option A to separate them.

In February, in response, new FCC Chairman Powell, with support from a majority of the commissioners on the FCC, asked the Court as a whole (rather than the normal three-judge panel) to reconsider the decision, something it rarely does. The Court agreed, but on reconsideration, again held the EEO rules unconstitutional.

The only option for further appeal would be the U.S. Supreme Court. The FCC has not indicated an interest in fighting that battle. Instead, Chairman Powell has stated publicly he would like the other commissioners to join him in proposing new rules more likely to be found constitutional. A new proposal could surface by early next year.

Shortly after the first decision, the FCC suspended its EEO rules while it awaited the Court's decision. Assuming no appeal to the U.S. Supreme Court is taken, the EEO rules will officially terminate shortly when the U.S. Appeals Court's second decision becomes final. In light of the possibility of new EEO rules, however, it may be advisable for stations not to dismantle their EEO record-keeping systems. While no penalties could be imposed for suspending record keeping while no rules are in effect, it may be administratively more difficult to restart than to keep systems in place pending the outcome of any future deliberations.

Satellite must-carry news

July 1, 2001, was the deadline for full-power television stations to send a letter to EchoStar and DirecTV electing either must-carry or retransmission consent on the satellite operator's local-into-local service in their markets. The right to carriage on the satellite systems exists only in markets where the satellite operator is currently picking up the signal of at least one commercial station and retransmitting it back into that station's local DMA ("local-into-local" service). Satellite operators are required to commence carriage of these stations by Jan. 1, 2002.

However, satellite operators are free to commence local-into-local service in new markets at any time, triggering carriage rights for stations in the newly served market. When an operator intends to provide local-into-local service in a new market, it must alert all local stations in that market, in writing, at least 60 days prior to commencement of service. Then, within 30 days of receipt of the notice, each television station must provide written notice to the satellite operator as to whether it elects must-carry or negotiation of retransmission consent for carriage. The station's notification must include its call sign, address, community of license and DMA assignment. The letter must be sent by certified mail, return receipt requested.

In the meantime, the satellite industry is continuing its legal challenge to the satellite must-carry requirements. It has recently consolidated its two appeals with the U.S. Court of Appeals for the 4th Circuit in Richmond, VA, and received an expedited hearing schedule. The industry hopes to have a decision from the Court prior to the Jan. 1, 2002, deadline.

Federal Census data

The results of last year's Census are being released this summer state-by-state. This data will assist those seeking marketing information for the coverage areas of their stations. As in decades past, the Census data is extremely detailed and provides demographic information specific to individual cities, towns and neighborhoods. The data is available on the Internet at the www.census.gov. ■

Dateline

Annual regulatory fees are due for commercial TV stations Sept. 10 through Sept. 21, 2001. Fee payments are made to Mellon Bank in Pittsburgh and must be accompanied by a signed FCC Form 159.

Oct. 1 is the filing deadline for biennial ownership reports for stations in the following states and territories: Alaska, Florida, Guam, Hawaii, Iowa, Mariannas, Oregon, Puerto Rico, Samoa and Virgin Islands.

Oct. 10 is the deadline for placing July – September issues/programs lists and children's TV programming reports (FCC Form 398) in stations' public files.

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

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DSL/cable modem update

BY MARK R. SMITH

Cable modems, or Digital Subscriber Lines (DSL) — which will prove dominant in the broadband market?

The answer seems to be a resounding "neither." Last year approximately 2.5 million DSL lines and about 3.5 million cable modems were in place. There appears to be little argument they can coexist, and the main question seems to concern how to best use infrastructure already deployed by the telcos and cable companies.

Many in the industry want to know when the technology's growing pains will be worked out and afford users more services, such as video-on-demand and games. Several factors must be analyzed before making any estimate, not the least of which concerns distance: just how far signals can be pumped via copper phone lines, or how far cable can (or will) be laid.

In rural areas, laying cable is very expensive, and phone lines, technically, can only take the DSL signal out about three miles. In major metropolitan areas, however, given the high density, a firm laying ten miles of infrastructure can ensure easy access to many buildings or consumers.

However, according to Robert Beliveau, product marketing manager for Copper Mountain Networks in Palo Alto, CA, cable companies do not always serve businesses. In this case, DSL may be an option for those businesses in need of phone lines and data networking, provided phone companies make DSL service available.

With existing systems in place, it would cost broadcasters about $2 per user to distribute a movie.

It makes sense economically for them to do so, as businesses often pay a bit more than consumers for basically the same service. It only costs consumers about $50 a month for DSL or a cable modem. For businesses the range is often $200 to $500 a month for DSL.

Beliveau noted that in the early days of DSL, cities like San Jose, Boston, Washington, Chicago and Los Angeles were hot spots, due to the major concentrations of people and businesses in these areas, which meant hundreds of thousands of people were reachable by a central office.

But there are only so many major markets, and smaller markets offer slim returns, if any. Also, after a couple of miles, high speeds dissipate. That's fine for the average Internet user, but businesses need symmetrical lines, since consumers surf to them and employees surf everywhere else.

So, along with the old copper phone lines already in place for DSL users, out come the multiplexers and D-SLAM, a digital subscriber line access multiplexer. While they are costly — approximately $10,000 for the basic platform and $200,000 for an elaborate system — they are not as expensive as laying new copper. Most of the cost is backhaul, at any rate.

Cable also becomes expensive when upgrading old systems or laying out additional infrastructure for small markets. Symmetric vs. asymmetric bandwidth is an issue as well, as much of the cable data runs only one way, from the company to the home. Cable plants, however, are set up for high bandwidth going out and lower returning to the headends.

Now back to DSL, which has two generic classes of symmetrical technologies (S-DSL, H-DSL 2 and the new standard, G.SHDSL) for business services, with equal bandwidth in both directions. There also are two assymmetric versions — ADSL using Discreet Multi-Tone (DMT) modulation and G.lite (lightweight ADSL), which is up to 2Mb downstream and 512Kb back upstream. The lower speed makes it more economical and requires less power to the modem.

But there are other ways and means to distribute the DSL signal. San Jose-based Symmetricom offers a way to

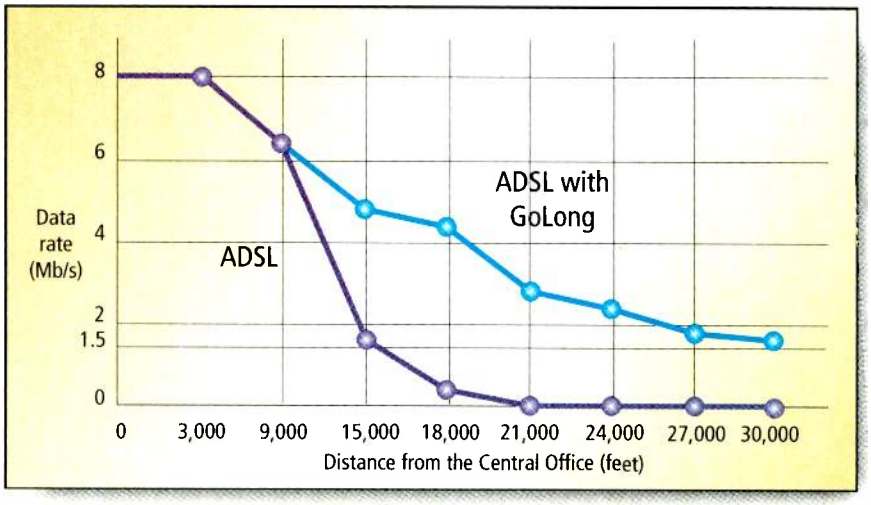

Figure 1. San Jose-based Symmetricom's active GoLong component increases users' reach and delivers more bandwidth via split signal amplifications.

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maximize bandwidth via copper. It is 8Mb when it leaves the central office, 1Mb on the return. It too attenuates, meaning users cannot tap into the higher frequency. At 9,000 feet it drops from 8- to 1.5Mb, and it is lost altogether at 12,000 to 18,000 feet.

To bridge the gap, Symmetricom markets the telcos with GoLong, an active component allowing users to double reach and triple deliverable bandwidth via split signal amplifications. (See Figure 1.) Ironically, it is similar to cable firms boosting their signal. It works for broadband Internet up to 30,000 feet, which Don Skipwith, vice president of business development for Symmetricom, noted covers more than 97 percent of all copper loops in the United States.

Another concern is what can be done to improve video. The phone companies are investigating providing two TV channels, broadband Internet and voice over a single pair. Unlike cable TV, the channels are video-on-demand. So users can have the TV and computer operating independently, along with phone service. It requires 6Mb which, again, roll off from 3000 to 5000 feet. Normally, 6Mb are needed to send the video signal 12,000 feet with GoLong.

Such technologies boost an already rising market. Projections for DSL and cable modems vary, but they are huge. While the latter got a roughly two-year jump on DSL, many analysts maintain that DSL sales will surpass those of cable modems in five years.

Numbers obtained from Verizon reveal that 70 percent of the mass (consumer and small business) broadband market uses cable modems, with the rest using DSL (28 percent) and some satellite. Fiber optics and wireless also will come into play over time.

Yet there are other kinks to be smoothed over as well. One source noted that data rates of DSL and cable vary dramatically and are almost never reliable. Everything along the path — D-SLAM, DS-3 connection, backhaul — tends to be oversubscribed, resulting in an uncontrolled network that cannot do live video (aside from interview shows) reliably and cuts out on occasion.

Even then, the Internet runs reliably at 200,000- to 300,000Kb, about a third of what is needed for a talking head. Full-screen video calls for at least 750,000Kb, so if the user buys up to 10Mb on cable, or 7Mb DSL, the Internet itself will limit the picture. One possible solution? To deliver video from a server inside each individual network.

Today, full-screen video requires cooperation from the network (except in programming) and servers and will probably be limited to between five and 10 percent of users on the network at once, since networks are not robust enough to deliver megabits to all users simultaneously. This means that broadcasters will need to have a costly arrangement with network operators (AOL, Verizon, Time Warner) to reach users.

Technology will solve the problems via upgrades eventually, but the infrastructure is so large and the business deals so uncertain (worth tens of billions of dollars), it will cost broadcasters about $2 per user to distribute a movie — appropriate for a huge event, but too much for the average show. ■

Mark R. Smith is a freelance writer and has covered broadcasting and post production for a decade. He resides in Odenton, MD, and can be reached at msmith1277@aol.com.

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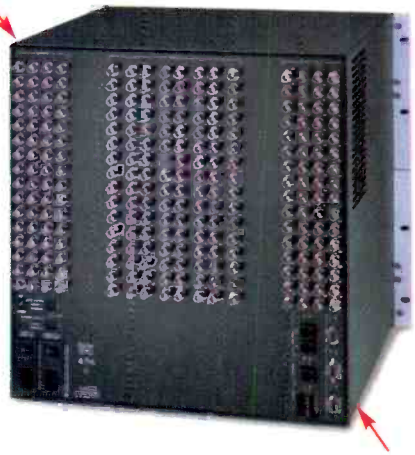

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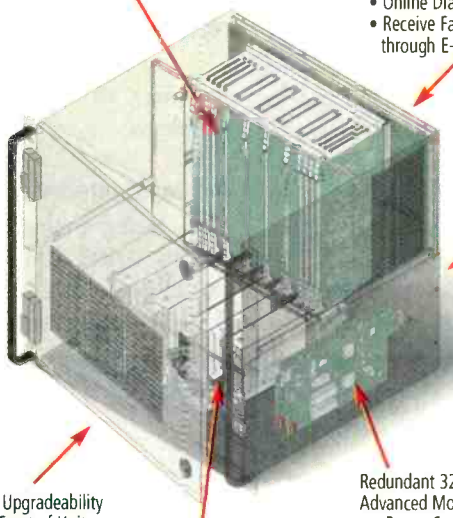

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Transition to Digital

New delivery technologies

BY MICHAEL ROBIN

New video compression technologies differ from the composite video concept. They use the MPEG-2 concept with all its permissible variations. The MPEG-2 concept results in a more efficient compression and maintains a reliable performance level at considerably reduced bit rates. In addition, the level of performance is a user choice. The MPEG-2 compression methods start with a signal conforming to the ITU-R BT.601 standard at the 4:2:2 level. The system works best if the I/O ports are SDI@270Mb/s. This would normally happen when the operational facility is fully digital.

In real life, it is found that the majority of telco service users feed and request NTSC composite analog signals to interface with their facilities. This mandates the use of analog composite NTSC-to-SDI@270Mb/s decoders at the MPEG-2 encoder input and SDI@270Mb/s-to-analog NTSC decoders at the MPEG-2 decoder output. This article will deal with the decoding of NTSC signals and its problems.

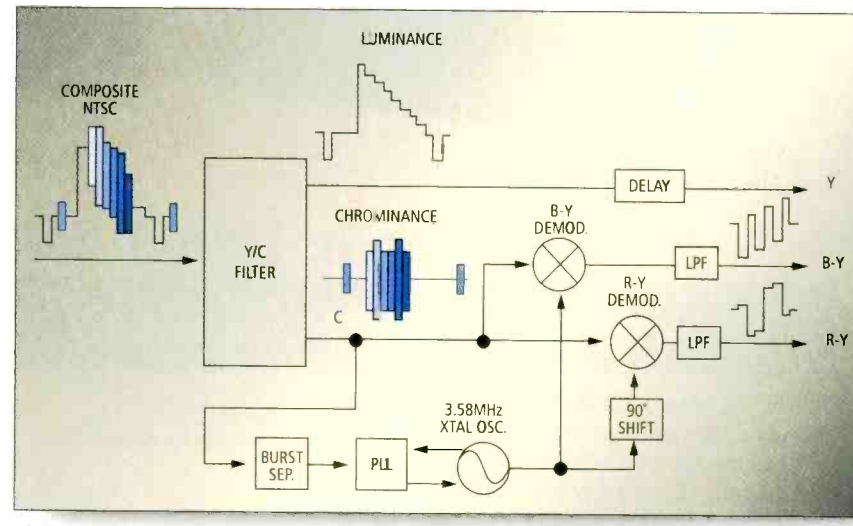
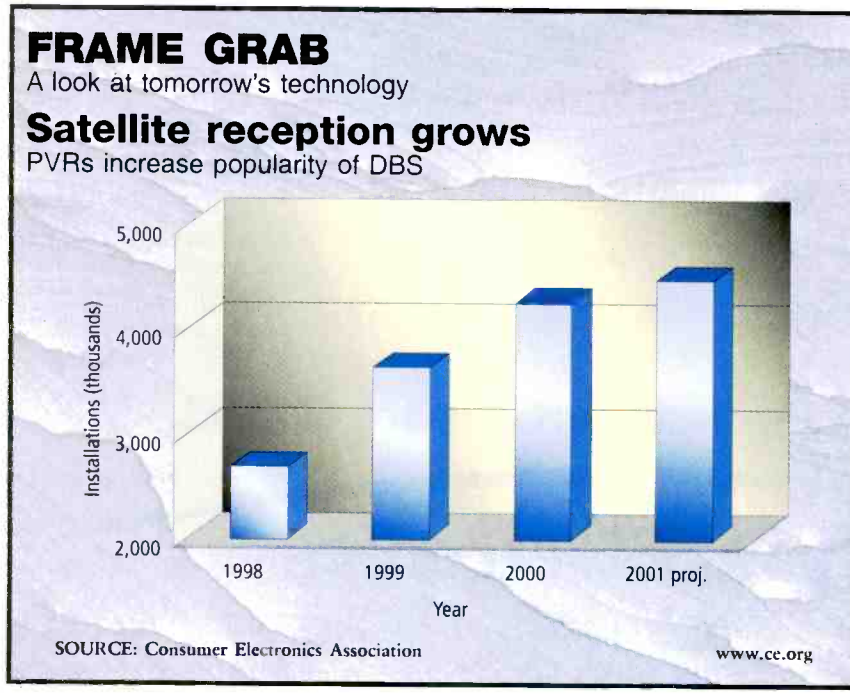


Figure 1. Simplified block diagram of an NTSC Y, B-Y, R-Y decoder.

The input interface concept

Interfacing analog NTSC source signals to SDI@270Mb/s requires decoding to basic analog components and digitally converting them to their digital equivalents as per ITU-R BT.601. While encoding to analog NTSC is a relatively simple process, the decoding back to components is difficult. The system was originally conceived as 1-way: camera to transmitter to receiver. With modern production requiring many passes through various types of production equipment, the tendency has been to operate in component, analog or digital, to avoid concatenation effects and encode to NTSC only once: prior to transmission. Using a decoded NTSC signal to drive an MPEG-2 system introduces unnecessary decoding artifacts. While these artifacts can be reduced, they cannot be completely eliminated.

Figure 1 shows a simplified block diagram of an NTSC B-Y/R-Y equiband decoder. The original 1953 NTSC encoding process proposed unequal bandwidth I/Q chrominance components instead of the original, and later universally adopted, B-Y and R-Y components. The aim was to allow for a wider bandwidth, and consequently resolution, for the I component chosen to carry face-tone information. This created an unnecessary encoding and decoding complication and



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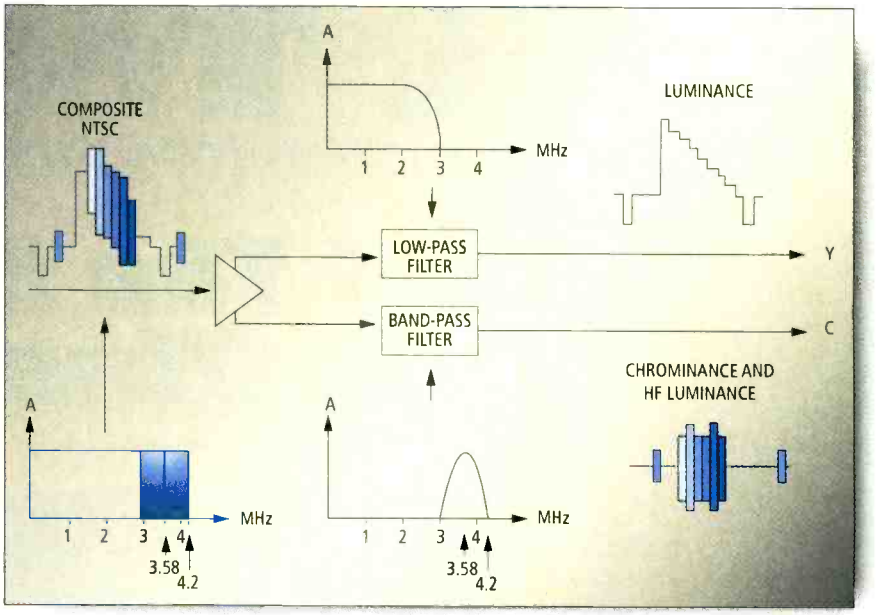

Figure 2. Simplified block diagram of low-pass band-pass Y/C filter.

was quickly discarded by studio equipment and TV receiver manufacturers, which used B-Y/R-Y instead of I/Q encoding and decoding. PAL and SECAM never even considered the I/Q concept.

The decoder consists of two parts: the luminance (Y) and chrominance (C) separator, and the chrominance decoding. The basic chrominance decoder consists of two demodulators fed with two recovered subcarriers in quadrature (90⁰ phaseshift) which, if fed pure chrominance, can recover the original color information without fail. In order for the chrominance demodulators to operate satisfactorily, it is important that the Y/C filter completely separates the luminance and the chrominance information. This is, however, a practical impossibility. Various filtering schemes are either rudimentary or feature various degrees of sophistication without achieving perfection.

Figure 2 shows a simplified block diagram of an unsophisticated Y/C filter. Essentially, luminance information is recovered by low-pass filtering the composite NTSC signal to 3MHz, thus removing all higher frequencies and the luminance detail they carry. A 3MHz luminance bandwidth results in a horizontal resolution of the order of 240LPH, roughly equivalent to a better VHS tape deck. The chrominance information is recovered by band-filtering the NTSC signal to a ±600KHz spectrum around the suppressed chrominance subcarrier of 3.58MHz. What is ignored here is the fact that the

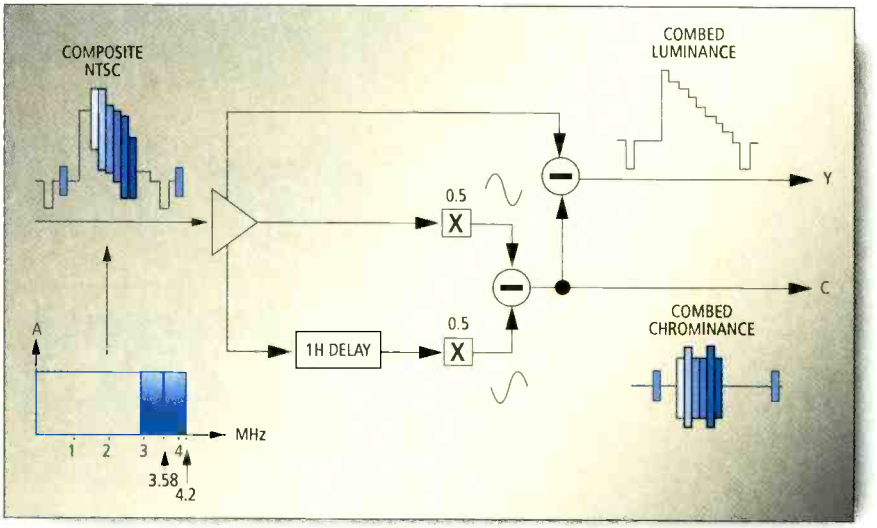

Figure 3. Simplified block diagram of a line-comb Y/C filter.

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spectrum around the chrominance subcarrier contains luminance information interleaved with the chrominance information. The recovered chrominance signal is, therefore, contaminated with high frequency luminance information which, when decoded, produces "cross-color" effects resulting in spurious and flickering color displays.

Figure 3 on page 24 shows a simplified block diagram of a simple comb filter. The comb filter takes into consideration the following:

- The chrominance subcarrier alternates its phase on a line-by-line basis as a result of its frequency being a multiple of half the horizontal scanning frequency; and
- In most pictures, the brightness and the color information do not change abruptly from line to line.

Consequently, subtracting the delayed signal of the preceding line from the information of the present line cancels, or "combs out," the luminance information and enhances, or "combs in," the chrominance information. In Figure 3, a 1H (the duration of one TV line) delayed signal is subtracted from the present line yielding "combed chrominance." The two signals are suitably reduced in amplitude (x0.5) to recover the normal amplitude chrominance signal. The combed chrominance is subtracted from the composite NTSC signal, yielding "combed luminance." Because all luminance information has been removed from the chrominance signal, no cross-color effects occur. A similar, but less perceived, "cross-luminance" effect also is eliminated. Now all this works if the assumptions made above are true. If, however, there are sharp transitions between the lines in the same field, consecutive fields or consecutive frames, the comb filtering fails, and the result is known as "hanging dots," resulting from the non-removal of chrominance from luminance.

A solution to the failing of the comb filter is to use an adaptive comb filter. The adaptive comb filter senses the failure of the comb filter and instantly switches to a LP/BP filter for the duration of the disturbance.

Chip manufacturers offer a selection of LP/BP, line-comb, field-comb, frame-comb or combinations such as adaptive filtering oscillating between comb and LP/BP. Some of the available chips digitize the composite NTSC analog signal and carry out the filtering and the decoding in the digital domain. Field or frame combs, while more efficient for operational environments where an operator uses the most satisfactory filter given the ever-varying characteristics of the image, are not advisable for a network distribution environment where the decoder operates unattended.

So the best choice for an MPEG-2 feed would be an adaptive line-comb filter. A much better choice is to feed the MPEG-2 encoder with an SDI@270Mb/s signal and avoid all the hassles of decoding NTSC. ■

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

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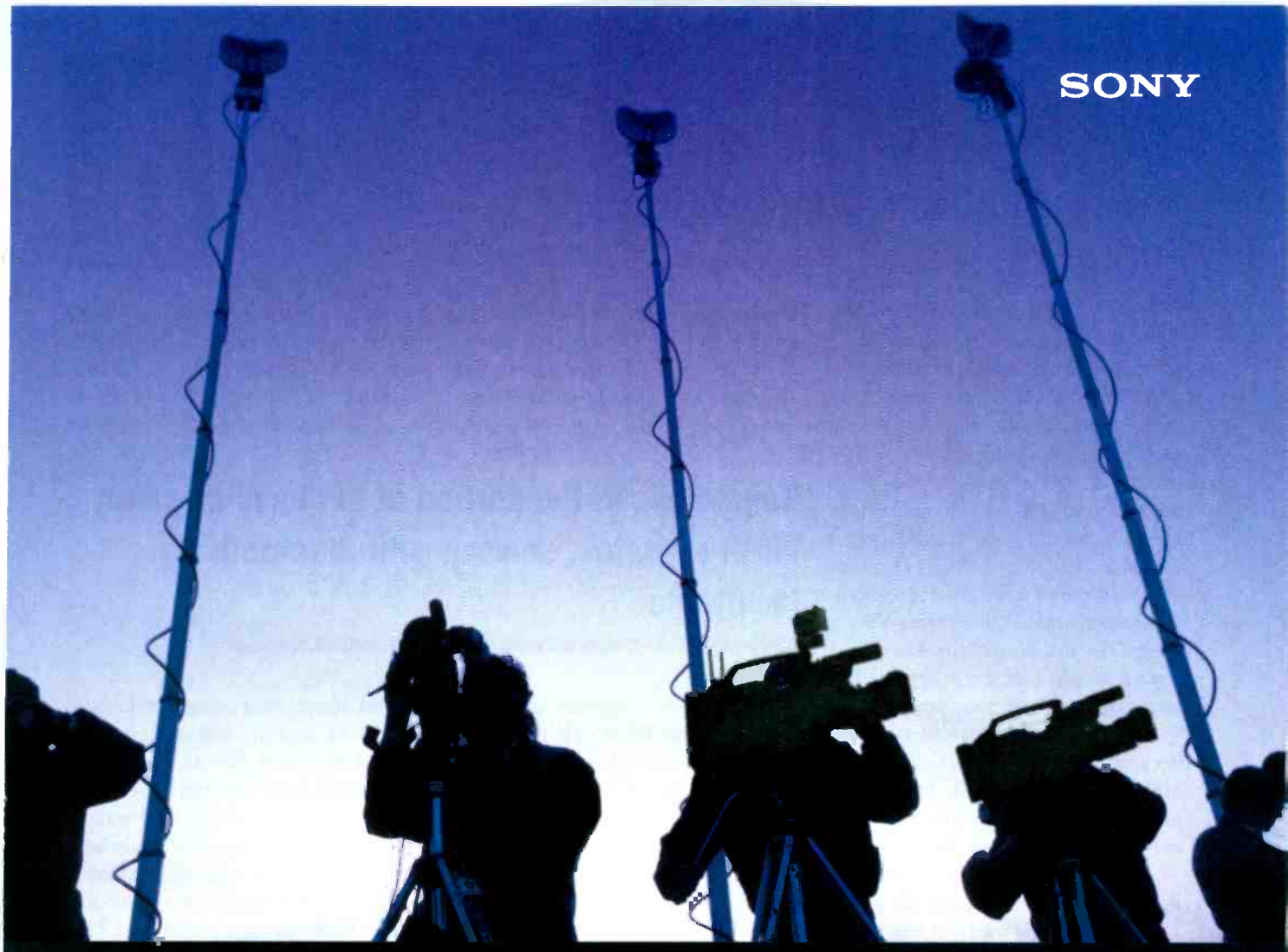

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Wireless technology for computers

BY BRAD GILMER

There is a battle brewing between two major wireless networking standards: Bluetooth and IEE802.11b or Wi-Fi. There are some other wireless networking technologies out there such as HomeRF, which is a force in its own right, but Bluetooth and Wi-Fi are the major contenders. At first glance, it would seem that Bluetooth would have it all over 802.11b. After all, you have to admit that a technology named after a 10th century Viking King (Harald Bluetooth) has got a certain amount of curb appeal. But upon closer inspection, you will see that there is not a clear winner, and perhaps these two technologies are not competing after all, but in fact may work together to make your computing experience wire-free.

First, let's start with the similarities. Both systems use frequencies in the 2.4GHz band licensed for industrial, science and medical uses (ISM). Both systems allow users to connect computer devices together to form networks without wires. Both systems allow peer-to-peer networking, and both systems allow you to connect a wireless-capable device to the Internet via a network.

Here are some of the differences. Bluetooth allows users to create Wireless Personal Area Networks (WPANs). Transfer speed is about 1Mb/s. The technology is designed for short distances (up to about 30 feet) and can be used as a wire replacement technology, interconnecting devices such as laptops, cell phones and PDAs. It permits a total of eight devices to be connected together through something called a piconet. Devices on a piconet all use the same "channel." Devices on different channels can overlap, operating on separate piconets. It is possible to join piconets together into larger networks, but Bluetooth technology seems to be targeted more at small ad hoc networks. These are created whenever two devices using Bluetooth come within 30 feet of each other. (See Figure 1.) Bluetooth manufacturers frequently mention synchronization and exchange of files and information between personal devices such as cell phones and PDAs as typical applications for piconets.

Out of a total of eight possible connections on a piconet, Bluetooth supports three synchronous connection oriented (SCO) links, which can be used for headsets or cordless telephony.

Regardless of the portion of the band in which Wi-Fi operates, sharing with Bluetooth is inevitable.

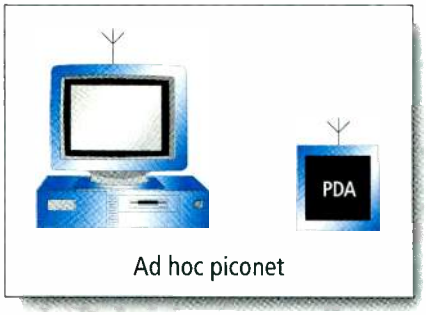

Figure 1. Ad hoc piconets are created whenever two Bluetooth devices on the same channel are near each other (within about 30 feet).

DATA RATE	MODULATION SCHEME
1Mb/s	Differential Binary Phase Shift Keying (DBPSK)
2Mb/s	Differential Quaternary Phase Shift Keying (DQPSK)
5.5Mb/s and 11Mb/s	Quaternary Phase Shift Keying/Complementary Code Keying (QPSK/CCK)

Table 1. Wi-Fi uses Direct Sequence Spread Spectrum (DSSS) at the above data rates and modulation schemes.

(Think about wireless headsets for your cell phone, and you will be on the right track.) Bluetooth has an eye on low power consumption and small form factor. A primary design goal was for Bluetooth technology to be implemented in CMOS on a single chip. Many of the user requirements for Bluetooth came from the cell phone and PDA community. Bluetooth uses a frequency hopping scheme (1600 hops/sec) and Gausian Frequency Shift Keying (GFSK) modulation. While bridging to a wired LAN is possible using Bluetooth, protocol conversion is required.

The other technology — 802.11b, or Wi-Fi — is used to create Wireless Local Area Networks (WLANs). Transfer speed is about 11Mb/s, but 53Mb/s is coming soon. Range for Wi-Fi systems is between 300 and 900 feet outdoors. For those of you familiar with wired networks, Wi-Fi will seem very familiar. It supports true multipoint networking, including functionality such as broadcast, multicast and unicast. Since Wi-Fi uses MAC addresses, a problem caused by common device IDs is virtually impossible. The system uses the same sort of collision and backoff technology as conventional Ethernet with some modifications. Collisions are caused when more than one device tries to talk at the same time. Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)

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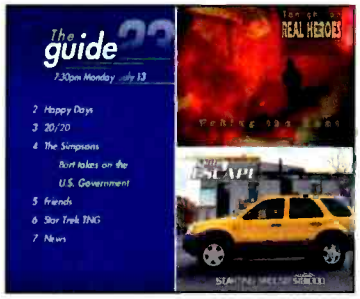

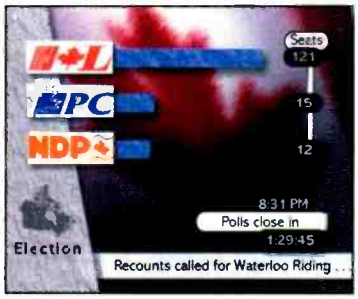

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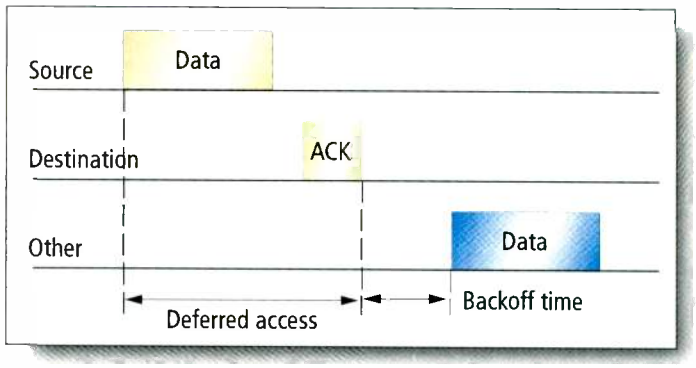

Figure 2. CSMA/CA avoids collisions by deferring transmission until the channel is clear.

is a technology used by Wi-Fi to avoid collisions. In this system, fast acknowledgement of packets received is key. A device wishing to transmit checks to see if the channel is clear. If it is, the device begins to transmit. It then pauses to receive an acknowledgment from the receiving device. The technology is designed so that acknowledgements are given high priority, and they are generated very quickly. If another device wants to transmit while the channel is in use, it defers access and then backs off for a predetermined amount of time and tries again. (See Figure 2.) This is similar to existing technology used on wired Ethernet. There is one catch to this scheme: It assumes that all devices can hear all other devices. If there are "hidden devices," then an alternate scheme is employed whereby a device can reserve space for a given amount of time. This information is relayed through the network, and devices communicate based upon this timeslot negotiation.

Wi-Fi uses Direct Sequence Spread Spectrum (DSSS) at four different data rates. The modulation used depends on the speed of the link. Table 1 on page 28 lists different data rates and modulation schemes.

While you can create ad hoc networks using Wi-Fi, its history is in providing wireless access to a network. Figure 3 shows how a large network of wired and wireless devices can be connected using Access Points or AP. Since the same protocols are used on the wired and wireless network, a protocol converter is not required.

Obviously, Wi-Fi is an IEEE standard. 802.11b is the current version. A new version of 802.11a is being drafted with enhanced features and increased speed.

The Bluetooth Special Interest Group is submitting their work to the IEEE 802.15 committee for consideration as the standard for Wireless Personal Area Networks (WPAN).

As mentioned earlier, Bluetooth and Wi-Fi may coexist in one facility. However, there may be problems using them in close proximity at the same time. Bluetooth selected FHSS, using 1MHz channels and a hop rate of 1600 hops/sec (625 microseconds in every frequency channel). Bluetooth uses 79 different channels in the United States and most of the rest of the world. IEEE 802.11b (Wi-Fi) opted for DSSS, using 22MHz of bandwidth (passband) to transmit data with speeds of up to 11Mb/s. A Wi-Fi system can use any of 11 22MHz subchannels across the allocated 83.5MHz of the 2.4GHz frequency band. A maximum of three Wi-Fi networks can coexist without interfering with one another. Geographies outside of the United States may support more or fewer than 11 selectable subchannels. However, regardless of the portion of the band in which Wi-Fi operates, sharing with Bluetooth is inevitable. There is a good chance that the two will interfere with each other under the right circumstances. As wireless systems become more common, you should be aware of this fact. Furthermore, as Bluetooth technology begins to be deployed in cell phones, PDAs and other devices, it could cause havoc if someone carrying one of these devices walks into an area with critical equipment operating on a Wi-Fi network.

Finally, a word about security. Both Bluetooth and Wi-Fi have security measures including encryption and authentication. But as you know, there is nothing one person can invent that another cannot figure out. As with all networking technologies, you should design your network with security in mind whether it is wired or wireless.

There is a wealth of information about Bluetooth (www.bluetooth.com), Wi-Fi (www.wi-fi.org) and HomeRF (www.homerf.org) on the Web. A search on any of these terms will bring up a vast amount of information. ■

Perhaps these two technologies are not competing after all, but in fact may work together to make your computing experience wire-free.

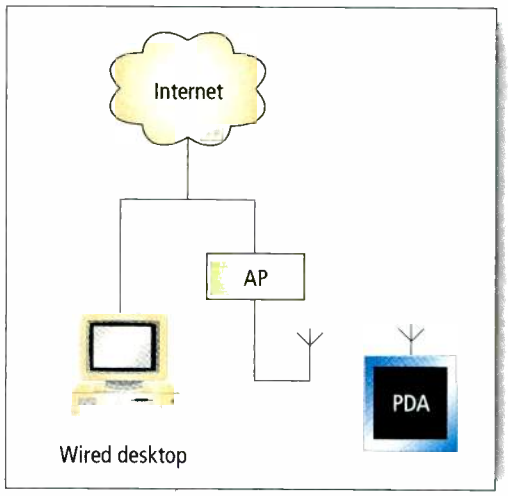

Figure 3. Using Access Points (APs), Wi-Fi networks can be combined with traditional LANs to provide Internet access.

Brad Gilmer is president of Gilmer & Associates, executive director of the AAF Association and technical facilitator of the Video Services Forum.

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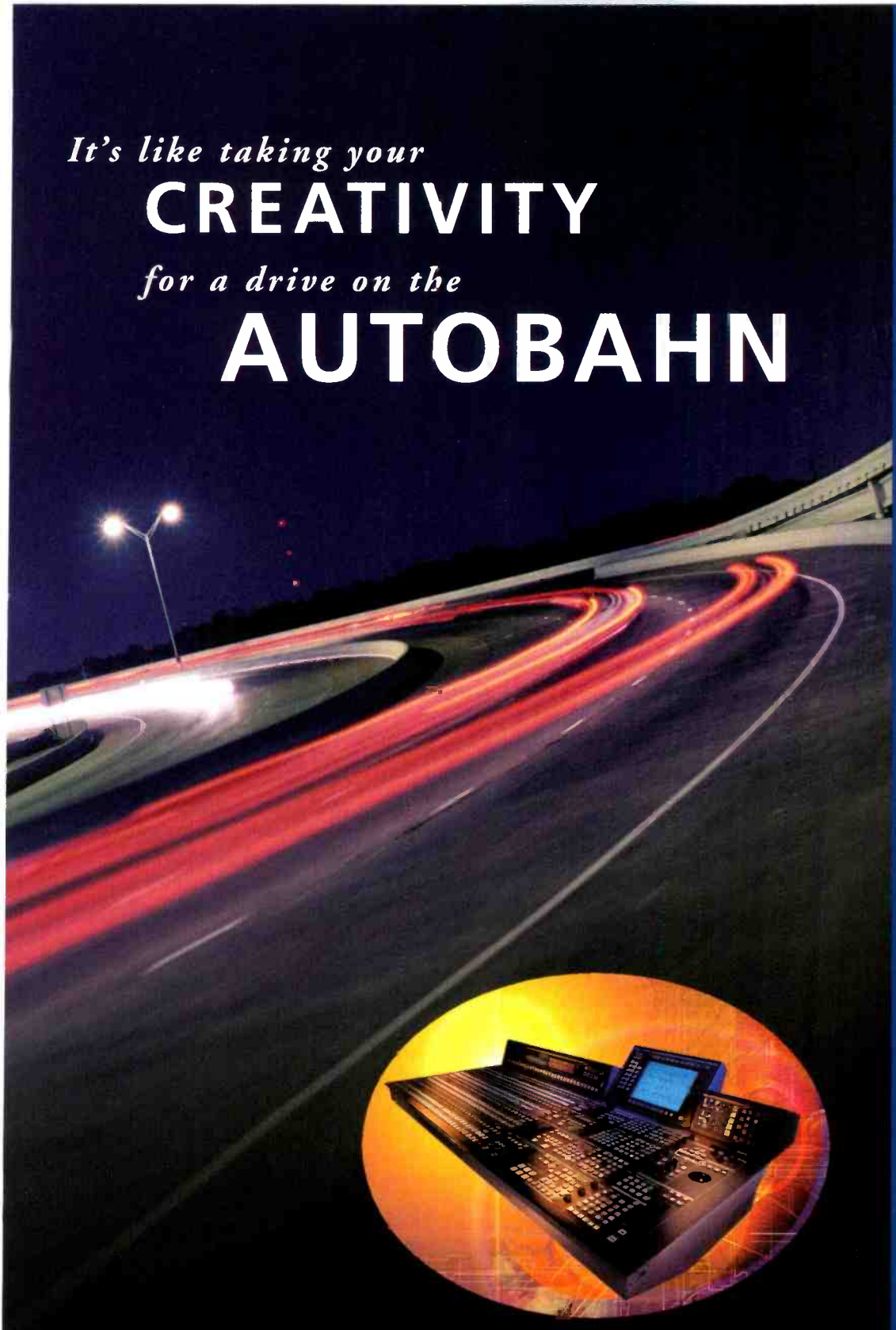

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Selecting a streaming partner

BY STEVEN M. BLUMENFELD

For the past few years I have been writing about streaming media and interactive technologies. I have tried to showcase some of the leading companies in the industry and give a realistic view of what makes them leaders. Looking back I have noticed that sometimes I have been right and sometimes wrong. Lately some of the showcased companies have gone belly up, while others have become industry stalwarts.

When selecting a streaming partner, no fly-by-night operation will do. There are many technicalities in delivering good online streaming media. In many cases the initial setup costs are not for the squeamish. So choosing wisely is very important. I have known many deals where the due diligence process required the submission of financial, operational and strategic documentation.

When selecting a streaming partner, no fly-by-night operation will do.

I have written extensively about I-Beam, Akamai and even Digital Island (which was recently bought by Cable and Wireless). Many times I have overlooked Globix as an also-ran. They entered into the industry late, after all the hoopla of the past two years. Their first real commitment to streaming media came last year with the founding of a dedicated group based out of Santa Clara, CA.

In recent months, Globix has come into its own, with major wins for online media streaming.

Organizations such as Radio Free Virgin, House of Blues, and ClearChannel Interactive Group, have chosen Globix on the basis of its strong network backbone and its highly scalable streaming content distribution network (CDN).

Globix has deployed its new EarthCache streaming technology, a next-generation content distribution system, throughout its global network. The technology works seamlessly with Globix's network to offer content providers scalable and reliable streaming media performance, with increased media server efficiency and better bandwidth management.

Like other streaming media suppliers, Globix is moving content to the edges of the network as part of the solution to some of the network congestion problems. Content is moved to peering points, where it stored for distributed "edge" delivery and directed efficiently to destination networks and to the end user.

As a result, frequently viewed content sits closer to the end user and is served by the infrastructure at the edge, not by the source media server at the network's core.

EarthCache's solution has allowed Globix to win some recent big contracts because Globix controls not only its distributed network, but also its own 20,000-mile worldwide Internet backbone network. By positioning streaming server deployments inside Globix SuperPOPs and the peering interchanges, and thereby minimizing router hops to the access network, Globix directly manages both content caching and intelligent routing directly to more than 500 destination networks. This control allows the support of true intelligence and fault tolerance.

Smaller content distribution networks have not been able to fulfill their promise of building out a substantial network with all of the necessary elements to control the delivery of content. It has turned out to be too costly to build this type of network infrastructure strictly for streaming. Globix has had the advantage of being, first and foremost, a well-established data delivery company and only recently devoting resources to streaming media.

Streaming at Time Warner Cable

BY EVAN SIROF

Time Warner Cable is developing a new newsroom automation and production platform for its New York One News operation, and four other locations. Harlan Neugeboren, senior director of engineering and technology for Time Warner Cable, provided some insight into the streaming systems they have chosen and what they hope to achieve. The operation will utilize a VorteXNews digital news production system and the Media Asset Review system (MARS) from Pinnacle Systems to manage assets and make all media available to all users. Seamless integration between the Pinnacle products and the facility's automation control system will play a critical role in the repurposing of news material for delivery on Time Warner Cable-owned websites.

The systems deliver both DV-25 and MPEG-4 streams to any PC on the network for editing, improving the staff's ability to react to last-minute changes and updates. The production staff is able to work with the compressed video feed as it is coming in, without tying up resources making copies. The MARS system also uses streaming to allow staff to access content without tying up expensive infrastructure like routers and encoders, enabling more effective use of archived material.

With the new systems, streaming will replace tape-based production at TIme Warner. ■

Evan Sirof is a freelance writer based in New York.

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Edge delivery of streaming media provides improved audio/video quality by reducing the packet loss and congestion buffering associated with traditional Internet streaming. In addition to improved performance, one of the key benefits is a significant increase in scalable network capacity.

Streaming media networks

Globix's network is a blend of three network components: the Globix Internet backbone, its extensive private and public peering relationships and its proprietary EarthCache streaming technology. The Globix network is the most important component of consistent stream delivery. Globix has built its own international network, designed to meet the reliability, availability and security requirements of businesses with mission-critical applications. It has instituted a policy to keep its capacity significantly underutilized to allow for traffic spikes such as those created during sudden surges in customer usage or during large live streaming media events while leaving plenty of bandwidth for customer IP traffic to reach its destination with minimum latency or packet loss. It will be interesting to see how this plays out once they start hitting capacity issues!

In addition, Globix is one of just a few service providers to use global "cold-potato" routing. This technique ensures that its customers' traffic will be carried on the Globix-controlled network to the greatest extent possible — and thus not suffer from the congestion or high latency of public networks.

The backbone, with guaranteed SLAs (service level agreements) including 99.99 percent uptime, is based on ATM and IP technology that rides over a protected synchronous optical network (SONET). A 6500-mile OC-48 ring connects the many SuperPOP Internet Data Centers and MiniPOPs in the United States. Connection to Europe is provided through two protected trans-Atlantic STM-1 connections. Each of the POPs is connected to the backbone by multiple fault-tolerant connections. Calculated mathematically, they claim a total network capacity that exceeds 32Gb/s.

Inherent in the OC-48 backbone is the latest routing technology to provide 100 percent network availability. The company re-routes traffic around any potential network segment experiencing a problem to another part of its network or to a peering partner's network.

Globix connects to numerous network access points, commercial Internet exchanges, and other Internet, application and network service providers. Multiple carriers provide diverse connections to diminish the negative impact of the loss of a single connection. It is the second largest peered network in the world and has peering agreements with more than 575 organizations that represent more than 1300 peering connections, including private peers.

Clients can benefit from these relationships, as latency and bandwidth are two of the most important factors in a consumer's streaming media experience. Through peering, it is effectively able to deliver streaming media from the origin point directly into many end users' access networks without ever using public Internet transit. ■

Steven M. Blumenfeld is currently the vice president of advanced services for America Online.

Making things even more efficient is the NewsEdit interface, which changes automatically depending on the mode in which an editor is working. Instead of an array of drop-down menus or a confusing and eye-polluting "windows-over-windows" scheme, the interface displays only the tools and information an editor needs.

Supporting DV/DVCPRO and MPEG with data rates up to 50 Mb/s, the NewsEdit system is designed expressly for hard news production and the demand for news content. It delivers all of the benefits of nonlinear technology, including instant random access, multiple levels of undo, real-time transition effects preview, and the ability to quickly make new versions of stories. It lets editors record directly from tape timeline while performing insert edits, voice-overs, L-shaped cuts, and three-point edits quickly. And the latest version of the NewsEdit system enables even faster package development through its real-time preview option for dissolves, wipes with soft-edge borders, plus pushes, and slides.

The NewsEdit system also enjoys fast and cost-efficient access to media through the Grass Valley Media Area Network real-time, shared-storage system. By converging video, text, and real-time effects on a single workstation, the NewsEdit system supports the need of news professionals to multitask at their usual breakneck pace.

Taking efficiency a notch higher, the NewsEdit system is compatible with low-resolution browsers and editors through OMF EDL file import. Stretching newsroom dollars and resources even further, the NewsEdit system integrates with newsroom computer systems (NRCSs) such as AP/ENPS and Avid's iNews, and with news delivery services such as that of Pathfire. That means that the journalists at your station covering the heat wave and regional energy crisis can assemble low-resolution versions of their stories using Avid's iNews Media Browse system, for example, and then pass an EDL to a NewsEdit system to conform the story in high-resolution for further editing.

An editor working on a NewsEdit system can also access feeds and clips captured by the FeedClip interactive feed capture system, making it easy to combine these materials with those brought in from field crews. Accelerating the process is the NewsEdit system's unique Edit to Timeline™ feature. The feature, which displays the edit while it is being recorded, makes the NewsEdit system the fastest nonlinear editor on the market for editing hard news tape footage.

QUICKLY SIFTING THROUGH MOUNTAINS OF DIGITAL ASSETS

In deadline-driven newsrooms where inching your way through hundreds of archived tapes just isn't an option, the Grass Valley Digital News Production Solution provides highly optimized sifting and sorting of your digital assets. For fast retrieval of archival footage and other digital assets, the Grass Valley Media Area Network shared-storage system—like all components of the Grass Valley Group News Production Solution—is integrated with the Profile Network Archive. Using high-speed Fibre Channel technology, the Profile Network Archive enables multiple Profile systems to access one or more libraries. The Profile Network Archive also scales easily and affordably.

Then there's the issue of application compliance—or the lack thereof.

To prevent newsrooms from having to choose between tools that work in their environment and tools they want, the entire Grass Valley Group news offering is compliant with the ContentShare software platform, an open, industry-standard framework for information access and exchange based on the eXtensible Markup Language (XML) that any application can use. Instead of costly custom interfaces, the ContentShare platform enables organizations to link third-party applications in a standard, cost-efficient manner and to maintain those linkages even as the applications change.

For example, the Pathfire NewsTracker news-on-demand system saves newsrooms from rolling tape constantly to record news feeds. Its Java-based interface lets news producers review categorized regional, national, and breaking news stories, then select broadcast-quality video clips and associated scripts right from their desktops. Both the NBC News Channel and ABC News One have selected NewsTracker for on-demand news delivery.

Using the ContentShare platform, Pathfire is enabling users to move materials from a NewsTracker server into a Profile XP Media Platform system as well as the Digital News Production Workgroup. This linkage will also simplify newsroom operations, allow multiple users to use the same media, and, most importantly, improve time to air.

Similarly, the ContentShare platform is helping BitCentral in its support of CBS NEWS PATH NOW, a system for targeted delivery of news content to network affiliates. Using the ContentShare platform, BitCentral can ingest audio, video, and metadata from third-party systems and distribute those materials using its MediaPipe product to 180 CBS affiliates.

Let's take a closer look. The editor working on the heat wave/energy crisis packages looks at the producer's rundown within the AP/ENPS NRCS, selects the package he's going to work on, and opens the clips; the editor also has the ability to view the story and take a look at all of the scripts written for it—including the director's cuts. The NewsEdit system takes the slug name from the package created in the producer's rundown and creates a file of the same name.

There are also additional fields of information embedded within the story that are available to an editor through the NewsEdit system. In this case, the story includes the name of the network's feed of the U.S. Senator; this same slug name has been selected and transferred into a Profile device or shared-storage system, making the story available across the network. The editor can look in his editing bin, grab that exact story, and drag it to his timeline.

With the story in his timeline, the editor can use tools of the NewsEdit interface to cut down the feed, add voice over, insert additional footage, etc. When the editor selects these tools, the NewsEdit user interface changes automatically depending on the mode in which the editor is working, speeding the process even further. At this point, the editor may edit from tape to the NewsEdit timeline exactly in the same fashion as a machine-to-machine edit bay: mark points on both the timeline and source sides, select the record tracks, set the input audio levels, and hit record. While editing to the timeline, the editor will see and hear what he expects from a hard news edit process. Further, record tracks can be toggled on and off on the fly, just like an insert edit in tape-to-tape. The editor then has the ability to add transition effects, move edit points, correct audio, and adjust play speed of the video. If the edit is clean, he moves onto the next edit—perhaps adding a voice track. Once the editor is done with his package, he can send it to the playout server. In a faster-than-real-time-transfer to a Profile XP Media Platform system, that video is available within three seconds after he hits the transfer button. If the station has the Grass Valley Media Area Network system installed, a transfer may not be required.

And with its ability to quickly trim clips or change and update sequences to make multiple versions of a story for a different look between newscasts, the NewsEdit system can help prepare a different package about the heat wave/energy crisis between the 5:00 P.M. and 5:30 P.M. news program.

5:55 P.M. Playout

At this point, you have two edited packages about the U.S. Senator and the mayors' press conference. As a review: material was brought into your station through a network feed—though it could have come as easily through a video-on-demand system—the FeedClip triage application, a Profile XP Media Platform system, and footage shot in the field. Your journalist browsed the material and created a low-resolution, edited sequence that was automatically conformed within the Profile XP Media Platform/MAN shared-storage system, and was immediately available for playout. Your editor used the high-resolution NewsEdit nonlinear editor to put together a high-resolution package that contained elements from the network feed, from the FeedClip system, and from field footage. That package also was sent to a Profile system for playout.

Now, you're minutes from playing the material to air. By basing the digital news production workflow on the Profile XP Media Platform, you can playout to air under the control of an application that controls the Profile system, such as the Grass Valley NewsQ™ Pro system—an application that is dynamically linked to your producer's rundown using the industry-standard MOS Protocol.

With the editing process completed, you send the package to the Profile XP Media Platform system for playout to air. The clip will play within a sequence of other clips the producer has requested in the rundown. If the producer reorders or shuffles the order of storage in the rundown, the Profile system, which is linked dynamically to the rundown, automatically refreshes the rundown.

Yet in newsrooms, life—and story order—does not always go according to plan. Sometimes, as a story is being readied for playout, fast-breaking news hits. In this case, a five-alarm fire in a thickly wooded area bordering a residential zone is broadcast over the scanner sitting on your news editor's desk. The fire broke out 15 minutes before air time—after the heat wave/energy piece was slotted in. Now, the forthcoming news broadcast will lead with the report from the scene. Whether you're using a Profile system and NewsQ Pro or the cost-effective NewsQ manual playback system, you can easily readjust the story order: now the live shot on the fire is the lead story and the heat wave/energy crisis story is second in the producer's rundown. With the NewsQ Pro system, a change in the rundown is automatically reflected so you're ready to play to air from the Profile system in the correct order; with the manual NewsQ system, it's a quick drag and drop and you're ready to go. Either way, you've eliminated that stack of tapes and the checking and double-checking that goes with it.

6:00 P.M. On Line as well as On Air

In addition to getting your news to air, the Grass Valley Group's Digital News Production Solution can get it online. The solution includes two complementary components: the Aqua™ Internet encoder and the WebAble™ Web publishing tool suite.

The Aqua Internet encoder offers a turnkey system that generates streaming bandwidths ranging from 28.8 kb/s (simple audio) to 2 Mb/s (DVD-comparable video) and supports all major streaming formats, including Windows® Media Audio and Video 8, RealNetworks' RealVideo™ and Apple's Quicktime™. Architected to provide the highest streaming throughput per rack-unit of space, the Aqua encoder's One Pass Encoding™ technology can pre-process, capture, clean and encode an input source and render it into multiple streaming formats at multiple bit rates—all in real time.

Meanwhile, the WebAble™ tool suite offers a drag-and-drop method for creating streaming media from Profile system devices that fits neatly within newsroom workflows. Using WebAble, transferring a video clip to a Web server is as easy as copying a spreadsheet to a floppy disk; conversion to standard streaming formats such as Microsoft's Windows Media and RealNetworks' Real Video is automatic. The signal pre-processing capabilities of the Aqua Internet encoder can also turbo-charge WebAble with the highest possible quality video.

To put your energy story online, for example, a WebAble user need only identify Profile system-based content or a Profile system-based clip, drag it to a Microsoft Windows NT-based Web server, and initiate the streaming conversion process as part of that transfer. The resulting digital file is then ready for insertion into a standard Web publishing tool.

Grass Valley Digital News Production: A Complete Solution

To learn more, go to **www.grassvalleygroup.com/digitalnews**

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THE DIGITAL NEWS PRODUCTION SOLUTION WHITEPAPER

Scorching heat and soaring demand for electricity have led to sustained power outages over the past week in your community. Your national network has arranged an interview with one of the U.S. senators representing your state. The Senator, who happens to sit on the Senate Energy Committee, will comment on potential federal relief for the region. The interview feed will arrive in 15 minutes—at the same time as an energy-related press conference held by the mayors of all the major cities in your viewing area. Numerous field tapes for local stories about the impact of the heat wave on residents and businesses are being carried in to your station and are being readied for air.

It's 5:30 P.M. And while it may be hot outside, it's nothing compared to the pressure cooker in the newsroom as your team of producers, editors, and journalists race against a 6:00 P.M. deadline to get these stories to air. You're accustomed to stressful days, but today promises to be more intense than most.

Apart from a cool front, about the only thing that might relieve the pressure in your station is a news production solution that lets you work faster, better, and more cost effectively than your existing VCR-based systems. A solution that gives your staff total access to all the material they want, supports great creative freedom, and lets you quickly re-purpose your media assets. A solution that can get your stories on air and online. A solution that can meet your deadlines—every time.

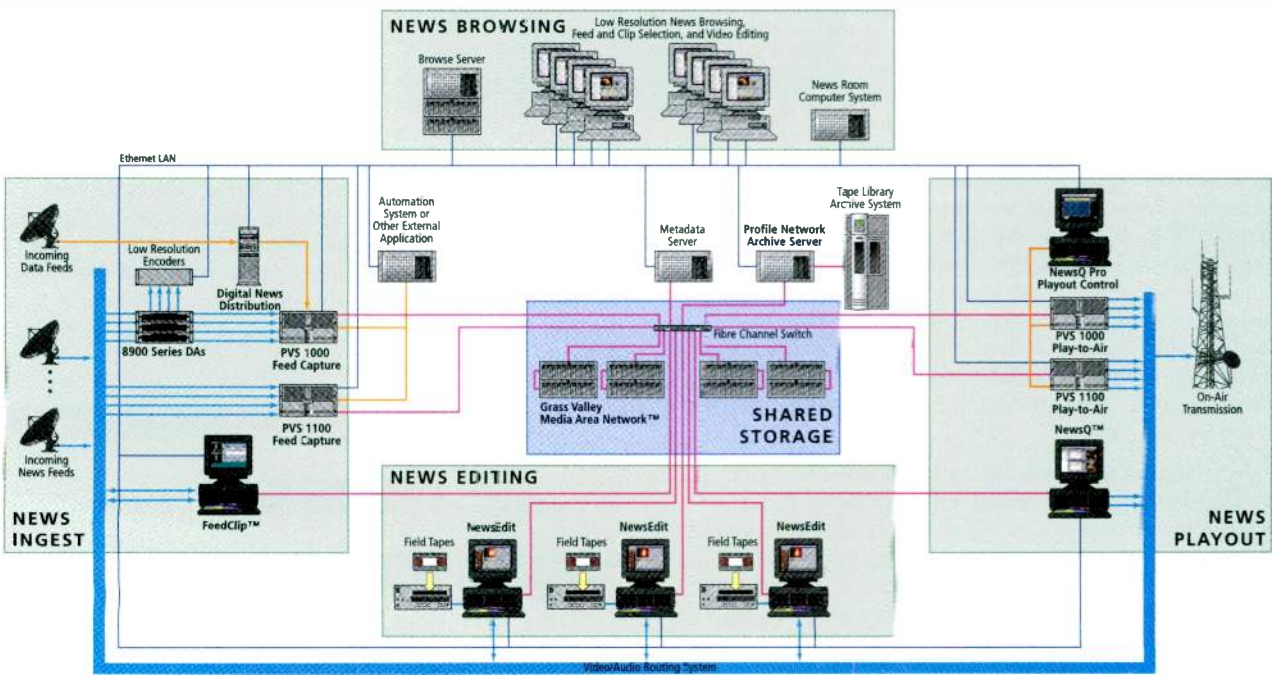
In the same way that computerization streamlined scripting, archiving, and rundown preparation, the Grass Valley Group's Digital News Production Solution offers workflow efficiency and cost savings across the entire news production process: from ingest of feeds, triage of the media, third-party desktop browsing, creation of an edited sequence, high-resolution finished editing, and playout under the control of a rundown. To see how it all works, take a walk through the story-creation process.

FROM INGEST TO PLAYOUT: A STORY TAKES SHAPE

5:30 P.M. Ingest & Triage

Broadcast newsrooms can ingest material from several sources. Traditional video news feeds from a national network—the interview with your U.S. Senator and the local live shot of the mayors' press conference are two great examples. Increasingly, there are also compressed file-based feeds, such as those generated by the Pathfire NewsTracker video-on-demand system.

For capturing incoming feeds, the Grass Valley Group's Digital News Production Solution offers two complementary products. The Profile® XP Media Platform, which offers both manual and automated record interfaces through third-party systems and software, is the best choice for scheduled multi-channel and automated applications. Profile systems provide compatible media to the Grass Valley™ NewsEdit™ nonlinear editor, which can locate clips on a Profile device and access them for incorporation in sequences through the Profile Media Manager. The NewsEdit system can access shared storage through the real-time Grass Valley Media Area Network™ system, today a network-based common storage topology



THE GRASS VALLEY™ DIGITAL NEWS PRODUCTION SOLUTION

and in the future via a direct-access shared-storage topology. Common storage provides a robust architecture for failsafe operation. NewsEdit accesses media archives through the Profile Network Archive system.

The second feed-capture solution of the Digital News Production Workgroup is the Grass Valley FeedClip™ system. It's the best choice for triage of breaking news or live events, such as a press conference or a sports feed. The FeedClip system allows producers to monitor a live event as it records to disk and mark clips on the fly — making it easy to capture sound bites from the mayors' press conference or the action around a goal in a sports feed. The system's Retro Mark™ feature lets them define the time automatically captured before a Mark In point, ensuring that the start of the event is not missed even if they react a second or two late. Producers can also trim clips frame accurately or send rough clips to any or all edit bays for editing—without ever having to break recording. Alternatively, they can organize selected clips into a playlist that is instantly available for playback. Trimmed clips can also be played directly to air from the FeedClip system, frame accurately and as a cuts-only sequence, such as a highlights package after a press conference, baseball game, or some other breaking-news event.

So as the triage of material related to the heat wave continues, a producer can use the FeedClip system to review material, call up a clip, and if she wishes, alter the time duration point specifications on the clip by adjusting the "trim" points that she originally marked on the material. Depending on her needs or preferences, she can make those trim points shorter or longer. In the case of a sound bite that she wants to use on air—such as a pointed statement from the U.S. Senator—she can mark that sound bite as a clip, trim that clip up to the exact piece of voiceover material that she's looking for, and transfer that material to the Profile XP Media Platform system and to the Grass Valley Media Area Network shared-storage system. The material is then instantly available for playout via a Profile system. At the same time, it can be made available to a NewsEdit system for incorporation in a more complete package.

One benefit of the Grass Valley Media Area Network infrastructure in conjunction with the Digital News Production System is speed: journalists and editors can access material directly without having to track down videotapes. Instead, material can be made immediately available through the real-time, shared-storage system. Ideally suited for broadcasters who need to share media assets and access these assets with a variety of tools, the Media Area Network system is a real-time, high-bandwidth, high-availability infrastructure built upon high-speed Fibre Channel technology. As a result, the minute a producer makes the "In" and "Out" marks during ingest and triage, that material will be immediately and universally available to all editors.

THE GRASS VALLEY™ DIGITAL NEWS PRODUCTION SOLUTION

The Grass Valley Group offers a solution that addresses the entire news production process—from ingest to playout, including integration with your newsroom computer system. One that works as fast as you do. One that can get stories wherever they need to go. One that can increase the production value of your news content. And, one that costs no more than tape-based solutions, while eliminating the maintenance headache.

Offering end-to-end support of DV/DVCPRO- and MPEG-based news production, the Grass Valley™ Digital News Production Solution is built for speed and workflow efficiency. The vanguard of the solution is the Grass Valley Digital News Production Workgroup, which includes the FeedClip interactive feed capture system, News Edit nonlinear editing system, and NewsQ™ manual playback application. These PC-based systems all feature native MPEG and DV/DVCPRO support at up to 50 Mb/s.

The infrastructure of the Grass Valley Group's Digital News Production Solution is based on the Profile XP Media Platform, the industry's popular and flexible server with more broadcast content stored on it than any other and supporting the high-quality standards required for broadcast television and low-resolution required for the Internet, as well as MPEG, DVCPRO, HD and MPEG Transport Streams (MTS) formats; the Grass Valley Media Area Network real-time, shared-storage system; and, the industry's most advanced archive technology, the Profile Network Archive.

Compliant with the Grass Valley Group's open ContentShare™ software platform for information access and exchange, the Digital News Production Solution also offers the most far-reaching newsroom computing integration, including interfaces with systems from AP/ENPS, BitCentral, iNews, as well as with video-on-demand systems such as the NewsTracker system from Pathfire. And its ability to leverage the Grass Valley Group's WebAble Web publishing technology and Aqua Internet encoder means that putting content online is as easy as putting it on air.

5:40 P.M. Desktop Browse

The Grass Valley Digital News Production Solution interfaces with third-party low-resolution browsing applications. These products allow journalists to browse low-resolution copies of media from their desktops—to select individual shots, mark those clips with a head and a tail, and, perhaps, even transfer them to a timeline. This cuts-only editing process can be as simple as selecting an individual shot to be used as part of an editing package or as complicated as assembling an entirely edited sequence that will be used on air. Selected clip information can then be sent in the form of an edit decision list (EDL) to a Profile XP Media Platform system for conformation and play to air or to NewsEdit for further editing of the original high-resolution media.

5:45 P.M. Editing

Having sequenced selections from the interview of the U.S. Senator, the sound bites from the mayors' press conference, and taped field footage, your editor is ready to do the necessary high-resolution editing to get the piece ready for playback and air.

By eliminating pre-digitizing, in tape to disk editing, the NewsEdit system is virtually twice as fast as other nonlinear editing systems. In fact, it's the industry's only truly open, PC-based editing system designed from the ground up to replace the record deck in cuts-only editing bays. Unlike most other nonlinear editing systems, the NewsEdit system enables editors to view edits as they are made—just like a machine-to-machine edit bay. An edit does not have to be replayed just to be sure it's right.

THE GRASS VALLEY NEWSEDIT™ SYSTEM RECORDS WHILE EDITING — ELIMINATING TIME-CONSUMING PRE-DIGITIZATION OF FOOTAGE.

From video to data

USA Cable NOC rebuild

SYSTEMS DESIGN SHOWCASE

BY TOM MICHALES

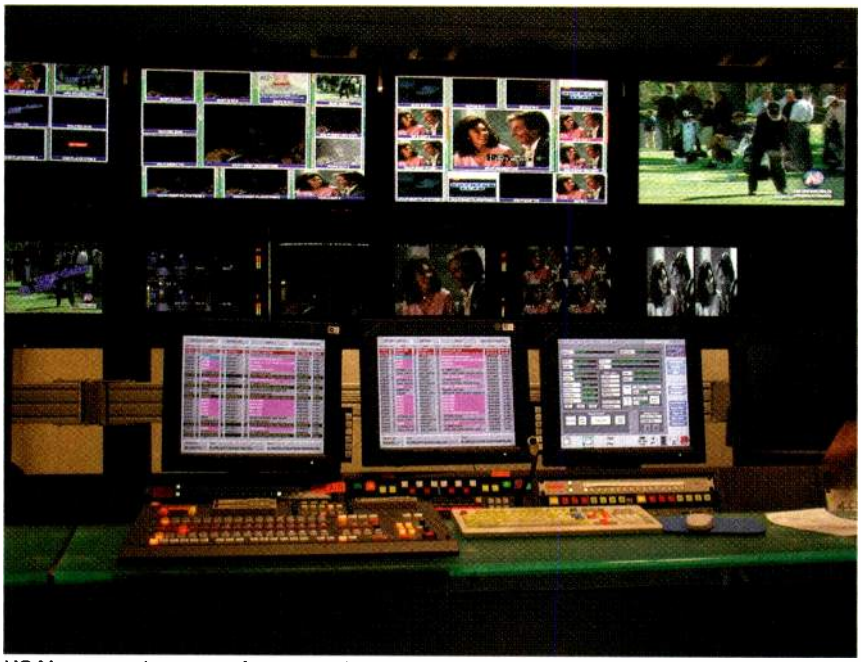
Construction on USA Cable's new multi-channel control room was planned in two phases to accommodate on-air operations. Photographs taken by Ken Alexander, Senior Broadcast Engineer, USA Cable.

In early 2000, USA Cable (formerly USA Networks) decided to do a sweeping upgrade of their network operations center (NOC). This was necessitated by a number of factors including growth needs and the desire for better control of their broadcast assets. To meet their growth targets, USA Cable needed to maximize their operational capacities with minimal operational resource changes. A.F. Associates (AFA) was retained by USA Cable to consult, design and build the NOC system. Subcontracts were placed with Omnibus, Grass Valley Group and ADIC for key subsystems.

The original USA facility was designed and built by A.F. Associates in 1993 and is used for the airing of USA Network (east and west feeds) and SCI FI Channel (east and west feeds). While state-of-the-art at the time, subsequent technological advances have radically altered the capabilities of systems today.

With the equipment still serviceable but aging, the decision was made to replace USA's composite NTSC infrastructure with a modern component serial digital configuration with embedded AES audio. The scope of work included replacing the Panasonic MARC libraries in operation with a server-based ingest and playout system with a data tape archive library. The new system also is fully automated using the Omnibus automation system.

Before the project was designed, USA Cable announced that they had acquired two new networks, Trio and News World International (NWI), and needed to get them on air from the Jersey City facility within a couple of months. A temporary system was assembled for this purpose and proved invaluable for testing before the primary system was fully designed



USA's control system is currently set up to handle six active networks and one redundant network, with the capability to handle up to 14 networks as the organization grows. The system design is modular to allow for easy expansion.

and implemented.

USA Cable's NOC has four primary operational areas: ingest, multichannel master control, master and transmission control, and a live master control room. Associated with these areas are three technical equipment centers and a data library room. USA had a limited amount of available space, so all new construction had to occur around the existing on-air operation. This required a unique plan for the facility design and construction phasing. The floorplan was carefully designed to allow the multichannel master control room to be built around the legacy MARC systems and control rooms for USA Network and SCI FI Channel. Equipment centers to support this environment were tucked into the corners of the facility. The construction also was split into two phases. After all the channels are changed over to the new system, the legacy system will be decommissioned and the remainder of the facility (the ingest area and live control) will be rebuilt.

Equipment selection

The design of the control room and equipment centers had to be able to handle the anticipated growth of the organization within its new footprint. The system has been designed to ultimately handle 14 networks (12 active and up to two redundant). Initially, the implementation is for seven networks — six active and one redundant. This growth mandate has driven a modular concept in the equipment centers and multichannel control room. Nearly all equipment needed for a particular channel is housed in a single rack. Additional racks hold the overflow equipment (DVEs and CGs). In the multichannel control room, TBC Consoles worked with AFA and USA to create a curved console that allows operators to handle channels individually or monitor several channels simultaneously. There are a total of nine operator positions: two allocated for "supervisory" use or overnight shifts and seven multichannel positions currently set up to handle either one or two channels per position.

> Nearly all equipment needed for a particular channel is housed in a single rack.

AFA designed the operating environment to enable operators to successfully monitor their assigned channels without getting overloaded with data. To facilitate this, Avitech Video multiwindow display processors are used with 18 Sony PFM-510 series 42" plasma display panels (PDPs) for viewing source signals. Thirty-six Sony BVM-20F1U monitors are used for high-quality display of program out feeds and downlink return feeds (using a Feral quad split processor from Keywest Technology). This combination of displays and processing has resulted in an innovative, flexible system with high image quality.

> All new construction had to occur around the existing on-air operation.

The console has an array of 29 NEC 18" LCD panels that are used in conjunction with KVM switchers to allow the operators to see the automation playlists, Videotek VTM QC monitors, and various other PCs used for CG, automation control and other applications. Each operating position has three LCD panels and the supervisory position has four. To handle the primary and backup playlists for a dual-channel position, RGB Spectrum quad split processors were used to show four VGA signals in one LCD panel. Shortly after the system goes live, a computerized alarm and signal monitoring system will be installed to aid the operators in keeping an eye on the expansive system.

For the server system, several vendors were evaluated. The Grass Valley Group Profile XPs were selected based on their scalability, bandwidth capabilities and an existing interface to a data archiving solution. The GVG Profile Network Archive (PNA) includes x86-based data movers running Solaris and Avalon (now EMC) archive management software to bridge the Profile servers with the ADIC AML/2 data tape library. The ADIC tape library was selected for

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its high storage capacity (in this case, using nearly 2800 Ampex DST 150GB cassettes) in a limited footprint, scalability and redundant systems. The storage capacity of the system is approximately 50,000 hours at the current recorded video bit rate of 15Mb/s in MPEG-2, long GOP format.

Since USA Cable was already using GVG Master-21 master control switchers in their legacy system, it was a natural choice to use the M2100 switchers to allow the operators an easy migration to the new working environment. The key requirements include four keying layers, ability to do voice-overs and processing SDI with embedded AES.

In USA's legacy system, automation was rather minimal. The MARC systems had their own computer systems, and another system was used to automate squeezebacks. Most of the other processes were manual, but had been refined over several years of reliable operation. USA's design goal was to automate the NOC system from ingest and playlist loading to air playout.

First the decision whether to buy or make the automation system had to be made. Making an automation system will yield exactly what is desired, but usually at great cost and lengthy schedule. For most broadcasters, buying an automation system is the practical decision, albeit with tradeoffs for client-specific customization. Ultimately, the decision was made to buy.

Several automation systems were evaluated, and Omnibus was selected due to its systems architecture, modularity, and resource and asset management features. The Omnibus system also offers scalability and expandability: As USA's operations grow and its needs increase, additional modules can be easily added.

With the entire system in place, the media flow through the facility is as follows. Program and interstitial material is sent to the NOC from outside or in-house sources in videotape format. The house standard is D-3/D-5, but media in digital or analog Betacam, or 1" formats are acceptable. An operator sits at one of the eight ingest workstations and dubs the media into an ingest Profile. Once marked up with the necessary metadata, the assets are transferred via Fibre Channel to the data archive system. (Interstitials also are sent to the playout servers.) Based on the playlist, program content is pulled off the data archive and moved via Fibre Channel to the playout servers. All data movement is controlled either automatically or manually via the Omnibus system.

> One must tiptoe around a live facility to ensure that the new system being built does not impact what is currently on air.

Communication is key

Once all of the primary vendors were selected, coordinating all the work became a continuous communications task. Weekly conference calls ensured that everyone knew what their responsibilities were, and when deliverables had to be met. This kept the team focused on resolving issues quickly and as professionally as possible.

With so many software applications in use within the system, there are the inevitable disagreements as to whose software may be causing a problem. USA has a punchlist and it is being completed in an ongoing process as the system gets tweaked. One of the most useful tools to combat confusion is to use revision control on the installed software, much as integrators normally do with drawings or other intellectual content. As the system operations stabilize, software updates will have to be carefully coordinated to minimize risk to the system.

When working in a facility that is on-air, there is always some implementation challenges. One must learn to tiptoe around a live facility to ensure that the new system being built does not impact what is currently on air. With respect to USA's legacy system remaining on air, project planning was a critical element to minimizing disturbances. This planning extended from determining the construction phasing to estimating in great detail the number of vendors and installation people who were on-site at any given time.

The primary design goals have been achieved. USA Cable now has a state-of-the-art SDI facility with embedded AES audio, has migrated to servers for program playout, and is storing all assets as data files in a central, robotic library. The system is scalable to handle the growth targets set by USA Cable's senior management.

To demonstrate further confidence in the system model, another network has been announced and will be added as the next incremental network to the facility sometime later this year. ■

Tom Michales is senior project manager for A. F. Associates, Inc.

Project team

USA Cable

Dick Ross, senior vice president of operations and production
Bruce Giuriceo, project manager
Steve Saville, Mario Patuto, Ben Zilinskas, Jim McGuigan and Lou Musso, project engineers

A.F. Associates, Inc.

Tom Michales, project manager
Jim McGrath, consultant
Nand Ganesh and Bud Pearson, project engineers
Rich Neil, installation supervision
Marc Bressack, VP of sales

Equipment list

GVG Profile XP servers
GVG M2100 MC switcher
GVG GVEous DVE
Pinnacle FXDeko CG
GVG 7500WB 256x256 router
Quartz Electronics router control
GVG 8900 modular series
Avalon Archive Manager
GVG PNA archive data movers
ADIC AML/2 Robot data library
Ampex DST312 data tape
Sony plasma displays
Oxtel ImageStore and PlayStore
Omnibus automation system
Keywest Feral processor
Videotek VTM QC monitors

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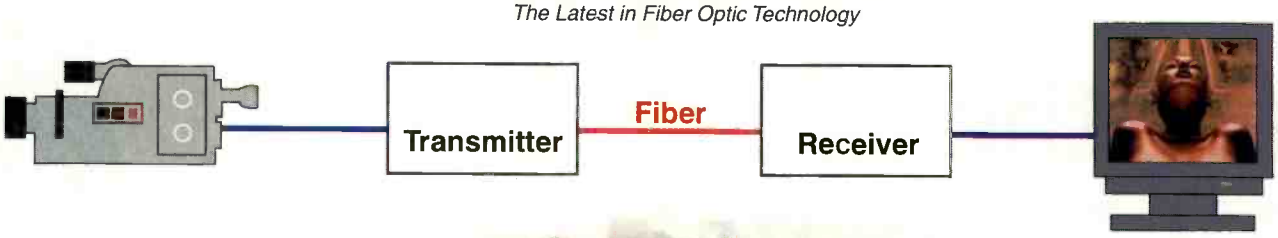

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SYSTEMS DESIGN SHOWCASE

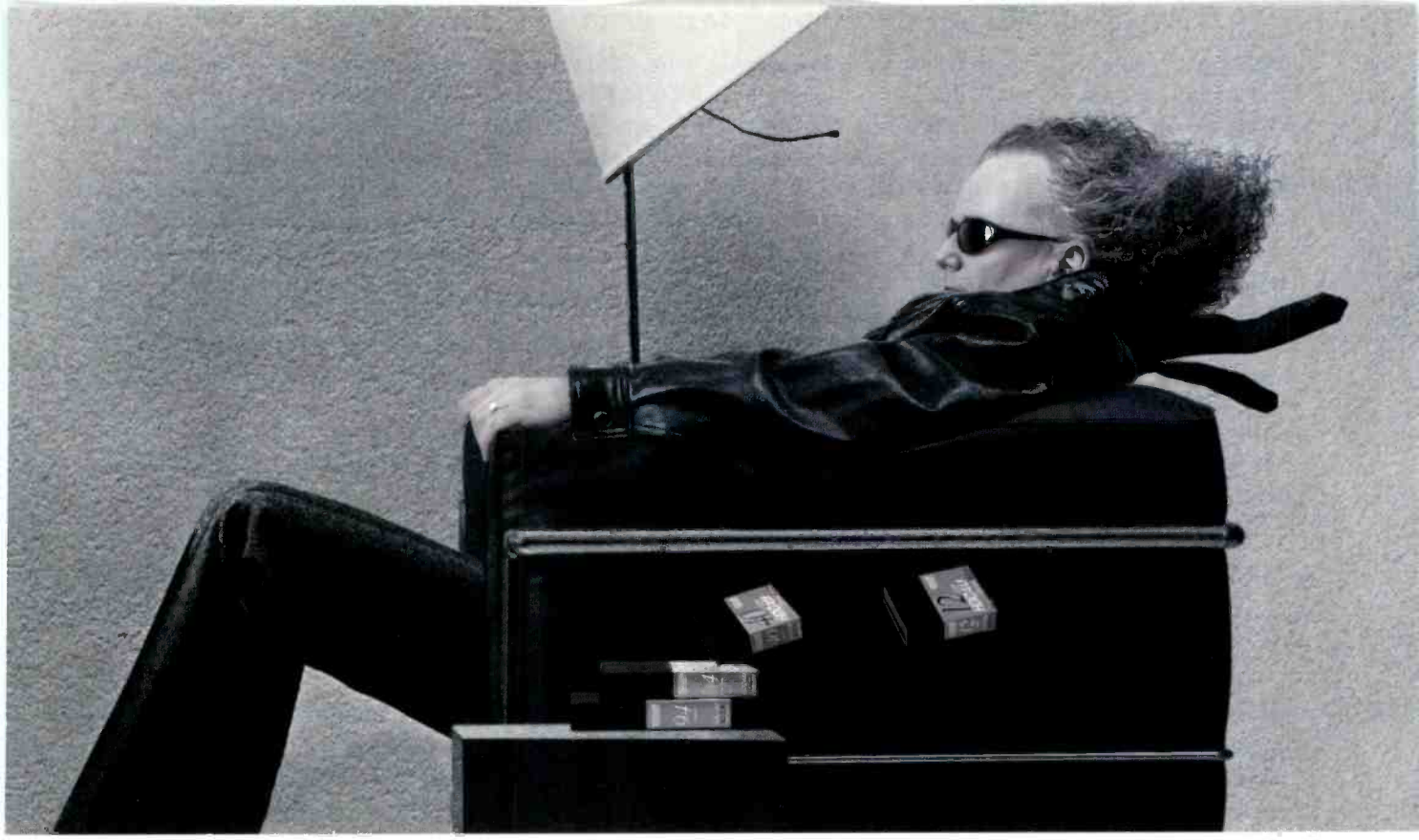
BY BRAD BARTHOLOMEW

Warner Brothers' affiliate KWBM -TV on-air

As indicated by the Communications Act of 1934, broadcasters are required to file for a license and refile for a renewal every eight years through the Federal Communications Commission (FCC) to broadcast to the public. Applicants must also satisfy the Commission that they are legally, technically and financially qualified, and that operation of the proposed station would be in the public interest.

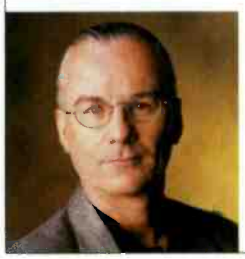
RS Communications Limited Partnership, an independently owned and operated Warner Brothers (WB) Network affiliate, was interested in expanding to Branson, MO. When the affiliate finalized the internal approvals to move forward with the project, it was faced with completing the facility in less than one year from when the license would expire. Executives at the new WB affiliate, KWBM-TV or WB-31, wanted to partner with a systems integrator that could meet the FCC deadlines and also had experience in building such facilities. President/General Manager James

The digital Master Control Room at WB-31 in Branson, MO, includes the M-2100 master control switcher from the Grass Valley Group, program preview monitors and source monitors.



To The Power of Maxell

Randall Paris Dark



Having been involved in over 350 HDTV productions, Randall Paris Dark, the Founder, President and CEO of HD Vision, is blown away by the reliability and performance of Maxell's professional media. "Maxell products deliver a superior quality HD picture while maintaining a high level of durability and reliability." Maxell's media family includes products like HDCAM, Digital Betacam, Betacam SP, Betacam SX, DVCPRO, D-5, D-3 and D-2. Can you depend on your professional media? You can reach Randall Paris Dark by visiting www.hdvision.com or by emailing Randall at rpdark@hdvision.com.

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Goodman approached a member of Professional Systems Network Inc.'s (PSNI) nationwide network of audio and visual system integrators, Professional Video Supply (PVS), to discuss the specifics and budget. PVS was asked to visit WB's newest affiliate in Dayton, OH, to reference how that station was constructed. PVS needed to determine how they could modify that design to meet the goals for the Branson-based station and create a complete digital facility.

Concurrently, WB-31 decided that because of time constraints, it would not be able to construct a new site to host the broadcast station as initially planned and would convert a former State Farm Insurance office into a complete broadcast facility for the new television station. The systems integrator worked to redesign the equipment racks to accommodate the reduction in room dimensions.

Upon approval of the redesigns, contracts for execution of the new facility were finalized four months later. The builder then was given approval to move forward with the project, allowing a 3-month time frame to complete the project.

Construction of the broadcast facility required complete reconstruction of the HVAC and all electrical power, as well as finding the proper location for the satellite dishes and mounting them. Initial construction started with electrical and computer floor construction and progressed to implementation of the master control and the editing suites. On schedule and on time, the KWBM-TV broadcast facility was completely digital, fully functional and ready for air—the first station in the country to use all-digital plenum-rated cabling throughout.

Technical features

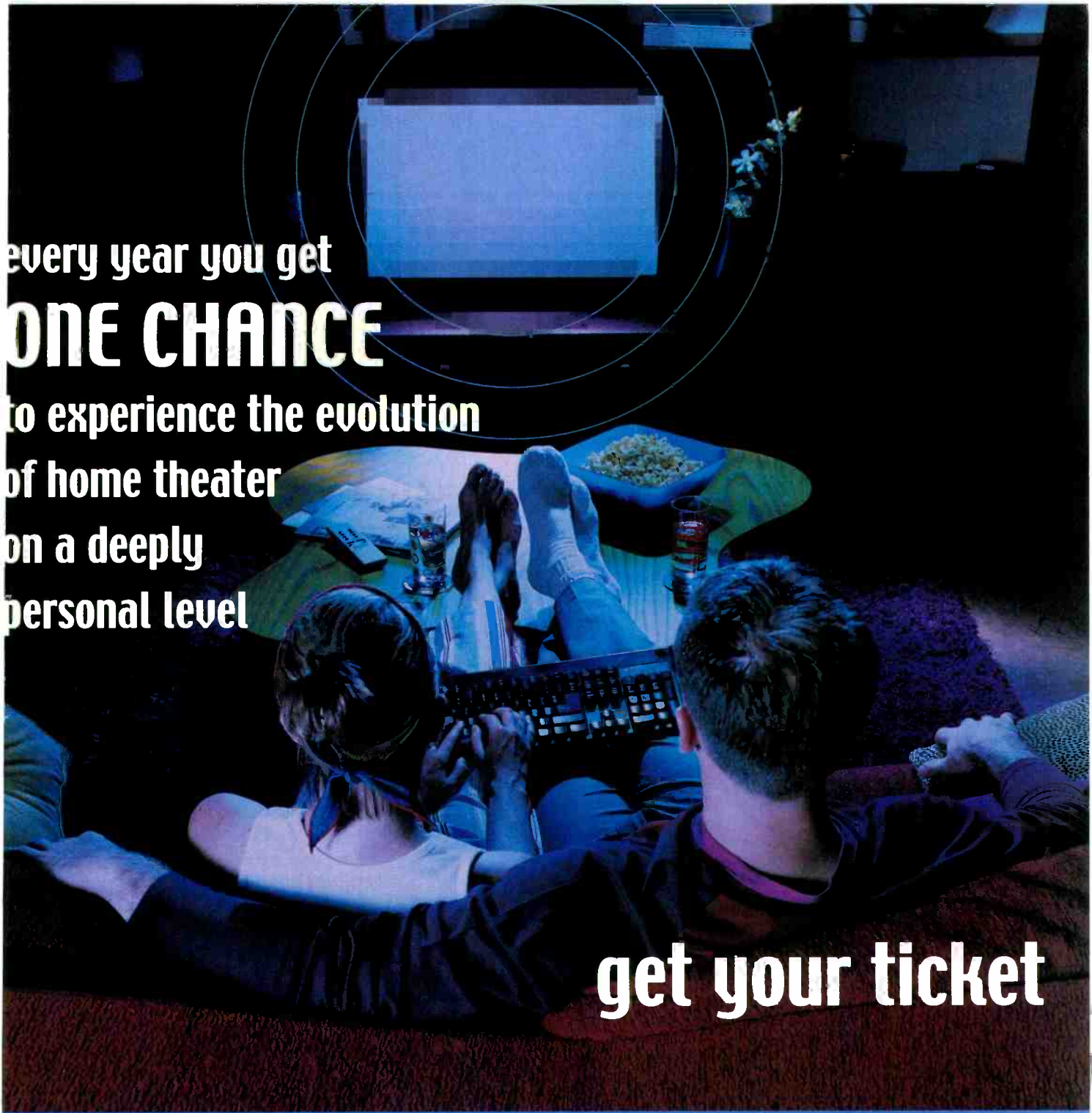
A raised computer floor served as a plenum for rack and master control cooling. Cooling from the floor through the racks into the ceiling returns provided superior equipment cooling and eliminated the use of rack fans, which reduced the ambient noise level significantly. The building code for HVAC design required the use of plenum-rated digital audio and video cabling throughout the installation. Gepco VPM2000TS plenum digital video cable with Canare BCP-C32 connectors were used for all 601/SDI and AES/EBU 75Ω connections, and balanced transformers also were used as needed. Color-coded boots were added for the management of numerous protocols using the same model of wire and termination.

Four Patriot 4.5-meter antennas were installed, controlled by Research Concepts RC-2000 dual-axis controllers and 2KPOL motorized drive feeds. The receivers selected included five Standard Global MT930 VU-RXs, one Unity MPEG IRD and a TANDBERG Digital Alteia. Nine DPS 475AV multifunction digital/analog audio/video synchronizers were used for conversion of analog satellite and tape formats to digital.

Routing was provided by a Grass Valley Group SMS 7000 SDI and an AES/EBU router populated with 32 crosspoints. Grass Valley Group's 8931 SDI DAs with equalization provide distribution to routing, while Canare and Bittree patch panels allow every I/O (audio, video, control RS-422)

Design requirements for the Branson facility included easy operation, a clean signal path and automated master control.

This full view of the Master Control Room at WB-31 shows the Grass Valley Group switcher, the satellite receiver and feed deck.



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source or destination of the system to be reassigned.

Panasonic DVCPRO was chosen as the tape format. Ten Panasonic AJ-D450 DVCPRO25s with 601/SDI and AES/EBU 75Ω options were provided for satellite and dubbing VTRs. S-VHS, ¾-inch, Betacam and 1-inch formats were converted to DVCPRO using the DPS 475AV for on-air playback. When necessary, analog tape formats may go to air by using GVG 8900 series analog-to-SDI conversion cards providing maximum flexibility.

All commercial spots are played back via a GVG Profile PDR312D 3-channel audio/video server with 10GB to 18GB hard drives. Crispin spot playback software consisting of RapidPlay X, AsRun, Dubber, Mapper and Turbo Browser provided a cost-effective solution for server control. VCI traffic software interfaced with Crispin to provide a comprehensive log and invoicing of all commercial spots.

The master control switcher is the GVG 2100 with borderline, drop shadow, dual luminance keyer, linear keyer and audio breakout. The use of the GVG SMS 7000 routing, 2100 master control switcher and the Profile server assure communication between all components. All that is required for master control to be fully automated is to upgrade to Crispin's 2000 software. The external NT computers in master control are PVS custom-designed rackmount PCs with dual power supplies. Redundant power supplies are incorporated whenever possible, assuring maximum on-air reliability.

Redundant power supplies are incorporated whenever possible, assuring maximum on-air reliability .

A Panasonic AT-1906 digital monitor is used for on-air monitoring and reference. Panasonic BT-1390s are used for on-air preview and program. Sony PVM-8042s are used for monitoring individual sources. AJA D5CE serial digital-to-component encoders provide the digital-to-analog conversion for picture monitoring.

A combination of Tektronix and Videotek scopes are used for measurement and calibration. The Tektronix AV601 is used for program out measurement and calibration, while the Videotek VTM-300 series are used for satellite transmissions and VTR playback. Wohler AMP-1DA AES speaker monitors and Videotek AP-200 stereo audio program monitors are used for monitoring audio signals.

Two Discreet nonlinear editing systems with both digital and analog I/O are used for productions and promotions. Each suite contains a Panasonic AJ-D950 DVCPRO50 VTR, Sony UVW-1800 Betacam, Mackie 1402 audio mixing boards, Tascam CD-150 CD players, Pioneer DVR-S201 DVD

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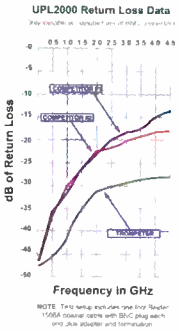

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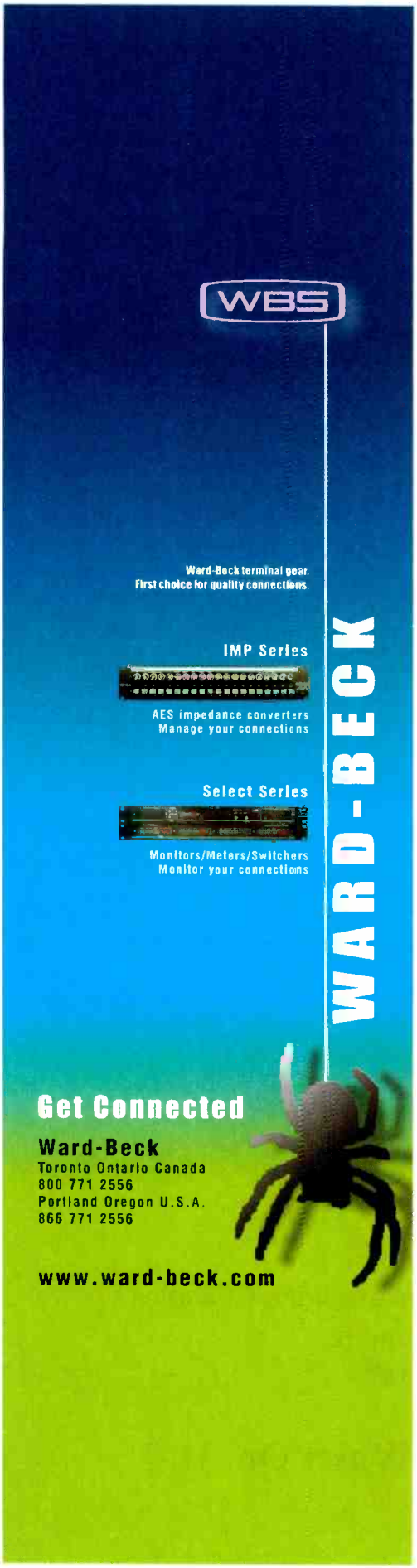

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recorder and an Ikegami DTM-2000 20-inch program monitor. The DVR-S201 permits production and promotion spots to be recorded on DVD. In-field productions use two Panasonic AJ-D610BIZ switchable DVCPRO25 camcorders, Vinten VIN-11LT, Shure U1 body pack transmitter with Sennheiser MKE2 microphones and UP24 receiver, Lowel T1 Trans-Kit, and Sony PVM-8042 monitors.

The studio has three separate sets — a chroma key, a desk interview and a large performing.

The studio has three separate sets — a chroma key, a desk interview and a large performing. Three Panasonic AW-F575 studio camera packages with Canon 18:1 lenses, a GVG 110 switcher, Chyron Maxine Bundle character generator, Yamaha GA32/12 audio mixing board and Vinten studio pedestals provide the studio basics. A Panasonic AJ-D90 DVCPRO25/50 dockable VTR allows one of the AW-575s to be converted to ENG/EFP configuration. A complete RTS intercom system provides operator communications. The studio teleprompting system consists of three QTV 15-inch prompters and QTV WinCue Pro software. Sennheiser and Audix microphones and a custom-designed light grid complete the studio package.

The end result

Overall, installation was completed in approximately six weeks and included installation of computer flooring, reworking HVAC and incorporating all new electrical service.

The PVS system integration project was completed two weeks ahead of schedule, and the new KWBM TV-31 was ready for air as planned. ■

Brad Bartholomew is president of Professional Video Supply (PVS), a Professional Systems Network Inc. (PSNI) affiliate. For more information, visit PSNI's Web site at www.psni.org.

Design team

Brad Eartholomew, project manager/system co-designer
Lee Mowry, chief engineer/system co-designer
David Starcke, lead installer
Jeffrey Washington, engineer/system programmer
Todd Nelson, David Goodman and Wilbur Brakhage, installers

Equipment list

360 Systems D2730 DigiCart II
Yamaha 8-input mic mixer
Chyron Maxine CGs
Chyron PC Scribe Bundle with PC Codi
Crispin automation
Discreet Logic nonlinear editing systems
GVG Group 5100 video DA/5200 601 DA
Ensemble TCD400 TBC controller
GVG M2100 master control switcher
GVG SMS7000 64x64 serial digital router
Leitch DTD-5225 digital time display
Leitch GPS-5300-1 GPS receiver
Leitch MGI-3701-36 logo and indent generator
Panasonic 610BIZ-PACC DVCPRO camcorder
Panasonic AJ-D450 DVCPRO studio VTR
Panasonic AJ-D950A 50Mb studio VTR
Tektronix 1710J waveform vectorscope
Tektronix 1720 vectorscope
Videotek AP-200 stereo audio program monitor
Videotek DL800 digital legalizer
Videotek VTM-300 digital/analog waveform vectorscope
Videssence lighting system
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Transmission & Distribution

Taming the RF system

BY DON MARKLEY

As is well-known and often discussed in laborious detail, most stations are either installing new RF systems to accommodate DTV or are still cleaning up the new DTV system. Part of that work obviously includes new RF plumbing inside the building as well as, in most cases, one or more new transmission lines and antennas.

The good news is that the combiner or diplexer assemblies to be installed usually don't require further tuning. Those units are tuned at the factory and are normally installed in exactly the same configuration. If not dented or otherwise damaged, they will not usually require field adjustment. If they are subsequently determined to not function properly, their tuning is a job for the factory representatives. They can be field adjusted with a network analyzer but they are a bit like a directional AM array in that if you start making adjustments without knowing what you are doing, they can be taken from needing a minor adjustment to a total mess.

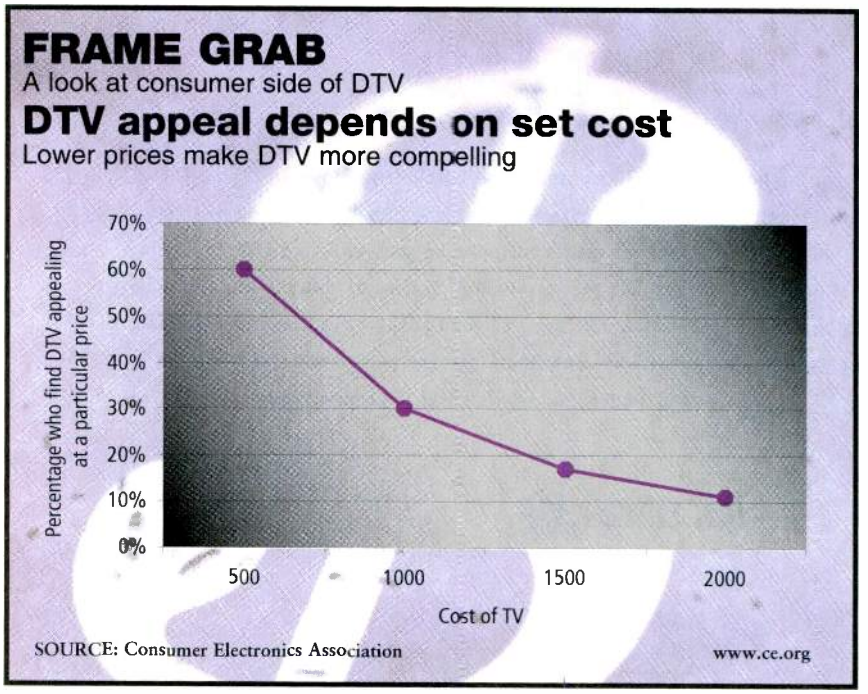
The rest of the equipment inside the building, consisting primarily of the transmission lines between the transmitters and passive components, can be tuned for proper impedance match. If the passive hardware is new, the input and output impedance values are usually right on. In that case, the short runs of transmission line or waveguide will not cause problems. It is more difficult to incorporate older existing equipment that has either drifted a bit over the years or was never tuned well in the first place.

The tuning of combiner or diplexer assemblies is a job for the factory representatives.

In the worst of systems, there may be a need to add an additional fine matcher or two into the system. Those can then be adjusted with a network analyzer to bring the system impedances back to normal. If only small problems are observed, two different approaches can be taken. First, just forget about it. Most transmitters will tolerate a minor impedance mismatch without causing trouble. For this purpose, a minor impedance mismatch might be considered something on the order of a VSWR of 1.1 to 1.15:1. The short runs involved won't cause reflections that would appear as ghosts in the picture.

The other response is to tune the interconnecting lines to eliminate the mismatch problems. This is normally done by adding slugs to the waveguide or rings on the center conductor of coaxial lines. The slugs and rings are sized and placed through a process of trial and error – mostly error. A network analyzer is almost a necessity for this work. It is attached to the system using a tuned adapter and the system response is measured. A tuning element is then inserted in the system and a second measurement taken. The process is repeated until the right size of tuning element has been correctly placed and the element is fixed in place. It doesn't take as long as it sounds and does result in a total system with flat response. It is often surprising to see the improvement in the transmitter tuning when the little irregularities in the system are corrected. One major note of warning is important at this point. The adapters for connecting the network analyzer must be known to be good, usually not simply an off-the-shelf component. Otherwise, the tuning simply matches the line to the impedance of the adapters. That can actually cause more of a mismatch than if you simply left the lines alone.

The above references to a network



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analyzer are meaningful. The instrument offers abilities that simply weren't available 20 years ago. The ability to measure the input VSWR to the system is only a start. With a modern vector analyzer, it is possible to look at only the antenna or only the transmission line system without moving the test equipment from the input. This facilitates the final tuning of the input match between the transmission line and the antenna as well as any necessary tuning of the transmission line components. This is particularly important for waveguide installations where tuning sections are involved. Using the time domain functions of the analyzer, it is possible to observe the reaction to the tuning in the area where the tuning is done, not simply at the input to the waveguide. That eliminates the need to repeatedly break the waveguide and insert a dummy load, greatly shortening the time needed to optimize the waveguide system.

With a good network analyzer, an experienced engineer not only can determine a problem at a bad flange, but can define the problem down to a particular insulator in a section of line. The only bad point is that a novice with the network analyzer will be quite limited in doing such an analysis.

Accurate power measurement has always been a problem. With traditional calorimeters, temperature and flow monitoring must be accurate and the proper correction factors known for the coolant in use. That problem has been greatly eased by the use of the current series of power meters using various sensors and probes. The main problem with such units is the initial calibration to accurately determine the degree of coupling between the probes and the transmission lines. This usually requires a network analyzer or similar device.

One new item that works well for both DTV and NTSC and does not require field calibration is the new series of power metering equipment from Bird Electronics. That equipment measures the power levels for complex waveforms accurately using a thru line approach. The equipment is calibrated at the factory and is installed in a line section in the same way as the sampling sections used for years. The difference is that the older systems do not measure the more complex signals, including DTV, accurately. In addition, the new system presents digital outputs that can be used in sophisticated monitoring systems to keep track of the system performance.

Also, Dielectric now offers the VSWR Vision for monitoring the antenna and transmission line system. The equipment samples forward and reverse power and maintains a file of the system performance. Periodically, the information is downloaded by the manufacturer and analyzed by their software. First, the equipment will place the necessary phone calls to alert both the station staff and Dielectric that a VSWR problem has occurred in the antenna system. Perhaps more importantly, the ongoing analysis contains trend-spotting capabilities that will alert the station of a worsening condition that may cause future trouble.

Dielectric's new VSWR Vision.

As an example, a station monitoring by Dielectric was alerted by a small, gradual increase in VSWR to the onset of the problem that would inevitably have led to a burnout. The monitoring system allowed the problem to be corrected without any loss of airtime for the station other than for the maintenance.

Modern equipment is so stable and dependable that stations are now accustomed to allowing the transmitter to sit quietly in the country and run without constant supervision. However, failures are going to occur in the best of systems. Equipment such as the systems mentioned above will monitor the power and the antenna system performance continuously and provide the station's technical staff with information that will help to avoid catastrophic failures. We all know what catastrophic failures are. They are the ones that cause the building lights to dim and the transmitter room to become suddenly so quiet that the screams from the front office as the ratings suddenly drop are very easy to hear. It is highly advisable to do everything possible to maximize the dependability of the transmitting plant. Finding the money to install a modern monitoring system will be much easier for management to accept than being off the air for a couple of days while repairs are made to the antenna system. ■

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

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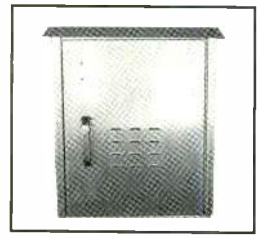

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Venturing into HD post production

BY CHRIS FISCHER

With digital TV transmission nearly a fact of life, many stations and facilities have to decide whether or not to tackle HD television production and post. The major professional VTR manufacturers are adding products that offer the ability to play SD and HD formats in the same deck. If your budget has room for a modern high-end digital camcorder or VTR, then an HDTV purchase is in your range. Century III, a post production company at Universal Studios in Florida, is an example of a facility that has integrated HDTV into its workflow.

We were in the market for a Digital Betacam field package, and for almost equal cost, Sony's 1080i HDCam 700A model camera made more sense. At first, we downconverted to SD straight from the camera's transport but soon added an HDW-500 1080i studio VTR. Though the VTR was an additional expense caused solely by HD, it has allowed us to keep the camera packages working more frequently. We can source directly from the HD camera tapes into any of our linear and nonlinear edit suites without the extra burden of downconversion. So current workflow is the same as shooting any SD format, with the added benefit of a superior camera image and format protection for the future.

Century III's newly remodeled Avid Symphony suite. The HD suite currently under construction will employ this same design.

If you are shooting HD, but plan to post in SD for NTSC or PAL distribution, there are several things you should consider. First is aspect ratio. Since HD natively shoots in 16x9, you will compose with both 16x9 and 4x3 framing in mind. In post, you will have to decide which framing you will use. The 16x9 HD footage can be converted to 16x9 SD (an anamorphic image in a 4x3 frame), a letterboxed or a cropped 4x3 image. Keeping the 16x9 squeezed image lets you retain all the image information, but then you have to decide how your final master will be used. This may mean creating several separate masters — letterbox, "pan-and-scan" 4x3 and the anamorphic version. Graphics will have to be composed and edited for each of these versions.

If your budget has room for a modern high-end digital camcorder or VTR, then an HDTV purchase is in your range.

HD cameras are far sharper and have more natural resolution than their SD counterparts. This resolution looks very pleasing and filmic in HD but may seem soft in the SD conversion. If your end result is to be NTSC, you may wish to run with more enhancement than you'd like for HD. Consider a separate outboard downconverter with image enhancement adjustments. The cameras can be "painted" to create many different looks. This can be stunning in the right hands, but terrible in the wrong hands. Shooting for a "safer" look will often render an image that is somewhat flat, necessitating more color correction in post.

After a couple of years of shooting HD footage, Century III has now moved into HD post. Our SD editing has almost completely changed over to Avid-based suites, complemented by one Digital Betacam linear suite. HD will follow the same path, because it keeps the investment and maintenance costs in VTRs down, while adding far greater versatility. This is truly the first year in which you can build a nonlinear-based HD edit suite for about the same cost as a high-end SD nonlinear suite or a low-end component digital linear suite.

If you are designing an HD suite, here are some things to consider. Which signals do you have to deal with? The dominant HD formats are either 1080i or 720p with frame rates of 24, 25, 30, 50 and/or 60. A broadcaster won't have to deal with all of these, but a post facility might. Remember, in HD you can go 23.96 or 24 and 29.97 or 30, so be careful. A domestic broadcaster will probably be mainly concerned with either 720p/60 or 1080i/30, so don't overpurchase. Fortunately it's all mainly done in software. Do you want your system to function for SD work as well? If so, it will stay busy and you will get the best return. Do you want to work in the compressed native format of your HD system? All modern HD VTRs use compression

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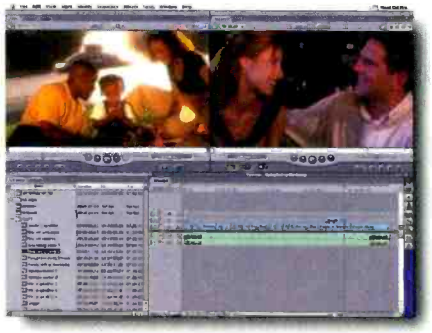
but output their signal to a switcher or NLE as full bandwidth HD. If your NLE can utilize the native codec of your in-house recording format, you will be able to squeeze more HD media onto your drives. Typically uncompressed HD video consumes hard drive space at about 8GB per minute.

All of these considerations have implications for which peripherals you purchase. Take sync as an example. Most NLEs working with 29.97 material (1080i) will function locked to NTSC black burst or sync for reference. Many require a new tri-level sync generator to work with 24p material. What about your scopes and video monitors? Many NLEs will give you a converted SD monitor signal, but that doesn't truly represent what the material looks like in HD. Professional HD video monitors are fairly expensive. A good substitute is the use of a high quality SVGA monitor for your HD image. Miranda and AJA Video, among others, make HD-to-SVGA signal converters for this application. These CRTs, and flat panel screens, are available in wide-screen (16x9) versions. True HD waveforms and vectorscopes also are a good idea, but you might wish to consider some of the on-screen displays, like those from Videotek, which convert the HD signals along with audio displays into a VGA signal. Add a standard computer CRT and you're done.

A big advantage with nonlinear HD suites is that they are generally SGI, PC or Mac-based, meaning that they will network nicely with existing graphics workstations. Rendering is a real factor in finishing HD projects (almost no effects can be completed with real-time processing), so spreading the load becomes very beneficial. If your graphics/effects department already uses After Effects, Commotion, Combustion, Maya, Softimage or others, they are already equipped to produce graphics, animation and/or effects for HD. You can send them materials from your system over the network (usually as a sequential frames or a QuickTime movie), let them add their work and then import the rendered files back into the NLE, all over the existing network. 100-T is fine, but fatter is better!



Screen capture from CineWave HD nonlinear system interface in testing at Century III.

The last consideration is workflow. HD post is largely the same as SD post, except that because many effects work requires rendering, you will wish to go back to offline/online editing procedures. This will let you work quickly at low cost to rough in the show and then spend time in the HD suite tweaking the effects. Unfortunately, if you are using most of the popular standard definition NLEs for offline editing, your effects information won't come across too well. It works better within the same "family" of products. To improve this, most HD manufacturers are offering draft or offline modes on their HD systems. You also could cut on a lower-cost version of the same system during the offline editing phase in order to guarantee direct interchange. For instance you can rough-cut a show on a low-cost version of Apple's Final Cut Pro and then post the online using a Cinewave HD system, which is driven by the same Final Cut Pro software. Effect metadata is then virtually identical.

Like everyone else, Century III has been struggling with all these issues. We have posted a few HD projects with Pinnacle's Cinewave HD system to put it through its paces. This is giving us an idea of how best to finalize purchases for our HD nonlinear suite. Meanwhile we also are looking long and hard at some of the others so we'll be ready in the next month or so to make our final commitment to the system that is right for our clients. HD demand isn't terribly high right now, but like so many things, the floodgates will soon open and we had all better be ready. ■

Chris Fischer is a visual effects editor at Century III in Orlando, FL.

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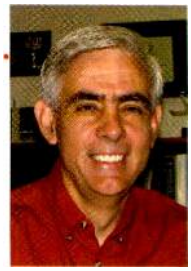


Planning for cooling

BY DWIGHT CRUMB

Heating ventilation and air conditioning (HVAC) in video control spaces is an issue for just about any broadcast facility in operation. The main struggle has to do with the contrast between what temperature is necessary for equipment and what is comfortable for staff. To ensure the needs of both are met, it is often necessary to redirect the flow of air within the control room.

The control room needs to be kept at approximately 66 to 68 degrees in order to keep the broadcast equipment in top working condition and prolong its life. Unfortunately, this temperature is often considered too cold by the control room staff. Naturally, the trick is to find the right balance.

There are several areas in each control room that need to be adjusted for proper airflow. The main problem often stems from the common approach of pulling air from the front area of the equipment and pushing it through the equipment. There are two problems with this. First, the air in front of the racks generally needs to be colder than most people can withstand. Second, this process often pulls dirt and other impurities from the air into the equipment.

The main struggle in cooling is balancing between what is necessary for equipment and what is comfortable for the staff.

The remedy for this scenario is to pull the air from behind the racks. This airflow keeps the equipment clean and cool, and allows the staff to remain comfortable. Keeping the equipment cool and free from a large influx of dust and grime drastically improves its life span and reliability. Power costs also are reduced, as the cold air is mainly confined to where it is needed. This also means that control room staff will find space heaters unnecessary, resulting in even higher cost savings.

The process of moving the cold air to the back of the racks does have its complications. However, it is beneficial to all involved and can be accomplished easily with careful planning.

One way to move the cold air to behind the racks is to direct the air through the access floor below if possible. However, once the floor is converted into an air plenum — an area air is channeled through — the cost of cabling nearly triples due to fire codes that require a plenum-rated cable in the air plenum. The air can be directed into the top of the racks, but in either case the racks must have doors. (See Figure 1.)

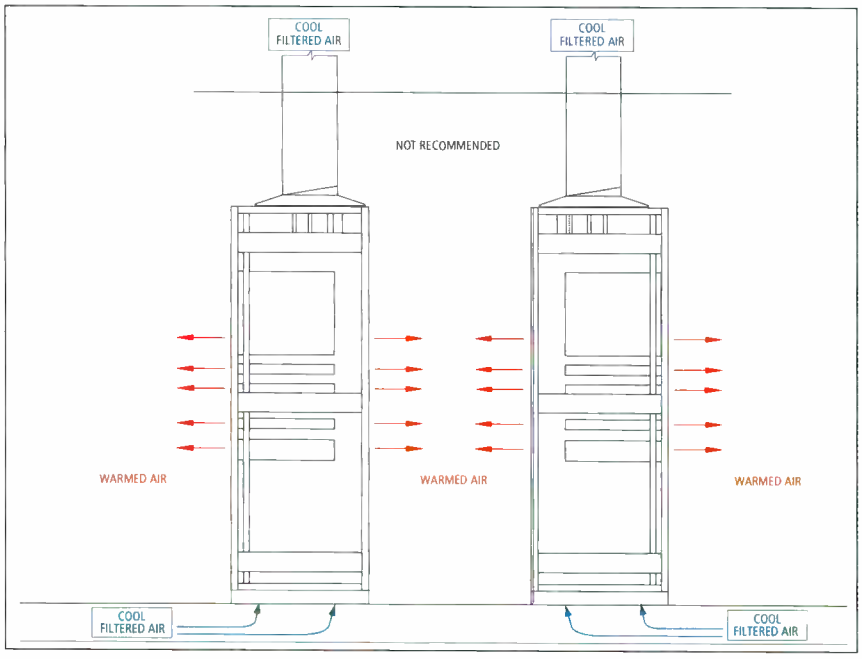


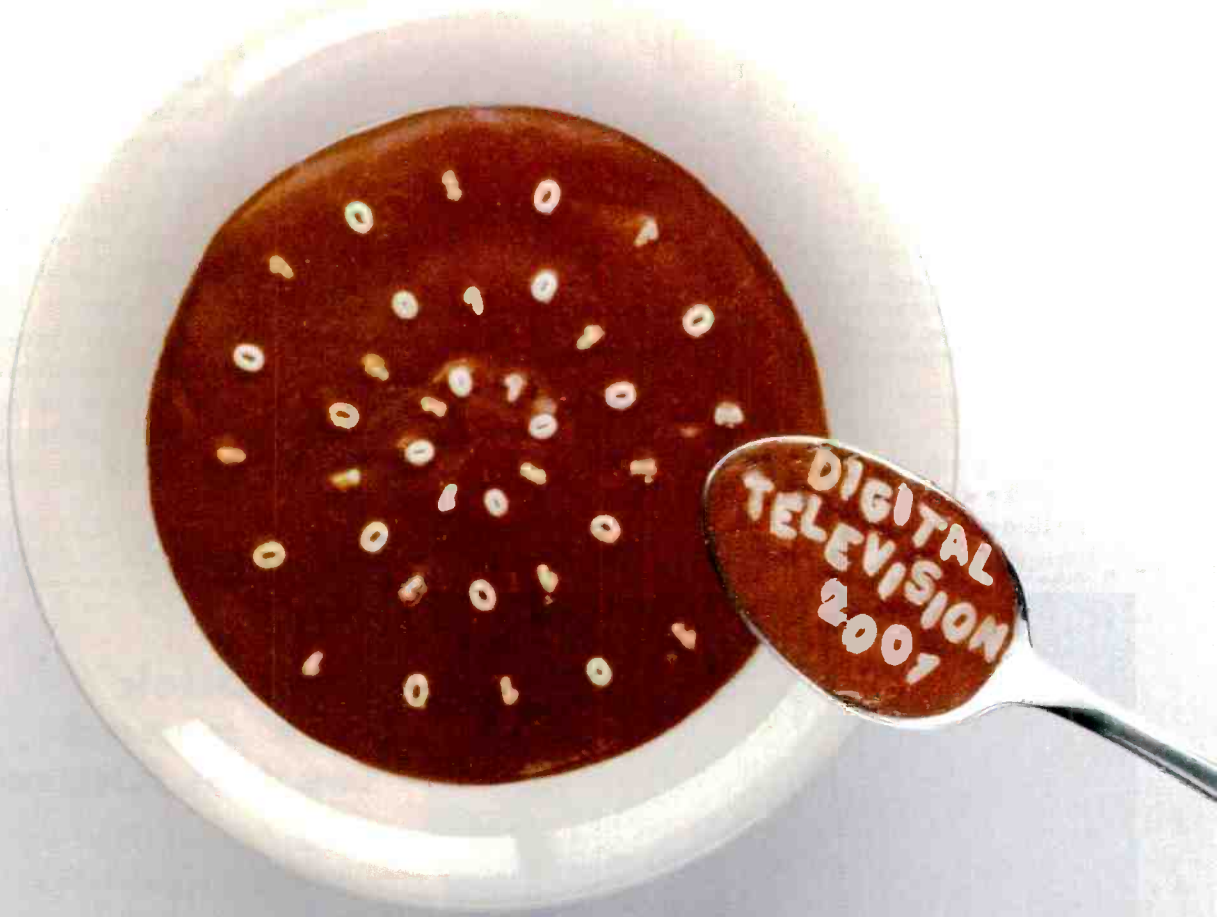
Figure 1. Cold air can be channeled into the back of the racks through the floor or directed into the top of the racks. In either case, the racks must be nearly enclosed.

Pulling air from behind the racks keeps the equipment clean and cool and allows the staff to remain comfortable.

Some building inspectors may require plenum cable because the racks could be considered an air plenum.

The solution is to set up the racks either back-to-back or up against the wall. A soffit can be constructed from the top of the racks upward to just below the ceiling. Avoid touching the ceiling, as once again you could be required to purchase and install plenum cable. The ceiling above and behind the racks should be as high as possible so that it serves as a buffer in case the HVAC system shuts

Think of it as alphabet soup for the digital soul.



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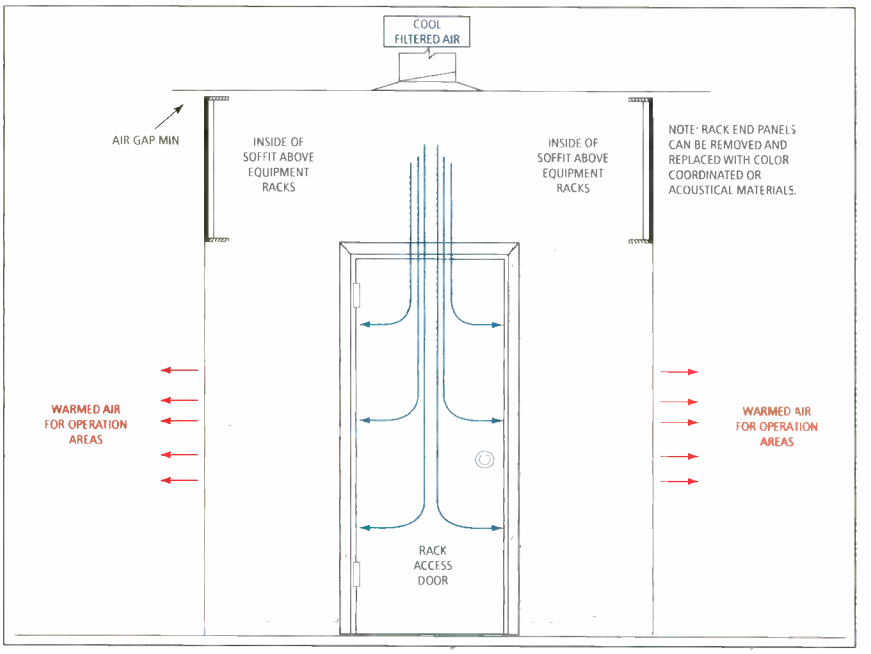

Figure 2. An example of redirection of airflow in a control room. In this case, the air supply sits behind the racks and air is pulled through the equipment from back to front. Warm air is then returned to the HVAC through staff operation areas, providing a comfortable temperature for staff as the equipment is being cooled.

down at any point.

Once the soffit is built the air supply should be positioned behind the racks. All racks should have blank panels installed so cold air is forced through the equipment. This section of the air supply should be devoid of heating capabilities and run constantly. The air should be returned through the staff area of the control room.

This flow redirection keeps cold, clean air on the equipment. As the equipment warms the air, the air returns through the staff area. The HVAC then filters and cools the air. Figure 2 illustrates this redirection of airflow.

Numerous manufacturers build their equipment so that it pulls air from in front of the units, which creates a challenge if you are trying to pull air from behind the racks. A good deal of equipment does not have enough room on its back to include fans. If possible (and after checking with the manufacturer), the airflow through the equipment should be reversed. If this is not possible, installing a vented panel between the hardware that pulls the cold air from front to back can mitigate this issue.

DST has used this approach in many installations with excellent results, in facilities that have been in service for many years in dirty environments. These results prove that the back-to-front airflow keeps the equipment cold and clean while the people stay comfortable, resulting in happier employees and longer equipment life. ■

Dwight Crumb is vice president of engineering for Digital System Technology.

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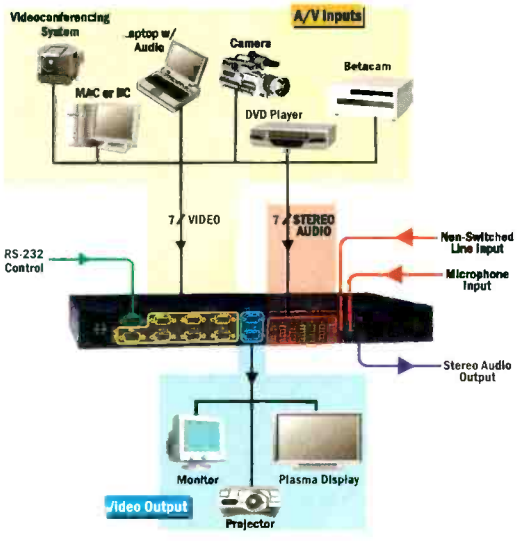

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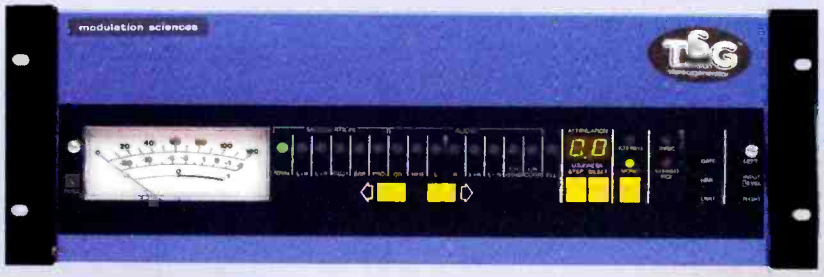

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The language of digital audio workstations

By Gary Eskow

That sound you are hearing comes from spools — the kind that are used to hold reels of tape — rolling into oblivion. At this point an entire generation of young engineers has been trained with only a cursory exposure to tape. Clearly, the digital era is in full swing with regard to sound, both for music and audio post applications.

Although even diehard fans of analog tape have given up the ghost and fallen in line with the legions of operators who embraced digital audio early on, there are still some fundamental issues that need to be worked out. How to move files from one digital audio workstation (DAW) to another, what factors to consider when choosing a workstation and the future of the mixing console are several of the most important questions that facility owners face. This article will attempt to address where the industry is today and where it may be heading.

Manufacturers must make sure DAWs speak the same language in the face of increasing file exchange by facilities like Novastar Digital Sound Services in Hollywood (shown above). Photo courtesy Digidesign.

How good are your ears?

When CDs first became available to the public in the mid-1980s, the advantages of digital sound were widely touted. By today's standards, many of those early recordings sound terrible. Subpar analog-to-digital converters were routinely used, which resulted in multiple distortions, especially on the high end. Operators who were not used to making sure that audio stayed as close to the 0dB mark as possible added unwanted noise to recordings, and tools to normalize audio — simply put, to bring an entire track as close to this optimal level as possible — hadn't been developed and brought to market.

> Audio post operators on any and every budget have access to converters of extremely high quality.

Today, while there may be disagreement regarding which ones offer the truest digital representation of an analog source, the fact is that audio post operators on any and every budget have access to converters of extremely high quality. Mastering houses also have learned how to create 16/44.1kHz masters with all the dynamic range possible within this standard.

Current broadcast standards affecting the vast majority of viewers blur whatever distinctions exist between the best converters and the very good. But is 16/44.1kHz good enough in the long term? Technology has advanced in two areas that have a major impact on this recording industry spec, one that the broadcast industry has picked up on. Most audio experts hear a clear improvement when 24-bit technology is substituted for 16-bit. 24-bit yields a dramatically increased number of resolutions, impacting the way subtle dynamic changes are heard. The result is a warmer and richer sound. Doubling the 44.1kHz sampling rate to 88.2kHz, or even more dramatically, sampling at rates as high as 192kHz, also yields a clearly improved product. In addition to the advances in bit depth and sampling rates, the development of DVD means that record and film producers have much more storage space available to them than ever before. Obviously, music benefits most when it need not share disk space with the more demanding needs of video. In many instances, however, a judicious allocation of bits for video will still leave enough room for audio mixed to the higher standards, even when that audio is blown out from stereo to a 5.1 field. Not today, but one day in the future, digital transmission will catch up, and the average listener will own equipment capable of decoding material delivered to this higher standard, which is why many television producers are archiving their programming with mixes built to these elevated standards.

But what kind of quality does the consumer demand now? Will he or she be willing to buy another round of audio equipment to hear records and surround sound tracks played with the greatest fidelity? Although it pains audiophiles, one of the reasons Napster came under siege from the record labels was that severely compressed MP3 downloads, written to disk on a home computer and thrown into a CD player, sound just fine to many people. While high-end mastering engineers find distinctions between the Dolby AC3 and DTS compression schemes, and pine for records and soundtracks

Steve Puntolillo of Sonicraft Inc. (www.sonicraft.com) at his Nuendo workstation. Sonicraft is currently doing sound design and surround mixing for the upcoming feature film "Megalodon" using Nuendo. Photo courtesy Sonicraft.

mixed with no compression at all, the plain truth is that consumers are content with a level of audio product that falls far short of that which today's technology can output. If you are building an audio post facility though, at any level, one thing is certain: You need to weigh in on the future of digital audio transmission and make equipment purchases that fall in line with your strategy.

Purchasing a DAW

The options available to the audio post professional today are staggering, considering the capital required only a decade earlier. At that point, if you did not have $100,000 to spend on a DAW — not counting a console and all of the required ancillary equipment, including analog tape machines, DAT decks and a large patch bay — you could not be in the game.

In addition, digital editing brings specific advantages to the post world where, unlike the record industry, keeping an EDL with hundreds of clips accessible at all times is essential. The high cost of this technology helped cement audio post as an area reserved for highly capitalized companies. The residue of this phenomenon is that even today, when affordable DAWs are readily available, there are far fewer project studios specializing in audio post than music.

What factors should you consider if you are planning to build a single station audio post room? Your choice of workstation is critical. Given its wide use, Digidesign's Pro Tools platform deserves some consideration. In its early days Pro Tools was a great idea — multitrack audio on an off-the-shelf Macintosh computer — that could not quite cut it in either professional music or audio post applications. CPU speeds were not fast enough to manage all the data necessary to run a session, especially an audio post session, without running the risk of constant crashes.

That era is past. The current generation of Pro Tools systems routinely run continuously with minimal problems.

Pro Tools costs more than some other products, but this fact must be balanced against an assessment of the added power and flexibility of the system, compared to what $25,000 would have bought in 1990. Pro Tools plug-ins cost more than the native versions of those same plug-ins, and adding farm cards to a Pro Tools rig can add expense, but there are no format issues involved in moving audio between Pro Tools systems. Sessions begun on one Pro Tools rig will open on another, although various setup issues including I/O will need to be addressed.

It is important to remember, though, that many of the problems associated with moving between platforms are being addressed at this time. Also, other digital audio solutions are available. Of the cost effective systems that combine proprietary hardware and software designed to work on personal computers, the E-MU Paris workstation is worth a look for any project audio post facility that does not require 100 percent compatibility. The $10,000 system offers a fully functional 48-track recording and mixing environment, complete with the plug-ins that ship with Paris and some popular third-party software. A 16-track mixing control surface also is included with every Paris system.

Until recently, manufacturers of digital audio systems that rely exclusively on the host computer for all DSP needs have been reluctant to claim that their products are capable of handling the rigorous demands of audio post. As dual processor machines are coming to market, and with faster CPUs on the horizon, some of these manufacturers are getting bolder.

Steinberg originally released Nuendo, a multitrack software application for the SGI platform, in the mid-1990s. It was less than a smashing success. Undeterred, Steinberg realized that both Macs and PCs were getting faster, and bet that one day soon these platforms would be fast enough to handle the audio needs of both music and audio post professionals without the assistance of any of the cards that systems like Pro Tools and Paris require.

Steinberg also realized that multichannel audio was soon to become the norm, so it designed Nuendo with surround sound in mind from the beginning. The resulting application, released first for the PC and then for Macs, handles multichannel mixing beautifully and works with its own I/O hardware or with I/O built by a variety of third-party manufacturers. Price this option out for yourself but, with the Nuendo software going for about $1000 and computer prices dropping, this option is clearly worth considering.

Are you branching into audio post to augment the income you derive as a project studio musician/engineer? If so, you probably know all the secret corners of your digital sequencer's audio engine. A number of these applications, including Mark of the Unicorn's Digital Performer, Emagic's Logic Audio and Cakewalk, are adding surround sound and clip-based editing functions that make them candidates for some audio post work. Learn how to serve your clients' needs! You may find that the tools you already possess, plus a bit of study, are all you need to get some corporate post and local spot work.

You may find that the tools you already possess, plus a bit of study, are all you need to get some corporate post and local spot work.

Audio file interchange

No audio post facility exists in isolation. At the very least, the work you do will need to be laid back to a medium that carries both sound and picture. What equipment you'll need for layback is beyond the scope of this article, but the issue of file compatibility touched on earlier needs to be addressed.

A Pro Tools Session includes all of the digital audio and mix information that was saved with it. But what if you own another system — Paris, or a native

The day of the mixing console may not be past, but control surfaces on workstations like the Nuendo shown above offer users many of the same advantages. Photo courtesy Nuendo.

application like Nuendo? Can you open Pro Tools files? In short, yes and no. Digidesign sells an application, DigiTranslator, for about $500 that will allow some other applications to open a Pro Tools Session. However, Pro Tools owners are not likely to spend $500 on an app that will let someone else open their Sessions. What does happen frequently is that users of other applications will ask a Pro Tools facility to save files in Digidesign's SDII format. Originally limited to 16 bits, SDII now can carry either a 16- or 24-bit stream. Any application that can read SDII files can open them easily, regardless of the system that originally created them.

SDII files are simply audio streams that start at one point and end at another. No EDL or mix information can be saved in this fashion. These limitations present no insurmountable problems for the recording industry. After all, in the old days producers carried reels of 2-inch tape around with one thought in mind only: Get a good performance! Mix decisions — save those that required on the spot bounce downs when track count became an issue — were intended to be executed only once, during the final mix. Therefore, sending off SDII stereo mixes, or even individual files, on cheap CD ROMs is simply an extension of the time-honored way record makers have worked for the last half century.

This methodology does not quite cut it in post, where sound effects, Foley, music and dialog editors are often working on a film at the same time. The pre-mix a dialog editor executed might work perfectly and still changes will be called for all the way up to the mixing stage. Many factors, including the fact that no picture is ever "final" these days, make it necessary for every file's location and all aspects of the mix process to be saved in audio post — not just the files themselves.

Finding a way to allow manufacturers in the DAW industry to get at all of the information stored in other manufacturers' files has been challenging. Fortunately, the AES Standards Committee Working Group on Audio-File Transfer and Exchange has been working on this problem for the last four years, and has made progress, according to Ron Franklin, president of WaveFrame Inc., in developing AES31, a file format allowing the accurate transfer of audio files and all related media references, tracks, fades and edit events between DAWS from different manufacturers. The interchange format is the first approved by a standards body — the Audio Engineering Society, with input from the audio industry itself. The standard has been ratified and is being implemented by manufacturers.

Do I need a mixing console?

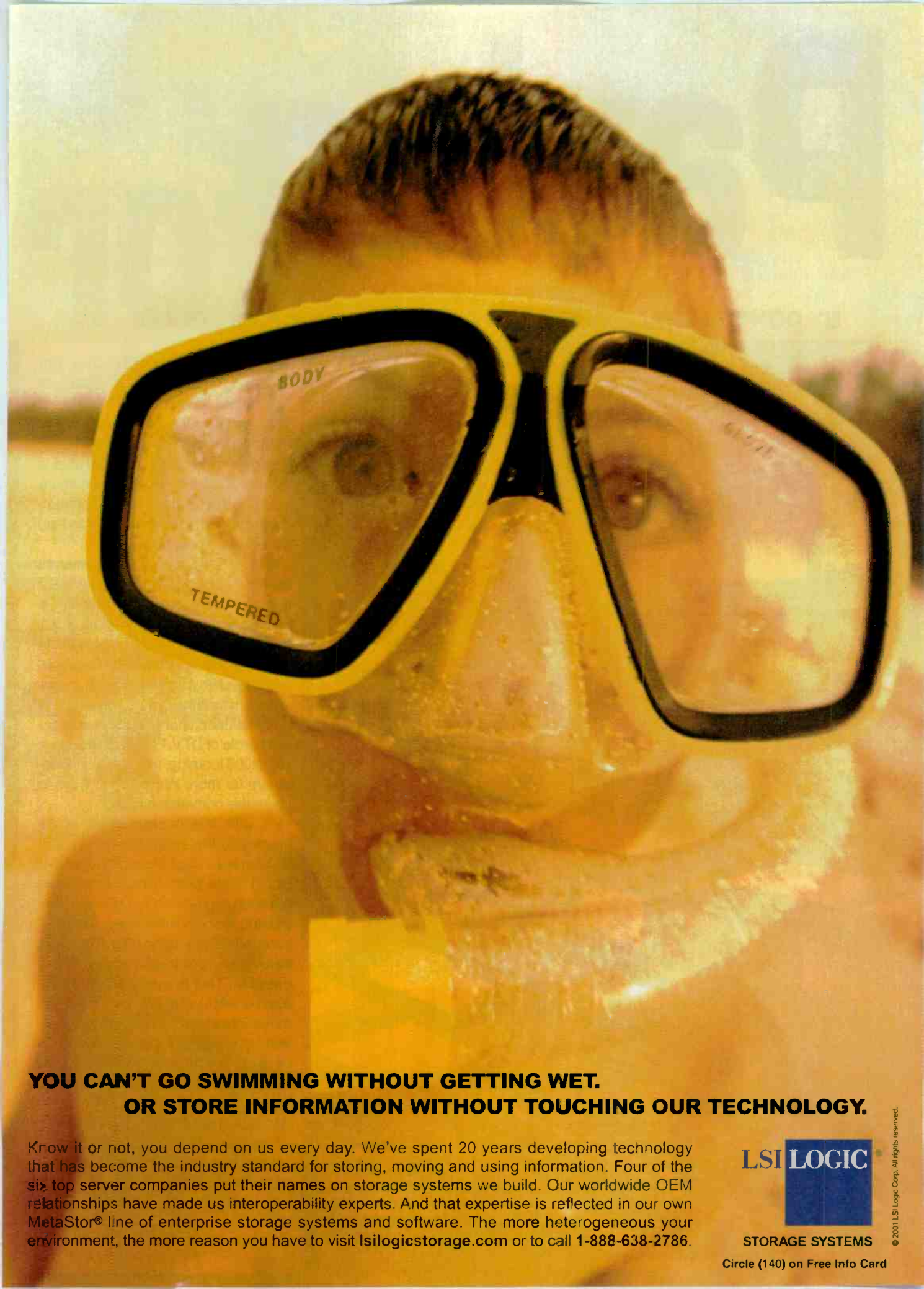
Even the question seems strange, considering the fact that mixing boards have been the central destination point for all audio sources for more than 50 years. Consoles not only allowed engineers access to audio tracks for mix purposes, they also were key to the way audio was bussed to external devices like effects processors and tape recorders. Today, much of the bussing load is handled in software, and digital transfer protocols have streamlined the process considerably.

Very few audio professionals would argue that the days of the broadcast console are over. Of all the areas in this business, performance pressure is greatest at the point of signal dissemination. However, the post industry has very different needs. One of the most interesting areas of development is the proliferation of control surfaces. Add-on hardware designed to add fader functionality to computer-based DAWs that do not require them, control surfaces bring many of the advantages of a traditional mixing board to the user of Pro Tools, Nuendo and a number of other software-based workstations. Facility owners and operators have many interesting options when it comes time to look at control surfaces. Do you need to have 24 faders at your fingertips, or will eight do? Would you like to control EQ and plug-ins from the surface, or can you work some functions with a mouse? You can tailor your studio to include a workstation that meets your needs, depending on your budget and requirements.

These are exciting times for the audio post industry. The price barriers that kept smaller facilities with limited capital from competing with their more well-financed competitors are falling. We are seeing the first of the new breed — the hungry, talented audio post engineers who are willing to buy the equipment they need, hang a shingle, and go after market share. ■

> Although it pains audiophiles, severely compressed MP3 downloads, written to disk on a home computer and thrown into a CD player, sound just fine to many people.

Gary Eskow is a composer and journalist based in New Jersey.



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Paying for

BY DON STENDAL

The proposed tax credit could be transferred or sold to raise funds for construction of new digital facilities, or retained for use on equipment upgrades by stations already on the air. Photo courtesy DST.

Few would argue that getting from here to 2006, at least in the DTV world, is problematic at best. Stations are facing millions in conversion costs. There's no reason to believe that a digital signal will generate any more income than an analog one. Consumers are as confused about DTV as they are about income taxes.

Yet the FCC has set a deadline and it seems that it will not move. So is there a way to offer the entire industry a positive encouragement – okay, a carrot — rather than the stick approach to DTV conversion? *Broadcast Engineering* magazine suggested a tax incentive more than four years ago as a way to help broadcasters get over the financial hurdle of DTV. Few listened. Now, with 2006 looming, many in the industry are far more interested in ways to make this conversion work.

It's with this background that we present to the entire broadcast (and consumer) industries a proposal that would allow both camps to achieve the total conversion to DTV in a less painful, more positive way. The proposal offered by author Don Stendal is innovative, progressive and highly possible. This program offers a low-cost benefit to all concerned and helps move forward an entire nation's conversion to digital. Broadcasters would be wise to immediately step forward and embrace this program while there is yet time to affect the process. Don't wait. Your personal and our industry's future may depend on your actions.

Read on, there is a way to pay for DTV without becoming bankrupt.

Brad Dick, editor

DTV

The big problem for most stations with regard to DTV is simple. It's cost — how to pay for it. Suppose the IRS created a federal tax credit program for stations that allowed for the recovery of DTV conversion costs — even up to the point of $1.50 in tax credits for every dollar of qualifying DTV expenses. Suppose the tax credits could be used as a tool to generate cash whether your projects were complete, were in progress or as an up-front funding mechanism to create cash to start and build your projects.

What if this program also provided a similar tax benefit for viewers? Such a program might provide an incentive for viewers to buy new DTV sets or STBs so they could enjoy DTV programming.

The goal of such a program would be to stimulate the completion of all station DTV conversions by May 2003 and to bring the viewing public online between 2003 and 2006. Combined, these steps would make the NTSC cutoff date of Dec. 31, 2006, a reality. Interested?

Benefits

Most of the discussion on DTV has been in the form of a "stick" swung at broadcasters. It's been a "do it or else" proposition. But what if there was a way to substitute a carrot for the stick? What if it became a win-win for the broadcaster, the viewer and even the government? What would the benefits be to a cost recovery program for DTV?

The tax credit tool would afford broadcasters the benefit of recovering their costs of expansion and build-outs or to raise funds up-front for construction. For some, tax credits could mean the difference between compliance with FCC timing requirements, or not.

Consumers would benefit through a partial or full recovery of upgrade costs. A timely conversion to DTV could be orchestrated through a well-organized advertising campaign donated by all broadcasters. If they were informed of the value of DTV and of the cost recovery benefits available through the generosity of the U.S. government, they just might become motivated to convert to DTV sooner, and begin to enjoy a whole new dimension in their favorite pastime. All the while, they would be completing the changeover between 2003 and 2006, oblivious to the "drop-dead" turnoff date.

Even Congress gets a win here. In political terms, this is their "cover." A partial or full cost recovery program would help avoid what is likely to be a huge public outcry when the American public finally understands that their analog TV set is about to go dark. Those that may need a little help to buy new TV sets get it, and again, Congress gets credit for providing a "universal service." Only in this case, the rest of us don't end up paying for someone else's TV set.

Government benefits again because broadcasters will free up the spectrum they want to auction off. The sold spectrum will generate funds for their favorite projects. But this time, there's not a penalizing tax increase to raise those funds.

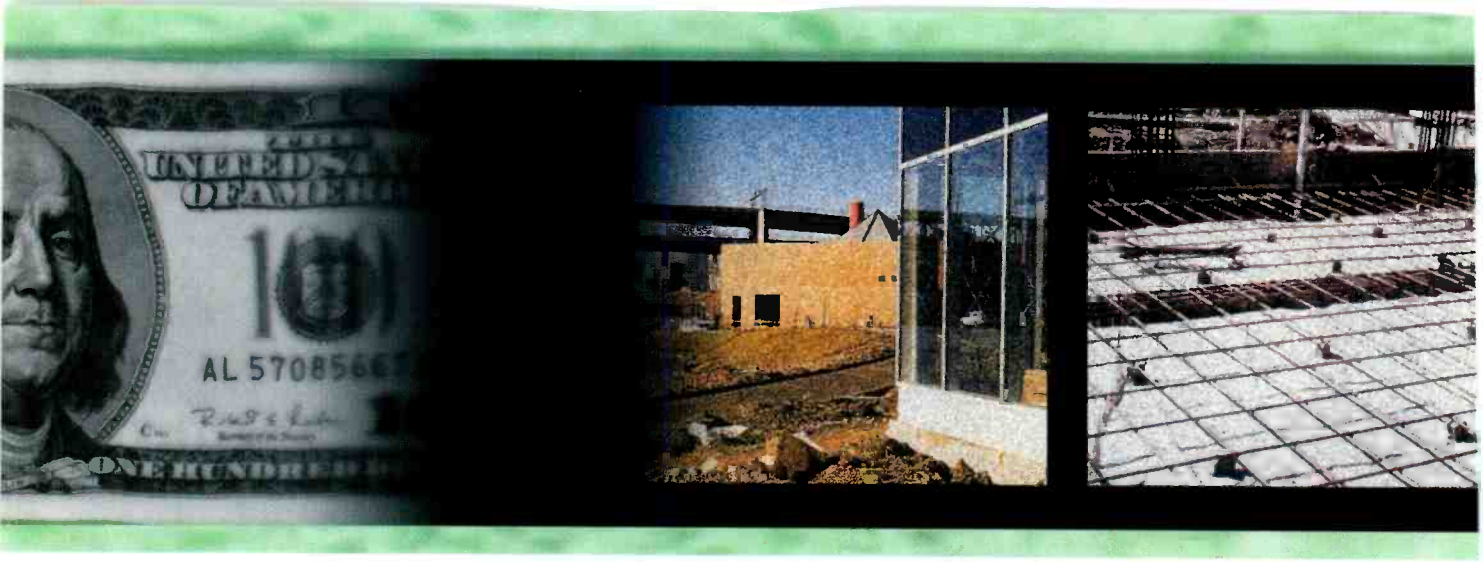
The basics

The basic premise is that *tax credits* for broadcasters is cost recovery based on the sum of the costa of assets purchased plus other expenses incurred related to DTV conversion, as well as a bonus of 150 percent. In an abbreviated explanation, the total tax credit award would be the sum of those amounts increased by up to 150 percent.

The tax credit is applied to a corporate or personal federal tax return after the "total tax" is computed and reduced dollar for dollar the amount of that tax. The tax credit could reduce or even eliminate federal income taxes to pay.

A station owner may elect to "carry back" the tax credit to recover federal income taxes paid in up to five previous years. In that case, using the carryback option would not trigger the need to file extensively amended federal tax returns. Assets reported, depreciation and all other expenses would remain unchanged. Amendments would start with a line that says "Income Tax" (due). Below that line, the DTV tax credit would be entered in an amount that would either eliminate or reduce the tax to pay (paid). This would apply to either a corporate or individual tax return.

This tax credit program would be available to any commercial or noncommercial station owner whose license is within the purview of the FCC rules requiring conversion to DTV. Owners would have filed for DTV construction permits since April 3, 1997, or will file based on current FCC DTV conversion rules. The tax credits could only be awarded once for costs related to the DTV build-out of an individual station. After program



implementation, acquisition costs for DTV projects that have previously been the subject of a tax credit award would not qualify for a second award. However, it might be possible further DTV upgrades or enhancements to qualify. A station could elect to keep the tax credits for use on their own federal tax returns. Alternatively, the tax credit is a detachable benefit and could be transferred or "sold" to raise immediate cash for their own cost reimbursement or to raise funds for construction.

The DTV Tax Credit Program would have a sunset provision of Dec. 31, 2003, for broadcasters and Dec. 31, 2006, for homeowners. The key is that broadcasters (and government) could meet the mandated conversion time frame. Combined, this plan suggests a positive way for all concerned to *Make the Switch by 2006*.

Qualifying costs

The tax credit must have a foundation to determine its quantity. The foundation is called *eligible basis*. Eligible basis is the total of all qualifying costs plus the special 150 percent bonus program for broadcasters. The example development budget would list all qualifying expenditures. That amount would actually be increased by 150 percent. The result becomes the total eligible basis and would be the value upon which the tax credit is based. This bonus is designed to help stations offset, in a small way, the interruption of routine, and disruption to their organization. For instance, most stations will need to operate both NTSC and DTV transmitters for several years. The costs of this are significant and this bonus would help them recoup some of these costs.

Every station filing for the tax credit would be required to supply basic information. The application would require, among other things, listing the licensed owner, station location, transmitter site, call letters and other necessary information that ties the tax credit allocation to a specific station, address and owner and to specific build-out features. Also required would be a development budget that itemizes project costs (see Table 1) and a worksheet to compute eligible basis. The cost accumulation process would be the same whether the station is owned by a corporation, an invidivual or is a non-commercial station. Non-commercial stations would likely need to list grants received, especially federal grants, which might be subtracted from eligible basis.

Once Congress agrees to this program, stations could immediately begin seeking financing commitments, and projects could move forward. Those stations that have not already started their DTV planning would need to promptly begin assembling the needed data in preparation for their application. Stations with completed projects could begin to assemble data in preparation for their tax credit application and cost recovery as well.

The timing of expenses is also important. To maximize benefits to stations, the cost accumulation period could extend from April 3, 1997, through the date their DTV license is granted by the FCC. For stations that are not built out, that date could extend an additional 90 days to allow final cost documentation to settle.

At their option, stations that are already built out might use the tax credit benefit as an opportunity to purchase additional equipment, make changes or modify their installations, even though the DTV license already is "granted."

Examples of allowable costs include engineering, architecture, general contractor fees, consultant fees, past research and development, developer fees, accounting and legal. Other allowable costs would be for project construction, including permits of all types, lease costs, permanent and construction loan financing, and other

Many stations, like WHYY in Philadelphia, are far advanced on the road to DTV. These stations can still benefit from a tax credit, by applying it to recover $1.50 for every dollar paid in taxes on DTV-related expenses. Photo courtesy Communications Engineering.

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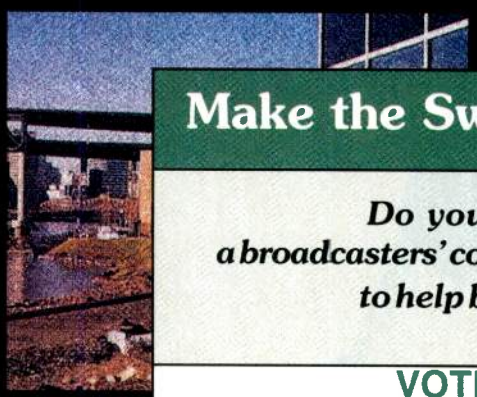

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related costs inside and outside the property lines. (Refer to Table 1 for a detailed list.)

Program outline

With the basics in place, here is how the program might be administered from a financial standpoint:

• *Allocation period.* The tax credits would be issued annually, based on a 10-year allocation period. This is also called the *tax credit stream.*

• *Carryback.* This provision allows recovery of federal income taxes paid in up to five previous years. In that case, the first-year distribution would include an allocation for those carryback years. The current year would be prorated based on the in-service date and would also be included in the first-year allocation. This is an important benefit to those who have already invested in DTV. These early adopters must be supported equally in the program not only because it's fair, but because the program needs their support. The same applies to viewers who have already made DTV purchases.

Each year of DTV Tax Credit allocation would have its own individual 15-year life. The credit allocated in any given year must first be used in the current year. Unused portions may then be carried back to the first, then second, etc. previous years. Remaining unused portions may then be held, or "carried forward" for use in following years. The credit must be used by the 15th anniversary of its allocation year or be returned to the IRS. Therefore, if the last year of allocation for your tax credit stream was 2013, then the allocation for 2013 must be used by 2028 or returned to the IRS.

• *The application process.* The application process is quite simple, at least in concept. Proof of compliance with certain FCC Construction Permit and other regulatory requirements would be required, including proof that certain time-line milestones have been met. These deadlines are discussed in a little more detail later. The tax credit program would have its own rules that would require compliance separate from any other rules or programs.

Falling out of compliance could mean loss of tax credits, interruption in the tax credit stream or repayment of tax credits used. There could be a compliance period requiring the owner to maintain the DTV station in service throughout the 10-year allocation period.

• *Reporting and filing deadlines.* To help monitor the tax credit reservation application progress and to ensure a smooth process for both the applicant and the IRS, the project would be broken down into four reporting phases. Basic filing requirements would vary depending on whether the project was already completed, in progress or if the applicant wanted funding for construction. Equity payments would be tied to accomplishments by these four phases. Stations that are already DTV-compliant but wanting to upgrade would have a different reporting schedule. Stations using the tax credit program to raise funds would likely receive payments from their equity sources in multiple payments. A typical payment schedule might be 50 percent before construction start, 30 percent when the station submits for final reservation, 10 percent upon receipt of their granted DTV license and the final 10 percent upon receipt of the first tax credit allocation from the IRS.

Key program phases

The program can be broken down into four basic steps or phases separate from any equity payment schedule. Each step would require unique submittals and reporting. While it may seem complex, the actual process is relatively straightforward for anyone who has been involved in a large capital project and applied for a commercial construction loan.

• *Phase one.* The application for a Preliminary Reservation of Tax Credits. This application would be filed by any station wanting to participate, whether the construction is complete, in process or not started, and whether commercial or non-commercial. At this stage, a station is seeking funding for the conversion process. Application data and submittals would include:

· identification of owner, station, project location and project description;

· if construction capital is sought, a development budget for the project

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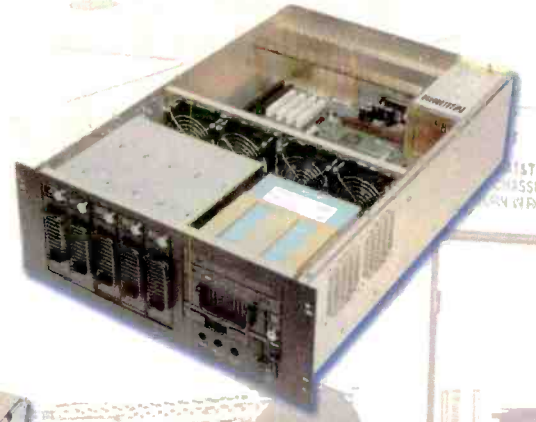

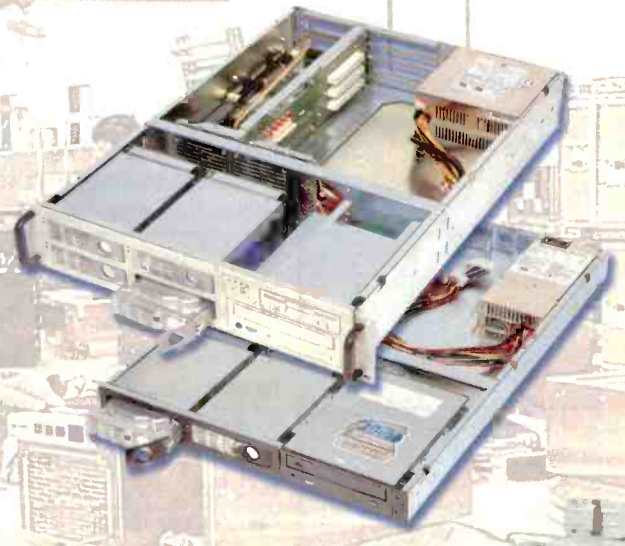

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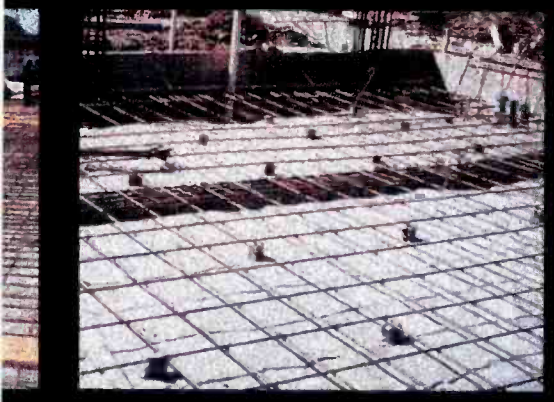

ITEM	DESCRIPTION EXAMPLE
LAND Cost of land, long-term lease, legal costs	Equipment, structures
CONSTRUCTION Utilities, roads site work, structures	Transmitter buildings, towers, remodel of existing to accommodate DTV, studio facilities RF equipment of all sorts, heating and cooling, electrical, all interior build-out, furnishings, all other exterior build-out
General contractor	General requirements, all contractor costs
ENVIRONMENTAL Local, NEPA and others	EIR, negative declaration
DESIGN Research & Development Engineering, architect	DTV technology, scientific, experimental, legal Survey, civil engineering, structural engineering, mechanical engineering, electrical engineering, RF studies/engineering, other scientific, architectural and technological costs
FINANCING Construction loan	Loan interest, origination fees, application fees, title and recording, taxes, loan interest*
Permanent financing	Origination fees*, application fees, title and recording, other
PERMITS & LICENSES Local Federal	Most local/zoning permits FCC, FAA
OTHER	Tax credit application fees, activist groups, marketing*
DEVELOPER COSTS	Most applicable costs

Table 1. Applicants for the tax credit would be required to submit a development budget itemizing allowable project costs. Actual allowable costs may vary. *(*Cost is not allowable.)*

would be based on assumptions of reasonably expected costs and eligible basis, or if the project is complete, the applicant would submit actual costs and actual eligible basis with engineering and accounting certifications;

· preliminary commitment of funds from the equity provider or an election by the applicant to retain the tax credits;

· a carryback request if the station has elected to recover income taxes previously paid within the past five years; and

· a sources and uses of funds statement to support ability to complete the project. In other words, show the IRS you know where the money is coming from and that you have committed, sufficient financial resources to complete the project. Proof of funding sources will be especially important with PBS stations that may have received state, federal or private grants, which may have an impact on the amount of tax credit awarded.

• *Phase two.* This step is primarily for stations that have already completed a DTV project and are seeking reimbursement. By now, stations would have received a Preliminary Reservation of Tax Credits notice from the IRS. They should prepare the applicable documentation and go to step three.

If the station is attempting to raise capital for the project, it must convert any preliminary funding commitments (which were submitted in phase one) to final agreements with the lender or source of the capital. The station would then receive the funding and begin building the station. Once it is completed, the station needs to submit a Certificate of Occupancy. This simply confirms that the facility is built and meets local ordinances. The station would be typically be in the Program Test Authority stage. The station then applies to the FCC for a DTV license.

• *Phase three.* Receive the final reservation of tax credits. By way of submitting for the Final Reservation, the station notifies the IRS that the construction is complete, the project has applied to the FCC for a DTV license and is in the process of completing FCC requirements. While the FCC work is in progress, the station can accumulate its final cost and engineering certifications. Once the granted DTV license has been received, the applicant may apply for his "Placed in Service" Reservation.

• *Phase four.* At this stage, the station should have received a final reservation from the IRS and it is time to file a Placed in Service notice. Here's where the station must submit detailed documents certifying legal operation, costs and justifications, and funding agreements. Typical documents required include:

· certified copy of the station's granted DTV license;

· engineer's cost and eligible basis calculations;

·development budget and eligible basis computations adjusted to actual and final cost certifications (certifying what equipment you bought and how much it cost); and

· copy of the final agreement with bank or loan provider.

The IRS loves documentation. So upon project completion, the equip-

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ment, services and other costs claimed as development expenses would be reviewed by an independent engineer. That engineer would need to validate their relationship to the project. A CPA would then review the expenses to certify that all costs claimed are, in fact, allowable in eligible basis.

A Placed in Service reservation would have to be issued before the expiration of the allowable time frame. Typically, this would be within two years of the date the preliminary reservation was issued (step two).

In January of the year following the filing of the Placed in Service Reservation, the station would receive the first allocation of tax credits. Carryback years would be included in this first distribution.

A win-win situation

On the surface, some outside the industry may say that only the commercial broadcaster benefits from this program. Let's examine how noncommercial stations, the consumer and even the government benefits from this program.

Non-commercial and PBS stations don't pay taxes, right? Then why should they support this program? The advantage to these stations is that they can pool their credits and then sell or auction them off. For them, the benefit isn't a credit against taxes (which they don't pay anyway) but a *credit* they can turn into hard cash.

The benefit extends to consumers as well. When TV first came on the market, no one had to give up our radios. When color became available, viewers still had a choice of color or black and white. As other delivery methods became available, viewers could choose to get their television signals via OTA, cable or satellite. But when digital replaces analog, there will be no choice. Viewers will either be in — or in the dark.

The consumer is unwittingly caught up in the DTV push, which is unique to this technology. While government is highly motivated and involved, and is in the position of compelling compliance, there is clearly a political penalty for not doing so in a consumer-friendly way.

This proposal is a way of softening the burden on the broadcaster and homeowner alike, while simultaneously creating a benefit for the government. Further, it is intended to bring about a favorable, productive reaction to progress from the public and all concerned.

A cost recovery program for homeowners that would partially or completely offset the expense of their DTV upgrade (which might be limited to converter boxes) and would likely increase their receptiveness to conversion. Broadcasters could help by establishing a strong advertising campaign promoting the benefits of DTV, thereby effectively attaining everyone's attention and encouraging its rapid adoption.

Lastly, but most important, is government's participation. Congress is certainly going to ask "What's in it for me?" Fortunately, this proposal benefits the government in many ways.

The key benefit to government of converting to digital has always been the revenue generated through the sale of the analog spectrum. While that has been somewhat lost in the recent financial turmoil, it's certain to rise to the forefront as Congress struggles with rising costs of programs. The auction of spectrum will soon again be seen as the goose laying the golden eggs.

Broadcaster support

Television used to be an option, even a luxury. In today's world, TV is a much more integral component of our lives. Now government is making digital TV a requirement. If broadcasters are to benefit from the conversion to DTV, they need to influence the process. For years, broadcasters have contributed vast amounts of public service airtime, advanced the technology, and returned billions of tax dollars to the government through direct corporate income tax payments and by income taxes paid by their employees. Now it's time to use a small portion of that goodwill to help build American's digital future.

At their request, an outline of this concept has been submitted to the Senate Commerce Committee. The committee has said that in order to take this concept further, widespread industry support is needed. If you think this concept has merit, then we need your support to move forward.

Readers are encouraged to visit the *Broadcast Engineering* website and voice their opinion on this issue. In addition, links for the Senators from all 50 states are provided so you can personally contact them and encourage their participation. ■

Don Stendal is a developer and consultant who works in conjunction with Holmes & Narver/DMJM _Harris, Architects and Engineering to offer design, construction and single point of contact project management. He can be reached at 801-463-5074.

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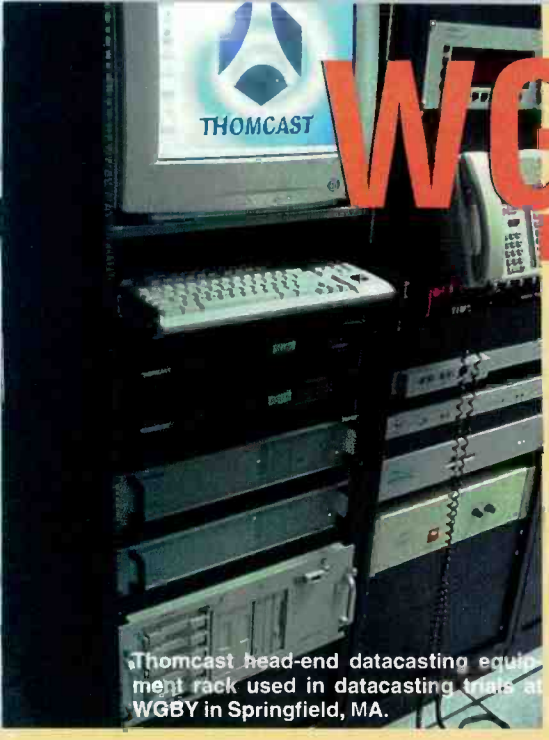

Thomcast head-end datacasting equipment rack used in datacasting trials at WGBY in Springfield, MA.

WGBY datacasting field trials

By Ted Karam

The broadcast paradigm is shifting with the transition to DTV, transforming the industry in new and unfamiliar ways. Datacasting promises to deliver many new service revenue opportunities never before available to the conventional broadcaster. Today, major questions surround datacasting: What exactly is datacasting? What are its benefits? What equipment is needed for the application, and how does it work? Probably the biggest question is: What are the viable datacasting business models for generating substantial incremental revenue streams? This article takes a brief look at straightforward answers to each of these questions.

For the purposes of this article, datacasting refers to the broadcasting of IP data within a DTV transport stream. The data may or may not be synchronized with, or related to, the content of an associated video program.

Datacasting trials at WGBY

For the past year, Springfield, MA, PBS station WGBY has been conducting datacasting trials using equipment from Thomcast. These trials have acted as a long-term test bed, serving as the grounds on which to explore the special challenges that datacasting presents and develop innovative solutions.

WGBY chose Thomcast head-end equipment including the Turquoise interface adapter, the Amethyst smart switch, the Amber remultiplexer, the OPAL IP Encapsulator and the Pearl PSIP generator for their datacasting solution, along with datacasting products from other suppliers. Figure 1 outlines the architecture used.

At the studio, WGBY receives a single HD or quad-SD DTV signal from their satellite link with PBS National in Alexandria, VA. This signal is passed through an interface adapter to convert the stream from a SMPTE310M to a DVB-ASI format, and then fed into one of the eight inputs of the remultiplexer. This is the DTV input to the remultiplexer. Data may or may not have already been inserted in this transport stream, designated DTV TS, back at the satellite uplink.

A second input to the remultiplexer originates as HTML content that is encapsulated as IP datagrams and carouseled by a multicast server, then encapsulated into an MPEG-2 ATSC compliant transport stream via the IP encapsulator (IPE). The two transport streams are remultiplexed into one, DTV + Data Stream, and the national PSIP information in the DTV stream is replaced with local PSIP supplied by the PSIP generator. A smart switch monitors this DTV + Data Stream for proper syntax at the PID level and will automatically switch to the DTV-only reference stream if a problem is detected. This ensures that the DTV stream never goes off-air. The switch then outputs the multiplex signal, which is passed through another interface adapter to convert the stream from DVB-ASI back to SMPTE310M for uplink via STL to the transmitter. WGBY broadcasts their signal as DTV Channel 58 in the general Springfield, MA area.

> Broadcasters that are fifth or sixth in a conventional market can easily be first in the emerging datacasting market.

Several PCs located in a research lab about 20 miles away from the WGBY transmitter site are equipped with DTV

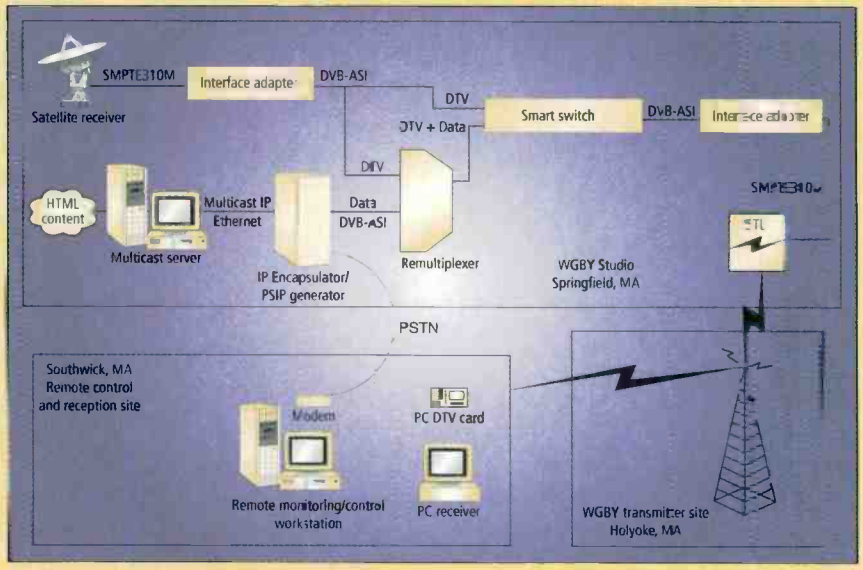

Figure 1. In WGBY's datacasting architecture, HTML content is encapsulated and multiplexed with a DTV transport stream from PBS National. The off-air signal is transmitted to a lab where DTV reception boards store the data portion of the multiplex to the computer hard drive, while streaming the DTV video portion for display.

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reception boards to receive the off-air signal. The board drivers separate the data portion of the multiplex and store it to the computer hard drive, while streaming the DTV video portion for display. Also located in the research lab is an OpenMux remote monitoring and control workstation for interfacing via PSTN to the OpenMux head-end equipment located at the WGBY studio.

This end-to-end system has demonstrated consistent over-the-air delivery of Internet data multiplexed into WGBY's broadcast transport stream, as well as information from the WGBY website, which is received and stored in the hard disks of the receiver PCs to allow simultaneous viewing of the DTV program and surfing of the website.

One of the goals of these long-term trials was to find products that could interoperate in an open and flexible system architecture. Many proposed datacasting architectures are able to operate only with proprietary solutions on both the receive and head-end sides. The test at WGBY shied away from proprietary technologies and attempted to focus on products commercially available and able to interoperate with a variety of other manufacturers' equipment. Until DASE becomes a standard with compliant receivers, ATVEF has been used as the application standard for the trials.

Benefits of datacasting

With datacasting, broadcasters have the opportunity to become a conduit connecting local advertisers with local consumers, and generate incremental ad-based revenue streams. Viewers spend a significant portion of their money in their local community. Datacasting allows the broadcaster to deliver interactive, market-targeted, program-related local advertising, in order to potentially divert ad revenues from other media. Imagine watching a golf match in which Tiger Woods makes the final putt to win the tournament and in the corner of the screen is a special offer from the local sport shop for the golf club that Tiger just used to win the game. Impulsively click on it and, guess what, you just bought it at the special discount price shown — to be shipped to your door the next day. This brings a level of convenience to the consumer and a huge impulse-buy benefit to the local advertiser.

In the not-too-distant future, when DTV reception devices are prominent in consumer homes, widespread consumer applications become viable.

Also, the broadcaster could supply market intelligence to the local advertisers on the who and when of what is watched and bought. Another benefit to the broadcaster is the opportunity to recapture viewers who are migrating to the PC to acquire Internet information.

An additional point to highlight about the consumer datacasting market is that it is a level playing field. Broadcasters that are fifth or sixth in a conventional market can easily be first in the emerging datacasting market by being the first conduit to provide additional value to the local community and the first to establish new business relationships.

Datacasting applications can generally be broken down into two categories, professional and consumer. Professional applications include business-to-business, government and educational services, and typically take advantage of proprietary client-server architectures to deliver data. Consumer applications focus on enhanced and interactive viewing experiences. These are facilitated by the use of a standards-based client-server protocol such as SMPTE DDE-1 (previously ATVEF).

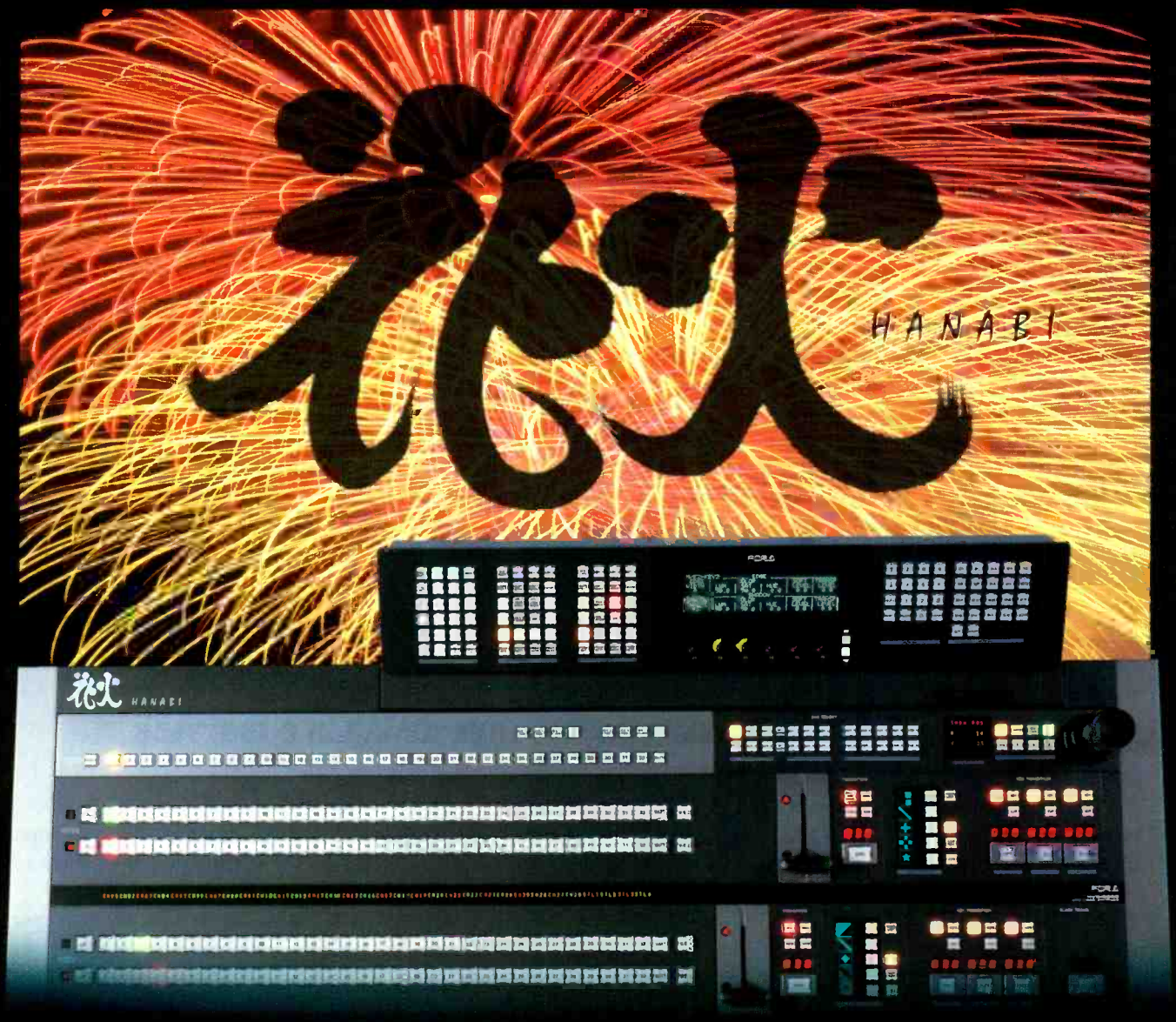
With datacasting broadcasters can generate advertising revenue by enabling local viewers to buy products with a click of the remote.

The more profitable datacasting applications in Europe, where the rollout of this technology via satellite distribution has preceded that in the United States by several years, appear to be based on professional applications. Some examples of professional applications include ISP cache updating, distance learning, remote training and wireless intranets for the dissemination of corporate media to multiple company locations. The technology is here today to support professional services and is currently under trial at many broadcasting stations. These types of applications will more than likely lead the way in the United States as well and offer an initial means for broadcasters to begin to recoup capital investments.

In the not-too-distant future, when DTV reception devices are prominent in consumer homes, widespread consumer applications become viable. For example, users might have the option of receiving up-to-date information like local news or sports from the Internet at the click of a button while their favorite program takes a commercial break. There is also the opportunity to rent instead of buy any form of digital data (like videos, games, software or music). There is great potential for broadcasters to realize ad-based revenue streams via these consumer models.

While waiting for DTV reception device penetration, broadcasters probably would be best served to focus on providing professional datacasting services, thereby gaining expertise and recovering some of their capital investment while positioning themselves to be a significant datacasting service provider to the consumer market in the future. ■

Ted Karam is software and digital design manager for the Broadcast and Multimedia Division of Thomcast Communications, Inc.



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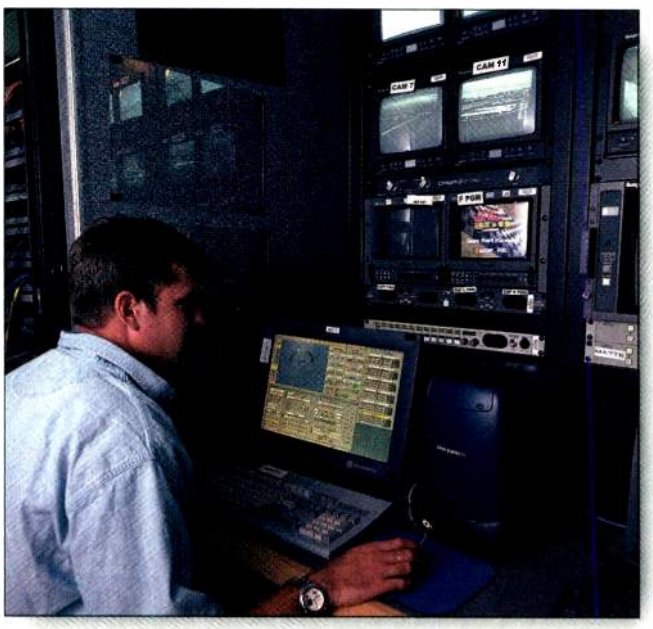
Applied Technology

Sportvision's RACEf/x and SGI's O2

BY COLETTE CONNOR

If you've watched NASCAR racing recently, you've seen live graphics popping up on-screen providing real-time in-vehicle data along with current place information. What you don't see is the on-site Sportvision truck behind those graphics, which tracks all 43 cars, moving at 200 mph, as well as data on how all six broadcast cameras are panned, tilted, zoomed and focused, continuously throughout the race.

In the Sportvision truck, the producer controls the generation of a graphic effect showing the car's position, with its relative time and place compared to the leader. The crew computes the graphic and keys it on top of the live broadcast video in two seconds using RACEf/x, Sportvision's latest technology, created with and running on Silicon Graphics O2 visual workstations. Sportvision has formed a partnership with NASCAR to feature RACEf/x during every race in the Winston Cup Series through the 2006 season.



Sportvision's RACEf/x running on an SGI O2 workstation during the race. Photo courtesy SGI.

Creating graphics for racing

There are three components of the technology: the in-vehicle sensing system, the two-way radio telemetry and the broadcast enhancement system.

According to Stan Honey, president and chief technology officer of Sportvision, a remote in-vehicle sensor system installed in each car measures throttle position, brake and rpm, working as a kind of extended GPS system, in conjunction with inertial sensors and a 3D track model.

Sportvision's RACEf/x also could potentially drive applications such as the "holy grail" of video games — live racing in a real race.

For the two-way telemetry, to and from the cars, Sportvision built a 900MHz spread spectrum slotted system that allows them to send control and GPS differential correction information to the vehicles, which return real-time position updates and the sensor information. Sportvision created the custom telemetry system to send packets with high redundancy in order to increase the likelihood of getting the packets in time for live broadcast. Honey noted that a normal TCPIP structured packet retry system would not work in a racing environment.

The broadcast enhancement system consists of sensors that measure the pan, tilt, zoom, focus and extender information of each camera, while rate gyros on the cameras measure the bouncing of the platform that the camera is mounted on, and inclinometers measure the tilting of the platforms. All of the information is telemetered back to the Sportvision truck.

A crew of six travels to each race with the Sportvision truck for setup, operation of the system and teardown. During the live broadcast, RACEf/x is operated by two Sportvision employees and one broadcaster employee, who is on an intercom with the producer and runs the effects control panel.

According to Honey, the broadcast feed is delayed for about two seconds, while the broadcast producer indicates what data to highlight and display. Sportvision uses its own software on five Silicon Graphics O2s to render the graphic highlights in real-time by computing the 3D location of the cars, accounting for the location of the cameras and the distortion of the lenses, and geometrically determining where all the highlights should be located. The graphic is then keyed over the program feed, which then goes via the backhaul to the broadcast studio for distribution.

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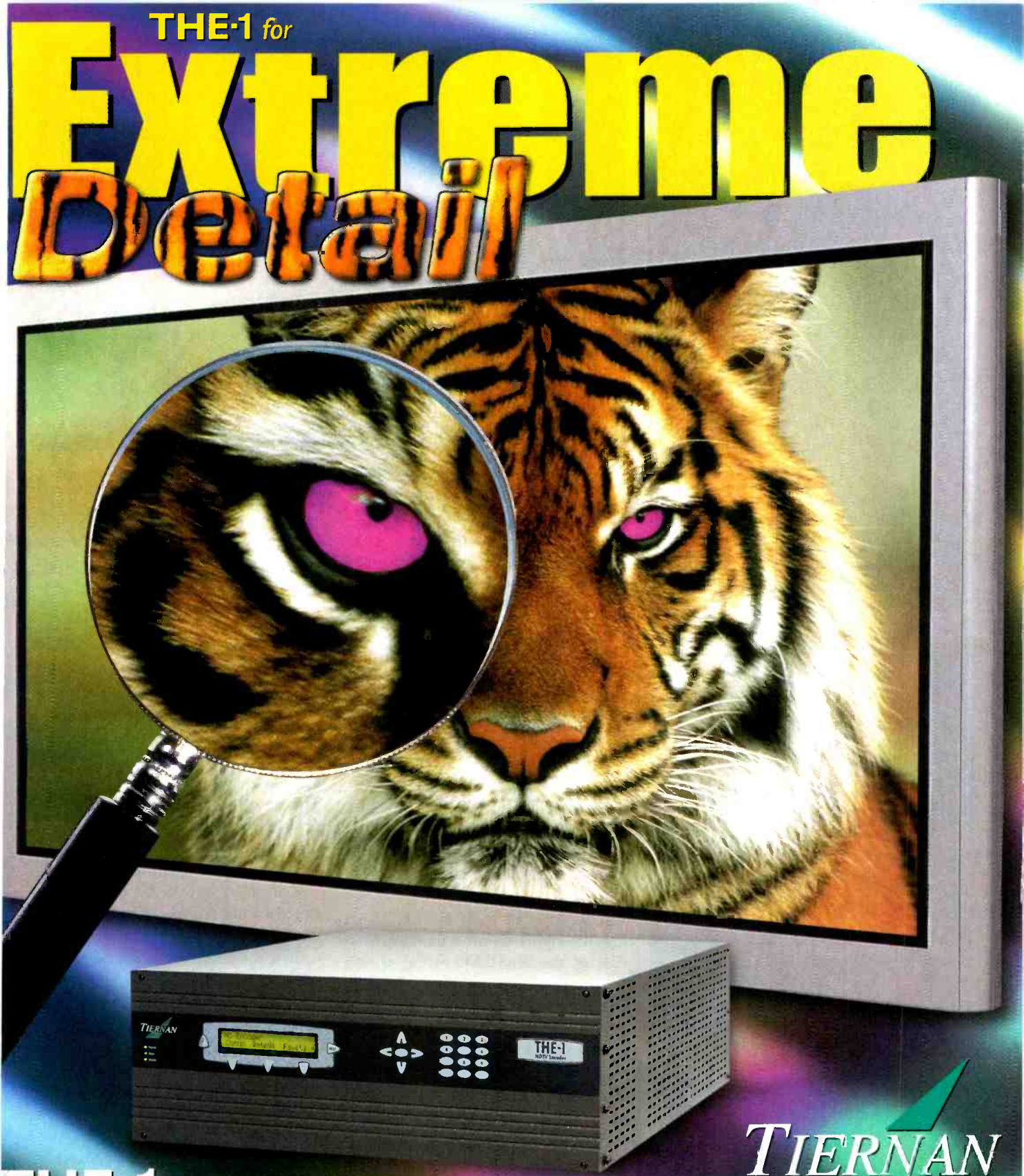

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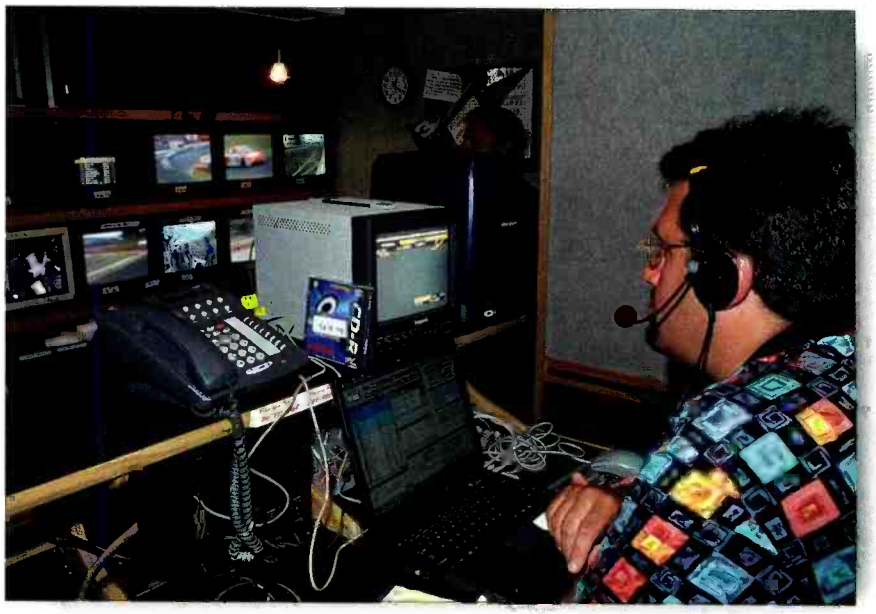

FOX Sports used the SGI O2 to run in-house graphics software during its coverage of the racing season.

Honey also noted they have a demodulator that accepts all of the data from the cameras, and an industrial PC, called the Gather Computer, that takes that data and makes it available to the other computers. A time-synching computer measures and resolves the ambiguity between the TV time and the GPS time, which is the time that is used to measure the location of the racecars.

Honey notes that Sportvision chose the O2 for its reliability, clean architecture and its ability to input and manipulate digital video signals in main memory and then output digital video.

In the case of FOX Sports, which has the rights to broadcast the first half of the NASCAR racing season for the next six years, the Sportvision truck created the pointers that identified which car was which. Information was fed from the truck to the FOX Sports truck, into a Silicon Graphics Onyx2 graphics system running Discreet frost and FOX Sports' in-house created software.

The graphics for the NBC and TNT broadcasts, which cover the second half of the NASCAR season, will be created solely by the Sportvision truck. NBC will customize RACEf/x to fit into their programming, and Sportvision is currently implementing those graphics to give each network's NASCAR coverage its own unique look. One additional computer and a delay line will be used in the Sportvision truck to key the additional graphics on the program.

Future plans

Sportvision, headquartered in New York City, was among the first customers to receive beta units of the new Silicon Graphics O2+ workstation at their research and development facilities in Mountain View, CA. The new workstation will offer 47 percent faster compute and 32 percent faster graphics, as well as double the system memory and hard disk.

While it is yet to be determined exactly what role the Silicon Graphics O2+ might play in Sportvision's future, the company is already looking at real-time ways in which viewers can take advantage of the data that the RACEf/x system generates. As Honey says, viewers might be able to watch the race from above or inside any car. A unique rendered version of the race also might be available. He anticipates that the data also will drive applications such as interactive TV or the "holy grail" of video games — live racing in a real race. ■

For more information on SGI's O2, circle (451) on Free Info Card.

Colette Connor is a freelance writer reporting on the advances of digital content creation and related technologies. She is based in New York.

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Telestream's FlipFactory Pro

BY DAVID HEPPE

The march of technology has brought many advances to the broadcast industry. Stations today enjoy crystal-clear HD picture quality, nonlinear editing, sophisticated graphics and vastly more efficient archiving, and these are only a few improvements. But with new digital devices come differing file formats and standards. An increasing number of digital transmission devices, like on-air servers, news servers and edge delivery systems, have varying file formats and content file data. Many stations face incompatibility between file formats when moving digital media and its associated metadata between different digital devices or when preparing it for a Webcast.

This type of problem is as frustrating as it is typical. What stations need is a way to easily transport media within, and between, facilities. However, there is no universally accepted digital media format that can be used by all of the devices. Media exchanged processes have usually involved manually going back to baseband video and re-encoding the media to another digital format. But exchange via baseband video and machine control is awkward as well as inefficient. Repurposing content into streaming media also increases the need for automated translation. An efficient solution for media transport is needed.

So, with a couple of key enabling technologies — the increasing power and speed of general purpose servers, and modular scalable software applications — flexible universal format translation for broadcast facilities is now possible, allowing direct digital file-based media transfer between devices and facilities.

Telestream's FlipFactory Pro facilitates this task in a number of ways. First, an automated transcoding feature enables broadcasters to convert digital media from one file format or bit rate to another. It automates the process of transcoding and delivering streaming media directly from broadcast servers to streaming servers, in popular formats like MPEG, QuickTime, DV, Windows Media, RealVideo and WAV. This is key to improved format translation.

It not only "flips" media into those popular streaming formats, but also supports leading broadcast servers including GVG Profile, Pinnacle MediaStream, Sony MAV-70, SeaChange MediaCluster, the Leitch VR series and Omneon Networked Content Server. One application is the standardization of MPEG files. All MPEG file formats have not developed as equals between manufacturers. For instance, a station's on-air server might be a GVG Profile, while its new newsroom solution might be from Pinnacle with a Mediastream server. Although they both talk and play MPEG, their metadata and file structures differ enough that they cannot be exchanged and played directly.

There are at least two separate groups in the format wars, which means separate, incompatible formats for the foreseeable future.

While server manufacturers are trying to get together on a common file format, there are at least two separate groups in the format wars, which means separate, incompatible formats for the foreseeable future.

FlipFactory Pro facilitates the transfer of files between edit systems, broadcast servers and archives. The software maintains the highest level of broadcast quality with the least amount of manipulation of the video data possible.

This offers benefits for broadcasters wishing to transfer media between two MPEG broadcast servers at the same bit rate/GOP structure. With software translation the source MPEG video remains untouched (preserving picture quality), and only the necessary metadata and file structure changes. On the other hand, if the MPEG bit rate needs to be changed to save storage space, a software solution can utilize the motion vectors and keep the media in DCT space, preserving picture quality better than decompressing all the way to baseband.

Not only can the streaming automation software move media directly on or off a broadcast server, it also can automatically repurpose valuable broadcast content for the Web, using multiple formats — such as Real Media, Windows Media and QuickTime — at multiple bit rates. This function allows users to reduce the time and money spent repurposing programming for the Internet. For instance, users working on a news segment can submit a media source file such as a DV file into a "factory" configured on the FlipFactory Pro's standard Windows NT server to produce the MPEG version for the broadcast server as well as all the streaming formats desired. The software then delivers all the resulting files to their respective servers. Users can complete the process with the push of a button.

This capability is only a glimpse of what is to come. It is important to note that the advantages of a software-based media format transcoding solution lie in providing scalability to meet increasing translation needs, as well as adaptability and flexibility to handle future formats and standards.

For more information on Telestream's FlipFactory Pro, *circle (452) on Free Info Card.* ■

David Heppe is vice president of marketing and business development for Telestream.

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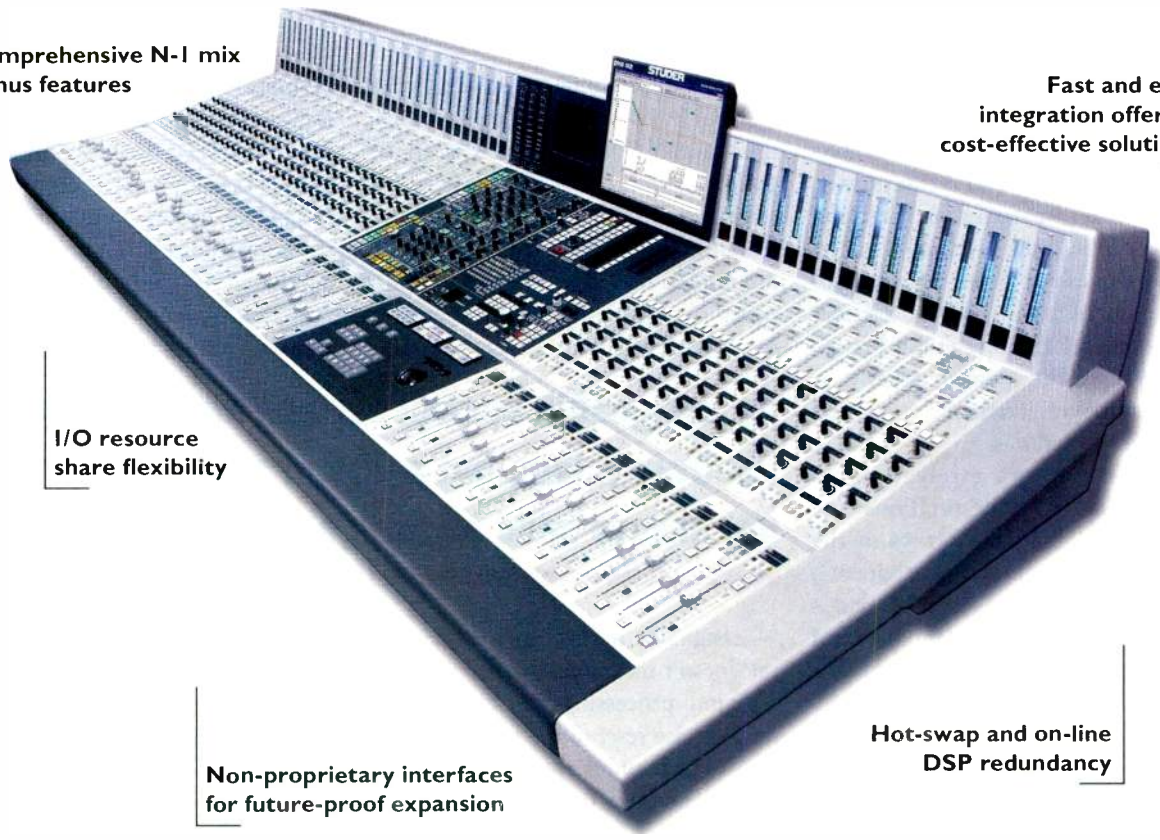

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Solid State Logic's broadcast consoles

BY NIALL FELDMAN AND MARK YONGE

To say a broadcast mixer can be any mixer used for broadcasting is avoiding the question. Any audio mixer can be connected to a transmitter, and a self-op on-air or presentation mixer can be (and often is) used to record discussions and music programs. But what are the differences between a music mixer and a broadcast mixer? The answer, briefly, is communications, control systems and monitoring facilities.

Recording mixers rarely need to communicate with destinations any more remote than the artists in the studio. Broadcast mixers are part of a larger system, sharing sources via a switcher, supporting telephone and remote facilities and specialized monitoring. Recording mixers have lots of mono channels, all with highly sophisticated dynamics and EQ and integral multitrack tape routing and monitor returns, but no subgroups. Broadcast mixers have a mixture of mono and stereo channels with fairly simple dynamics and EQ, subgroup faders and no timecode-based dynamic automation.

Because an assignable control surface needs a digital control system, many people assume that the converse is true — that a digital audio console must be assignable. In broadcast applications, this casual assumption needs to be tempered with an imperative need for real-time control. It is easy to conceive a nightmare vision of trying to handle a complex network news show on a console with a single fader or just a mouse or a touch screen. Let's be clear — assignable means digital, but digital doesn't mean assignable.

An assignable control surface needs a digital control system, but a digital audio console does not always need an assignable control surface.

Digital processing not only brings fast, precise reset to the broadcast studio, digital audio routing allows the mixing console to embrace a wider role. A major feature of all Solid State Logic "A Class" consoles is their large-scale audio routing and data control system. This provides bidirectional audio plus networked control for multiple channels of digital audio, using fibre cable where necessary. Remote audio input/output (RIO) units, which may be analog or digital, may be sited more than a mile from the console. SSL's remote-controlled microphone inputs allow the operator to adjust a range of analog preamp parameters, channel by channel, directly from the console.

Routing capacity may be extended by the addition of SSL's Hub Router to manage more than 2000 inputs and outputs. Audio samples are re-clocked at routing nodes to ensure jitter-free operation; sample-rate conversion takes place as necessary in the remotely mounted digital RIOs. SSL's Switcher Interface allows a conventional routing switcher to control routes to selected outputs within the console system. Up to 254 inputs and 128 outputs may be set up as "external switcher" sources and destinations. Control from the switcher uses the widely accepted Pro-Bel General Switcher Protocol, enabling any control position in a studio to access SSL audio for remote monitoring, and providing a cost-effective audio-follow-video routing system.

Finally, it is almost a maxim that today's technology will be obsolete in a few years. This is a significant concern for investors with business plans that need to take a longer view about the value of their capital equipment. This underpins SSL's recent introduction of its HS processor and the latest A-series Plus consoles. The fact that this leading edge processor technology is available to upgrade customers' original Aysis Air, Avant or MT consoles extends both the capabilities and value of the console, with minimum impact on operator training and console productivity. An example of how SSL's unique policy of product development ensures that the customers can benefit from the latest hardware and software, without unnecessary control surface makeovers.

For more information on Solid State Logic's "A Class" consoles, circle (450) on Free Info Card. ■

Bruce Davies, product executive at Solid State Logic, works at the new MT Production (MTP) digital console at SSL headquarters in Oxford, U.K.

Niall Feldman is director of product marketing and Mark Yonge is broadcast market manager at Solid State Logic.

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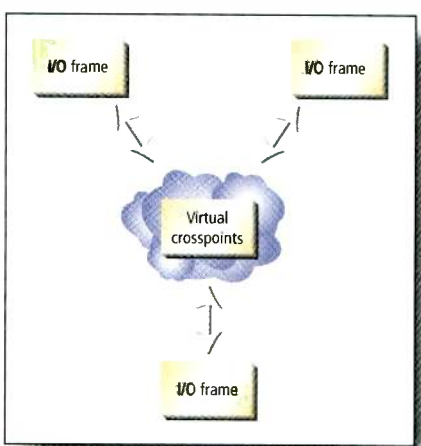
Routing switchers: POTS, routers and switches

BY JOHN LUFF

What constitutes routing today is not what it once was. Electronic switches were developed to expand the capability of facilities, improve quality and reduce reliance on mechanical patching systems. It became more and more difficult to support large systems of distribution amplifiers and patch panels.

In some ways television routing is less complex than the telephone switchboards of decades ago. NTSC and SDI systems are inherently unidirectional. POTS service is inherently bidirectional. A video routing switcher only needs to open a circuit from one input to one output, unlike a POTS or computer network connection that must manage bidirectional service. Video topology is different. A device with an input and output, for instance a VTR, requires two circuits. Both are switched independently, but the topology of video facilities today supports only point-to-point, always-open connections.

One solution to fostering the growth of video facilities about 25 years ago, was to provide an electronic patching system where fewer distribution amplifiers were necessary because every input was available to all outputs simultaneously. A routing switcher could reduce complexity and improve performance. But as the number of inputs and outputs grows the total count of crosspoints grows. A 20x20 system has 400 crosspoints, while a 100x100 system has 10,000 crosspoints. The cost of the system was directly related to the number of potential paths. In the above system the crosspoints account for 98 percent of the circuitry.



In newer digital systems, switching is done via "virtual" crosspoints.

As the number of inputs and outputs grows the total count of crosspoints grows.

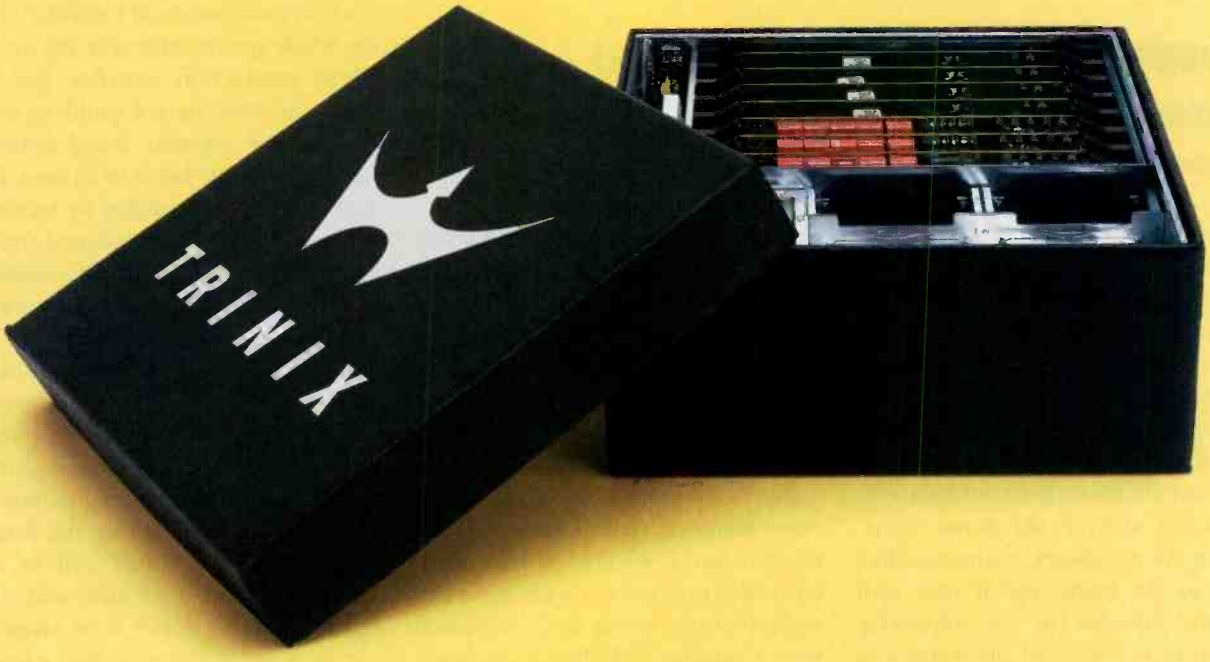
In some newer digital systems the switching is done in a time domain switch where the crosspoints are "virtual," and though the complexity is high the cost is less. (See Figure 1.) This is done by using time domain multiplexing of the signal within the switcher. Some manufacturers have designed such switchers. In a small switch the cost of the multiplexing equipment will swamp any savings, but in large systems the cost can be significantly reduced and new capabilities provided. For instance, consider a large central switch that actually consists of several smaller distributed time domain switchers. Inputs and outputs could be wired to nearby connection frames, but the actual time domain multiplexed signals can be connected to multiple frames, creating a fabric where any output can access any input without regard to the location of the input. This reduces the length of I/O cables, and thus the cost of implementation, without resorting to tielines between discrete routers.

What about bandwidth? Today services exist in video facilities that vary in required bandwidth from under 100Kb/s to 1.485Gb/s, a difference of four orders of magnitude. The complexity and range of signals to be switched seems to expand at least annually.

It is no longer always practical to have individual routers, treated by the control system as a "level" for each signal type. It also wastes resources to expand the router in a flat system where every signal is available to every output even if the logical connection is invalid. In a system with AES and SMPTE 292M, there is no intrinsic reason for using a single fabric for switching both. However, signal types can be combined in one flat matrix — especially where the structure uses time domain crosspoints — to save implementation cost in the end, particularly in large and complex systems where many signal types are present.

It is common today for video routers to accommodate signals from below 10Mb to 1.5Gb. This combines at least SMPTE 292 with conventional SDI signals. By doing so, a television station facing the implementation of a digital plant and the addition of DTV can save by not buying two routing frames. Such routers often offer reclocking at only one rate. The ability of SMPTE 259M to travel reliably about 1000 feet without signal restitution, and the relatively small number of devices the signal passes through without processing and reserialization into SMPTE 259M, makes reclocking for SDI signals less critical than it is for HD-SDI where the signal can only traverse a few hundred feet of cable before reclocking is important. As a result some manufacturers have chosen to make their routers reclock at only 1.485Gb.

A few years ago the cost of the line drivers, serializers and de-serializers for SMPTE 292M was very high. Fortunately these costs have dropped significantly. The difference in cost between a wideband router and an SDI router can be as little as 10 percent.



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It seems prudent to give serious consideration to a wideband system today. The insurance it gives is well worth the marginal difference in cost. In the future the distinction will reverse itself and the common implementation will be wideband.

Inside a video facility many devices today are being equipped with monitoring and status reporting capabilities that require bidirectional topology. If you "route" a signal to a monitoring station it would be valuable to send status and control information at the same time, using the minimum number of levels for the routing system. In fact the concept of "levels" could become unnecessary if the video circuit is bidirectional and carries the program services (video and related audio), metadata, status and monitoring, and control.

Though complexity is high with virtual crosspoints, the relative cost is less.

The future will hold the convergence of many factors that may fundamentally change the way circuits are set up and managed in video facilities. For instance, DTV can only deliver unidirectional service without additional back-channel capability. The digital RF broadcast service mandates no return circuit to support interactivity. However, deliver the same ATSC stream via a network connection like fiber to the home and it may well become valuable for the originating system to be aware of the status and capabilities of the receiver.

This is a change at the very core of video facility design. It is not difficult to envision a television plant as a fabric where devices provide input and accept output in an unconventional view. Consider a production switcher that is viewed as only a processing engine. It could have access to a multiplexed fabric of virtual crosspoints without having any of those circuits itself. It could process entirely in the time domain, and deliver the result back to the fabric in its assigned time slot. Individual functions within a production switcher could be available to the whole system without tying up the whole production switcher. For instance, master control could access a keyer for a weather crawl without having a discrete keyer of its own. But such holistic approaches to facilities require seamless bidirectional topology not only for signal interconnection, but also for control, status and monitoring.

The range of signals requiring point-to-point connections is steadily increasing as the impact of computer power in video and audio equipment grows. One major manufacturer announced at NAB this year that in the future every device they build will be designed with Ethernet addresses and connections. Wouldn't it be easier to put an ATM connection that carried everything on the device? What if such a system were built where access to video would not require that bandwidth be held in reserve to audio, and where the device being "served" could simply ask for status when it wants it, audio when it needs it or perhaps only the luminance video channel if a luminance key is the objective? In such a system the multilevel router of today would become redundant. Only the switched fabric of the "video network" would be needed, and each device would only need access to a homogenous single network connection. Scopes would simply request the data they need to display the intended signal. Digital audio mixers could request the signals in digital form as they are needed instead of having tons of unused input and output connections.

Routing has been at the core of television facility design for more than a quarter of a century. Today the topology issues, which include issues of how to grow complex systems at affordable cost require rethinking of how routing is viewed in the global context. ■

John Luff is vice president of business development for AZCAR.

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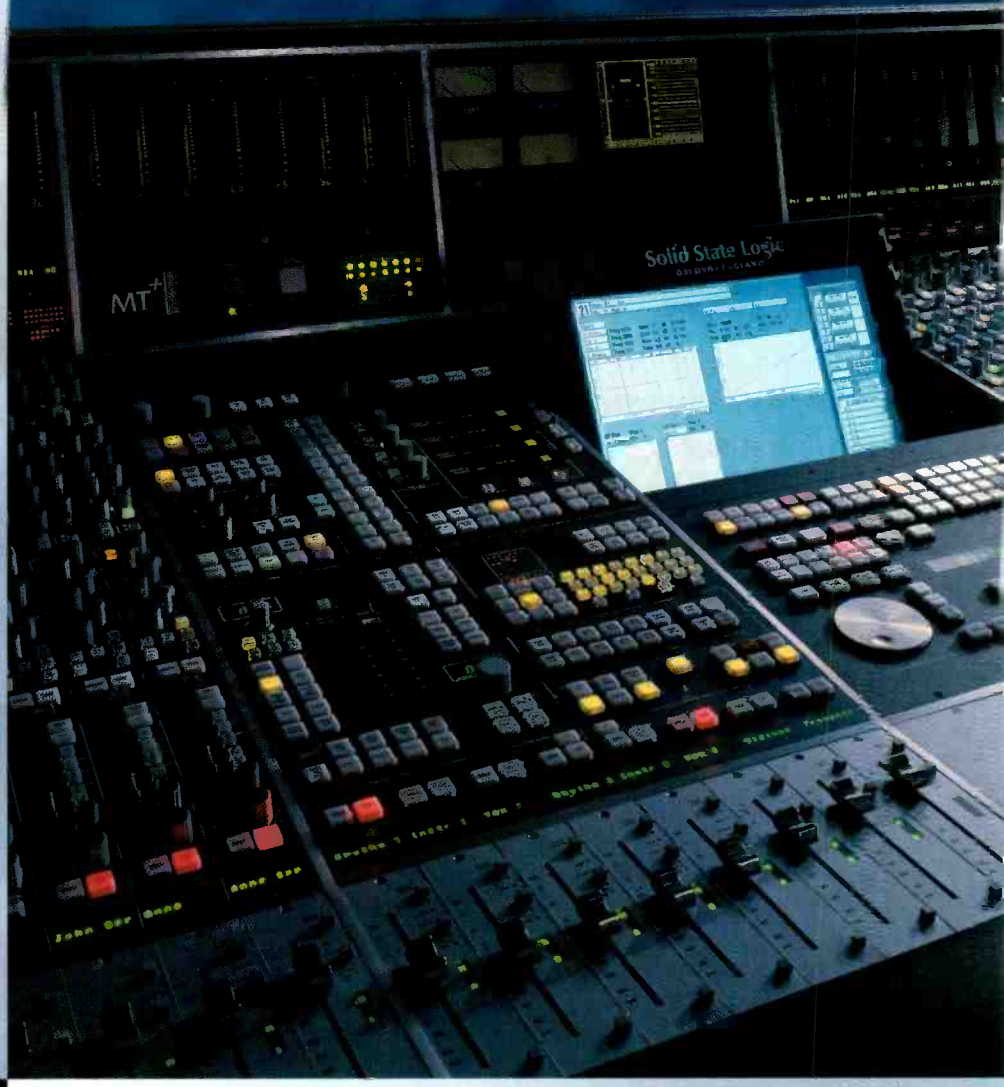

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CLASSIC "ON-AIR" LIGHT

CBT Systems On-Air light: features traditional sand casting, bright finished aluminum housing, plexiglass window and modern high output LED array; unit is UL Listed; easily installs on a standard 2-gauge j-box; optional legends and flasher module available; 858-536-2927; fax: 714-957-8138; www.cbt-net.com.

Circle (362) on Free Info Card

UHF TRANSMITTERS

Rohde & Schwarz UHF transmitters: operate in the low-power range from 50W to 200W (digital) and 100W to 200W (analog); air-cooled low-power transmitters equipped with LDMOS transistors and an integrated analog, OFDM or 8VSB coder; series of transmitters are based on MOSFET amplifiers and designed for a range from 2kW to 20kW and 800W to 5kW for DVB-T or ATSC; can be converted from analog to digital by simply replacing the encoder module in the exciter; +4989/4129-11765; fax: +4989/4129-13208; www.rohde-schwarz.com.

Circle (352) on Free Info Card

MULTICHANNEL DIGITAL EFFECTS SYSTEM

Lexicon 960L 2.5: version 2.5 includes more than 100 new factory programs utilizing seven newly developed stereo and multichannel delay algorithms; includes two additional stereo and multichannel 96kHz reverb algorithms; available at no charge, for a limited time, to 960L owners who register their 960L online; 781-80-0300; fax: 781-280-0490; www.lexicon.com.

Circle (353) on Free Info Card

MONITORING ENCODER

Crystal Vision MON210: provides monitoring quality conversion of SDI to PAL/NTSC or Y/C, and replaces the MON204; provides five composite outputs for each channel when using the new RM18 frame rear module; can be used with the RM01 rear module to access two outputs per channel or with the RM02 for four outputs of the first channel and three of the second; +44 (0)1223 506515; fax: +44 (0)1223 506514; www.crystalvis.com.

Circle (354) on Free Info Card

EDITING STATIONS

Incite Multimedia Incite Editor: Windows NT/2000-based NLE designed for the Matrox DigiSuite hardware product family; now integrated with Matrox's MAX card and real-time VIA support for greater CG capabilities; provides an easy-to-use interface featuring a fast-cutting and thorough toolkit; Incite Audio Plus also is entering the market; +41 22 308 57 57; fax: +41 22 308 57 58; www.inciteonline.com.

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Comprehensive Video Group CVC-C5E+/HR: suitable for data and high-resolution video; provides up to 350MHz bandwidth; is a low-cost solution for high-resolution video transfer and is easy to install and pull; features 24 awg solid, bare copper construction, low attenuation and crosstalk for maximum signal transfer; 800-526-0242; fax: 201-229-0262; www.comprehensivevideo.com.

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MPEG EDITING PLUG-IN

Applied Digital ShearMPEG: performs frame-accurate cuts edits on I.P or B frames in long or short GOP MPEG-2 format on the Speed Razor timeline; ideal for newsclip gathering, asset management, trimming and splicing MPEG spots, segmenting batch-encoded files and editing long format material; MPEG material received from satellites, servers or other sources can be edited in MPEG and output directly; 352-338-0516; fax: 352-338-1108; www.applied-digital.com.

Circle (356) on Free Info Card

DIGITAL AUDIO NETWORK ROUTER

Wheatstone BRIDGE 2001: features bidirectional fiber optic or CAT-5 interlocation connectivity, all digital domain AES switching, analog or digital inputs and analog and digital outputs; 252-638-7000; fax: 252-635-4857; www.wheatstone.com.

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Accom Abekas 6000: features eight digital video channels and RAID-5 disk array to deliver both DVCPRO and MPEG-2 compression; fully DTV ready, accepting and supplying both serial digital video and AES/EBU digital audio signals; ideal for use in digital video production, digital video post production, news editing and playout, program cache and playout, advertisement spot cache and playout, and program materials distribution; 650-328-3818; fax: 650-327-2511; www.accom.com.

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POST PRODUCTION SYSTEM

AMS Neve Logic 3SC: fully networkable post workstation offering high-speed editing and mixing; ESP menu-free mixing gives users all the channels, outputs and automation needed to deliver complex mixes quickly and efficiently; includes the new DSP ToolBox, a range of advanced DSP plug-ins; 212-965-1400; fax: 212-965-3739; www.ams-neve.com.

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ONLINE CHARACTER GENERATORS

Aston Red and Aston Blue: combine purpose-built VLIW graphics processing power with PowerPC G4 technology to deliver a high level of speed and functionality to the broadcast user; they exploit Aston's Vivid multiprocessor architecture, providing high-speed rendering and huge animation capabilities, while maintaining full compatibility with Aston's other CGs; +44 (0) 1252 836221; fax: +44 (0) 1252 837923; www.aston.tv.

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TRANSFER STATION

Euphonix AES31: uses Broadcast Wave files, compatible with most audio software; utilizes a high-performance PC running under Windows 2000, and ships with two 100Mb/s Ethernet NICs; two spare PCI slots allow integration of additional network or SAN interfaces to customize the system to an existing network architecture; 650-855-0400; fax: 650-855-0410; www.euphonix.com.

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FAST STUDIO-NATIVE EDITING

FAST Multimedia blue: every native DV, DVCAM, DVCPRO 25, DVCPRO 50 and MPEG IMX transfer in 2- or 4x real time; native parellel crossover output and playback in real time of all formats mixed in one timeline, including real time playback of AVI open DML, graphics, 16 audio tracks and effects; +49-89-50 20 6-207; fax: +49-89-50 20 6-199; www.fastmultimedia.com.

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DIGITAL VIDEO PROCESSING SYSTEM

Fiber Options B742AV: features 24-bit dual-channel audio processing; dual 10-segment LED displays provide for complete monitoring of transmitter and receiver operation; signals monitored include input video, output video, audio input and audio output levels and the received optical signal; 631-567-8320; fax: 631-567-8322; www.fiberoptions.com.

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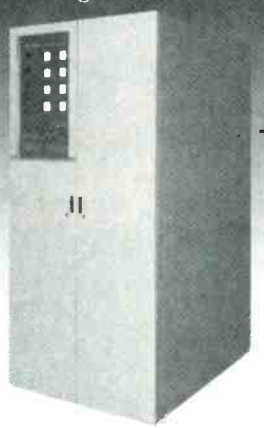

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WEATHER INFORMATION SYSTEM

Accuweather Local Digital Weather: PC-based system allows local stations to offer their viewers local weather 24 hours a day; system is designed for unattended operation and can be customized to insert weather content from the station's weather talent, as well as providing any combination of full-motion video ads, on-screen graphic commercials or logo banners; 814-235-8650; 814-235-8649; www.accuweather.com.

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PESA Switching 300MHz Cougar: delivers 300MHZ wide bandwidth performance that preserves crisp images for the highest resolutions of RGB, RGBHV and HDTV applications; housed in a compact 3RU chassis that includes internal dual power and dual controller capabilities; 631-845-5020; fax: 631-845-5023; www.pesa.com.

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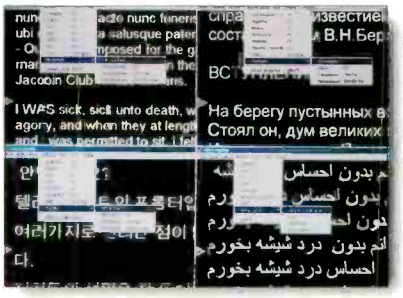
PROMPTING SOFTWARE



TelescriptAV: allows users to prompt in any language within a single version of the program; offers localized versions of the software that can include drop down menus, help files and internal navigation items that will display in the language of the user's choice; 201-767-6733; fax: 201-784-0323; www.telescript.com.

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LOGO INSERTION

Inscriber E-Clips: allows for easy placement of logos and clocks; users can adjust the duration and transparency levels of the effects; NT-based system controls VTR events, playout and capture of live events, as well as playing full-screen graphics directly from an intuitive interface; 519-570-9111; fax: 519-570-9140; www.inscriber.com.

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Accom WSD/2Xtreme Digital Disk Recorder: now shipping with the DDR option is the Work Station Disk/High Definition; now available with Digital Audio and Video Interpolator options, a turnkey solution supporting Windows Media Encoding of standard- and high-definition video formats for the professional marketplace as well as the DDR; 650-328-3818; fax: 650-327-2511; www.accom.com.

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STUDIO EDITING VTR

Panasonic AJ-D455: now shipping; model offers DV-format recording; records in DVCPRO, standard DV and mini-DV formats, and plays back DVCPRO, DV and DVCAM formats, thereby meeting today's applications from IEEE-1394-based desktop editing to fast-paced tape-to-tape news editing; in both record and playback, a cassette detection function automatically selects the proper mode for the type of cassette loaded; 800-528-8601; fax: 323-436-3660; www.panasonic.com/broadcast.

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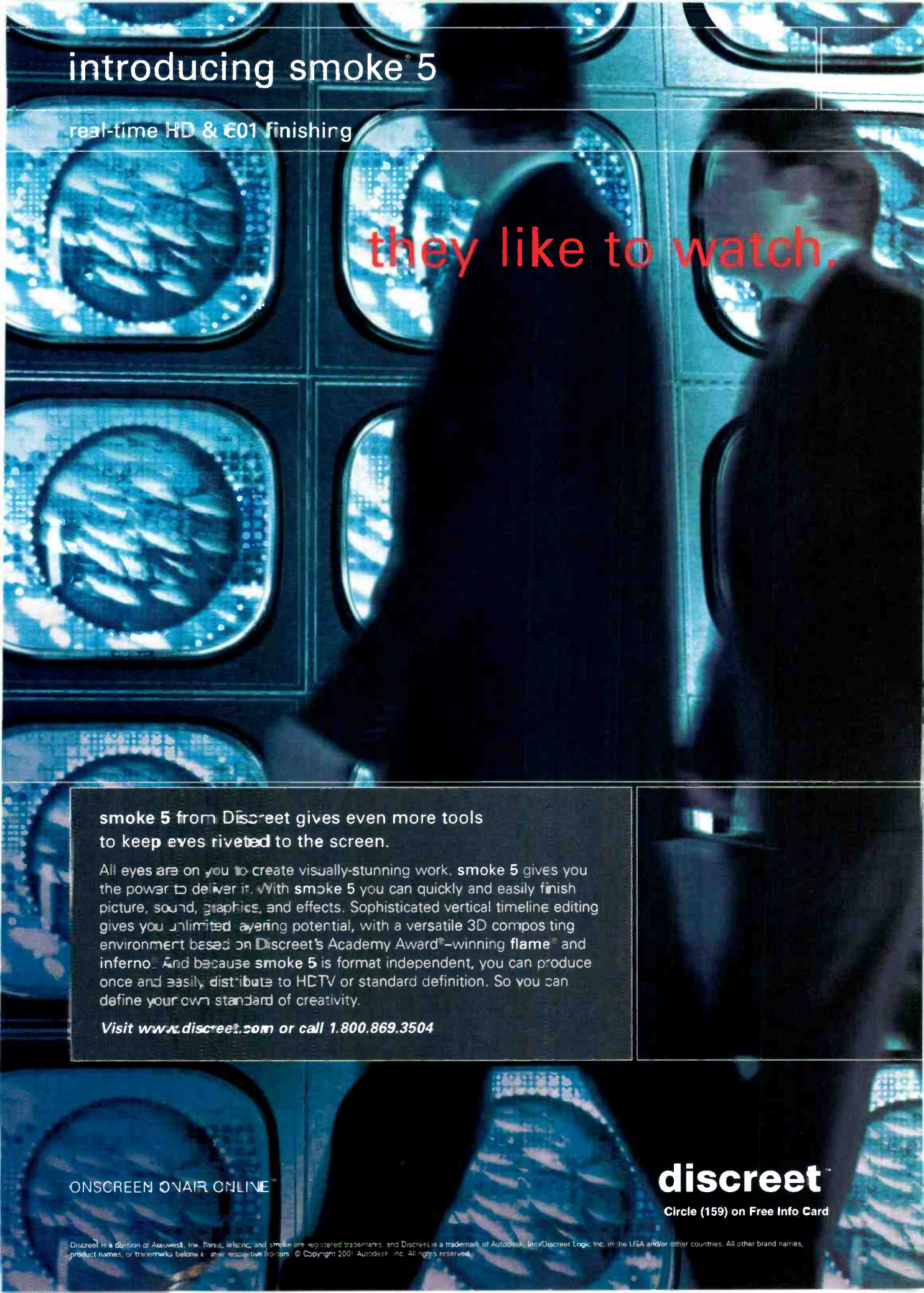

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Introducing everything you need in an event camera and more. The new completely digital DSR-250 from Sony is a high image quality reduced size camcorder which has been optimized for shooting events and parties. Every feature you could want is included in this revolutionary acquisition tool.

- **1/3 inch x three 380K pixel** (effective 340,000 pixels) **CCD's** allow two scanning modes: 480 progressive (still) or interlaced (for video) • One touch auto focusing in manual focus mode.
- **530 lines of horizontal resolution**
- **Switchable aspect ratio** 4:3 (TV mode) or 16:9 (Movie mode)
- **DXF-801 high resolution 1.5" black & white viewfinder** (same as on DSR500/1 & DXC-D35) enables easier focusing. Automatically switches from 4:3 aspect to 16:9
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- **Records in DVCAM or DV**, standard tapes or mini. Up to 270 minute recordeding in DV mode onto a 184 min. DVCAM tape.
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- **Wireless remote** .
- **Built in edit controller.** Equipped with an i.LINK interface, allowing camcorder to serve as edit player or recorder.
- External 12V supply/Connection for light. The DSR-250 is equipped with light output (DC 12 V, maximum 30 watts)

DSR-300A

3-CCD Digital (DVCAM) Camcorder

The affordable DSR-300A actually extends operational convenience with a range of new features and peripheral products. Remarkably compact and lightweight, the improved DSR-300A provides high mobility without compromising picture quality and can be held comfortably on your shoulder through the longest shoots and gives videographers the ability to acquire their footage quickly and easily.

- The DSR-300A has three 1/2" IT Power HAD CCDs to deliver 800 lines of horizontal resolution, 62dB S/N ratio and high sensitivity of F/11 at 2000 lux.
- With built-in 26-pin VCR interface, they can feed composite or S-Video output signals to an external recorder for parallel or back-up recordings. VCR recording modes including Parallel, Internal (only) and External (only) are selected via the trigger switch positioned on the operational panel
- LSI Digital Signal Processor (the very same one used by the DXC-D30 cameras) for a high signal-to-noise ratio of 62 dB.
- Both mini cassettes (PDVM series) and standard cassettes (PDV series) can be used with the DSR-300A. With PDV-184ME (standard), a maximum recording time of 184 minutes can be acheived. They can also play back tapes recorded in the consumer DV format
- For operational convenience while shooting, the Time Code is superimposed on the viewfinder screen or MONITOR OUT screen, even during playback
- DXF-801 viewfinder featuring variable peaking, 3 level tally light and a white LED light with 2 levels of intensity to illuminate the lens setting. • IEEE1394 i.Link (out only)

DSR-500WSL

2/3" 19:9 CCD (DVCAM) Camcorder

The DSR-500WS camcorder gives the video journalists the ability to acquire footage quickly and easily because the required functionality and performance was packed into this camcorder. In the meantime, the next generation widescreen TV's have been introduced and the demand for video material in widescreen (16:9) has greatly increased not only in broadcasting, but also in the event production and corporate communications market. To meet this demand , Sony offers this Widescreen Digital Camcorder. The DSR-500WS offers outstanding picture quality by adopting full Digital Signal Processing and three 2/3-inch (520k) Power HAD WS (Wide Screen) CCDs which are specifically designed for a 16:9 aspect ratio, switchable to 4:3 full screen. The camcorder extends the mobility, operational convenience and system flexibility with a range of peripheral products. Built-in digital output of the i.LINK interface for backup and simple field editing is just one example. Technological advances in Sony DSP and CCD Technologies, many powerful options and a convenient low price-point make the DSR500WS a formidable tool for a wide range of applications.

DXC-D35/D35WS

Dockable (DVCAM) Camcorder

The DXC-D35/ D35WS cameras are designed to the highest specifications, providing unprecedented video quality in this price range. The DXC-D35 is at home in the studio or field, docking directly to a host of backs including Betacam SP and DVCAM, as well as studio backs and viewfinders. The highly adjustable picture means that these cameras are ideal for capturing detail in low or changing light, as well as compensating for peoples skin flaws while keeping the rest of the image sharp. DXC-D35WS is switchable 4:3 to wide screen 16:9 ratio.

The DXC-D35WS camera is the latest Sony digital camera designed to the highest technological standards. With the proven Sony DSP technology combined with Sony high performance 16:9 CCD's. This high standard was previously held by the DXC-D30 series now being replaced by the NEW DXC-D35 series; DXC-D35 series feature a new Prism Assembly, new Pre Amplifiers, new DSP Software and a new Digital Encoder resulting in astounding performance. The DXC-D35WS camera fully interfaces with Sony's CCU-TX7 Wideband Component Triax System. It provides 8 set-up files (3 user) as a stand alone. 16 additional scene files (all user settable)are available when combined with the RCP-TX7 remote control panel. The DXC-D35WS is equiped with three 2/3" IT Power HAD CCD s switchable between 16:9 and 4:3 aspect ratio's. The camera docks to DSR-1 DVCAM and DNV-5 Betacam SX recorders for digital video recording, or PVV3 and BVV-5 Betacam SP recorders for analog recording.

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- Display characters on/off switch • Take Tally
- Horizontal and Vertical peaking • Die cast aluminum
- Better flare compenstation • DynaFit shoulder pad
- Lower minimum illumination (0.25 lux with HyperGain)
- Better color reproduction at high gain
- Improved dark detail and contrast • New preamplifier, prism and encoder • Better performance at overloads
- Reduced noise at Gain Up • Variable color temperature adjust
- Adjustable 4:3 safety zone when at 16:9
- New HyperGain mode of 42dB gain
- Aspect ratio select from Main Menu

JVC

GY-DV500U

1/2-inch 3-CCD Professional DV Camcorder

QUICK DIAL 14

The GY-DV500 combines the convenience and cost-effectiveness of Mini DV with the performance and features you need. Incorporate three 1/2-inch 380,000 pixel IT CCDs for superior picture performance (equivalent to 750 lines of resolution) superb sensitivity of F11 at 2000 lux and minimum illumination of 0.75 lux (LoLux mode). Rugged construction with a rigid diecast magnesium housing. Extremely portable, compact and light weight (less than 11 lbs. fully loaded). Additional features like the menu dial and Super Scene Finder assure ease-of-use and shooting flexibility, while the IEEE1394 and RS-232 interface allow integration into various non-linear and post-production systems. A professional camcorder in every sense, the compact, lightweight GY-DV500 redefines acquisition for corporate, educational, cable and broadcast production, as well as wedding videography and multimedia applications.

GY-DV550U

1/2" 3-CCD DV Camcorder

Introducing the Versatile GY-DV550 from JVC. Designed by professionals, for professionals, the GY-DV550 is the world's first DV camcorder to offer studio camera capability. Thanks to the built-in 26-pin interface, you can connect the GY-DV550 to a CCU for remote-controlled studio operation or backup recorder in the field. But that's not all. It also comes with pool feed input/output, so you can transfer image data back and forth to another camera or cameras, making it ideal for special shooting situations such as press conferences, exclusive interviews, and sporting events. Record isolated camera views (ISO-Cam) during a live multi-camera shoot, making it ideal for parallel shooting at live concerts and other events. Naturally, we've made sure the GY-DV550 is equipped with all the other capabilities you need, including a standard 1/2-inch bayonet mount for use with a great diversity of professional lenses, bidirectional IEEE 1394 (NTSC), two 48 kHz 16-bit digital PCM audio channels, and a built-in SMPTE or EBU timecode reader/generator, as well as XLR microphone inputs, audio outputs, headphones output, and both composite and Y/C outputs. Maximum versatility, top-level performance, and superior cost-efficiency make the GY-DV550 the smart solution for producers who need a camcorder capable of doing double-duty in both the studio and the field.

Ready for EFP remote control (RM-LP57/LP55) The EFP remote connects directly to the GY-DV550 for precise control over the video parameters.
Return video output for Tele-Prompter Tele-Prompter capability assures full support for studio program production.
Genlocking function To meet the demand for systemization, the GY-DV550 is equipped with a genlocking function that includes SC lock to assure high-resolution pictures.

State-of-the-art 1/2" 3-CCD image pickup Incorporates three 1/2" 380,000 (NTSC)/440,000 (PAL) pixel interline-transfer CCD's. Each CCD is equipped with highly advanced circuitry that eliminates vertical smear when shooting bright lights in a dark room. Lag and image burn are also reduced to indiscernible levels, while high sensitivity of F11 at 2000 lux assures creative flexibility and simplifies lighting requirements.

Panasonic

AJ-D610WA

2/3" 16:9 IT-3CCD DVCPRO Camcorder

The AJ-D610WA is an affordable DVCPRO camcorder which combines three high sensitivity 2/3" IT CCD's with digital component technology, to create a true broadcast recording. The AJ-D610WA is switchable between 16:9 and 4:3 aspect ratios. A built-in PCMCIA card slot makes it quick and easy to adapt the camera to different shooting conditions. Features Super Gain, Super Iris, and Digital Signal Processing (DSP). The AJ-D610WA can operate with a minimum illumination of 0.5 lux (F1.4, +36 dB Gain), and resolves 750 lines of resolution.

- The AJ-D610WA has three high density (520,000 pixels) 2/3" CCD's. The CCD's feature a large light collecting area that gives the camera a S/N ratio of 63 dB, plus a sensitivity of f 11.0 @ 2000 lux.
- The Digital Signal Processing (DSP) helps to deliver a very high quality picture. The user has the ability to adjust different parameters of the camera to accomodate any situation
- A PCMCIA card slot is built into the operator side of the camera, allowing the set-up (DSP) data to be saved. The saved set-up data can be used to reset the camera parameters.
- The optional AJ-YAP900P Picture Link Board is part of an exclusive Panasonic production data information system which stores shot logging in camera memory and records it on tape during the eject cycle. The logging information can be read by Panasonic's newsBYTE DVCPRO native nonlinear news editing system.
- Exceptional resolution of 750 horizontal lines.
- A Super Gain feature is available to boost gain by a full +30 dB or +36 dB for high quality shooting in low light, making it possible to shoot as low as 0.5 lux (f1.4, +36 dB)
- An optional Digital Triax for studio or mobile use is available. • A six speed electronic shutter (1/100 to 1/2000 sec) features Synchro Scan to match the frequency of a computer monitor.

Pickup Device: 2/3" IT Power HAD 1000 16:9 x 3
Picture Elements: 1038 (H) x 504 (V)
Filters: Clear, 5600K + 1/8 ND, 5600K, 5600K + 1.64 ND

SONY

DNW-9WS

2/3" 16:9 IT-3CCD Betacam SX Camcorder

Equipped with three 2/3 inch 16:9/4:3 switchable Power HAD 1000 16:9 IT CCD's.
Designed as a cost effective camcorder to help bridge the transition from 16:9 to 4:3, yet it still maintains a high performance and high mobility.
The DNW-9WS weighs less than 14 lbs. including a battery, tape, viewfinder and lens. Includes an integrated slot for the optional WRR-855A wireless audio receiver.

SONY

QUICK DIAL 72

DSR-1500
DVCAM Studio Editing Recorder

DVCAM becomes more and more flexible with the introduction of this brand new, half-rack width studio editing deck. The DSR-1500 boasts studio editing function capability in a compact size. The new DSR-1500 incorporates the same innovative, high standard technology featured in the DSR-2000.
The space-saving size makes the DSR-1500 ideal for installations in OB vehicles and desktop editing systems.

- SDI interface ensures a migration path to Digital Betacam™, Betacam SX™ and SDI-based systems.
- SDTI(QSDI) and i.LINK IEEE-1394 interfaces enable a high quality, virtually lossless transfer with DV compression based systems.
- Compatibility to consumer DV (SP mode only) and DVCPRO 25 format recordings in addition to DVCAM, automatically accommodate all cassette sizes without the need for an adapter.
- Analog input interface board which includes component, composite and S-Video is also available as an option.

DSR-1600/1800
DVCAM Studio Editing Player/ Player Recorder

The DSR-1600 is a **studio editing player**, and the DSR-1800 is a **studio editing recorder**.
Both incorporates innovative technology at an affordable price. Excellent playback of all DV based (25 Mbps) formats and cassette sizes is possible without the need of an adaptor. A jog/search dial is standard, including jog audio. A variety of option boards are available for SDI, SDTI, and i.Link outputs.
They both provide two selectable audio channel modes: Two channels of 16-bit (48 kHz) Four channels of 12-bit (32 kHz). PCM Digital Stereo recording is used in both modes to ensure superb audio performance with a wide dynamic range and excellent signal-to-noise ratio.
• Automatically adjust for playback of any DV based format, including DV (SP only), DVCAM or DVCPRO 25.

DSR-2000
DVCAM Editing Recorder

The DSR-2000 is a highly flexible DVCAM studio deck designed for demanding ENG editing. It can playback all DV (25 Mbps) based formats, including two consumer DV formats (Standard and Long Play), as well as all types of DVCPRO tape as an editing source, without any mechanical tape adapters. Equipped with audio/video pre-read editing and includes a Jog/Shuttle dial that allows two-machine editing. A SMPTE standard MPEG SDTI-CP interface option is available for the DSR-2000 to output an MPEG stream in addition to the optional i.LINK interface. This allows the DSR-2000 to seamlessly link to Betacam SX and other MPEG-based video equipment by means of SDI, i.LINK and MPEG SDTI-CP.

DSR-11
Compact DVCAM VTR

Compact desktop DVCAM recorder. This VTR provides a powerful and cost-effective option for NLE editing systems. Provides basic VTR features, along with an i.LINK (IEEE1394) interface and is compatible with both NTSC and PAL color systems. Designed to be used in either a horizontal or vertical position; A footprint of only 2 3/4" in the vertical position.

- The DVCAM format uses 8-bit component digital recording at 25 Mbps, with Intra-frame 5:1 compression, 500 lines of resolution and 4:1:1 color sampling. A 15 micron track pitch provides superior picture quality, superb multi-generation capability and production flexibility. Two 1/4" ME cassette sizes are available: Standard and Mini.
- Plays and records either a DVCAM format signal or a DV format signal. • Both Mini and Standard size cassettes can be used with the DSR-11 without the need of an adaptor
- Play or record in either the NTSC or PAL color systems.
- Equipped with a 4-pin i.LINK (IEEE-1394) interface, for lossless transfer of digital video and audio information with other IEEE-1394 equipped devices. The single 4-pin i.LINK cable can be connected to MAC or PC based NLE systems or to another VTR for degradation-free editing.
- DV EE (electronics to electronics) Out: Analog input signals can be converted into digital signals, and can be simultaneously output from the i.LINK interface.

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

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

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

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

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

- Optional BVR-50 allows remote TBC adjustment.
- Two types of component output: via three BNC connectors or a Betacam 12-pin dub connector.
- RS-422 interface for editing system expansion.
- Frame accurate editing is assured, thanks to sophisticated servo control and built-in time code operation.

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

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

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

PFM-42B1
Flat Panel Plasma Display Monitor

Flat Panel AC plasma display monitors are used where space and aesthetics are a major consideration. They accept and automatically detect computer and video signals ranging from NTSC to HDTV and VGA to UXGA.

- 42-inch screen
- 1024 x 1024 pixel display, with a 160° viewing angle
- Aspect ratios from standard 4:3 to widescreen 16:9
- Accommodate DVD presentations and widescreen broadcasts
- Advanced scan converter reproduces digital video signals (including SDTV, and HDTV) & UXGA computer signals
- 3.25" thick & weighs 65.5 lbs.

PROFESSIONAL VIDEO TAPES

QUICK DIAL 71

FUJI

Professional Grade VHS

PG-30	2.29	PG-60	2.39	PG-120	2.59

Broadcast Grade VHS Box

BGR-30	3.49	BGR-60	3.99	BGR-120	4.69

H471S S-VHS Double Coated

ST-30	6.99	ST-60	7.49	ST-120	7.99

M221 Hi 8 Double Coated

Metal Particles			Metal Evaporated		
P630HMP	4.49		E630HME	7.69	
P660HMP	6.29		E660HME	10.49	
P6120HMP	8.49		E6120HME	13.99	

M321SP Metal Betacam (Box)

05S	10.99	10S	11.99	20S	12.99
30S	13.99	60L	20.99	90L	32.99

DP121 DVC PRO

12M (Med.)	7.49	23M	8.79	33M	10.99
63M	19.99	66L	22.50		
94L	30.99	126L	39.99		

maxell

Broadcast Quality Hi8 Metal Particle

P6-30 HM BQ	5.39	P6-60 HM BQ	6.09
P6-120 HM BQ			7.99

P/I PLUS VHS

T-30 Plus	1.69	T-60 Plus	1.99	T-90 Plus	2.09
T-120 Plus	2.19	T-160 Plus			2.69

HGX-PLUS VHS (Box)

HGXT-60 Plus	2.69	HGXT-120 Plus	2.99
HGXT-160 Plus			3.99

BQ Broadcast Quality VHS (Box)

T-30 BQ	3.89	T-60 BQ	3.99	T-120 BQ	5.99

BQ Professional S-VHS (In Box)

ST-31 BQ	6.79	ST-62 BQ	6.99
ST-126 BQ	7.45	ST-182 BQ	13.99

Betacam SP

B30MSP	13.49	B60MLSP	19.99	B90MLSP	27.95

Panasonic

Mini DV Tape

AY DVM-30	6.49	AY DVM-30 (10 Pack)	ea. 5.99
AY DVM-60	6.99	AY DVM-60 (10 Pack)	ea. 6.49
AY-DVM80	12.99	AY-DV123EB	20.95

DVCPRO

AJ-P12M (Medium)	7.99	AJ-P24M	9.99
AJ-P33M	11.49	AJ-P66M	19.49
AJ-P66L (Large)	20.99	AJ-P94L	29.99
AJ-P126L			38.95

SONY

Hi-8 Professional Metal Video Cassettes

P6-30 HMPX	4.79	E6-30 HMEAD	6.99
P6-60 HMPX	6.79	E6-60 HMEAD	9.99
P6-120HMPX	8.99	E6-120HMEAD	13.99

PR Series Professional Grade VHS

T-30PR	2.39	T-60PR	2.59	T-120PR	2.79

BA Series Premier Hi-Grade Broadcast VHS (In Box)

T-30BA	3.69	T-60BA	4.19	T-120BA	4.99

MQ Master Quality S-VHS (In Box)

MQST-30	7.49	MQST-60	7.69	MQST-120	7.99

BRS 3/4" U-matic Broadcast Standard (In Box)

KCS-10 BRS (mini)	8.99	KCS-20 BRS (mini)	9.99
KCA-10 BRS	8.99	KCA-20 BRS	9.49
KCA-30 BRS	10.69	KCA-60 BRS	14.99

XBR 3/4" U-matic Broadcast Master (In Box)

KCS-10 XBR (mini)	9.79	KCS-20 XBR (mini)	11.29
KCA-10 XBR	10.29	KCA-20 XBR	11.79
KCA-30 XBR	13.29	KCA-60 XBR	17.39

BCT Metal Betacam SP Broadcast Master (In Box)

	Single	10 Pak/Ea.	50 Pak/Ea.
BCT-5M (small)	10.99	9.99	9.19
BCT-10M (small)	11.49	10.29	9.79
BCT-20M (small)	12.99	11.49	10.99
BCT-30M (small)	13.49	12.49	11.99
BCT-30ML	13.49	11.89	–
BCT-60ML	20.99	19.99	18.99
BCT-90ML	30.99	28.99	27.99

PDV Mini Series Professional DVCAM Tape (w/memory chip)

	(1)	(10) Ea.		(1)	(10) Ea.
PDVM-12ME	14.49	13.49	PDVM-22ME	15.19	14.49
PDVM-32ME	15.49	14.99	PDVM-40ME	16.99	16.49

PDV Series (Standard) **Professional DVCAM Tape**

PDV-34ME	24.99	23.99	PDV-34N	20.99	19.49
PDV-64ME	27.99	26.99	PDV-64N	24.99	26.99
PDV-94ME	32.99	31.49	PDV-94N	29.99	28.49
PDV-124ME	38.49	37.49	PDV-124N	32.99	31.99
PDV-184ME	46.49	44.49	PDV-184N	39.99	38.99

Mini DV Tape

DVM-30EXM w/Chip	12.79	DVM-60EXM w/Chip	16.99
DVM-30EX "No Chip"	11.99	DVM-60EX "No Chip"	12.99
DVM-30PR "No Chip"	7.99	DVM-60PR "No Chip"	9.75

Full Size DV Tape with Memory Chip

DV-120MEM	24.99	DV-180MEM	26.99

ALL ITEMS ARE COMPLETE WITH ALL ACCESSORIES AS SUPPLIED BY MANUFACTURER

COMPUTER VIDEO EDITING

Authorized Reseller

G4/Final Cut Pro Complete Video Editing Systems

Good System
Includes: • Apple G4/466 Computer
- Final Cut Pro version 2 editing software
- Total of 256MB of memory
- 60GB of ATA/100 storage
- CD-RW rewritable CD writer
- Final Cut Tutorial CD
- Mitsubishi Diamond Pro 2060 22" Monitor
- Apple Care-three year warranty
- Complete System integration and testing

$4,599.95

Great System
Includes: • Apple G4/533 Computer
- Final Cut Pro version 2 editing software
- 60GB of ATA/100 storage
- Total of 256MB of memory
- CD-RW rewritable CD writer
- Artel Boris Graffiti CG Program
- Final Cut Tutorial CD
- Mitsubishi Diamond Pro 2060 22" Monitor
- Apple Care-three year warranty
- Complete System integration and testing

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Best system
Includes: • G4/533 DUAL Processors
- Final Cut Pro 2 Editing Software
- 150GB (2x75) of ATA/100 storage
- Sonnet Tempo Raid 66 IDE Controller
- ATI Rage Orion dual display card
- Total of 256MB of memory
- Artel Boris Graffiti CG Program
- Final Cut Tutorial CD
- 2 Mitsubishi Diamond Pro 2060 22" Monitors • CD-RW writer
- Apple Care-three year warranty
- Complete System integration and testing

$7,599.95

DVD Authoring system
Includes: • G4 with 733 MHz Processor, 60GB Hard Drive.
- DVD-R/CD-RW SuperDrive
- Total of 512MB of memory • Built-in Gigabit Ethernet
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- Sonnet Tempo Raid 66 IDE Controller Card
- Matrox RTMac Realtime Capture Card
- Final Cut Pro 2 Professional Editing Software
- Apple DVD Studio Pro DVD authoring software
- 2 Mitsubishi Diamond Pro 2060 22" Monitors
- Artel Boris FX 5.0 Software • Post-Op iMedia Keyboard
- Artel Boris Graffiti Character Generator Software
- Pinnacle upgrade to Commotion DV 3.1
- Apple Care-three year warranty

$10,999.95

matrox Digital Video Solutions — RTMac
Realtime Editing for Mac G4 & Final Cut Pro

Matrox RTMac brings realtime power and creative freedom to Apple Final Cut Pro users. A Matrox RTMac in your Apple Power Mac G4 lets you work with three layers of video and graphics in real time and create broadcast-quality effects instantly — NO RENDERING! Fully optimized for Final Cut Pro and seamlessly integrates into Power Mac G4 computers. Realtime creativity Realtime editing lets you experiment to your heart's content. There's no penalty for changing your mind. Try out any number of different effects and transitions. View them instantly on your computer and video monitors simultaneously.
Get exactly the look you want every time.

$999.95

PINNACLE SYSTEMS — CineWave
Uncompressed Editing for Final Cut Pro

Revolutionary non-linear editing package that delivers the power of true uncompressed video with Apple's Final Cut Pro. Using Pinnacle's new HUB3 video processor, the CineWave combines infinite layering, incredible effects, advanced compositing tools and accurate motion tracking with all the major video formats in compressed or uncompressed video. Based on the new dual processor Apple G4's, CineWave delivers the worlds first scaleable desktop video system capable of outputting both Standard Definition and High Definition simultaneously.

Breakout Boxes — Analog (Betacam).....879.00 SDI (CCR601) 879.00
HD (1080i/1080 24Pr7021).....9,499.00

from $4,499.95

matrox Digital Video Solutions — DigiSuite LX MAX

Advanced Realtime Features

The DigiSuite LX MAX platform delivers maximum editing power and creative freedom with more realtime features than any other on the market. It features fully keyframable realtime 3D effects and transitions, an additional 2D effects channel, two YUV color correction channels, independent transparency control on all layers, 32 bit animated graphics, two advanced chroma/luma/matte keyers, and a customizable wipe/tile generator. DigiSuite LX MAX also brings other important benefits to streamline editing workflow and let users deliver in record time on tape, CD, DVD, and the web.

- Advanced realtime effects layering on video and graphics
- Realtime broadcast-quality 3D digital video effects powered by Matrox Flex 3D curls, distortions, and perspective effects with drop shadows, soft edges and borders.
- Native-DV and 50-Mbps MPEG-2 editing
- DV (IEEE-1394 component), Y/C and composite support
- Optional SDI and AES/EBU add on module
- Realtime MPEG-2 encoding for DVD authoring
- Accelerated MPEG-1 encoding for multimedia and Video CD authoring

Includes: Adobe premiere, Inscriber Character Generator, Ligos LSX MPEG, Pixelan Video SP Lite, and Sonic Solutions DVDit! SE

DigiSuite Max Turnkey System

- Dual Pentium III 1 GHz processor • 300 watt Full tower
- Asus CUSL2 motherboard • 3.5" floppy
- 48X CD ROM Drive • **DigiSuite LX Max**
- IBM 40GB System drive • Windows 2000
- PNY 512MB SDRAM memory
- Matrox G450 Dual Display Card
- Adaptec 29160 LVD-160 SCSI Card
- Seagate 73GB LVD-160 SCSI Drive
- 102 Button Keyboard
- Microsoft Trackball mouse
- Adobe Premiere 6.0 Editing Software
- 19" Mitsubishi Diamond Plus Monitor
- 90 day Free Tech Support
- Fully assembled and tested

$7,995.00

Avid — Xpress DV 2.0
Powerful Video Editing Tools

Avid Xpress DV software combines powerful video and audio editing tools, digital mastering, and extreme ease of use. Captures and edits DV video, adds effects, mixes audio, and outputs over IEEE1394 FireWire. Or transcodes the content to all major new media formats. MPEG-1 (for CD-R) MPEG-2 (for DVD-ROM) QuickTime or AVI for computer based presentations or for streaming on the web. As a member of the Avid Xpress Family, The Xpress DV 2.0 offers the same Avid graphical user interface (GUI) used in the very high-end avid products. powerful audio and video tools. • Dual monitor support • New audio features • Improved nesting • Sonic AuthorScript • Customizable UI, keyboard and command palate.

$1,499.95

DELL — Xpress Workstation
Workstation Bundle

Shown with optional Monitor

- Pentium 4 Processor at 1.4 GHz
- 128mb/256mb RIMM (RDRAM) memory
- Matrox G450 32mb Graphics Card
- 40GB ATA100 IDE (7200 RPM) System Drive
- 75GB ATA100 IDE (7200 RPM) AV Drive
- 48X IDE CD ROM Drive • 3.5" Floppy Drive
- Windows 2000

XPress DV software loaded and tested

Express DV on Dell Precision Workstations

Super Special!
Precision 330 Workstation
1.4 GHz Processor, 256mb RDRam $3,499

Portable Solutions
Portable NoteBook Outfit

- Dell Latitude C600 Pentium III 750 MHz Processor
- 256mb memory
- 14.1" Active Matrix TFT screen
- 20GB system drive
- 75GB Extenal AV Drive
- LowePro Carry Case

• XPress DV software loaded and tested

$4,999.95

Upgrade to Avid Express DV v2 Power Pack ($4200 Value)
Additional software to above outfit including Avid ePublisher Companion, Pinnacle Commotion DV 3.1, Knoll Light Factory AVX, DVDit! SE, Stabilize Effect AVX, DV Filmaker's ToolKit with purchase of any outfit $1,000

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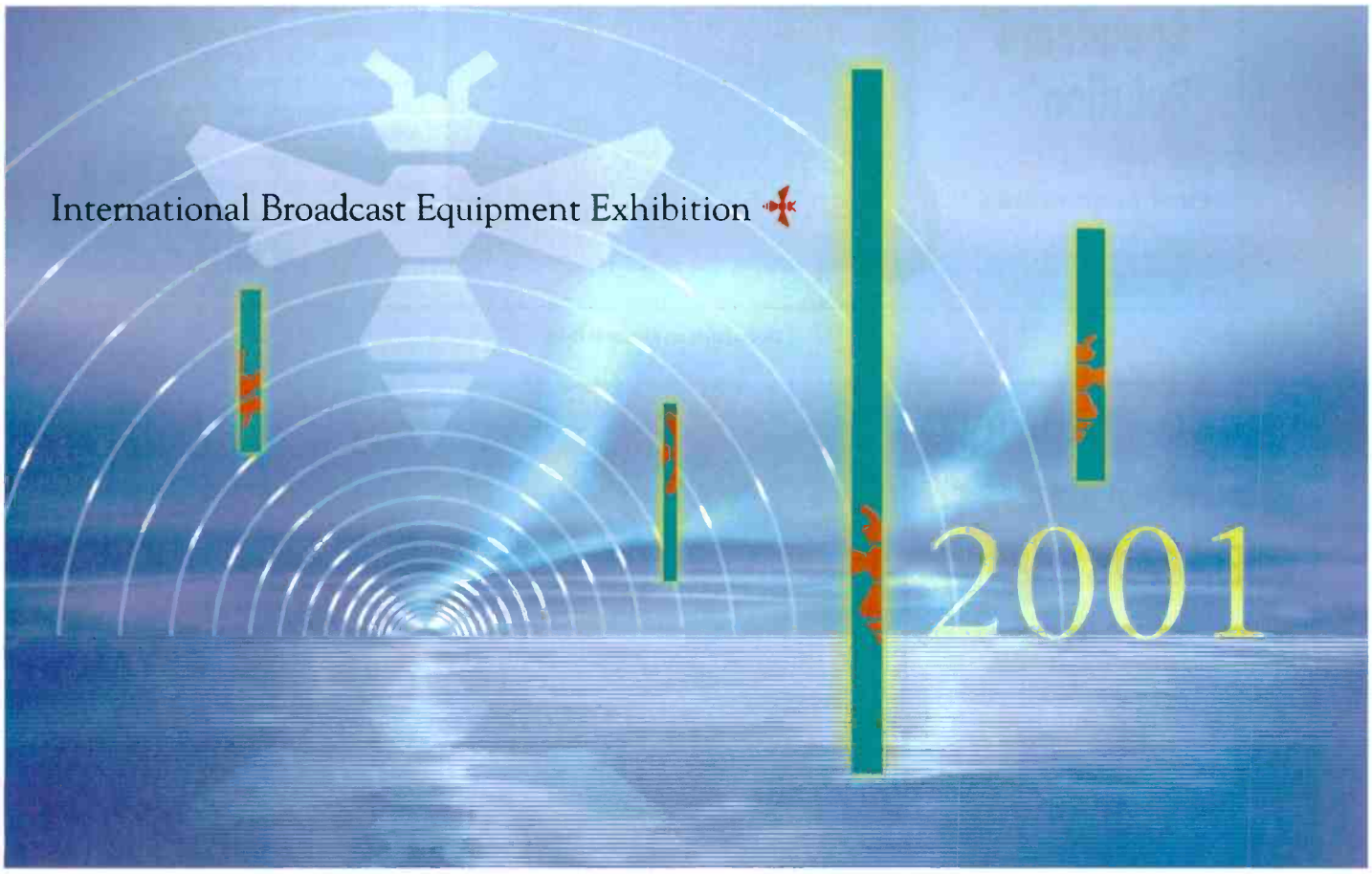

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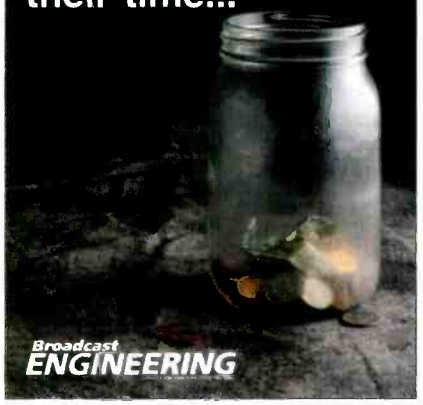

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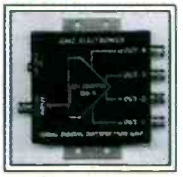

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EOM

It's still the content

BY PAUL MCGOLDRICK

We live in changing times, and it is essential that we absorb change in ways that make sense for everybody. Sometimes seeing what is relevant about new ways of doing things is not as apparent to some parts of the population as others. Lawyers, of course, are well versed in quoting precedent in order to prove their cases: Logic might sometimes better serve them.

If you have been reading this column for some time you will know that the NAB is not my favorite organization. It is impossible for a single lobbying group to represent the entire broadcast industry, with broadcasters' diverse needs. The NAB does, however, still champion causes that are entirely relevant to the whole industry. One, which has started as a radio issue, also could become extremely important in television.

The battle began when the United States Copyright Office issued a Final Rule that AM and FM broadcasters who simultaneously stream their content on the Internet should be paying royalties to the recording companies. This is a major blow for the radio industry, which has always been exempt from copyright liability for over-the-air transmission of audio recordings. The industry pays royalties to various performing rights organizations, never to the studios. The balance has been maintained over the years, even though royalties from the studio are slightly lower than they otherwise would be, because the authors, composers and performing artists also receive per-play fees. If the system changed and the broadcasters had to get a license — presumably per title or per studio — then the artists would lose out twice, being paid the lower royalties.

The notion of per title, per studio or compulsory licenses is a nightmare in how it would all be organized, especially when the copyright laws have all been drafted to exclude such licenses. Congress has passed laws protecting the record labels by making the piracy of their materials illegal, but not until 1995 was there any public performing rights protection. The Digital Performance Right in Sound Recordings Act (DPRA) offers some measure of protection for digital recordings in interactive transmissions and for *subscription* audio transmissions. I haven't seen a broadcaster offering streaming audio asking for fees — have you?

The product in an AM/FM terrestrial broadcast is the same as in an Internet webcast. The delivery vehicle should be of no concern.

The record companies already earn sizeable revenues from the over-the-air play of their material; it is a promotional system that they truly would not want to have to pay for if it was defined as advertisement. Hit songs are made or broken by over-the-air plays.

Rulemaking by the registrars of such as the Copyright Office does not, of course, happen on a whim. The request for such a ruling came from the Recording Industry Association of America, the Association for Independent Music, the American Federation of Musicians, and the American Federation of Television and Radio Artists. The NPRM and the subsequent Final Rule make it clear that these rather heavyweight players persuaded the registrar that streaming over the Internet is not a "broadcast transmission." Taken in the context of technology today does that make any sense?

A Federal judge in the U.S. District Court for eastern Pennsylvania obviously either thought the registrar was right, or did not feel the need to interfere in the Copyright Office's work, and dismissed the NAB case challenging the Final Rule. The reasoning offered was that the Digital Millenium Copyright Act of 1998 (DMCA) protected the copyright of creative works used in webcasting. Even such a short time ago, however, little was understood about how radio would evolve with the Web, and the Act was cobbled together with some considerable ignorance about what the Internet really is.

It is obvious to the engineering mind that the product being offered in an AM/FM terrestrial broadcast and in an Internet webcast is the same. The delivery vehicle should be of no concern. We don't discriminate between broadcasts over-the-air, through cable or from a satellite in the TV side of the business, but this ruling could clearly open those channels for separate copyright issues as well. It also will considerably hamper streaming of video on the Web.

So, I agree (surprisingly) with the NAB on this issue. If you expected a little Internet radio appliance in your kitchen or car just hold off a while. Maybe the NAB will appeal; maybe the FCC and the Copyright Office can come to federal blows with one another; but to me this is just another instance of Hollywood and its partners going to cloud-cuckoo land with a control-freak issue. As a whole the industry does not trust its consumers, but it feeds a lot of lawyers. ■

Paul McGoldrick is an industry consultant based on the West Coast.

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