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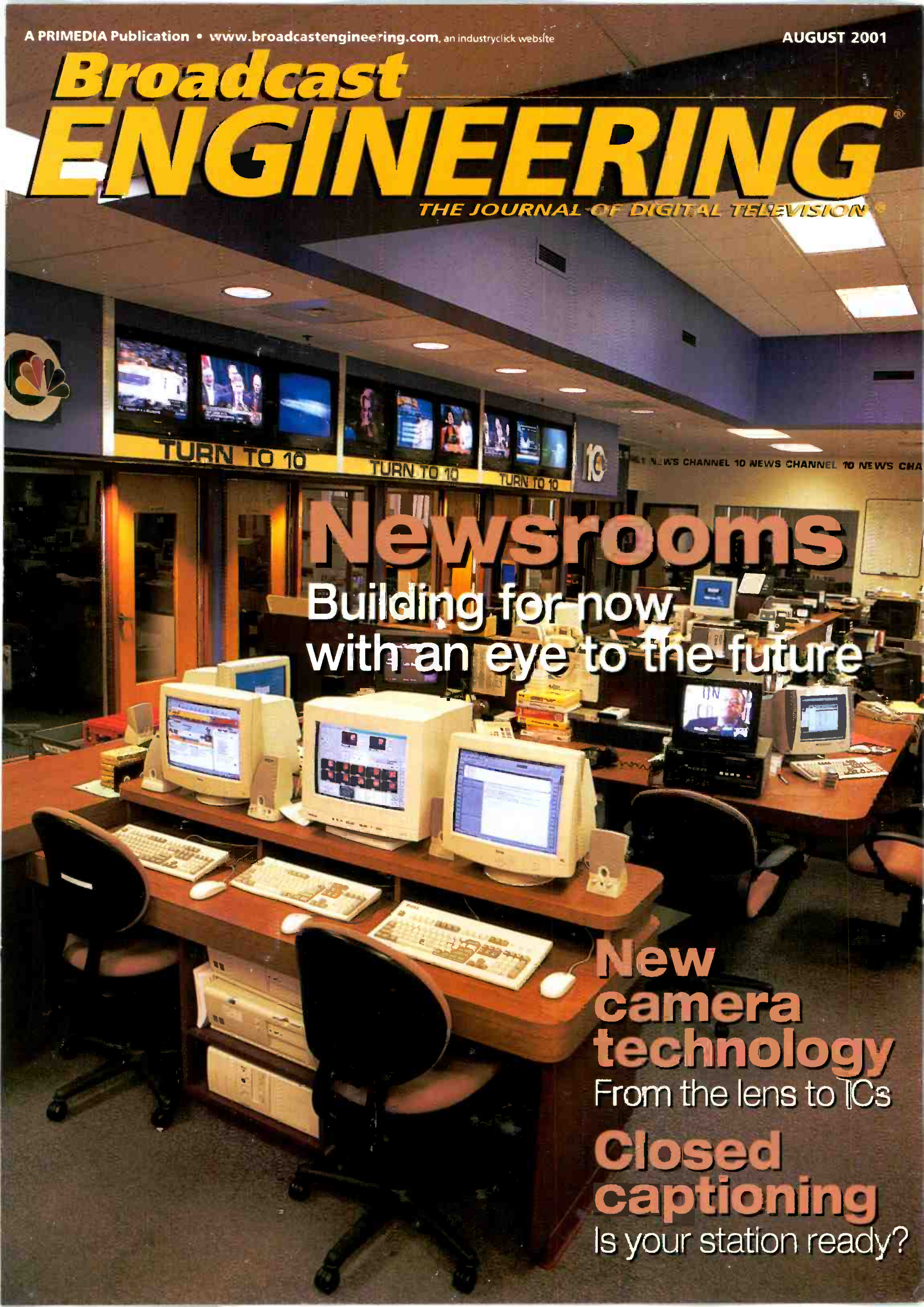
Broadcast ENGINEERING

THE JOURNAL OF DIGITAL TELEVISION®



Newsrooms

Building for now with an eye to the future

New camera technology

From the lens to ICs

Closed captioning

Is your station ready?

August 2001
Volume 43
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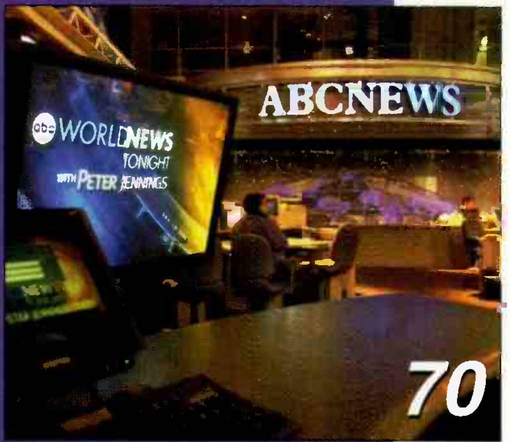

Features

Beyond the Headlines

By the Numbers

Digital Handbook

ON THE COVER: WJAR-TV's new all-digital newsroom, with monitor bridge and edit bays at left. Photo courtesy Grass Valley Group. Photo by Steve Dunwell Photography.

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Systems Design & Integration

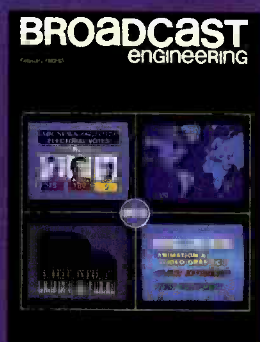
New Products & Reviews

Departments

FREEZE FRAME
A look at the technology that shaped this industry

Who invented the CG?

Name the year, model number and the famous (but long-gone) company that developed the first working "videographics" device. The device allowed the operator to correct a spelling mistake in only "40 minutes!" Hint: The device wasn't called a "CG." All correct entries will be eligible for a drawing for the new Broadcast Engineering T-shirts. Enter by e-mail. Title your entry "Freezeframe-August" in the subject field and send it to: bdick@primediabusiness.com. Correct answers received by Sept. 17th, 2001, are eligible to win.



Could dead birds derail DTV?

If a few bird-loving, environmental wackos have their way, you'll be broadcasting your new DTV signal from an unguyed, 100ft stick so far from your city of service you'll need a map, an ATV and two days' rations just to get to it.

As if you didn't have enough DTV problems, two bird-loving organizations are now claiming that broadcast towers are killing millions of our feathered friends. The groups allege that a tower's red obstruction and beacon lights confuse birds at night, causing them to become disoriented, especially in fog or water-laden air. The tower lights refract off the water particles, creating a lit area the birds use for navigation. Keeping the light at a 90-degree angle causes the poor little things to end up flying in circles, eventually slamming themselves into a guy wire, tower face or even other birds. They then spiral downward, smashing into the earth where they are eaten by nasty ground-based predators.

Just makes you want to cry doesn't it?

The two organizations joining forces to put you out of business are the Friends of the Earth and the FCC (no, not the familiar Federal bureaucrats, but the Forest Conservation Council). The groups have petitioned the real FCC to deny about 40 applications for towers until the Commission "conducts further environmental studies." They have seized on the 1918 Migratory Bird Treaty Act as reason enough for the Commission to deny the construction of almost any tower anywhere. Unfortunately, the Act makes it almost a crime to cause the death of even a single bird.

Bill Evans, an ornithological consultant, claims to have witnessed bird deaths via dangerous guy wires firsthand. After recording bird distress calls at various tower sites, he said, "Those sounds just hit you inside." He now runs a website called towerkill.com.

Other researchers spin similar yarns. Dr. Charles Kemper, a physician and bird enthusiast, professes to have monitored bird kills at one tower site in Eau Clair, WI, for more than 35 years. Over that time, he maintains that the tower has killed 121,560 birds. His record was 30,000 bird kills in one night.

Of course I was absolutely shocked to learn of these dreadful "facts," so, I did a bit of research. It turns out that towers aren't the biggest murderers of birds, as the above experts claim — it's cats.

The University of Wisconsin-Madison states that between 7.8 million and 200 million birds are killed every year by the common house cat. Now, my math says that means cats kill 50 times as many birds as all TV towers combined.

But hey, we can't let this wholesale massacre of birds by towers continue. What we need are some more Federal rules to save the little poopers. Here's my suggestion.

First, all birds should be required to wear bird helmets and parachutes. That way they won't break their little scrawny necks when they bump into a tower or guy wire. Second, the other FCC must issue rules requiring padding on every tower and guy wire.

Finally, all those darn red obstruction lights and beacons will have to be turned off. Oh, I realize that may result in a few airplane crashes, but we simply can't continue this bird bloodbath. After all, what's more important, a flea-infested, poop-dropping, Black-bellied Plover or a Tufted Titmouse or a few million jobs and an entire industry?

Brad Dick

Brad Dick, editor

Send comments to:
direct: editor@intertec.com
website: www.broadcastengineering.com

Reader Feedback

Long live Heathkit

Readers will recall my fond recollections of Heathkit products. For those of you with similar memories, check this out.

Brad Dick

Dear Brad,

My wife and I have a Heathkit TV kit of my dad's we are looking to sell. We tried it on eBay, but got no bids and there were no other Heathkit electronics on the site. Do you have any other recommendations? It is a Heathkit GR-2000 25" color TV with all the manuals. My father got it and only opened the boxes to take a look, then resealed them and they have sat ever since (1976?). Sadly, I have neither the time nor talent to assemble this. We'd appreciate any help you could give us. I can provide digital pictures.

Sincerely,

DOYLE R. HILL
doyle_7@bellsouth.net

Understanding CCIR 601 and CCIR 656

Dear Mr. Robin:

Are the horizontal and vertical sync structures of CCIR 601 and CCIR 656 similar?

MIKE TSINBERG
KEY DIGITAL

Mr. Robin responds:

CCIR 601 and CCIR 656 are complementary standards. CCIR 601 deals mainly with the sampling concepts, while CCIR 656 deals mainly with the parallel and serial distribution. Both standards talk about the horizontal blanking structure. The only difference is that CCIR 656 details the EAV/SAV timing reference signal and CCIR 601 doesn't. CCIR 601 does not mention the vertical interval structure.

Where's ATSC's 720 format?

Michael,

I enjoyed reading your article "Getting from 4:3 to 16:9" on the *Broadcast Engineering* website. You did make one fairly large (to some people, anyway!) error though. There is no 720 horizontal format in Table 3 of the ATSC standard!

JOHN GOLITSIS
MISSISSAUGA, ONTARIO, CANADA

Mr. Robin responds:

I have several comments as follows:

First, format conversions from 4/3 SDTV to 16/9 HDTV use signal sources as specified by the ITU-R BT.601 Recommendation with a 4:2:2 sampling strategy. Table 1 of the ATSC A53 lists this standard and two HDTV standards and refers to them as "Standardized Video Input Formats."

Second, the "601" signals using the 4:2:2 sampling strategy have an active luminance sampling grid of 720 pixels by 483 lines. While the 720 sample structure is strictly adhered to, some signal sources may change the active number of lines to slightly different values. In my example I used the 720x480 source format.

Finally, the change from 720 horizontal pixels to 704 occurs in the ATSC compressor. Table 3 of the ATSC A53 lists the allowed compression formats. The ATSC document does not explain why 720 is changed to 704 in the compressor. Interestingly, the ATSC A63 version intended for countries using the 625/50 scanning format specifies 720 pixels instead of 704. So this is another ATSC item needing revision.

Will the May deadline be delayed?

Dear Mr. Martin,

I read your DTV Dateline item on the *Broadcast Engineering* website. My company, SignaSys, is entering the DTV market by providing a low-cost DTV compliance package. I am curious what you hear about the issue of smaller commercial stations (markets 100+) that are opting to "gamble" and miss the May 2002 deadline. Some of the stations we have talked with seem to think that they will be able to argue economic hardship for a first extension, then order equipment with a long lead time in order to be able to tell the Commission that they are attempting to comply but face equipment shortages.

LARRY SHENOSKY
SAN JOSE, CA

If the May 2001 deadline sticks, you can expect the FCC to be liberal in granting waivers.

Mr. Martin responds:

There is a good chance the May 2002 date will be postponed, although nothing is eminent. The Commission is aware of the economic circumstances facing mid- and smaller-market TV stations (ad revenue off, network revenue off, no market for stations, bank credit tight, no market for IPOs).

If May 2002 sticks you can expect the FCC to be liberal in granting waivers. Even so, an argument of economic hardship alone probably would fall on deaf ears. Everyone can plead economic hardship to some degree (even lawyers!). Past waivers have been based on tower leasing problems, tower space shortages, tower construction delays, equipment availability and delivery problems, and zoning. ■

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Mark Smirnoff

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Circle (106) on Free Info Card

News

NBC begins central-casting

BY LARRY BLOOMFIELD

With the spiraling costs of doing business, facility owners are looking for new, less expensive ways of doing business. One such approach is to co-locate facilities and personnel while serving the needs of several markets. Although this approach is not entirely new, let one of the networks do it and it's like Columbus discovering America; he wasn't the first to do it, but he's the one who gets all the credit.

Looking very much like the direct-to-home (DTH) satellite operators and the multiplicity of cable companies across the country, group owners big and small are moving to consolidate their operations under one roof. The DTH and cable industries have been employing the "single point of control multichannel" configuration for many years.

NBC has now begun central-casting. The long-range plan is for NBC to automate all its O&Os in the U.S. Programs and interstitials will be stored and played from three hub sites, New York, Miami and Los Angeles.

The first phase of the implementation is in Miami. From there they will eventually run everything but local news to their O&Os in Birmingham, AL; Raleigh, NC; and Dallas. Network and syndicated programming will be transmitted to the spoke station sites by redundant fiber links. Final switching will occur at the spoke stations to merge news, local programming and last-minute promotions produced at the station. Commercials will originate from the hubs.

The spoke stations will send local commercial material and promotions via FTP to the central server from on-site video servers acting as caches. News programs that are to be rebroadcast will be streamed to the hub's central servers over fiber optic landlines.

Cost savings can be achieved through the consolidation of personnel from five or 10 stations into a single facility.

During regional news and other local live programming, the stations will use control panels at the regional sites to trigger the computers at the central site to play break material.

The control system is completely redundant, with no single point of failure. Special features include handling of multiple time zones and the ability to seamlessly mix video material from the hub and spokes within a single break. News departments will update playlists located at the hubs using their local terminals in the production suites or at the assignment desks.

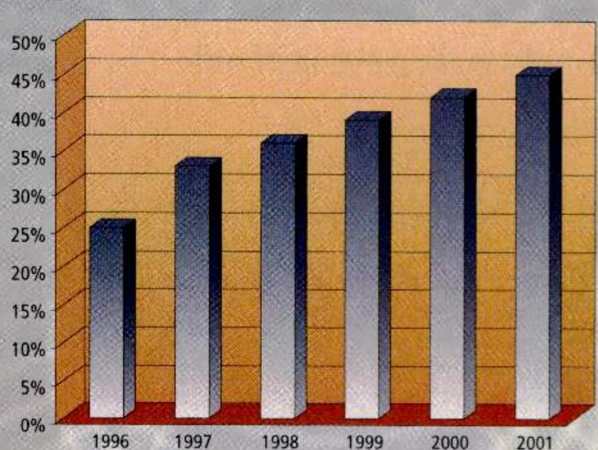
According to Florical, whose software will be running the NBC hubs, cost savings can be achieved through the consolidation of personnel from as few as five to 10 stations into a single facility, with the exception of the news department, the local sales personnel and an on-call transmitter engineer. We can thank modern technology for making this all possible, specifically in the area of computer control system software and hardware, not to mention the growing availability of fiber and satellite bandwidth. In addition to realizing savings from centralizing its traffic and accounting departments, NBC says it

FRAME GRAB

A look at the issues driving today's technology

Station consolidation isn't a new trend

Percent of stations owned by largest 25 media companies has grown to almost half



SOURCE: FCC www.fcc.gov

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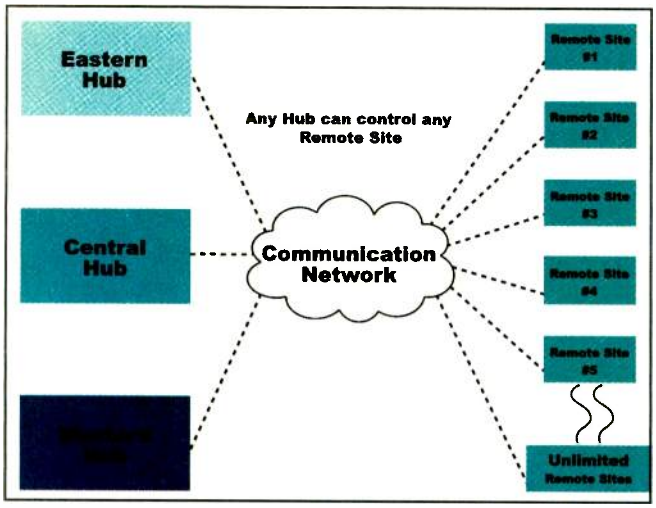


Central-casting would take programming from one of three regional hubs and funnel it to local stations, eliminating most production not associated with news. Image courtesy Florical Systems.

will significantly reduce the capital expenditures for digital television equipment that would be spent without the hub/spoke concept.

While the cost savings are attractive, there are several technical challenges not found in typical automated station operations that must be met by the technical automation system:

- Multiple time zones controlled from the hub site;
- Signal path delay between the hub and stations;
- Zero timing to match timing between video and audio originating at different sites;
- Master/slave operations to handle manual timing of common programming and regionalized commercial breaks;
- Multiple switchers in serial path; and,
- System recognition of location of sources.

Personnel costs are a heavy cost to a TV station. Central-casting can save 20 to 40 percent of total personnel costs by consolidating technical operations, traffic, accounting, promotion, programming and shipping/receiving. Note that the news department is excluded, but there is the potential for centralizing the national portions of a station's news and sports presentations.

Television for the visually impaired

People without vision impairments are not as apt to realize how television program material that is highly visual — with lots of action and little or no dialogue — can be nearly incomprehensible to someone with impaired vision. Video description, a narrative of the key visual elements in a television program, is not entirely new. Both PBS and the Turner Classic Movies channel provide a service though which narrations for the visually impared are inserted at natural pauses in the dialog of the program. Due to the infrequency of this type of programming, the FCC has placed requirements on the networks to address this issue. This new rule is part of a broader FCC effort to make technology more reachable to people with disabilities.

On July 21, 2000, the FCC adopted video description rules that will make television more accessible to people with visual disabilities. These rules will commence with the calendar quarter April to June 2002 (Docket 99-339). Using the same logic that inspired the FCC's plan to move from analog to digital, the law requires broadcasters affiliated with the ABC, CBS, Fox and NBC networks in the top 25 television markets (as determined by the Nielsen Designated Market Areas, or DMA, rankings) to provide a minimum of 50 hours per calendar quarter (roughly four hours per week) of described primetime and/or children's programming.

The FCC is also requiring multichannel video programming distributors (MVPDs), such as cable systems and satellite systems, with 50,000 or more subscribers to provide video description for the same amount and type of programming on each of any of the top five national nonbroadcast networks they carry, as determined by national prime time audience share.

In addition, the FCC also says that "Any broadcast station, regardless of market size, will be required to pass through any video description it receives from a programming provider if the broadcast station has the technical capability necessary to do so." This applies to MVPD players as well.

The Commission also ruled that any broadcast station or MVPD that provides local emergency information as part of a regularly scheduled newscast, or as part of a newscast that interrupts regularly scheduled programming, "will be required to make the critical details of this information accessible to persons with visual disabilities in the affected local area." This includes narration for those facilities that put up emergency information in the form of crawls or scrolls. ■

States garner revenue from DTH

Florida is implementing a communications tax for DTH services beginning on Oct. 21. North Carolina included in its proposed 2001-2003 state budget a provision to tax not only satellite equipment, but cable as well, on a statewide basis. According to the Satellite Broadcasting and Communications Association, a six percent tax would be charged on gross receipts from the sale of cable and satellite TV services across the state under the legislation.

Under the 1996 Telecommunications Act, satellite providers are exempt from paying any local tax, but states are allowed to charge sales tax on DTH.

Currently, satellite TV is not taxed by the state, but cable is subject to local taxes, but the bill would allow cable operators to be credited for any local franchise tax they pay.

Taxing satellite equipment in North Carolina is no trivial thing. North Carolina ranks fourth in the country with more than 800,000 subscribers with Florida, California and Texas each having more than 1 million DTH subscribers. ■

County attempts satellite tax

Los Angeles County Tax Assessor, Rick Auerbach recently planned to impose property taxes on as many as eight satellites owned by Hughes Electronics in El Segundo — Los Angeles County, CA. Fortunately the County Board of Equalization, which imposes county taxes, ruled to outlaw levies on spacecraft.

Attorneys for the state Board of Equalization, consulted by Auerbach, came down on the county assessor's side, saying in a background paper; "While the satellites are in Earth orbit, they nonetheless have a status for tax purposes in Los Angeles County" although the satellites never pass over California territory.

The issue of taxing the spacecraft first came up during a regular quadrennial audit of companies owning $300,000 or more in asset properties. During the audit it was discovered that Hughes showed the satellites on their books. According to Auerbach, the satellites are no different from any other movable personal property that he has authority to tax, i.e. boats, construction equipment etc.

Geosynchronous satellites remain fixed in orbit, with occasional correction, for about 10 to 15 years or until they run out of the fuel necessary to adjust their positions, after which they are moved to a designated space graveyard and replaced by newer and more functional birds.

Satellites are, after all, valuable bits of property, worth hundreds of millions of dollars each. The LA County Assessor views them as viable sources of revenue that will bring millions of dollars annually into the County's tax coffers.

Hughes expectedly bristled at the idea of a satellite tax. "Part of the philosophy of property tax, be it county or state, is to provide services in return for the monies collected, like fire and police protection and safety, and opportunities for growth," said George Jamison, vice president of Corporate Communications for Hughes Electronic.

Had Auerbach been successful, the effects would have been felt through the satellite industry. Barbara Lamont, president of Network Teleports said, "The FCC has ruled, definably, that 22,300 feet and up is out of local jurisdiction. We have offices all over the world." If anyone is successful in a like action it could, according to Lamont, "... bring the entire communications industry onto its knees and subject to local jurisdictions everywhere."

A Hughes Satellite PAS-10 under construction. Los Angeles County recently considered taxing orbiting satellites owned by Hughes. Photo courtesy Boeing Satellite System.

Satellites are no different from any other taxable movable personal property.

The satellite industry is somewhat skeptical of anything like this action ever getting off the ground. Morgan Broman, director of Public Relations at Lockheed Martin Global Telecommunications says he doesn't see how the County (Los Angeles) could make any money after backing out the launch and building costs of the satellites. "It doesn't seem logical to me to consider something 22,300 miles away, local."

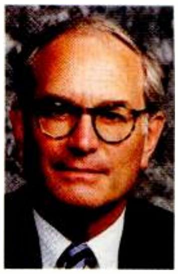
"The three key issues associated with taxation are opportunities, benefits and protection," Jamison observed, "and the County of Los Angeles will never be able to provide one of these causation, much less all three."

This is not the first attempt at satellite taxation: The city of Virginia Beach, VA, was unsuccessful in January of this year and ordered to refund $480,000 to Fox network, which now owns "The Family Channel." The city stopped taxing the three transponders, valued at approximately $12 million, in 1999, after The Family Channel was bought by Fox and moved to California. Fox had initially asked for $630,000 — all taxes collected from 1993 to 1998 — but the judge said Fox could go back only to 1995. The spacecraft in question was launched in 1992.

"Transponders are not cars or ships or airplanes, which are covered by Virginia tax law," said the judge in his decision. "No state law mentions transponders in space. It appears to me that the city's effort to tax these items comes through analogy and implication. The city can't tax by analogy and implication. It must come from clear and specific authority." ■

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

FCC Update



Rules for digital auxiliary services proposed

BY HARRY C. MARTIN

In an ever-evolving effort to smooth the transition from analog to digital technology, the Federal Communications Commission is proposing to revise its rules to allow broadcast auxiliary services (BAS) to convert to digital technology along with broadcast stations.

BAS stations must be technologically compatible with the rest of the broadcast industry because television and radio stations and networks use these stations to transmit program material from the locations of breaking news stories or major events to studios. However, under the current rules, digital modulation can be used only in specified BAS bands, which slows the overall broadcast industry's transition to digital. For that reason, the Commission is proposing rules that permit TV and aural BAS stations to use any available digital modulation techniques in all BAS frequency bands.

The Commission also is considering an expansion of its short-term operation rule. The rule currently allows AM, FM and TV broadcast stations including Class A stations to operate broadcast auxiliary stations up to 720 hours per year to cover events outside a station's normal operating area without submitting STA requests. The proposed rule would expand the short-term operation rule to include broadcast network entities, cable network entities and low-power television stations. Under this rule, BAS licensees would need to notify the Commission of short-term operation for planned events, such as conventions and sporting events, but not for unplanned events, such as natural disasters. The Commission also seeks comment on whether 720 hours is an appropriate cap on annual short-term operations.

Additionally, BAS and other radio services currently share several frequency bands and have technically and operationally similar stations. Nonetheless, they sometimes must operate under different technical rules. These inconsistencies in the rules have led to confusion when licensees in different services have tried to operate in the same geographic area. The proposed rules would conform technical rules that are currently at odds, including transmitter power and emission limits, for services including BAS, Cable Television Relay Service (CARS) and Fixed Microwave Services (FS). Further, the Commission proposes to require aural and TV BAS stations to coordinate shared frequency use in order to minimize instances of harmful interference that may otherwise occur when a station begins transmitting.

Other proposals designed to update the BAS rules would allow film and television producers to operate wireless assist video devices on unused VHF and UHF channels, permit BAS applicants to operate under temporary conditional authority after an application has been properly filed, and make BAS application rules consistent with the FCC's Universal Licensing System (ULS).

FCC may dismantle Mass Media Bureau

The FCC has issued a public notice requesting comments from the communications industry and other interested parties on how to achieve the following goals:

- The development of a clear substantive policy vision, consistent with the various communications statutes and rules to guide agency deliberations;
- The creation of a management style that builds a strong team, produces a cohesive and efficient operation, and leads to clear and timely decisions;
- The development of independent technical and economic expertise through recruitment, training and employee development; and
- A realignment of the organizational structure to conform to the realities of a dynamic and converging marketplace.

In connection with the last goal, it has been informally reported that the Television Branch of the Mass Media Bureau may be merged into the Cable Bureau. It also has been reported that the audio services regulatory staff, which deals with the nation's radio stations, may be moved into the Wireless Bureau. This dismantling of the Mass Media Bureau would likely cause a loss of knowledgeable top-level staff, subject radio and TV to different regulatory schemes (just as the TV/radio cross-ownership rules have been relaxed), and otherwise make the FCC less responsive to broadcasters' needs.

LPTV/translator auctions planned

Some 3500 MX'd LPTV applicants have been given until Aug. 23 to either settle any mutual exclusivity problems or be put into an auction.

Such applicants can avoid having to participate in the auction by eliminating the mutual exclusivity through settlements filed by the Aug. 23 deadline. ■

Dateline

Oct. 1, 2001, is the deadline for biennial ownership reports for stations in the following states and territories: Alaska, Florida, Guam, Hawaii, Iowa, Mariana Islands, Missouri, Oregon, Puerto Rico, Samoa, Virgin Islands and Washington.

By Oct. 10, issues/programs lists and Forms 398 (Children's Programming Report) for the period of July 1 to Sept. 30 must be placed in stations' public files.

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

SEND Send questions and comments to: harry_martin@intertec.com

Selling TV station bandwidth

BY MARK R. SMITH

In major markets — and more than a few smaller ones, by now — digital TV has made its grand entrance.

But while the industry transition is happening, it hasn't been cheap. Building what amounts to a second station, which is basically the order, costs between $2 million and $12 million and doesn't generate more revenue.

TV stations are searching for new streams to help pay for the digital transition, and the future is now. After all, 6MHz on the analog spectrum can only hold so much data, or program content, as the case has been.

But new technology is allowing stations to fit much more data into that bandwidth and gives them more flexibility to market products that traditionally have not been sent along the same lines as a station's signal, like downloadable DVD-quality movies, software and video games.

To call the advent of data broadcasting timely is an understatement, as it's hoped it will help offset costs at a pivotal time in the history of the TV medium. It shows stations can make those sorely needed incremental revenue increases, since the advertisers who have always driven the business model don't pay more for HD. It's not a picture quality thing for them — it's all about viewers. It also allows stations to compete for distribution dollars with the likes of UUNet, AT&T and even Federal Express. It's right around the corner, too.

Data networks like iBlast allow broadcasters to use extra bandwidth to deliver non-traditional products like downloadable movies, video games and business-to-business catalogs in addition to their regular program content. Photo courtesy iBlast.

The ABCs

Data broadcasting is really a way to allocate, and hopefully generate revenue from, the bits that broadcasters are not using (see ATSC standard A/90, at atsc.org).

Full-motion sports in HD, like hockey and basketball, are the most demanding in terms of bits, because movement is constant — taking about 90 percent of the 19.39Mb/s bit rate. An HD movie has much less motion and is therefore much less demanding, employing 60 percent of the bits. An HD news show would only demand about 30 percent of the bits. So the encoder changes the bit rate depending on the HD broadcast, often from program to program. HD program quality never suffers, and stations can then use the extra bits to provide data in addition to their regular programming.

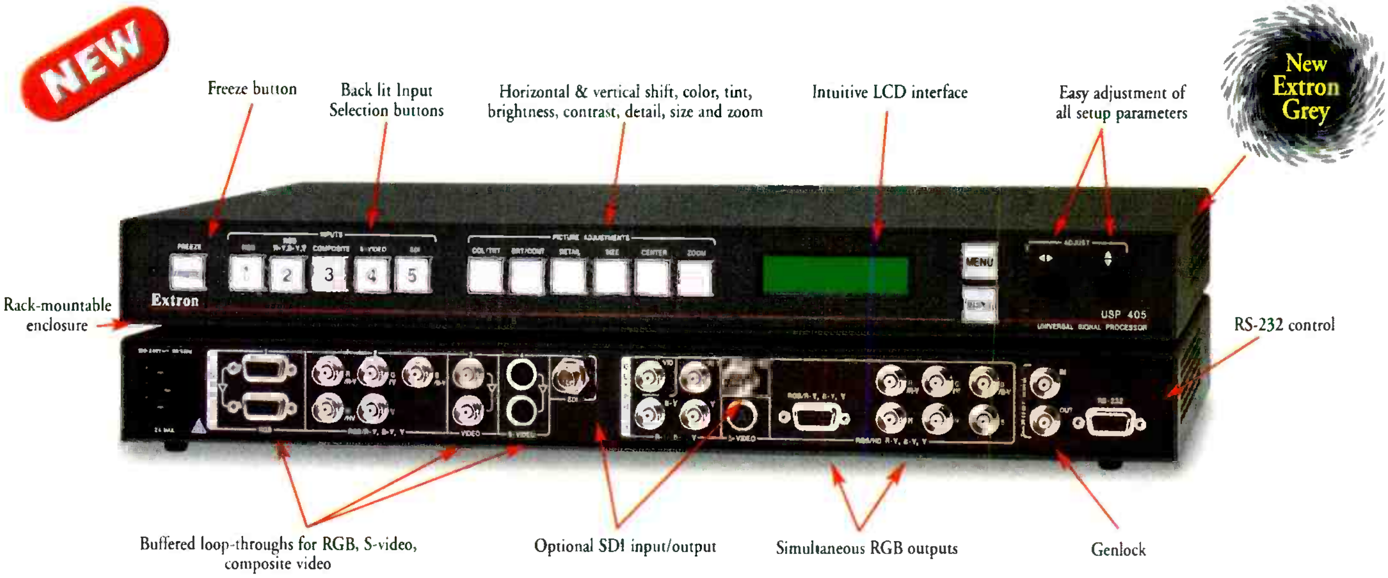
As mentioned, the data can be many things: software, CAD drawings, medical images or business-to-business information, like catalogs. The idea is to make money by distributing this extra data and share it with the likes of data broadcast networks like iBlast or DTV Plus.

While manufacturers like Triveni and Skystream bring the technology to the table, iBlast and DTV Plus (owned by Capitol Broadcasting) are networks that deliver a range of broadband content using DTV bandwidth for the last mile. They are not buying and selling, because broadcasters own them. iBlast, for instance, is a collection of 22 of the nation's largest owners of TV stations like Post-Newsweek, Tribune, Cox, Gannett, etc., which aggregate for data transmission in a way analogous to what NBC does with TV programming.

The way these stations divvy up the bits varies. Some give iBlast less bits during HD and more during SD transmissions. The benefits are that stations experimenting with digital data transmission see what works and what doesn't. The other advantage would be the opportunity to share any revenue that might be gained.

There are two tiers of capacity: base (or fixed) level and additional incremental capacity.

A defined amount of capacity, the base level, is always present during HD or SD broadcasts. If a station transmits HD programs, it overtakes the incremental capacity and leaves the base level there. The primary idea would be to broadcast HD and the base level of iBlast data simultaneously. During non-HD transmissions, stations would broadcast more iBlast, or



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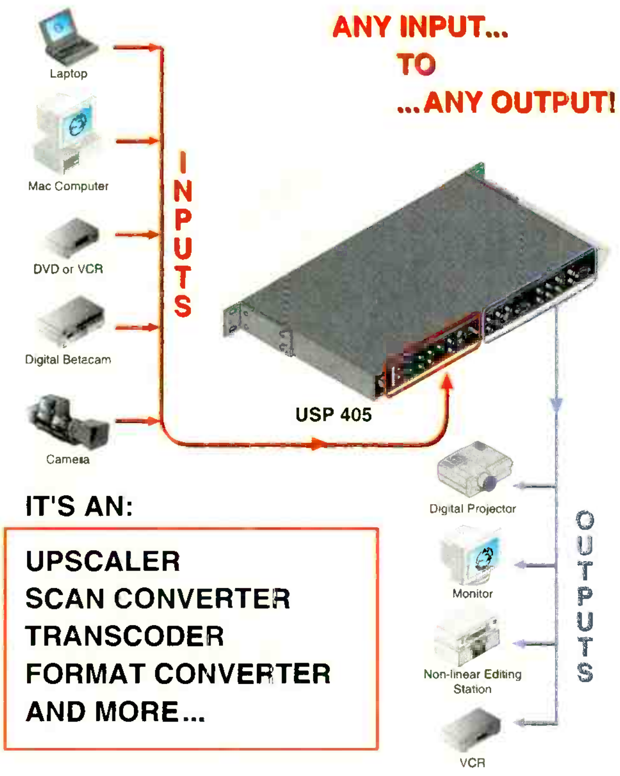

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SD, data (meaning program content). The goal is to transmit a certain amount of additional data over the course of a day, depending on the program content that needs to be transmitted over the base level.

That is quite a change from the old days, when an analog broadcaster would produce analog content: some local, some national and some syndicated. Yet it's much the same thing today, just with different content. Today, content could be electronic books, files, encrypted films, etc.

Technology is allowing stations to market products that traditionally have not been sent along the same lines as a station's signal.

Also, rather than distributing content on transportable media like DVD, in data broadcast networks it's transmitted and stored in the consumer's home on any device with a hard drive, such as TiVo, AOL TV, Ultimate TV or even a PC. The user needs only to equip his appliance of choice with an antenna and a DTV receiver, or cable.

Most of what services like iBlast, DTV Plus and the late Geocast provide is downloads of products like movies, software, catalogs, electronic newspapers and games to be stored in a device of choice along with streaming video or file downloads. Hard drives also are plummeting in cost, offering users more capacity for content.

In the end

Broadcasters' perspective on the spectrum they have available has changed. Rather than looking at it as 6MHz, they think of it as 19.39Mb/s. This allows them to send anything that will fit in that space, even simultaneously. No one can forecast the next decade of content distribution models, so firms are building a data broadcast architecture that is open to all possibilities. iBlast has been up since Jan. 1 of this year in technical trials. The commercial launch is set for the first quarter of 2002.

What this new technology boils down to is managing bandwidth. Like any business, it depends on where the economics lie. But the overriding factor, say insiders, is staying true to FCC and Congressional mandates to deliver HD programming, and only then for stations to accommodate commitments to data broadcasting networks. There is a budget to work with, but there also must be a balance. The economic model has to support the stations. ■

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.

By the Numbers

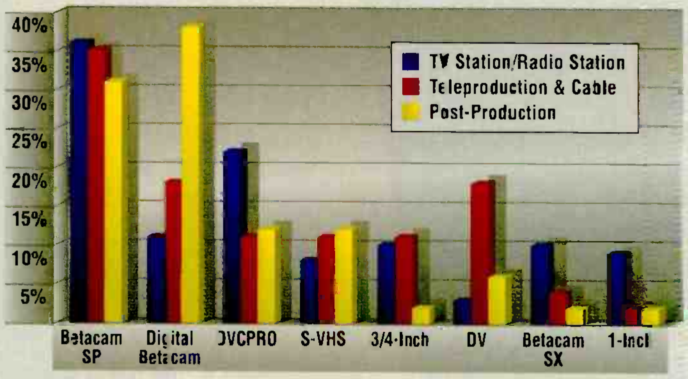
BY BRAD DICK, EDITORIAL DIRECTOR

This is Part IV of our series on research of the State of the Industry. This month we look at facilities' plans for storage technology. The results show that while there is strong interest in server technology, tape is a long way from dead.

Beta SP still top house tape format

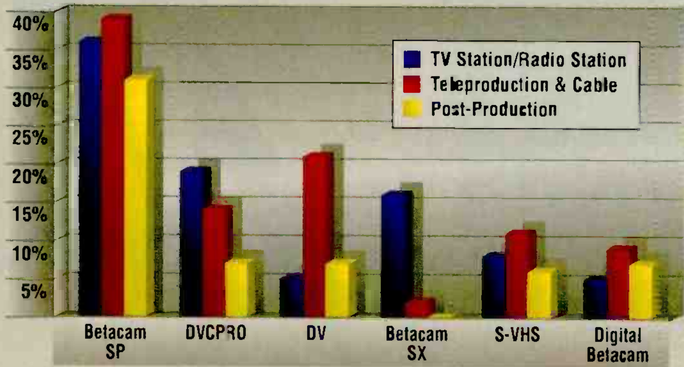
Betacam SP is used most often as the primary house tape format for all facilities, except post production. Those facilities use Digital Betacam more than any other format.

DVCPRO is the second leading house tape format for TV stations. Production and cable facilities have an even mix of Digital Betacam and DV as their second most popular format.



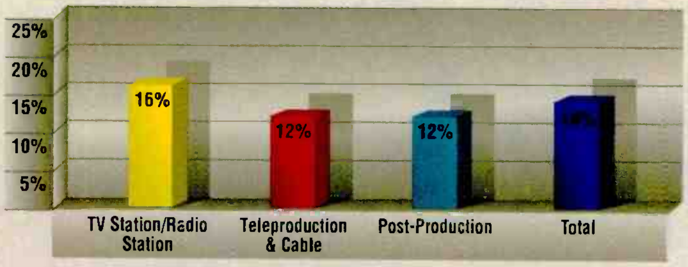
Beta SP the primary ENG/ field tape format

Approximately one-third of all facilities use Beta SP as the primary ENG/field tape format. DVCPRO and Betacam SX are used by many of the TV stations as the primary ENG/field format. For production and cable facilities, DV is the second most used format. Post facilities rely on a mix of digital formats including DVCPRO, DV and Digital Betacam.



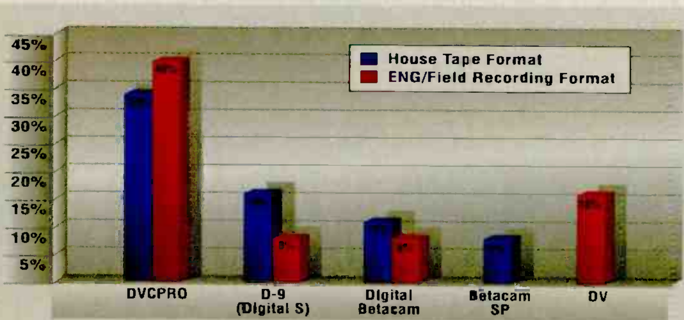
Few plan to change formats

Only about 14 percent of facilities intend to change tape formats this year. This low number may be due in part to the change to digital operation. As was reviewed in the February issue, page 30, the average analog-based station does not plan to complete the digital conversion of its production facilities until 2004.



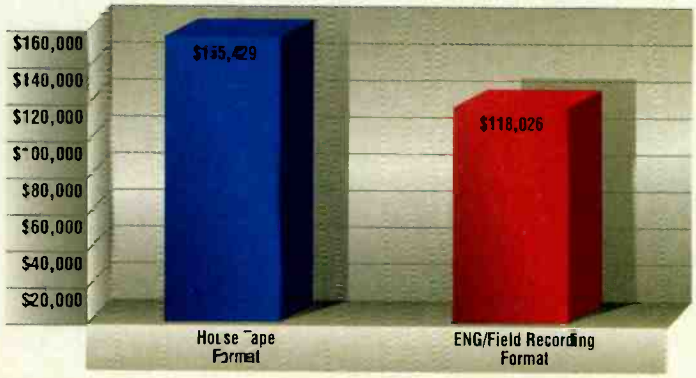
Selecting ENG and house tape formats

Of the 14 percent of facilities planning to change tape formats this year, the most popular house format selected will be DVCPRO, with D-9 second. The most popular ENG/field recording format will also be DVCPRO, followed by DV.



How much will you spend?

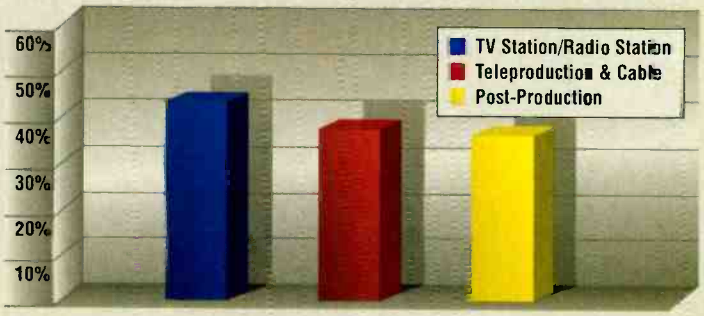
The average expenditure for a new house format will be $155,429. The average expenditure for a new ENG/field format will be $118,026.

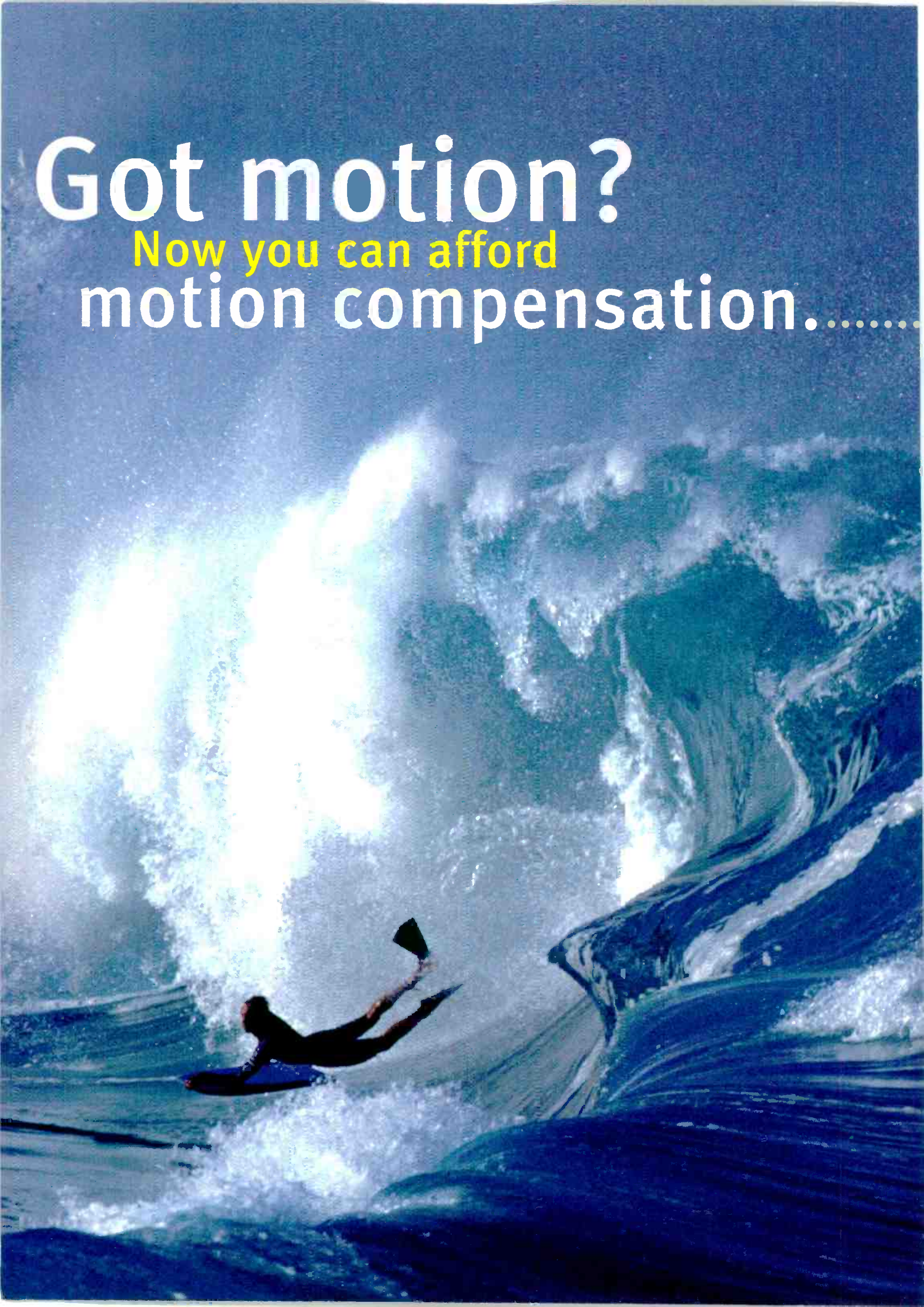


Video server purchases and budgets

Just over one-third of the TV stations report they'll buy new video servers this year. A slightly lower number, about 30 percent, of cable facilities and post houses say they'll buy new video servers. Measured overall segments, just over 30 percent of facilities report they'll buy new servers in 2001.

TV stations plan on spending an average of $241,193 for new video servers this year. That's just slightly higher than the overall average budget for all facilities of $213,441.

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Digital Handbook

Transition to Digital

Video resolution

BY MICHAEL ROBIN

The extent to which a picture medium such as television can reproduce fine detail is expressed in terms of resolution. The early development of television resulted in the two dominant SDTV scanning formats, the 525/60 and the 625/50. The aim was to achieve a satisfactory picture taking as a reference the visual acuity of the eye. The human visual system (HVS) has two main resolution characteristics namely: The spatial resolution and the temporal resolution.

The spatial resolution concept

Television system design takes as a reference the visual acuity of the eye, which is of the order of one minute of arc. The eye does not perceive picture details that subtend an angle of less than one minute of arc. The assumption was made that the picture would be viewed at a distance of approximately six times the screen height. So a decision had to be made as to the number of lines that make up a picture. Too many lines would be a waste and too few lines would make the raster line structure visible. North America chose 525 lines and Europe chose 625 lines.

•**The vertical resolution:** The vertical resolution is equal to the number of alternately white and black horizontal lines that can be resolved vertically over the full height of the picture. It is expressed in lines per picture height. The 525/60 and 625/50 scanning standards use interlaced scanning. The early developers of television in the 1930s determined that in an interlaced scanning system the vertical resolution is statistically equal to 70 percent of the number of active lines. The so-called "Kell Factor" of 0.7 is at the origin of all conventional television systems. Given an active number of lines, let's say 485, the vertical resolution is equal to 0.7x485=339.5 so let's round it up to 339 lines per picture height (LPH). If the vertical details in the picture exceed 339LPH they are blurred. The vertical resolution is independent of the video bandwidth.

•**The horizontal resolution:** The aim is to achieve an equal number of picture elements per unit of distance (the picture height) horizontally as well as vertically. The system must therefore allow for a number of horizontally displayed picture elements that is equal to the picture ratio, let's say 4/3, multiplied by LPH. So in the 525/60 format we need to display 339x4/3=452 picture elements (or 226 cycles) per active picture width. Given an active line duration of 52.5 microseconds this results in a cycle duration of:

$T = 52.85/226 = 0.2338$ microseconds

The associated frequency is

$F = 1/T = 1/0.2338$ » 4.28MHz

Format	Total lines per picture	Active lines per picture	LPH (K=0.7)	Bandwidth (MHz)	Lines per MHz
525/60 (CCIR M)	525	485	339	4.2	79.2
625/50 (CCIR B,G)	625	575	402	5	80.4

Table 1. Horizontal resolution capability of the dominant SDTV formats.

FRAME GRAB

A look at tomorrow's technology

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Internet usage slows as schools close

netScore Top 50 Properties - June 2001

June 2001 Rank	Property	June 2001 U.S. Unique Visitors (000)	% Change May-June
1	Microsoft Corporation	91,341	-5.4%
2	Yahoo Inc.	86,465	-5.5%
3	AOL Time Warner	80,256	-2.5%
4	Terra Lycos S.A.	49,949	-9.1%
5	At Home Corporation	35,880	-9.4%
6	Amazon.com Inc.	30,118	4.1%
7	U.S. Government	29,655	25.4%
8	InfoSpace Inc.	28,941	-12.8%
9	Primedia Inc.	28,593	-9.9%

SOURCE: comScore Networks & Diameter
www.comscore.com, www.diameter.net

This is the bandwidth required for equal horizontal and vertical resolution. The horizontal resolution factor for a 4.28MHz bandwidth is

339/4.28 = 79.2 lines/MHz

Given that the transmitted bandwidth is 4.2MHz the transmitted horizontal resolution is reduced to:

4.2MHz x 79.2 lines/MHz » 333 lines

Format	525/59.94			625/50		
Component	E'_Y	E'_{CB}	E'_{CR}	E'_Y	E'_{CB}	E'_{CR}
Sampling frequency (MHz)	13.5	6.75	6.75	13.5	6.75	6.75
Nyquist frequency (MHz)	6.75	3.375	3.375	6.75	3.375	3.375
LPF cutoff frequency (MHz)	5.75	2.75	2.75	5.75	2.75	2.75
Horizontal resolution (LPH)	≈455	≈218	≈218	≈449	≈215	≈215
Samples per total line	858	429	429	864	432	432
Samples per active line	720	360	360	720	360	360

Table 2. 4:2:2 sampling structures and horizontal resolution.

Reducing this bandwidth reduces the horizontal resolution. A 2MHz bandwidth, typical of VHS, would result in a horizontal resolution of about 160LPH without affecting the vertical resolution. Table 1 compares the resolution capabilities of the 525/60 and 625/50 scanning formats.

NTSC and PAL composite signal encoding formats have a typical color difference (B-Y and R-Y) bandwidth of the order with a resulting horizontal resolution of around 48LPH.

The temporal resolution concept

An important property of the eye is persistence of vision. Persistence of vision is the ability of the viewer to retain, or in some manner to remember, the impression of an image after it has been withdrawn from view. When light entering the eye is shut off, the impression of light persists for about 0.1 sec. Ten still pictures per second is an adequate rate to convey the illusion of motion. The phenomenon of flicker, however, requires still higher picture rates. Given the transmission spectrum conservation requirements, which imposed a 6MHz channel bandwidth (7- or 8MHz in Europe), the early television developers adopted the interlaced scanning concept, in which a picture is divided in two consecutive fields transmitted at a frequency (nominally) 60Hz (50Hz in Europe). This allowed for the reduction of the transmission bandwidth requirements. The result is that large areas of uniform color and brightness flicker at the field rate (60Hz or 50Hz large area flicker). This is an acceptable compromise. When two adjacent fields in two consecutive fields have different luminance values the result is small area flicker, at the frame rate (30Hz or 25Hz), which is highly objectionable. In the 1930s this was a small price to pay to achieve restricted transmission bandwidth.

Too many lines would be a waste and too few lines would make the raster line structure visible. A decision had to be made.

The ITU-R BT.601 digital concepts

The ITU-R BT.601 standard was the first international agreement on how to migrate from two incompatible analog television scanning formats to a common sampling concept and structure. The original analog component signals are sampled to obtain three digital component signals. The most popular sampling structure, the 4:2:2, uses a 13.5MHz sampling rate for the E'_Y (analog luminance) signal and 6.75MHz for each of the E'_{CB} (blue color difference) and E'_{CR} (red color difference) component analog signals. The sampling frequencies impose Nyquist constraints on the maximum sampled analog frequency that has to be lower than half the sampling frequency to avoid the occurrence of aliasing. The standard specifies the tolerances of the anti-aliasing and reconstruction filters thus implicitly specifying the analog horizontal resolution.

In the 525/60 version the luminance sampling frequency of 13.5MHz = 858 x F_H, where F_H is the horizontal scanning frequency. The resulting number of samples per total line is equal to 858. The digital active line accommodates 720 Y samples (active pixels). Under ideal conditions, given the Nyquist frequency of 6.75MHz, 720 pixels per active line is equivalent to 3/4 x 720 = 540LPH. The standard specifies an anti-aliasing and reconstruction filter bandpass of 5.75MHz resulting in an analog horizontal resolution of the order of 455LPH.

Given the color-difference sampling frequency of 6.75MHz, the digital active line accommodates 360 C_B and

360 CR samples (active pixels). Under ideal conditions, given the Nyquist frequency of 3.375MHz, 360 pixels per active line is equivalent to 3/4 x 360 = 270LPH. The standard specifies an anti-aliasing and reconstruction filter bandpass of 2.75MHz resulting in an analog horizontal resolution of the order of 218LPH.

The analog resolution figures above assume ideal brickwall low-pass filters. Such filters don't exist in practice. Under the influence of the computer industry, various bodies have started referring to the number of samples (pixels) per active line as horizontal resolution and to the number of active lines per picture as vertical resolution. This is misleading. Table 2 summarizes the situation.

ATSC concepts

The ATSC standard picks up where "601" left off and applies the principles of 4:2:2 sampling to SDTV as well as HDTV scanning formats. The confusion starts with the 4:2:2 nomenclature, which originally meant 4x3.375MHz=13.5MHz and 2x3.375MHz=6.75MHz. The normalized HDTV sampling frequencies of 74.25MHz for Y and 37.125MHz for CB and CR would suggest that the sampling structure be called 22:11:11. This was however never considered. The confusion is carried further by the coexistence of two HDTV formats: an interlaced scan format of 1125 lines per picture (1080 active lines) and a progressive scan format of 750 lines (720 active lines). Comparing the resolution capabilities of these two formats and expressing them in an easily interpreted number is quite a challenge.

The specified antialiasing and reconstruction filters create the same horizontal resolution ambiguities. Here the analog related horizontal and vertical resolution concepts are completely ignored and the quoted resolutions are the active horizontal pixels and the number of active scanning lines. It is interesting to note that the vertical resolution uncertainty that has produced the Kell factor is currently criticized or completely ignored. Whether the generally used figure of 0.7 is realistic or not and whether it applies equally to interlaced and progressive scanning is immaterial. The fact is that camera sampling and picture monitor display suffer from a certain amount of vertical uncertainty that occurs irrespective of whether the scanning is interlaced or progressive. While the uncertainty is reduced with progressive scanning the fact remains that unless the signal source is a computer the vertical resolution is not equal to the number of active lines. Also using the number of samples per active line to express horizontal resolution is misleading. ■

Camera sampling and picture display suffer from vertical uncertainty irrespective of whether the scanning is interlaced or progressive.

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

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User requirements for graphics systems

BY BRAD GILMER

If you are looking at purchasing or upgrading your graphics systems, the first question to ask is how you are going to use the equipment. A mismatch between the job you need to do and the equipment you buy could mean that you spend more than you need to (or less), and that you have to live with functionality that does not suit your tasks.

Graphics user requirements can be divided into several categories, but perhaps not the way you might first think. User requirement categories can be divided into close-to-air, non-close-to-air and post production. (Thirty minutes before air is a good dividing line between close-to-air and non-close-to-air/desktop.) Table 1 on page 42 shows how different applications fit into these categories.

While some areas might overlap, there is a clear differentiation. This differentiation impacts user requirements for equipment performance, reliability, price and so on.

The close-to-air environment is full of high-pressure situations. Breaking news, live events and weather graphics are examples of applications in this area. Operators look for tools and techniques that reduce workload and speed in the production process. Templates and pre-defined formats are used to shorten the design process. The non-close-to-air environment is usually much less stressful. Here is where the graphic design work is done, and where rough drafts are kicked around. This is where the creative process starts once it has moved from yellow tablets, bar napkins and ideas thought of in the middle of the night. The post production process also is less stressful from a time standpoint, although anyone who has been in a production session with a demanding client can tell you that things can get very stressful indeed. In this environment, operators, clients and producers work with a critical eye to get exactly the look they want. Attention to technical detail of the finished product is high. User requirements for these different areas are driven by the applications. Let's start with the close-to-air application.

Nothing will get a piece of equipment expelled from the post environment like unstable software.

User requirements for the close-to-air application include 1) excellent ergonomics 2) sufficient tool set 3) real-time feedback 4) robust design 5) rapid fault recovery. Time constraints and the high-pressure environment drive all of these requirements. In this environment, the graphics workstation should get out of the way of the operator and let him get on with his job. This is not the place for splashy screens, complicated menus or fancy interfaces. The tool set provided should be sufficient for the operator to do his job, but it should not be overly complicated. Manufacturers should take the time to carefully think through the tools required

Operators in on-air graphics areas like the one at Fox (shown above) face time restraints that make a simple, highly intuitive interface and real-time feedback necessary features. Photo courtesy Fox.

in this environment.

Real-time feedback is critical. An artist *must* be able to see what he is doing as he is doing it. If he is making a mistake, he must know about it now, not later. A robust design also is required. The hardware must be physically strong, made to accept the rigors of traveling in a truck. The live sports/live event environment is brutal. Finally, rapid fault recovery is a must, and is closely associated with a robust design. The equipment must be able to quickly recover from power glitches and software errors. The artist's work and machine state should be preserved if at all possible. Reboot times must be minimized. Remember that in some cases, these systems are not just close-to-air, they are on-air.

Next, let's look at requirements in the non-close-to-air or desktop environment. Systems in this environment must be 1) lower in price 2) available on the desktop using conventional processing power 3) user friendly 4) connected with high-end systems 5) Internet aware. One factor that enters into almost every purchase decision in the "desktop graphics" or non-close-to-air application is price. Most users have combined the requirements for items one and two above, asking for advanced functionality at a reduced price (yes, users want to have their cake and eat it too). For many years, users were not offered that alternative. However, with the declining price of MACs and PCs and the corresponding leaps in processing power, it is now possible to do some really amazing graphics work with a MAC or Intel platform. Prices for well-equipped graphics systems have continued to fall while functionality has increased. Along

A mismatch between the job you need to do and the equipment you buy could mean living with functionality that does not suit your tasks.

with this comes the power of the consumer market, driving down prices for things like large monitors and high-speed networks, all part of a high-performance desktop graphics system.

While close-to-air systems require very streamlined user interfaces, the requirements for the desktop environment are different. Desktop systems should have menus that are intuitive and easy to navigate. They should be self-explanatory for the first-time user while not being too cumbersome for power users. This may result in user interfaces that are less streamlined than the close-to-air systems. User interface design is always a trade off between efficiency and ease of operation.

The output from desktop systems is frequently used as input to more expensive systems. It is important to


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consider the level of interoperability of Web browsers. As images become In the post production environment,

Summary of User Requirements for Graphics Systems

Close-to-air	Non-close-to-air	Post production
Excellent ergonomics	Lower price	Uncompromised image quality
Sufficient tool set	Desktop platform	Very complete tool set
Real-time feedback	User fr endly	Intuitive user interface
Robust design	Connectivity	Stable software
Rapid fault recovery	Internet aware	Complex rendering
		Lower cost

Table 1. Close-to-air, non-close-to-air and post production applications in graphic production. Operators working on breaking news demand different functionality from their graphic systems than graphic artists in a post production environment.

operators become annoyed with functionality that is difficult to use because of poorly planned user interfaces. There also is a difference in the level of familiarity and training of post graphics users. Most users are highly trained and do not require the simpler interfaces of the non-close-to-air systems.

Nothing will get a piece of equipment expelled from the post environment like unstable software. It is not hard to imagine that a customer who is paying a lot of money for the privilege of sitting next to a graphic artist will get upset if lockups and reboots are the order of the day. If you have ever experienced the frustration of losing your work in the desktop environment, imagine what that is like when you have a paying customer sitting next to you watching the last three hours go down the drain. Needless to say, stable software is good.

The ability to render complex graphics and effects goes hand-in-hand with the requirement for complete tool sets. The important thing to note is that rendering time may be allowed in the post environment. It is virtually banned from the close-to-air environment.

Finally, as with desktop systems, users demand all of the above at a reduced cost. They see the increasing power and functionality of desktop systems available at a falling price and expect the same from their high-end systems. This may not be realistic. Stable software costs money. Well-developed user interfaces require programming time (more money). There is no doubt that some users will replace low-end post systems with desktop systems as their functionality improves. However, there will be a market for high-end systems for the demanding post environment for some time to come. ■

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

SEND Send questions and comments to: brad_gilmer@intertec.com

Changing bit rate

BY CHARLES CARTWRIGHT

The MPEG-2 world is made up of highly structured and interdependent data. The data is generated and packed at the source and only unpacked again at its final destination. Intermediate "repacking" is not simple but it is desirable. For the intermediaries it is a question of freedom to choose: The freedom to choose the bit rate and quality that best suits your business model or your channel capacity; to remultiplex and transmit variable bit rate material such as that from statistical multiplex groups; and to integrate remote and local encoding into single statistical multiplex group. A bit rate changer product provides this freedom and control.

MPEG-2 evolution has been rapid over the past five years. First-generation systems involved compression of the original signal, and formatting and modulating the data for delivery over a channel (typically satellite or cable) to a customer receiver for decompression and presentation. This was a "one-hop" direct-to-home (DTH) transmission chain. As this did not match the complexity of the current analog transmission systems, there was pressure to provide more flexibility in the MPEG-2 chain. The next step was to allow remultiplexing of the MPEG-2 stream. This meant "unpacking" the originally transmitted transport stream into its component parts and recombining them with elementary streams from other transport streams. The processing was fundamentally on the packet layer and on the metadata about the composition about the transport stream (MPEG PSI, DVB SI or ATSC PSIP). However, there was no modification of the elements that made up the stream itself. Now, using bit rate changing technology, it is possible to decompose the original compression a stage further to provide the operator with even more flexibility and control over their transmitted stream content. This decomposition has focused almost entirely on the video domain as it is the most significant element, in terms of bit rate used, of any broadcast transmission. Progress here in manipulation of content will yield the most effective results for the operator.

Until now, the only operators who had control over the bit rate allocation of service are the original content generator and compressors.

Before effective remultiplexing the only operators who had any choice over the composition of a multi-program stream were the original content generator and compressor. Likewise, until now the only operators who had control over the bit rate allocation of service (and are therefore allowed to make the quality-number of channels choice) are the original content generator and compressors. Bit rate changing gives this choice to those not generating the original content. It is worth noting that operators have overcome this limitation in the past by fully decoding the incoming material and re-encoding it under their own control. This has been their only choice until now, but it is expensive in equipment terms and relatively poor in quality. Bit rate changing, without using complete decoders and encoders, offers a lower-cost and higher-quality solution to ownership of bit rate allocation. More detail on the methodology of bit rate changing is available in other papers.

The most likely places to use bit rate changing are digital turnarounds (DTAs). Specific examples of a DTA are: regional cable headends, terrestrial regional playout centers or satellite broadcasters generating their own content as well as rebroadcasting others' original content. All these environments are slightly different, but they will all need to redirect and repurpose the compressed material they receive into their own transmit path. There are three key elements in such environments in which bit rate changing can play its part: modifying compressed content bandwidth to match final delivery capacity; putting the owner of the final delivery in charge of the tradeoff between picture quality and the number of channels per megabit; and remultiplexing of previously statistically multiplexed sources.

The first issue — bandwidth matching — is relevant to both terrestrial and xDSL delivery headends. While the DTH or

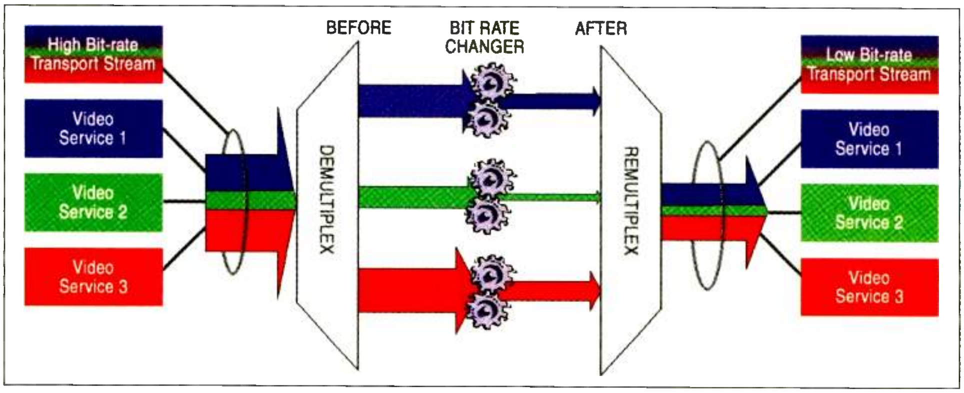

Figure 1. The process of squeezing the bit rate of material.

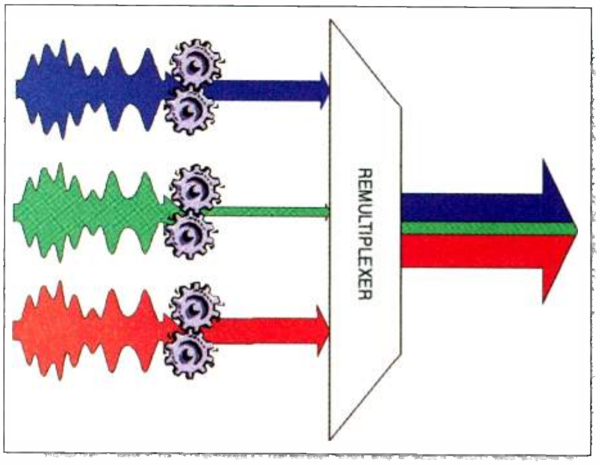

Figure 2. Bit rate changing allows DTA operators to create their own statistical multiplex services by remultiplexing the original streams at a known rate to keep them from peaking at the same time and overloading the new multiplex.

distribution satellite system is capable of carrying in the region of 35- to 40Mb/s of content the terrestrial channel may only carry 20- to 30Mb/s and each xDSL link as little as 2Mb/s. Taking the terrestrial scenario we see around 25 to 30 percent reduction in capacity between the distribution link and the final channel. Reducing the number of services offered on the terrestrial network or remultiplexing onto more channels to make up the bandwidth could resolve this. Alternatively, the operator could reduce the bit rate of each service by 30 percent (or each service by varying amounts such that the average reduction is 30 percent) to squeeze the entire original multiplex into the new channel allocation. The process of squeezing the bit rate of material is shown in Figure 1. The width of each arrow indicates the magnitude of the bit rate for the service.

Until now full decoding back to baseband video and re-encoding at a lower rate has accomplished this. That method is expensive in space, equipment and maintenance costs. There also is a problem with quality of pictures after the decode/re-encode process. Studies have shown that concatenated encoding increases picture degradation. This degradation is mostly caused by different coding decisions in the original and later encoders. Some encoders contain methods for identifying original coding decisions and replicating them in the subsequent re-encodes. This method is effective but does not remove the cost element.

If we consider complete decoding to uncompressed material and then re-encoding as being flexible but ultimately crude video bit rate changing, then we can compare it to far more elegant solutions in terms of cost, size and picture quality. In a bit rate changer the compressed video is only partially decompressed and then recompressed at a lower rate. Because the decompression is partial, not all of the options for re-compression are available, but processing requirements, and thereby costs, are reduced. The tradeoff is between equipment cost investment and flexibility of implementation.

We have looked at the baseline reasons for a bit rate changing function. However it is sometimes not a matter of choice, but a necessity. For the DTA operators there is the increasing problem of statistical multiplexing. This is when the original encoder has been allowed to vary the data rate allocated to encode its video such that when aggregated over a group of encoders the sum of all encoded bit rates remains constant. This technique uses the statistical advantage that the video sources are independent and the peaks and troughs of bit rate requirements do not have any correlation. Only where coherent peaks occur across several sources are the original encoders required to reduce their coding quality to maintain constant group bit rate. This technique has been exploited to increase capacity of networks by around 30 percent. Naturally, more original content providers wish to take advantage of these improvements to get more services or quality out of their current bandwidth. The problem for the DTA operator is that when they wish to recombine several independent statistically multiplexed sources they cannot be sure that the content will fit into their new multiplex. The only guarantee is that the sum of all the data rates of the original group is fixed and below a certain level but if they combine elements from different groups then all the elements may

peak simultaneously and overload the multiplex. Using bit rate changes the varying video rates of the statistically multiplexed services may be capped to a known rate to ensure compliance with the requirements of the output stream. Some of the time this would require reducing the bit rate considerably and at other times passing the video through with unchanged data rate. Further, this offers the DTA operators the ability to implement their own local statistical multiplexing. The variable bit rate of the original material would change to a new bit rate, but the new bit rate need not remain constant. It could vary in accordance with a local statistical multiplexing implementation. The natural extension to re-statistical multiplexing of remote sources is the option to add local service to the statistical multiplex group. Now we have a DTA with local statistical multiplexing of local and remote sources. The final option for operators of the DTA is to receive service from several multiplex operators and recombine them each at a lower rate (or some at lower rates and some not) such that they may provide more programming per megabit to their customers. All of these techniques and methods may be combined to meet the individual needs of each DTA operator.

Servers have become a more significant part of the direct-to-home and contribution network design because of their flexibility in material management. The problem is that material is compressed before storing to the server, not at the time of playout. This can be done either in a high-quality constant bit rate or, to save further space at constant quality, variable bit rate (using "single-channel statistical multiplexing"). Either method creates problems in the delivery chain after the server similar to those we have seen with remote sources: If we want to store material to be played out on a variety of channels the material must be stored at a suitable bit rate for the highest quality channel, but it also needs to be delivered in a lower bit rate channel. This lower bit rate delivery allows for lower pipe capacity at the end of the delivery chain or a different business model with higher program numbers per megabit of pipe capacity. In either case the material will need to be converted to a new bit rate for inclusion in the channel. Alternatively, providers might want to incorporate the material from the server into a statistical multiplexing group with local real-time encoded sources. In this case, the bit rate of the stored material will need to be modified in real time to fit the statistical multiplexing algorithm. Material stored more efficiently as variable bit rate (VBR) will, on playout, look the same as a remote statistical multiplex group element. Essentially, servers using VBR or constant bit rate (CBR) compressed storage present the same problems as do remotely encoded sources to the DTA operator, and the solutions using video bit rate changing are likewise similar.

We have seen a variety of applications for bit rate changing technology that give more choice than re-multiplexing and more compact and cost-effective solutions than full decode and re-code design. With processing power increasing and the cost of that power falling, there will be more and more applications where bit rate changing will offer flexibility and control at an effective price. ■

Charles Cartwright is product manager of multiplexers and stream processing for Tandberg Television.

Class-based queuing

BY STEVEN M. BLUMENFELD

At Lawrence Berkeley Laboratories the idea of class-based queuing (CBQ) was developed to better manage the growing bandwidth needs of enterprises. This bandwidth-management algorithm has been designed to better deliver appropriate, controllable service levels across IP networks.

Class-based queuing allows the network administrator to divide users into classes based on specific IP addresses, protocols or even applications. In a broadcast facility you could think of this as a class system for network machines, with the highest class going to production machines moving high-bandwidth graphics and the lowest class to e-mail and word processing.

Network administrators use CBQ to classify traffic into a hierarchy that reflects the policies of an enterprise. It also ensures that each traffic class has the appropriate quality of service.

CBQ integrates easily within an existing router network and provides more control and reduced bandwidth costs. Your administrator would configure a LAN-to-LAN network between the local network and selected WAN routers. This minimizes costs by eliminating the need for any hardware changes in the router network.

CBQ is an IP network layer bandwidth management tool that provides benefits across any Layer 2 technology and is effective with any IP protocol, such as TCP and UDP. CBQ uses standard TCP/IP flow control mechanisms to control end-to-end traffic so all TCP/IP stacks, whether client or server, can take advantage of it.

CBQ can be used to create different service levels that are strictly enforced. Each class is guaranteed access to a specific amount of bandwidth — a minimum guarantee. They also can borrow unused or idle bandwidth when they need to burst above their set minimums.

Each class can have its borrowing priority set for the most important uses, which gives it first right to any excess bandwidth. The class ranges also can be set to maximum available bandwidth — thereby shutting every other class down to zero, in which case the user gets best-effort service.

You should ask your network administrator if your facility is using CBQ or some variant of it. It will increase your network's effectiveness and help to keep your bandwidth costs down. ■

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

SYSTEMS DESIGN SHOWCASE

WJAR-TV digital news transition

BY SCOT LAIRD

The compact New England region makes for an extremely competitive market. So WJAR-TV Channel 10 must satisfy viewers in its home state of Rhode Island as well as those in Massachusetts, New Hampshire and Connecticut — all while competing with the Boston stations in its own backyard.

The station, based in Providence, offers more than 30 hours of weekly news programming to more than 500,000 viewers. With a staff of 83, three ENG trucks and two news bureaus, the station produces five weekday newscasts – three each on Saturday and Sunday and, through a unique arrangement with Paxson Communications, a daily rebroadcast of its early- and late-evening newscasts to Paxson cable customers. In addition, the station produces NCAA college basketball- and NFL football-related sports programming, public affairs shows and long-form regional features.

WJAR-TV replaced its tape-based systems with new digital newsroom systems to facilitate production on the station's weekly newscasts. Photos courtesy Grass Valley Group.

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Last year, WJAR began evaluating digital ingest, nonlinear editing (NLE), storage and playout solutions: technologies that could take the DVCPRO material shot in the field and move it through the story creation process rapidly, eliminating the signal degradation endemic to the station's tape-based process. These solutions had to make the digital transition easy, especially for those professionals in the station's cuts-only edit bays, who had worked exclusively with tape machines. Sharing digital assets needed to be easy, inside and outside the newsroom.

News ingest and editing is fast, intense and pushes equipment hard, especially in cuts-only edit bays. Even with high-quality machines, the station was not immune to the toll day-in-day-out pounding took on its tape decks — and on output quality. In this all-tape news environment, it was too easy for a bad roller to crease a tape, a misaligned head to garble a signal or the overall quality of the material to degrade as it passed from editing to production and playback. Also operators had to constantly adjust signal levels as a tape moved from one machine to the next.

The all-tape editing environment also hampered the staff's ability to promote its upcoming newscasts. As in many other tape-based news operations, source footage was often locked up in editing bays, leaving producers to pace the halls outside until it became available.

Having already made the transition to the DVCPRO format for newsgathering, WJAR wanted to utilize digital ingest, NLE, storage and playback technologies to increase efficiency without disrupting the station's existing workflows. For example, the digital newsroom would allow operators to set a level digitally and it would stay constant from story creation to air. Also, an ingest system was needed that would handle the station's multiple

> Sharing digital assets needed to be easy, inside and outside the newsroom.

daily feeds and route them to an edit bay without forcing station personnel to race down a hallway.

Even more critical was WJAR's choice of NLE technology, as it would completely replace the tape systems with which story editors were familiar and comfortable. Thus the station placed a high premium on systems that offered high ease-of-use, open architecture and seamless integration with the station's network.

For media asset storage, sharing and playback, the station needed a digital server that would support the simultaneous push and pull of material, such as sending a clip between edit bays, or from a news editor to a promotions editor. They also needed a server that would offer an open architecture to accommodate a variety of third-party applications, including WJAR's Pathfire video-on-demand (VOD) system.

With Profiles integrated with Vibrint nonlinear editing systems, breaking news edited in WJAR's ENG trucks can be retrieved from shared storage and repurposed for later newscasts.

Digital news production

WJAR uses the Crispin Dubber with Turbo-Browse and a dual-channel Vibrint for ingest on separate router feeds. The Vibrints are used to schedule, view and break down incoming footage. They let producers program and assign names to individual or recurring feeds from the three ENG trucks and the station's second news bureau in southern Massachusetts. Producers also can monitor breaking news, live events or sporting contests, marking clips on the fly with a single keystroke and making those clips available to edit bays while recording continues. They also can drop stories from their news production control station, and these are automatically dropped from the playlist.

The Vibrint ingest system routes the signal to the station's six edit bays, where Vibrint editors are used to assemble stories. The editors offer instant random access, multiple levels of undo and real-time transition effects. Profiles integrated with editing systems allow station personnel to share stories, clips and other media assets. The Vibrints also can retrieve feeds stored in the Profiles to quickly create new story versions for later newscasts. No pre-digitization is required, so story editors can record directly from tape timeline while performing insert edits, voice-overs, L-shaped cuts and three-point edits. They can view the edits as they are made, just as they did in a machine-to-machine edit bay. Two tape machines are installed in each edit bay as sources for the Vibrints – a Panasonic DVCPRO machine for field acquisition tapes and a Sony Beta SP machine for use with older legacy archive material. A Chyron iNFiNiT! character generator run separately on the iNews system supplies electronic graphics, and Mackie 1404 BLZ mixer boards are used for audio.

Clips that are edited in WJAR's second news bureau and ENG trucks on Panasonic DVCPRO laptop editors are recorded on the Crispin Dubber. They bypass editing and

are fed directly into the Profiles over an analog input for storage and playout. The clips can be returned to the Vibrints in the edit bays for later repurposing.

For digital storage and playout, WJAR chose a six-channel Profile XP to provide multiformat support in the DVCPRO-based news environment, in addition to the Media Area Network for shared storage, the Profile network archive and the ContentShare platform. The iNews BCS automation system uses four channels of the BCS, while the Crispin software uses the other two for record/playback and a confidence record. The Chyron CG operator in the news production control room triggers the playlist and CG events on the BCS. Development work is underway to interface the platform with Pathfire video-on-demand technology.

From installation to training to workflow, the transition from a tape-based operation has been swift and smooth. The edit bays were completely refitted with new digital equipment. A thunderstorm shortly after installation led the station to add individual UPSs from APC to protect the editing systems. The systems' PC-based design and network compatibility allowed engineers to plug them into the station's network like any other device and have them fully up and running in a day. The station's existing Utah Scientific AVS-2 routing switcher remains in use with the new systems.

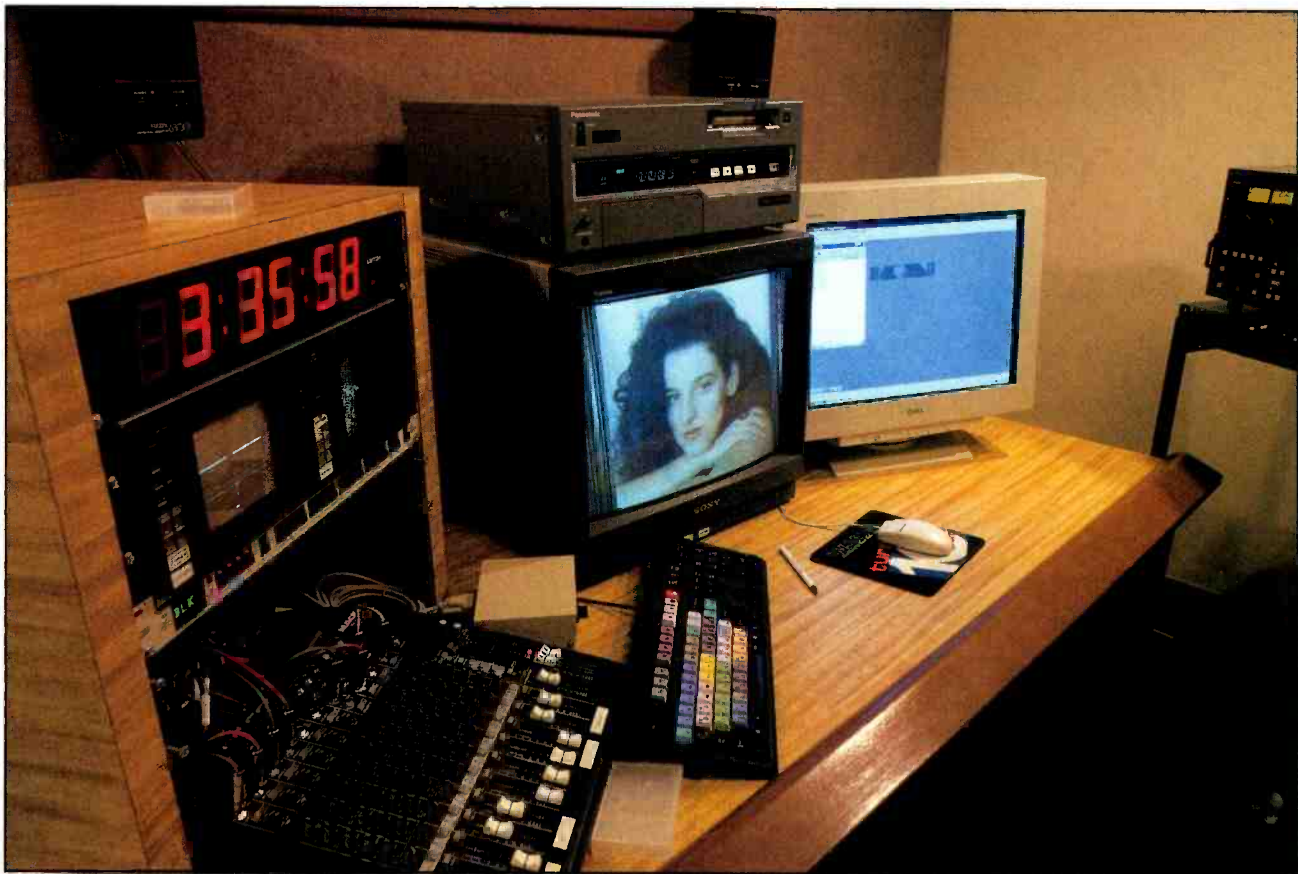
As a result of this digital newsroom conversion, WJAR has increased its operational efficiencies without changing its workflow. The station also is well positioned for integration with NBC's centralcasting topology, through which the network will distribute programming to its 13 O&Os.

News editing is fast, intense and pushes equipment hard, especially in cuts-only edit bays.

Scot Laird is the former director of engineering and information technology for WJAR.
Acknowledgement: Thanks also to Clark Smith, director of engineering for WJAR.

Equipment list

- Dual-channel Vibrint FeedClip
- Crispin Dubber with TurboBrowse
- Vibrint NewsEdit nonlinear editor
- iNews newsroom control system
- Panasonic DVCPRO laptop editors
- Panasonic DVCPRO recorder
- Sony Beta SP recorder
- Utah Scientific AVS-2 router
- Mackie mixing board
- Profile XP Media Platform (six channels)
- Profile PDR 324
- iNews Broadcast Control System
- Chyron iNFiNiT! character generator
- Grass Valley 250 switcher
- backup power systems



WJAR chose Vibrint editing systems with an eye toward ease of use, to facilitate operators' transition from familiar tape-based systems to the new digital equipment.

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Transmission & Distribution

Digital encoders

BY DON MARKLEY

The encoder — that magical silicon-filled device that makes the whole new ATV scheme of things work. To review, essentially all of the new television transmitter exciters look for the same input. To wit, a SMPTE-310M input for the MPEG-2, 19.39Mb/s Transport Layer signal. Some will accept two such streams and switch between them to allow switching between local and network signals with no change in the on-channel frequency. That little feature is important to avoid the loss of lock in receivers.

The problem arises in selecting the input du jour. The discussion has been raging for years about just how the incoming digital or analog video signal to the encoder should be configured. That is, how many scan lines, interlaced or progressive, scan rates, aspect ratios, etc. The various proponents are primarily divided between the computer camp, which sees advanced television systems as an extension of the Internet, and the movie crowd, which believes television should primarily be configured to replay Ben-Hur. Both sides make very convincing arguments and neither can really be considered to be wrong. The Federal Communications Commission has taken the same firm and helpful position that it did for stereo AM broadcasting — they have decided that the marketplace will be the determining factor.

As a result, multiple standards exist and will probably continue to exist for the foreseeable future. Various feeds may be 1080i, 720p, 480p, etc. The director of engineering is then forced to determine just what the configuration should be for the encoder to accommodate the local studio and one or more networks. In other words, this is not strictly an engineering choice. The choice may partly be made for the station by its network with the local production crew using the same or a different standard. This may be simple for many stations in the immediate future, because the network feed is used all of the time with only the insertion of local station breaks. That will probably continue until the station can start selling local spots on the DTV signal.

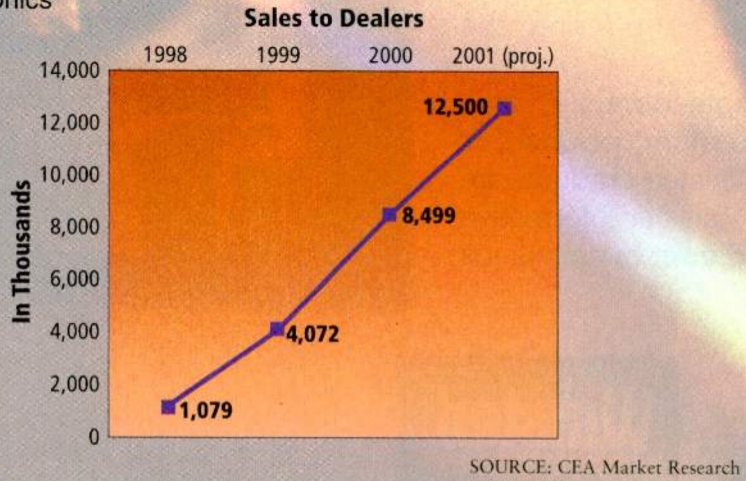
Be very reluctant to purchase a unit that is specifically designed for a narrow set of input parameters with no expansion capability.

The Chief is then left in a quandary. Just what capability should be included in an encoder? The problem is complicated even further when the station has to determine if and/or when it will operate with high definition, standard definition, multiple standard definition, PSIP (more later) and a datastream. The obvious answer is to buy an encoder that does it all for all of the standards and formats with all of the additional channels. That will run the encoder up to about the same price as a small transmitter.

A more practical solution is to ensure that the encoder can be modified or expanded as time passes. In other words, be very reluctant to purchase a unit that is specifically designed for a narrow set of input parameters with no expansion capability. While the expandable versions are somewhat more expensive, it is much cheaper to plug in cards in the future than to trash the whole thing when a new signal source is added.

FRAME GRAB
A look at the consumer side of DTV

DVD player sales skyrocket
DVD players are the fastest selling product in history of consumer electronics



SOURCE: CEA Market Research www.ce.org.

A secondary solution is to convert the new standard to the one currently in use at the station. Adequate systems are available to perform that little task but aren't a total cure. When such conversions are performed, the resultant picture may acquire problems that didn't exist previously. The reader is referred to John Luff's June 2001 article on HD conversion products. He does an excellent job of pointing out the problems that can occur which indicate that conversion, while practical, must be done carefully. In addition, the cost of the format conversion systems may well be more than would be necessary to modify the encoder. Luff also points out that conversion can cause the loss of information such as closed-captioning data, VITS and embedded audio.

Encoder design should be flexible in order to accommodate changes in input parameters. Photo courtesy Vela.

An additional problem is the use of the Program and System Information Protocol (PSIP), which has been found to be highly desirable to viewers. That also was covered in June 2001 by Arthur Allison. For ATV planning, that issue of the magazine should be read carefully. The configuration of an encoder should permit the easy insertion of the PSIP signal without interference between it and other signals.

Some encoders can operate as a simple system and are field upgradeable as future enhancements become available. It may well be advisable to buy at least the necessary frames and wiring for the more complete system initially rather than face the cost when the front office calls down to change the image formats. In any case, the blank shelf space can be used to store your old magazines. No one ever looks in there anyway.

It is difficult, in preparing this column, to avoid missing products that should be included. When discussing manufacturers with a solution to the N+1 combining problem, Micro Communications was omitted due to author error. In fact, the combiner manufactured by that company was a pick of the show during NAB2000.

This was properly brought to the attention of the author by Sam Matthews of MCI, who also brought up a point concerning the use of a small temporary antenna during the DTV conversion period. If tower loading will permit, the temporary antenna could be left on the tower to serve as a standby system when normal operation is shifted to a new permanent antenna. There are many station engineers who will attest to the value of such a system when a fault occurs in the main antenna or transmission line. ■

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

Production Clips

DVD production

BY BARB ROEDER

DVD is a high-density optical storage technology for video, audio and data. The application of DVD-Video, as developed by a consortium of manufacturers now known as the DVD Forum (www.dvdforum.org), allows the storage and playback of feature length films and long-form video content on set-top boxes and computer DVD drives. The interactive component of the standard also extends its functionality well beyond standard linear tape formats such as VHS. Adoption of the standard has grown steadily in applications such as entertainment, training and corporate communications.

The DVD-Video specification

With influences from Hollywood and broadcasters, targets for the DVD-Video specification included high-resolution, full-motion video and CD-quality audio. They adopted standard compression technologies such as MPEG for better compatibility across platforms. Video formats can be in NTSC or PAL and maintain a 4:3 or 16:9 aspect ratio.

DVD-Video is most often found in the MPEG-2 format, which offers high quality through an efficient coding process. For broadcasters this translates to easy repurposing of digital television content as the DTV standard is rolled out. Typical average data rates for video are 4Mb/s, but can go as high as 10Mb/s. The process of determining the target bit rate and achieving a high-quality encoded video is covered later in this article.

Standard digital audio formats also have been included in the DVD-Video specification. They include Dolby Digital Sound (DDS), MPEG and pulse code modulation (PCM). The format developed by Dolby Laboratories can be produced as stereo or as surround sound for a true "theater experience."

DVD media options

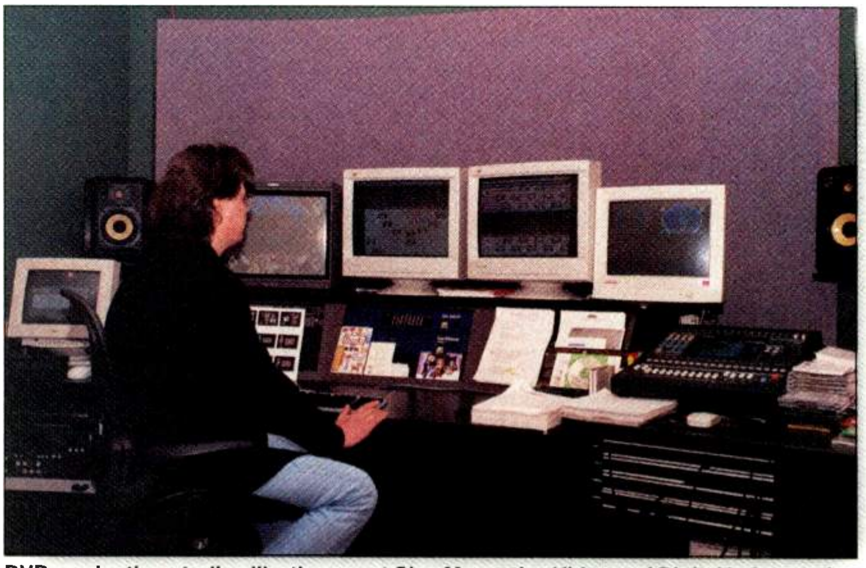
Manufacturers helped to define the media options for the DVD specification but, again, the driving force was the quality and amount of video that the disc could hold. Most DVDs today use the DVD-5 format, which offers a capacity of 4.7GB and has become relatively inexpensive to produce and duplicate for widespread distribution of feature length movies.

Bit budgeting allows the developer to plan for the video and audio content, and the client to brace for the cost of the project.

A capacity of 8.5GB is achieved on a single-sided disc using the DVD-9 format. This is manufactured as a dual layer, so the laser that reads the disc can reach both layers without turning it over. The density of a DVD-9 disc is slightly less than twice that of DVD-5 because the pits and bumps that are placed on the disc as data on the bottom layer need to be slightly more spread out in order for the laser to read through to the top layer.

Higher-capacity discs, like the DVD-10 with 9.4GB, are double-sided, meaning the disc needs to be turned over in the player in order to access information on both sides. Programming interactivity between the sides is difficult, so DVD-10 is most often used for recording the same content in two different formats, one on each side — for instance, a widescreen and a standard 4:3 version of a program.

Manufacturing of DVD-18 discs is still somewhat imprecise. The drive to improve this process may yet come from the high-definition television market, where four times the capacity will be required just to get a feature-length HD film onto one disc. DVD-18 would provide 17GB.



DVD production studios like the one at Cine Magnetics Video and Digital Laboratories in Armonk, NY, utilize sophisticated suites of equipment for authoring, MPEG encoding, noise reduction and audio processing.

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Developing a DVD

Advanced planning can lead to a more successful DVD project. Prior to encoding and authoring, it's best to determine the scope of the project. This includes how much video and audio will need to fit on the disc, how much interactivity needs to be built in, and what the overall look and feel of the title will be. A storyboard is useful for determining the project's complexity and hence the length of development time it may take.

With a plan in place, the assets of the project can be assembled and a bit budget can be determined for the disk. Bit budgeting allows the developer to plan for the video and audio content, and the client to brace for the cost of the project. Generally, a five to 10 percent overhead is given to menus, textual content and authoring requirements. If the video content is two hours or less, including extraneous clips such as movie outtakes or actor interviews, then the designer is pretty well assured of fitting the material on a DVD-5. Anything beyond this will be easier to lay out on a DVD-9. If cost is an issue, an experienced compressionist can usually achieve high quality at lower average bit rates in order to keep the project on a DVD-5.

Real-time encoding of the MPEG video is generally undertaken for medium- to large-scale operations. Often this is a two- or three-pass operation whereby the entire video is analyzed, perhaps preprocessed and finally encoded at a variable bit rate, or a constant bit rate if the video content is an hour or less.

For smaller-scale projects, MPEG encoding can be done in software. Motion estimation operations can be speeded up, at the expense of accuracy, but this can lead to a lower-quality encode. It's best to get a good demonstration and understanding of a software encoding application in order to determine its effectiveness.

The quality of the source and the amount of preprocessing also can affect the quality of the encoded MPEG. Most studios will use a Digital Betacam source and apply sophisticated noise reduction to the video prior to encoding. This step can take more time, but also can lead to significantly higher-quality results.

There are many breeds of DVD authoring applications that allow the producer to assemble the assets and create the interactive links for the project. Assets include menu screens, video and audio content, images, and textual information. Again it's important to plan this stage in order to avoid complicated menus or navigational dead ends.

The authoring process entails creating all the links between menus and the content. A front page of the title contains a menu of items for the user to select. The Chapter sub-menu consists of links programmed into a long video. The links are usually visual representations that may take the form of framegrabs from the video itself, graphics and text, or even short motion video clips that can be looped. Other sub-menus might allow the user to select language tracks for the audio or subtitles, actor biographies or interviews, and other extraneous content.

The menus are often created in Photoshop, or After Effects if they include motion graphics. In most authoring programs they are considered layered images, with a background, a subpicture overlay and a button description layer. The subpicture overlay consists of the images or motion video that is used to portray the buttons.

It's important to remember to include a common interface for linking back to the main menu, or even some of the sub-menus. There are standard definitions for many of these operations in the DVD specification.

A trained compressionist/authoring expert can turn around a relatively simple title in a week or two. A DVD-R can then be burned for testing. Generally, overall production will take four to six weeks, resulting in a glass master and a check-disc package for final approval.

The future of DVD

Broadcast-quality video and CD-quality audio are the most attractive features of the DVD specification. Interactivity extends the standard far beyond the consumer VHS format as well. Most believe DVD will co-exist with other interactive video environments like the Internet because it caters to high quality and ease of use for entertainment purposes. ■

Barb Roeder is president of Barb Wired LLC. She can be reached through her website, www.barb-wired.net.

FUJINON

Developing a DTV master control plan

BY ONALDA MARTINEZ AND TIM HUDSON

As more broadcasters embark on the DTV transition, most stations have chosen a phased approach – starting with a DTV transmission and encoding system, along with monitoring equipment, and then launching a master control system.The last priority is the studio and production facility.

When it's time to focus on digital master control, doing it effectively and efficiently is the issue. The key is up-front facility assessment and setting project parameters such as capital available, programming and business models, consolidation or relocation considerations, and project timeline. This will drive major considerations.

Considerations

The first consideration is the station owner's business plan. Short-term goals would involve meeting the minimum requirements associated with the FCC mandates. These requirements involve EAS, station branding and closed captioning. Of the four requirements listed, PSIP is the only one that is not truly mandatory. However, ratings, multichannel operation and newer receivers will be dependent on having proper PSIP information. Long-term goals would include the business plans of the station and network. The network may plan to distribute prime time programming in HD while the station may opt to provide either single or multiple SD channels during non-prime time hours. At this point, many station managers are asking themselves, "Will the addition of more channels develop other revenue streams?" Regardless of the route chosen, the goal of meeting FCC mandates will directly impact the second consideration, the budget.

The budget will influence the implementation plan for master control. Whether the capital is provided all at once or in increments, the task of selecting which is the most important feature or piece of equipment can become quite challenging and subjective. The selection of technology will be a major factor in the growth of the station and the quality it projects. When working with a budget, the broadcaster is challenged with investing in equipment and formats that will meet the goals of the business plan while not exceeding the capital allotted. Once the technology is selected, ease of operations can be addressed.

If the technology selected provides minimal human interaction and maximum growth potential, ease of operation issues will be laid to rest. Once these considerations are addressed, the question of how to implement the buildout can be answered. To date, broadcasters have taken three approaches to feed their DTV transmitter: the Legacy Switching approach, the Mini Master Control approach and the Full Master Control approach.

Approaches

Legacy switching consists of broadcasting either one SD channel or one HD channel. In the single SD channel model, the broadcaster would make a minimum investment in the technology selected. The single SD channel model would involve feeding the existing NTSC master control signal into an analog-to-digital converter and logo inserter. Once the signal is converted to digital, it can then be fed into the encoding and multiplexing system of choice. This solution would meet most of the FCC mandates, but issues of multiple audio channel distribution and manipulation may arise.

With some minor differences, the same process holds true for the single channel HD model. (See Figure 1.) In this model, the existing NTSC master control video signal would be converted from analog-to-digital and then upconverted to the proper HD format. Along with the program video, the closed captioning EIA 608 standard would need to be upconverted to the EIA 708 standard and reinserted into the upconverted master control stream. Investment and physical impact to the station would be relatively minimal.

In both cases, the amount of audio and video monitoring would be the same. A DTV receiver, an SD or HD monitor and appropriate audio monitor would fill the need. When researching the equipment, the broadcaster should be aware that manufacturers exist who provide modularized single channel encoding as well as "off-air " prepackaged studio-monitoring solutions that would allow them to grow into multichannel programming.

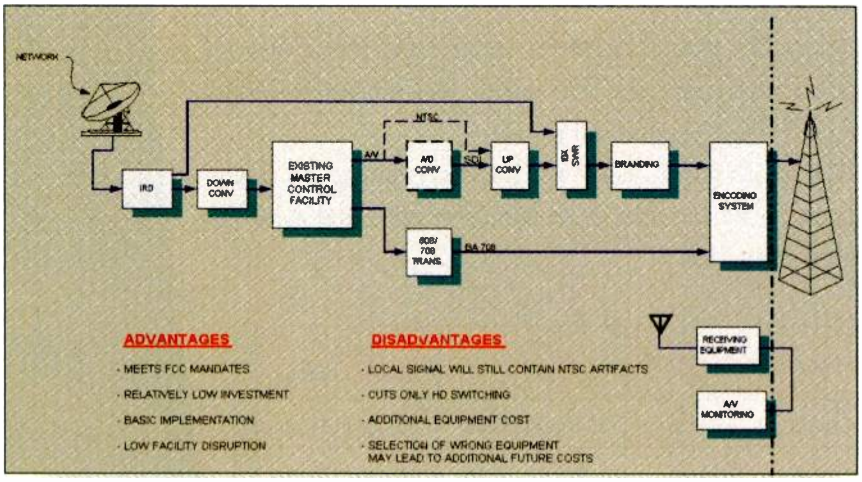


Figure 1. Legacy approach for single-channel HD.

Mini Master Control model

In order to take full advantage of network HD content, two combinations would be available. The first involves the seamless switching of HD programming between the local station and network. HD content is received and decoded into its baseband form. Local programming is digitized and upconverted to the HD format as shown in Figure 2 and, with a simple two- or three-input HD switching system, the broadcaster would now switch between the local and network signals seamlessly. This simple switching idea has driven some manufacturers to introduce integrated solutions that offer upconversion, test generation, frame synchronization and audio format conversion to the marketplace.

The second involves broadcasting of one HD and one SD channel simultaneously. In total, the broadcaster would provide two separate outbound channels. The investment would require, in addition to the HD switching and upconversion gear, an additional switching system for the SD portion of the programming. This model would drive the need for versatile automation, traffic and "off-air" monitoring systems.

Full Master Control model

In situations where multichannel operation and/or consolidation is in the future, broadcasters would benefit from the Full Master Control model. In this model, the station or group can choose to broadcast multiple SD channels with no HD content or alternate between HD and multiple SD channel programming. (See Figure 3.) Implementation of this model would consist of a major investment in conversion, branding, switching, encoding and monitoring equipment. It would require a stand-alone digital master control switcher for SD, as well as an HD master control switcher. With multiple channels and complex switching involved, a sophisticated automation system would be required to operate the systems.

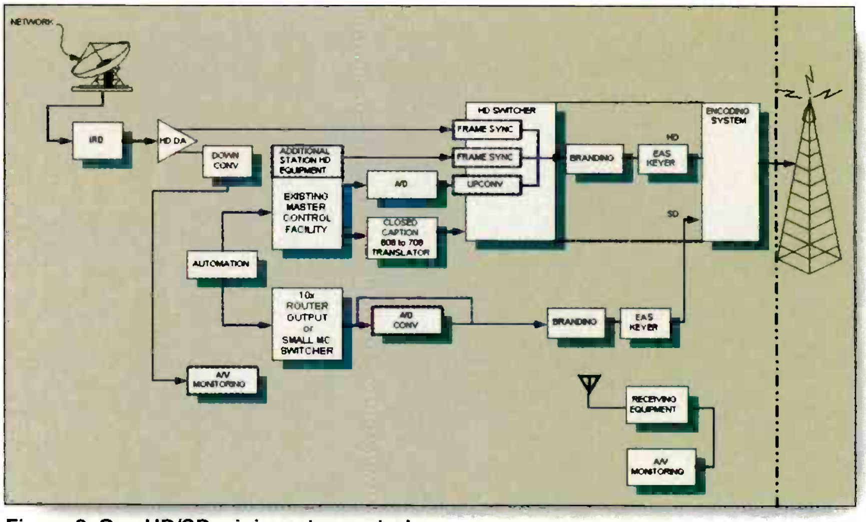


Figure 2. One HD/SD mini master control.

To ensure adequate conversion and distribution equipment, the broadcaster would need to take into consideration the audio format received as well as the local production format. In most cases, four levels of AES audio would be enough to cover both 5.1 channel surround operation and a secondary language service.

Because of the multiple audio and video streams involved an integrated yet flexible monitoring solution is needed in this model. Some companies have developed multiplexed monitoring solutions to drive down cost and space considerations. These systems offer the ability to display multiple pictures on the same large-screen display device. They not only display several channels of video on one screen but also up to four AES or eight analog channels of audio per video. Combining this solution with remote devices for streaming encoding creates an ideal monitoring solution for those operations that control a group of remote transmission channels.

Many new devices on the market can be controlled over TCP/IP-based networks. This makes possible the construction of distributed networks of devices controlled from a central automation server. One large automation manufacturer has led an effort to standardize device control over LAN and WAN. The protocol, called Network Device Control Protocol (NDCP), is an open standard for wide area automation control and is supported by a growing group of equipment manufacturers.

Today, solutions exist that can handle anything from conventional, manual master control equipment to fully automated equipment. As stations develop and grow, the broadcaster must be aware and take advantage of the modularized solutions that simplify both single- and multichannel digital broadcasting. ■

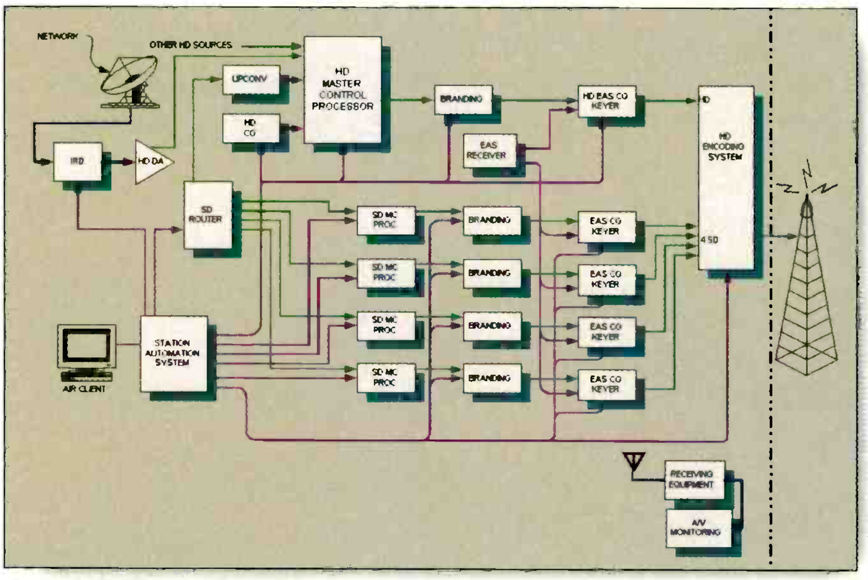
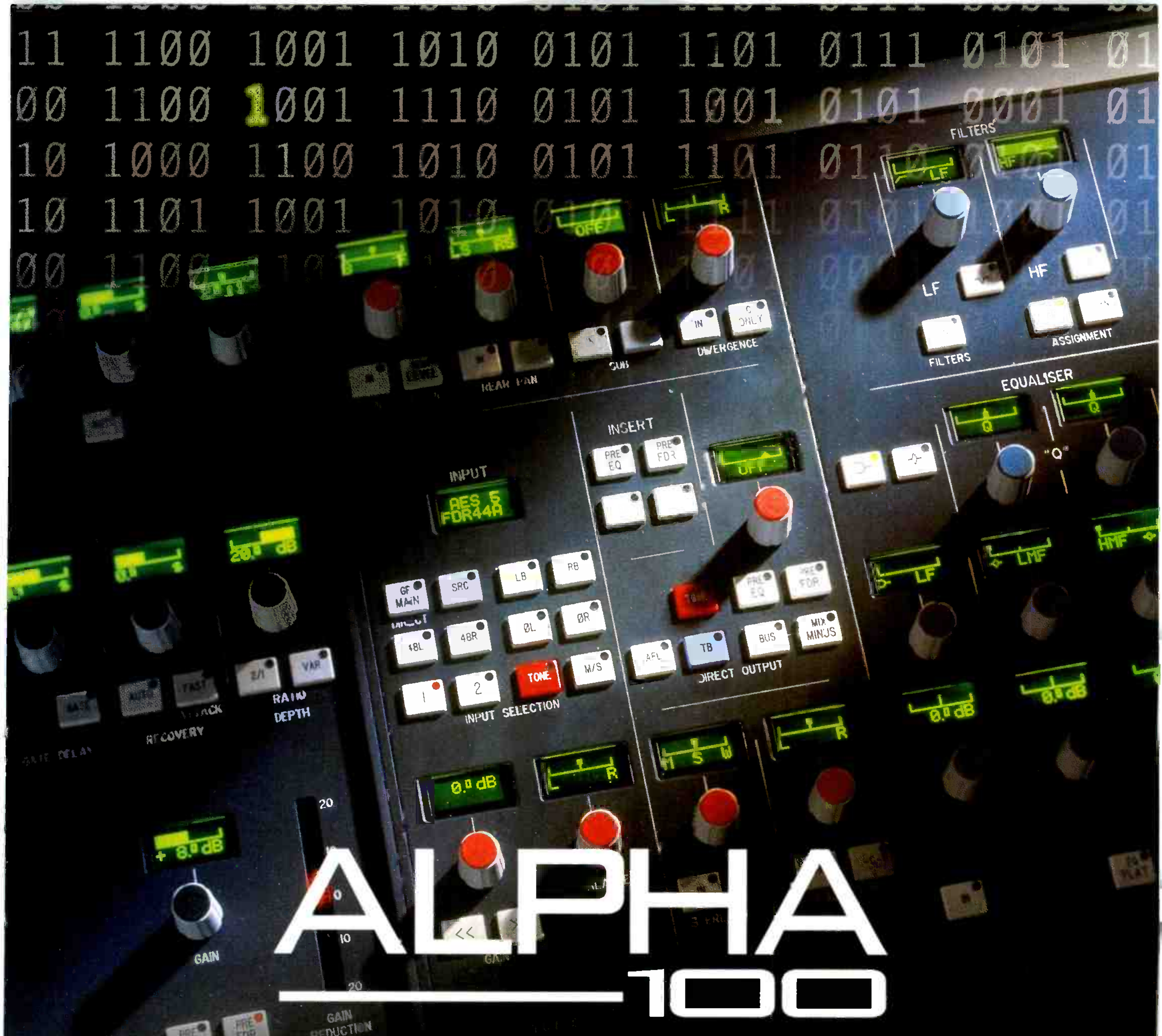


Figure 3. Full Master Control.

Onalda Martinez and Tim Hudson are application engineers at Harris Corp.'s Broadcast Communications Division.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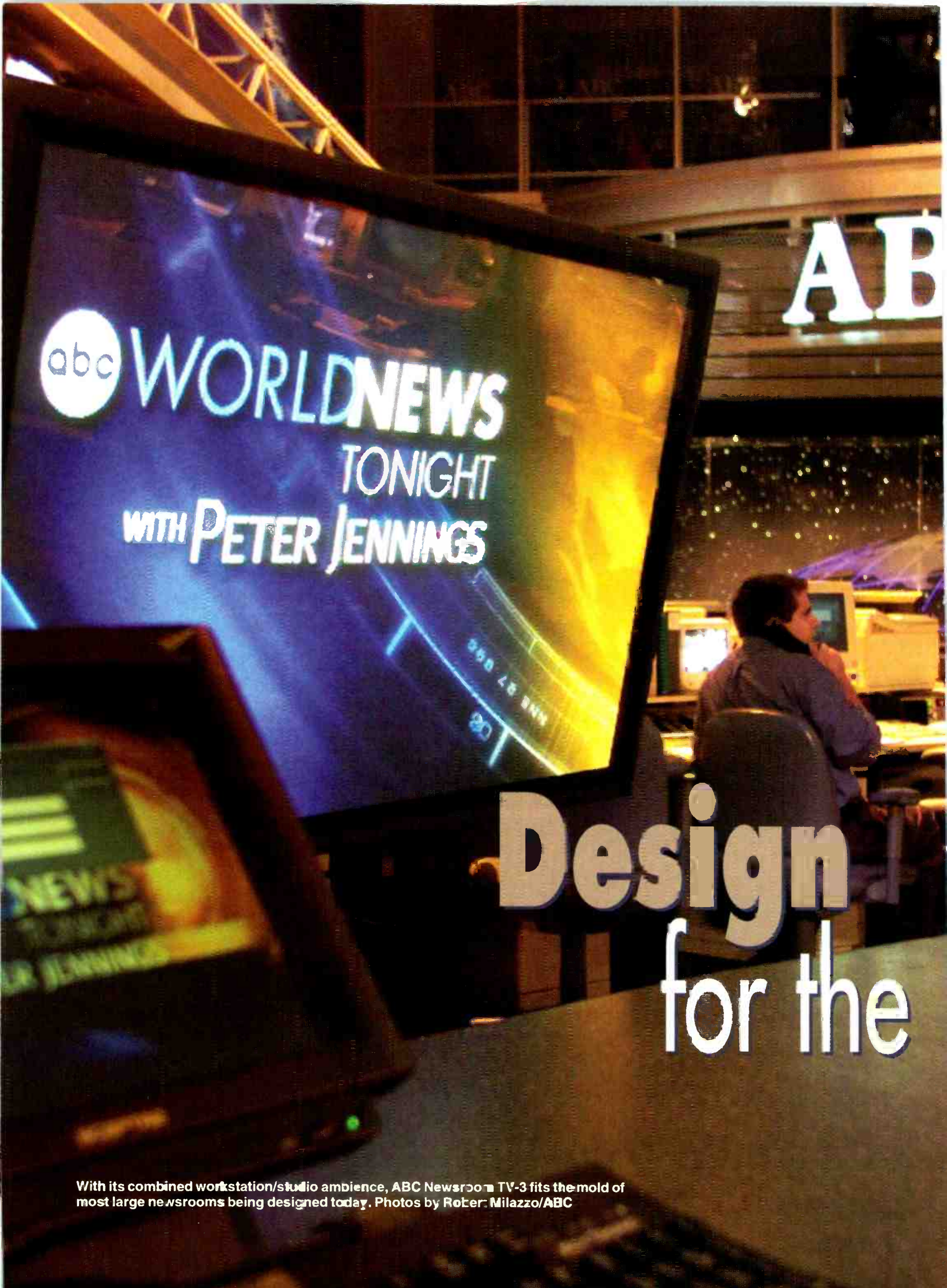


Design for the

With its combined workstation/studio ambience, ABC Newsroom TV-3 fits the mold of most large newsrooms being designed today. Photos by Robert Milazzo/ABC

newsroom of tomorrow

BY JEFF RISER AND PAUL KAST

The television newsroom of tomorrow will not resemble that of today. It will be closer in character to a mission-critical data or telecommunications center with a hardened infrastructure and the same facilities, system redundancy and skilled maintenance requirements.

Today's newsroom systems were designed based on technology of the mid-nineties that did not take advantage of the new methodologies available to computer sciences. Among these are data warehousing and metadata tagging of content for tracking and repurposing to print or other media; new "enterprise application interfaces," which can tie the traffic system to the newsroom rundown list and to automation playback systems; advances in network protocols and design that allow high-bandwidth file exchange; desktop PCs whose capabilities have been extended from simple scriptwriting to viewing and editing of video and audio content, and more powerful servers, which can become a common storage pool for the station's material with great redundancy.

For a station engineer or news director who is approaching a newsroom rebuild, it is essential to look at the big picture — to look beyond the new technologies themselves and to fully consider the planning and design of the station's infrastructure.

Islands of technology

Good infrastructure decisions will enable today's newsrooms to stay current well into the future.

A look at the current layout of the typical television newsroom suggests the challenges associated with integrating these new technologies. Typically, newsrooms today are laid out simply, with an area for the acquisition of news materials from satellite feeds, signals from ENG trucks, video wire services and field-acquired video. Reporters and editors work in another area, generating stories and scripts on some form of word processor. There is the traditional area for editing videotape, usually in a linear edit mode, with most edit bays laid out as stand-alone islands. There might be router I/O ports in each room and an area to do minimal processing to the video and audio. Playback of edited material typically is accomplished either at playout stations in the newsroom or from the production control videotape area. In the event of server playback, a computer station is required in production control for the director to queue and play back files that have been preloaded and encoded elsewhere, such as in the acquisition area of the newsroom or an encoding station. Finally, there is an area in the newsroom to archive file footage for later use. While there have been great advances in newsroom systems, which are becoming more affordable, most stations do not have elaborate systems in place, and existing systems are unable to communicate with the station's traffic systems or automation controls. In fact, most of the activities in a newsroom, as well as the station as a whole, take place in islands of technology. Most of these technologies are not or cannot be integrated. Material is exchanged in an analog mode in real time, requiring several stages of encoding.

One reason for the difficulty in integrating new technology is that many stations today still see their news as a separate operation from the station as a whole. The operating budget, engineering personnel and equipment are separate from the core operations of the station. When new editing bays are required, for example, an area of the newsroom is simply "carved out" for their installation, usually with little thought given to allowing the systems to integrate fully throughout the station.

The most obvious questions may be overlooked: Are there I/O ports to the router available? Is there sufficient electric power to handle the equipment load? Is there sufficient HVAC for the new digital equipment?

Can a facility be future-proofed? Absolutely not. But it is possible to plan for the changes the future will bring.

Indeed the newer technologies have greater operating features and quality than their analog predecessors, but these advantages come at a price that includes necessary adaptations of their operating environment.

New technologies

As noted above, advanced newsroom technologies take advantage of the new methodologies made available by computer sciences. Take the desktop PC, for example. A much more powerful tool than in the past, today's desktop PC has extended its capabilities to include the viewing and simple editing of video and audio content — performing offline editing functions such as marking in and out points, generating edit lists for later execution and recording the track from the reporter.

All of the new technologies are dependent on a place for storage of the content. The server-based technology of today has come a long way since the late 1990s. Servers today can become a common storage pool for the station's material, including commercial spots and raw news footage as well as edited reports and recorded shows for playback. They also can act as a time-shift device for multichannel playback or network program delay.

Another new technology is the storage area network. When running several video applications in a station or newsroom, a storage area network provides the ability to transfer blocks of video for production or editing between storage devices and other equipment such as servers and desktop workstations on a high-bandwidth network. There are several network protocols available for the design of the station's network to handle this transfer of video files: FTP over a 100Base-T network, Gigabit Ethernet or Fibre Channel and SDTI. One manufacturer has adopted IEEE-1394 (Firewire) as their transport standard. Isochronous transfer modes ensure sufficient, uninterrupted assignment of bandwidth for video delivery tasks over the network. While Firewire, which is also used to connect digital camcorders to PCs, has received negative reviews because of its length limitation, current and future versions of the standard eliminate those problems as technology improves. When Fibre Channel is utilized on a storage area network, many users in work groups located throughout a facility can simultaneously access the same data and files.

All of these new technologies permit faster preparation of news products. When nonlinear editing is used, a story can walk in the back door and begin to be encoded into the storage devices. Almost immediately, the reporter can start to screen the raw footage on his or her desktop workstation. After the reporter has made some edit comments, the editor can immediately start to edit the package — all sharing the same data file from the same central storage location.

The inherent advantage of this type of editing system is that the raw content remains unchanged as the story is being pieced together. Finished stories exist as a series of pointers that identify in and out points of the original footage. In this manner, the same original material can be repurposed for different story or show requirements. The amount of overall storage space required grows only minimally as new versions of the packages are edited, because only a new edit decision list needs to be stored.

With all of the new data being recorded and stored comes the need for asset management, sometimes called media asset management or content management. Asset management is the systematic cataloging and management of digital rich media — text, images, video and audio — so that they can be reused and/or repurposed at a later time. These assets can be as simple as a 15-second sound bite or as extensive as multiple versions of the same commercial.

Asset management requires data warehousing, in which large databases of stored content are established and indexed for easy retrieval of the files at a later time. The most important task of the asset manager is to keep track of the content. Because different server manufacturers choose to handle file redundancy in different ways, there may be more than one copy of each asset on the server. Couple this with the frequency at which some commercial ad agencies send spot updates, and you will quickly begin to appreciate your asset manager's ability to keep track of it all. Asset management will play a large role in services such as the convergence of the print and electronic media.

Now that all of this content has been established and stored, what do you do with it? With the introduction of the standard definition digital television format, a television station has the option to deliver several different SDTV program services in its digital stream. A news director now has the ability to choose among alternative news feeds from the same material stored in the station — separate feeds such as a zoned newscast tailoring the news like a

Newsroom technology allows content and information sharing between people working face to face as well as around the world.

newspaper to a local area, a second language newscast in Spanish or any other language important to the community, a local 24-hour news feed modeled after the traditional 24-hour news channel, or a time-shifted news program. This option repeats the segments stored on servers at scheduled times throughout the day.

Along with the multichannel digital stream comes the option for viewer interaction. A news director or show producer will be able to encode into a story more information about it, allowing the viewer to simply click with a remote control to see more details as it is being aired on the TV or, in the future, directly access the station's website.

New into old

When new equipment is put into an existing facility, it is usually placed wherever there is space. New edit bays are carved out of an old office. A feed rack is stuck in the corner. A newsroom computer system is put next to the assignment desk. Issues of integration usually center on the obvious problems of cabling and connectors.

However, the new technologies raise questions and issues of a different order of magnitude: First, will the station attempt the delivery of news in HD or multiple SD channels? What aspect ratio will the programming use — 4:3 or 16:9? And if 16:9, how will the existing sets, newsroom and newsroom infrastructure look in a wider aspect ratio? How will the acquisition of field material be handled — digital or analog? What screen format will it be in?

Integration of new television broadcast news technology into an old facility also raises many issues and questions related to the existing facility's site, architecture, mechanical and electrical systems. The answers to all these questions are site specific and budget driven.

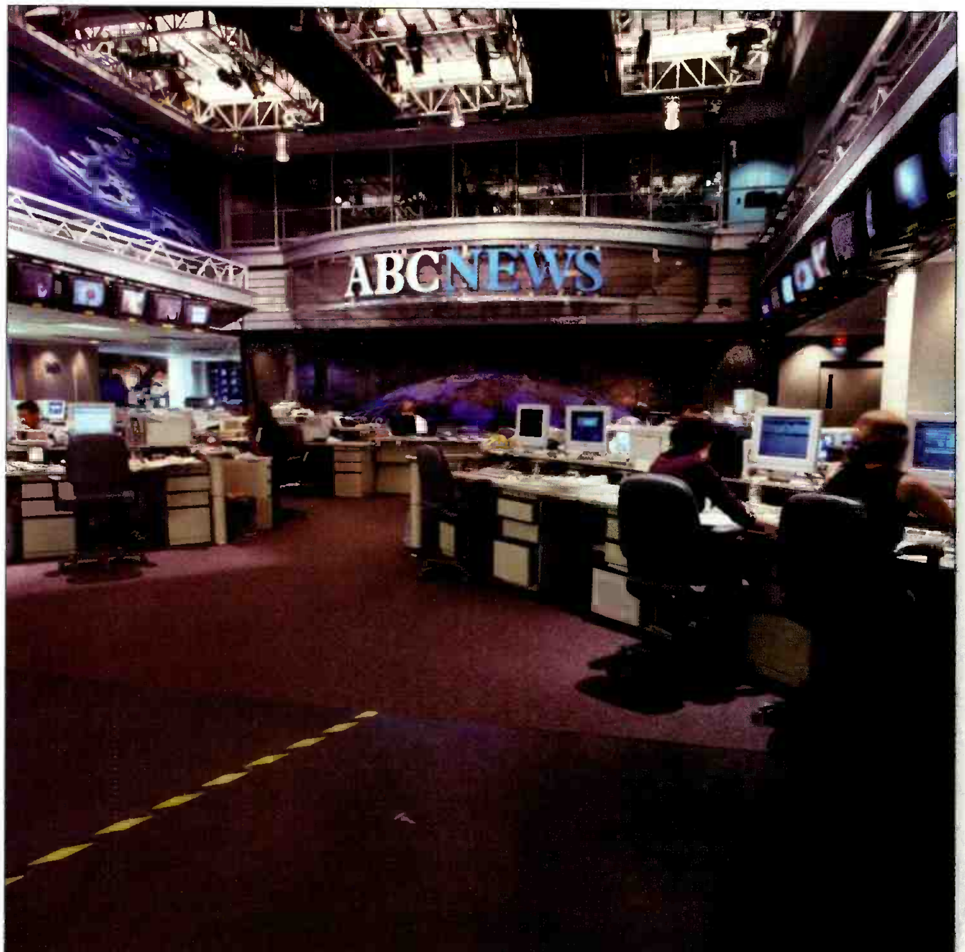
A television station that integrates new technologies will need to examine its current site from an architectural perspective. This evaluation should include security, the potential for flooding and other natural disasters, and adjacent properties whose uses might interfere with the new technologies being installed. The building envelope should be examined, including the roof's integrity, capacity of load-bearing walls, and floor-to-ceiling height. Considering the enormous capital investment in new technology, the site evaluation should also look at risk mitigation, including the ability to compartmentalize or suppress fire, prevention or containment of roof leaks that could take a station off the air by damaging equipment, and prevention of infiltration from environmental pollutants that could shut down operations.

The mechanical, or HVAC system should be evaluated for proper size and type of cooling source. The evaluation must determine whether it will use chilled water cooling source or dry cooler to generate the cooled air, where the new condenser units will be placed, and what special cooling will be required for the servers and racks. It also will determine whether the fire protection system should use a wet or dry pipe.

Electrical power requirements will probably have the greatest impact on facility planning for new technology in the newsroom. Consider the situation in California. With the current power blackouts, how can a station cover the news if it is in the dark itself? The issues around the electrical requirements for today's technology are backup generator power, uninterrupted power systems (UPS) and battery supplies. (For more on UPS systems, see the July 2001 issue.)

Common problems

This evaluation yields valuable insights into some of the common problems of integrating new technologies into an older newsroom facility. For example, it may not be cost-effective, or even possible, to redesign the



Through the use of new technologies and careful planning, an on-air newsroom like ABC's TV-3 can undergo reconfiguration with minimal impact.

newsroom in its current location for a 16:9 aspect ratio.

The functional integrity of the newsroom, technical plant and broadcast functions may be sacrificed. Many times one ends up with a technical plant or edit bay that requires long cable runs, or departments that should be adjacent to each other but are not.

> The advantages of new technologies come at a price that includes the adaptations of their operating environment.

Cabling is a major concern. Generally new types of cable need to be run to interconnect the new equipment. There often is not easy access to all the areas requiring interconnection, and it may or may not be feasible to install a raised floor to handle cable management in the newsroom.

There also is the problem of migration — whether all the work can be accomplished over a weekend or must be staged over a longer period of time. Staging can be disruptive to newsroom operations and end up being more costly than a clean start.

Another common problem encountered when integrating new newsroom technology into an existing facility is that the upgrade of the station and newsroom ends up rigid and tight, with few options for future change. This happens because existing buildings were not designed for the requirements of digital technology. In fact, digital technology's requirements for mechanical systems, electrical systems, RF, broadcast cabling, grounding, UPS and acoustics can overwhelm an existing building.

A solution for new and old?

Given these challenging issues, it may not be possible for stations to bring *all* of the exciting newsroom technology that is showing up on convention floors into their current broadcast newsroom operations without some major infrastructure improvements. One of the most important advantages of integrating new technology into a fully improved facility — or, better yet, new construction — is the flexibility that can be designed into a new system.

With a new facility, one can plan for future expansion and new technology in a manner that allows for minimal disruption. The digital broadcasting industry is characterized by rapid change, and it demands flexibility from its operations and facilities. Flexibility correlates directly to competitive advantage.

In either case, the key is planning. A station must design and document an integrated system of technology that works both for existing and new components. The documentation must include network-layering schematics that specify all necessary wiring, computers, monitors, servers and other broadcast hardware. Conceptual system layouts and room and equipment floor plans must be generated. A specific equipment list must be generated for verification of bids and receiving of new equipment. All of this must take place before the detailed design of the systems can even begin.

Getting there

We've looked at the present and future state of newsrooms, as well as some of the major issues, questions and challenges of integrating new technology. How can a broadcast news organization get from here to there?

• **Plan for change and build in flexibility.** Nobody likes to think that a costly rebuild will be torn out in a few short years. But that happens more often than most people think. Why? Lack of planning. Can a facility be future-proofed? Absolutely not. But it is possible to plan for the changes the future will bring in newsroom technology, infrastructure, space requirements and signal environment.

• **Develop an accurate, realistic budget.** Failing to develop an accurate budget leads to failure. Budget for the removal of everything that is no longer needed, including abandoned cable.

• **Develop a realistic timeline.** Determine the amount of time it will take to design and execute the plan and revise it as necessary. Communicate the timeline to everyone involved in the project.

• **Expect the unexpected.** Allow for contingencies in the budget and timeline.

• **Know your limitations.** Determine which elements in-house staff can carry out and which require the services of professionals, and at what cost.

• **Develop a plan of evolution.** This does not mean predetermining what the facility will look and work ten years from now. Rather, have in place a methodology for the infusion of new technology yet to be developed. For example, employ a hub-and-spoke approach to cable build. Wire and terminate all the spokes at least partially, whether or not they are needed today. Leave room for new and different types of cable. Use different color cables for different purposes and develop a standard for the facility. Plan cable paths and project physical bottlenecks. Employ path diversity to safeguard signals and spread the load.

• **Develop standards and documentation.** Use existing standards wherever possible and practical. Document every cable and connector. Leave room in the documentation for more racks, equipment and cables.

• **Budget for the annual expense of maintaining the facility and documentation.** This includes regular equipment maintenance, as well as updates to drawings and run lists as cables change or are added.

The newsroom of the future will be a newsroom connected by wireless voice and Internet technologies and will be heavily dependent on the Internet. It will be both a place where technology-smart personnel will have greater responsibility than today and a center in which technology will be used to interconnect workers in many remote locations across a region. ■

Jeff Riser and Paul Kast are broadcasting and media technical specialists at Carlson, an architectural and systems integration company.

The science

BY EDWARD E. WILLIAMS, CSTE

There was a time when selecting a broadcast camera for your studio or the field was a major process. In the early days of CCD technology, there was a real and noticeable difference between different cameras. An in-studio shootout immediately showed whose cameras met your requirements. In addition to poring over hundreds of pages of specs, a wise chief engineer or news director would make sure to personally view the pictures from each camera that was being considered to see it was sufficient for the task.

Advances in imaging and digital processing over the last few years have made it harder to distinguish the pictures made by one company's camera versus another. Over the years, the marketplace has simply demanded better and better imaging, so CCD makers have responded. Hold a shootout today and it's a challenge to pick out the best picture — your choice usually comes down to user features and fancy things like ultra-low-light capability. The task now is to work your way through various available DSP functions, CCD resolution and overall camera form factor. Which lenses match up with the camera has become a much more important consideration as well.

According to SCRI International (2001-2003 U.S. TV Station H/DTV Product Report — available at www.scri.com/sc_reprt.html), of the current installed base of broadcast cameras, only 0.04 percent is made up of HD models. Because most people are still buying SD cameras, we're going to look at the available technologies and features in SD cameras. If you're buying cameras today, right now, what do you look at? What technologies best fit your needs?

Informed decisions regarding cameras help end users to supply top notch services to clients. Here a crew from Century III films a segment for Ron Hazelton's *HouseCalls*. Photo courtesy Century III.

CCD basics

Before discussing the various features available on current cameras, we should go through a quick refresher on CCD technology.

The CCD is not a digital device, as odd as that may sound. The output from the CCD is a string of discrete analog voltages that represent the amount of light falling on the photodiodes on the face of the array. One electron flows from the photodiode for each photon that hits it. For a digital processing camera to work, these discrete voltages must be digitized so they can be processed, buffered and output from the camera. (See Figure 1.)

The charge from each photodiode is stored in a capacitor adjacent to it, the vertical transfer register. These charges

# of cameras

are shifted to a horizontal transfer register and sent out of the device. This is where the differences between IT (interline transfer)and FIT (frame interline transfer) imagers come into play. In an IT chip, there is less protection for the vertical transfer registers, so light leakage or leakage current from adjacent pixels in overload can cause vertical smear. Initially, the FIT chip reduced this problem by better light shielding of the vertical transfer registers.

Integration time is another important item for the CCD. Integration time, or the time it takes to store and readout a charge, can go to a maximum of 1/30 second. There really is no practical minimum integration time, except for the fact that you need enough time for enough photons to hit the imager to create a useable charge. Manipulation of integration time is what allows the electronic shutter. Current CCDs are so good that in some cameras, the electronic shutter can go down to 1/2500 second and still produce a beautiful picture.

Understanding how the photodiode array itself is set up is critical to an understanding of how some of the most desirable features of the camera work. The number of pixels on a particular CCD does not equal the number of photodiodes on the face of the chip. Each pixel on the imager is made up of a number of photodiodes. (See Figure 2.) A broadcast imager that has 650,000 pixels may have as many as 2.5 million individual photodiodes. The power of the photodiode/CCD imager is in the ability to clock out a variable number of photodiodes to make up one pixel, thus creating "virtual" pixels and enabling the camera software to manipulate pixel size.

CCD imagers

Two broadcast camera vendors make use exclusively of chips manufactured by an in-house electronics division. Others purchase CCDs on the open market from one of several vendors in addition to using their own. CCDs available now have similar noise specs and pixel counts. They have overload and vertical smear characteristics that only five years ago would have seemed impossible. Typical CCD features include microlenses, high capacity antibloom drains and the 2/3-inch form factor in 4:3, 16:9 and switchable chips.

Only a few years ago, most engineers would have recommended an IT chip camera only in cases of extremely limited budget or for a light-duty camera. First-generation IT imagers were prone to overload problems that created vertical smear in even moderate

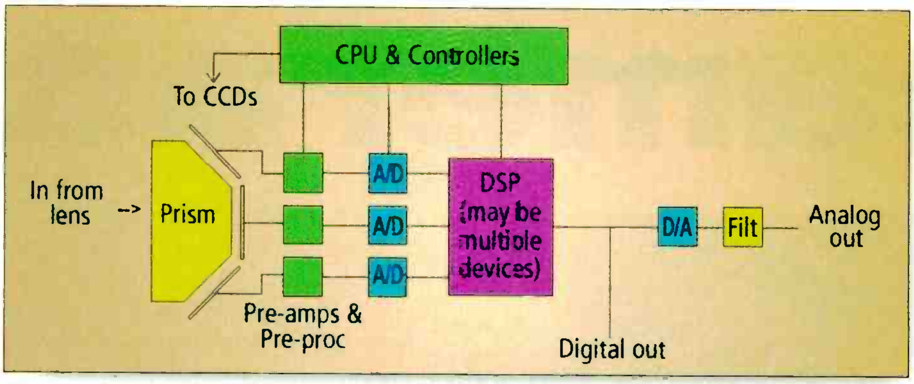


Figure 1. Generic block diagram of a typical digital signal processing CCD camera.

native 16:9 CCD with between 500,000 and 750,000 pixels. All use the full number of vertical pixels available on the image area of the chip for both modes.

The first method clocks the CCD at a different rate depending on the ratio desired. This has the effect of "slicing" the middle 400,000 or so pixels from the middle of the chip. Only the data from the pixels in the 4:3 section of the chip is sent to the DSP. This

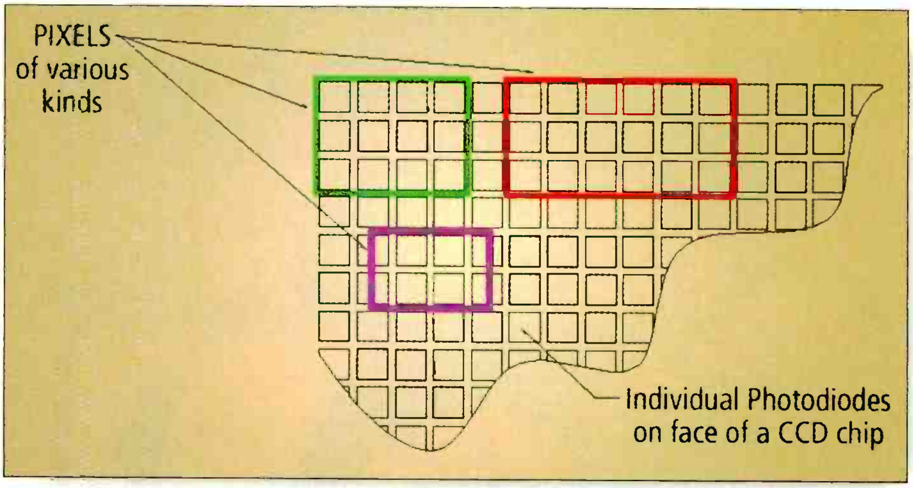


Figure 2. Pixels don't equal photodiodes. Each pixel is made up of a variable number of sensor elements depending on the mode of the chip.

highlights. The FIT helped reduce this problem, but at the cost of being a more complicated and expensive device to manufacture.

IT chips are simpler and less expensive to manufacture, and manufacturers are working to improve them. Vertical smear specifications are now running in the range of –120dB or better while maintaining excellent low light sensitivity. FITs still offer a slightly better spec in the range of –140dB to –145dB. For all but the most demanding applications, the IT imager now will produce acceptable pictures.

Some CCD arrays now use the Hole Accumulated Diode (HAD), a voltage pinned photodiode that offers better blue response and reduced lag. Add optical "micro-lenses" to the chip to focus light on the photodiodes and away from the readout section and transfer registers and you have what Sony trademarks as the "Hyper-HAD." Other vendors offer this technology, though they don't use the trademarked name.

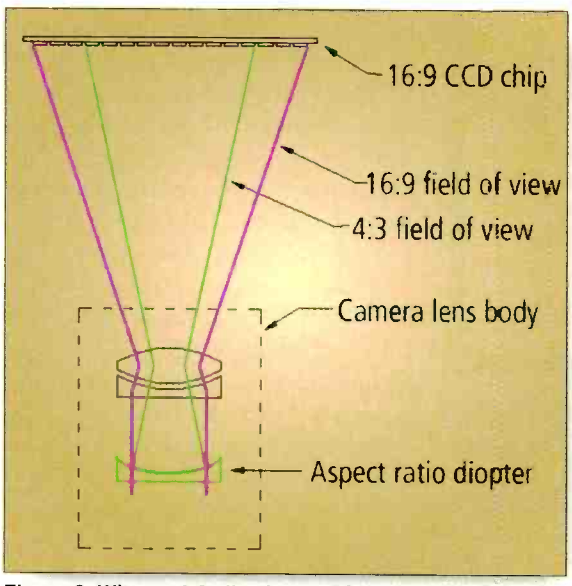


Figure 3. When a 4:3 slice is used from the middle of the imager, an optical diopter is needed to maintain the correct horizontal field of view.

Aspect ratio switching

One of the most popular features on cameras sold in the last two or three years is aspect ratio switching. The capacity to move between 4:3 and 16:9 brings a whole new level of functionality to the cameras. Understanding aspect ratio switching requires that you understand the basic discussion above. The process of how individual photodiodes are assigned to pixels is the basis of this feature.

Three methods are used to enable the switch between 4:3 and 16:9 aspect ratios. All have in common the use of a method has the advantage of a simpler DSP design, but requires a selectable optical diopter be added to the lens in order to maintain the proper horizontal field of view for each aspect ratio. (See Figure 3.)

The second method is similar in that it uses a portion of the 16:9 image area for 4:3. In this case, however, the CCD is always clocked at the same rate and all the data from all the pixels is always sent to the DSP. The change of ratio is accomplished in the DSP stages. The data from the "side panels" to the left and right of the 4:3 image area is simply discarded in the first data stage of the processor. This design has the advantage of simpler CCD management but requires a DSP with a bit more horsepower. It also allows some cameras to simultaneously output 4:3 and 16:9 versions of the signal. This design also requires the use of an optical adapter to maintain the correct horizontal field of view in single-mode operation.

The third method uses all the pixels from the 16:9 image area for both aspect ratios. For 4:3, however, individual pixels are made wider by altering the readout phase of the chip. (See Figure 4.) When reading out the individual photodiodes in three-phase mode, fewer photodiodes are used to make up a pixel. When reading the chip in four-phase mode, more photodiodes are used for each pixel. Downstream DSP handles the task of image stretching and/or letterboxing if needed. The advantage offered by this method is that no aspect ratio lens diopter is required to maintain horizontal field of view. These cameras also can produce dual aspect ratio output by taking a 4:3 slice out in DSP.

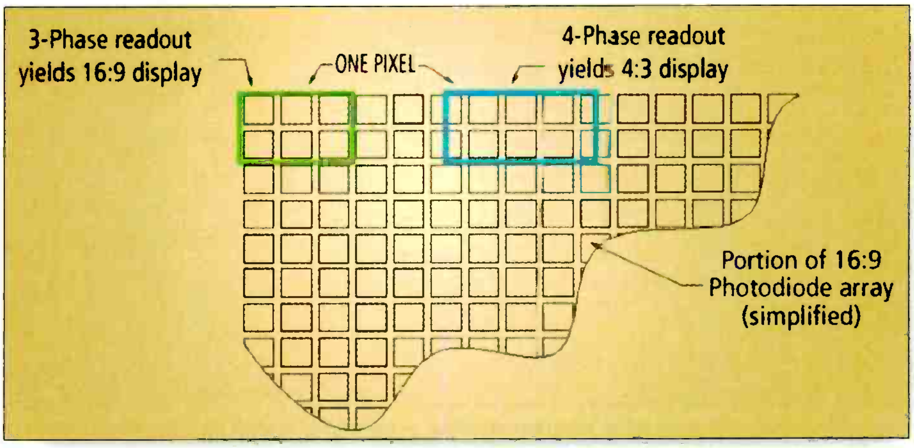


Figure 4. CCD imagers that use the entire 16:9 display for both aspect ratios increase or decrease the horizontal size of each pixel by reading out individual photodiodes in one of two different phase modes.

Progressive scan and other tricks

A CCD is not actually "scanned" like an image pickup tube is. In any particular mode, all the pixels in use on the chip are active all the time. Once you understand this, you see that image manipulation on the CCD itself is possible. We've already seen how a chip can make both 4:3 and 16:9 pictures. Progressive image mode is another desirable feature.

In effect, the "native" mode for a CCD would be progressive output. The simplest way to read voltages out from individual photodiodes is one after another serially, moving from one line to the next, to the next and so on. To output interlaced pictures, CCD cameras have to do a little fancy clocking. Two methods of interlace output are used in most CCDs — alternate row output and "pseudo-interlace," where the bottom row of photodiodes for one line becomes the top row for the next line. (See Figure 5.)

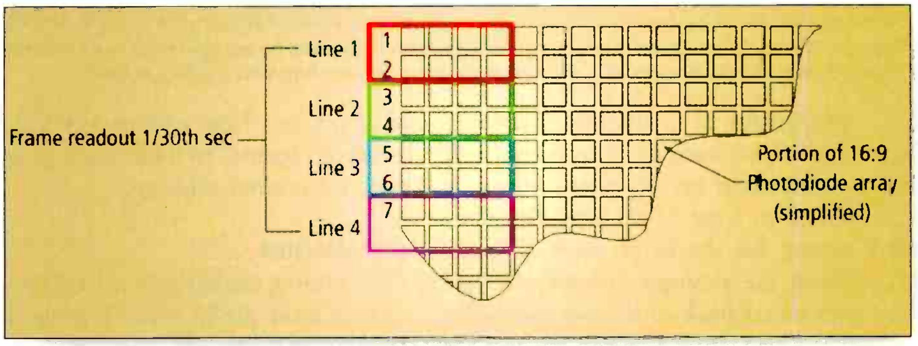


Figure 5a. Progressive array readout.

In addition to progressive mode, new features such as vertical resolution enhancement are possible. In vertical resolution enhancement, once again individual photodiode rows are manipulated by clocking the chip at different frequencies and with specific waveforms. With this feature, rows of sensors can be added or subtracted from individual rows of pixels (see Figure 6) to cause an increase, or decrease, in perceived vertical resolution.

The DSP makes the picture

Some form of DSP has been used for things like black stretch, auto knee correction, chroma balance, etc., since the late 1980s. It is only recently that large-scale ASIC design and advances in DSP firmware have enabled camera designers to advance today's cameras with full-function controls for all camera functions.

Advances in DSP design also have allowed high-end features formerly found only in high-end cameras to migrate down to less-expensive cameras and camcorders. One example is detail control and enhancement. Once you get to the point where you're processing the data from each pixel separately, you can do almost anything to any portion of the signal. This type of processing allows detail to be controlled in horizontal, vertical and even diagonal spatial domains, and dynamically controlled from field to field using predictive data.

With dynamic detail control operating in the time domain, a somewhat basic function like skin tone detail control gets a new feature — the ability to adjust itself based on lens settings. At least two camera manufacturers currently offer an automatic and dynamic skin tone detail adjustment function and others are

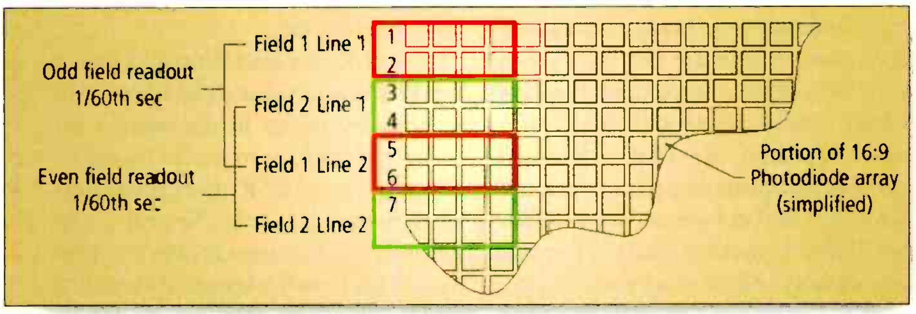


Figure 5b. One method of interlaced readout — results in good gain, but slightly reduced vertical resolution.

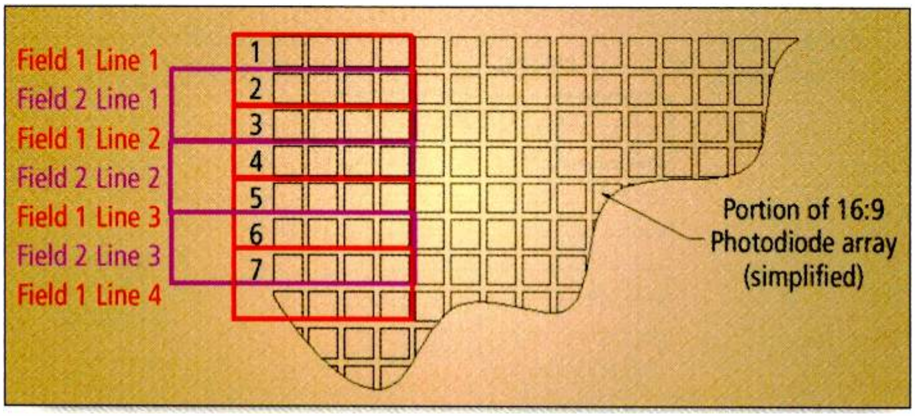


Figure 5c. Alternate method of interlace readout — results in higher vertical resolution, but slightly reduced gain.

working on it. By reading the zoom and focus settings of the lens, the DSP calculates whether the camera is on a tight shot or pulled out wide. The system can then adjust skin tone detail to be at maximum softness when zoomed in and minimum softness when zoomed out. This helps to reduce the "plastic mask" effect that can occur with talent when skin tone detail is applied at a fairly aggressive level while zoomed out on a wide shot.

What features would you like?

The decision to purchase a camera rests now as much with available features as with the deep technology on the circuit boards. Your shooters need to be able to make changes on the fly and access needed functions quickly and easily. Are the features in the camera accessible by buttons and switches or do you have to drill down through three menus to find what you need? The various manufacturers approach this point quite differently – what seems like a very basic function on one camera may be considered "engineering only" on another.

If you run a newsroom, one feature typically considered vital is the ability to make all your field cameras look the same. Gone are the days when only the chief photog had the best camera setup. Now, with smart storage cards and the DSP, almost all camera functions and parameters can be stored and copied between cameras. Unless a shooter really screws up the settings, all of your cameras can look the same from story to story and night to night.

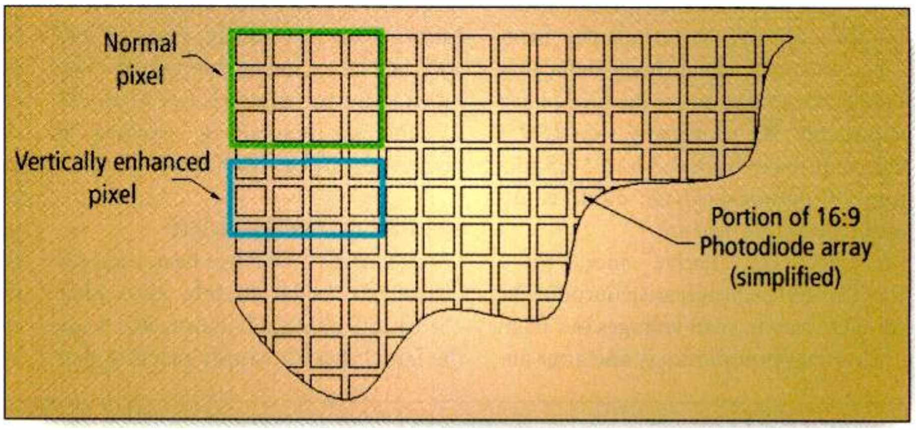


Figure 6. Vertical resolution is enhanced in higher-end cameras by using a smaller number of photodiodes per pixel vertically, then performing line doubling and tripling in DSP.

Do you change lenses often? Do you sometimes have a prompter on the camera and sometimes not? If you run an OB truck, this kind of thing may be a daily routine. Several cameras now offer pre-corrected setups for specific lenses. One vendor even offers the ability to store user-defined optical information in an automated fashion. This allows auto setup to be run and stored when the prompter mirror is placed in front of the lens, thus correcting for the extra piece of glass. When the prompter comes off, you just revert back to the non-prompter file. This feature also can be used for storing setups related to specific filters, lighting, etc.

How about product shots and studio work? Do you want to be able to do some fancy things in the camera directly and not have to post? One of the things high-end DSP offers is the ability to manipulate color. Several of the high-end studio cameras offer the ability to affect every portion of the color signal. You can even go as far as producing a monochrome scene with one bright red apple in a bowl of fruit. This may not be something you will use every day, but it illustrates the power of the modern DSP camera.

What about changing photographers? Some vendors offer camcorders that have hard switches on the front of the camera that can be assigned to a long list of functions. This means that even features that may be buried deep down in a menu tree can be accessed quickly when needed. The function of these "soft" switches is also stored on the camera smart cards.

Being able to set up the camera so video looks like film is popular with some. One vendor offers five different cameras in its line that have specific setups for the filmlike look. The feature uses the DSP to manipulate a host of parameters from gamma and knee on each channel to individual pixel gain, integration time, etc.

Your decision

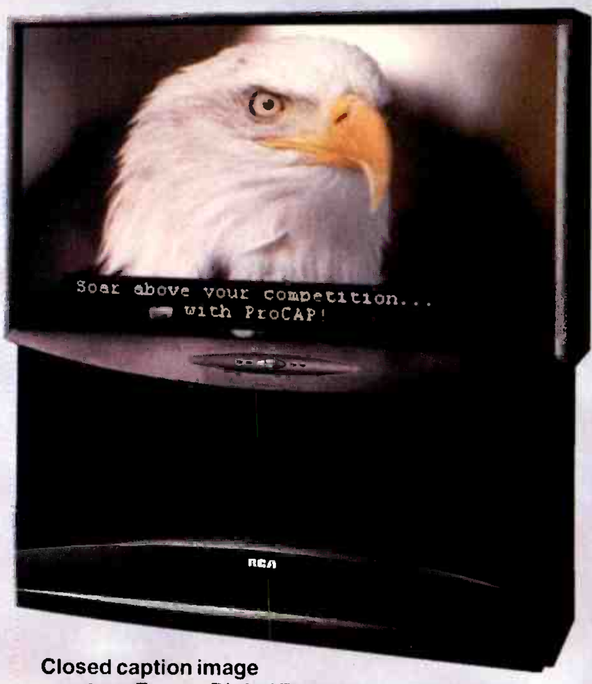
The camera market now offers products to meet pretty much any need. There is no longer any reason to compromise on one set of features to get another. It is truly an impressive crop of gear. The in-studio shootout? Yes, it's still probably necessary. Picture quality won't be as much of an issue, but with the advanced feature sets available on some cameras, you still need to put your hands on the equipment to know what you want to buy. ■

Edward E. Williams is director of engineering for KPDX Engineering.

Closed captioning for DTV

BY JERRY WHITAKER

It has long been assumed that closed captioning would be an important element of the transition to digital television for the United States. It is only recently, however, that all of the components — including standards, rules and technologies — necessary to make DTV captioning practical have come together. This past March marked a bit of a watershed for DTV closed captioning with a DTV Caption Summit, sponsored by the Advanced Television Systems Committee (ATSC), the Corporation for Public Broadcasting (CPB) and the WGBH National Center for Accessible Media (NCAM), held in Arlington, VA. The summit conference brought together leaders from the FCC, captioning organizations, the ATSC and equipment manufacturers to exchange ideas and chart a course for moving forward with the rollout of captioning services on DTV.



Closed caption image courtesy Evertz. Digital TV image courtesy RCA.

The need for closed captioning

It is estimated that half of the 28 million deaf or hard-of-hearing (D/HofH) people in the U.S. are regular users of closed captioning services. One of the benefits of DTV captioning is that the display of captioning information can be customized to user needs. Features such as altering the size, color and type of the font used for display, necessary for certain age groups, are all possible with digital systems. New captioning features available for the ATSC DTV system include a level of control over the transparency of the captioning block of text, rather than the common white text on a black background. (See Figure 1)

Program producers do not want to pay for captioning of a given program more than once, so the preservation of current captioning services in the NTSC-to-DTV conversion process is important for continuity. The migration to native DTV programming is the long-term goal and, therefore, any solutions implemented now must take this objective into consideration.

FCC actions

For television stations, the core responsibilities of broadcasters have been defined by the FCC. On July 31, 2000, the FCC issued a Report and Order (R&O) in ET Docket No. 99-254 regarding DTV Closed Captions (DTVCC). The R&O amended Part 15 of the FCC Rules, adopting technical standards for the display of closed captions on digital television receivers. It also amended Part 79 to require all captions to be passed through program distribution facilities and to reflect the changes in Part 15. The R&O also clarified the compliance date for including closed captions in digital programming.

In 1990, Congress passed the Telecommunications Decoder Circuitry Act (TDCA), which required television receivers with picture screen diagonals of 13 inches or larger to contain built-in closed-captioning decoders and have the ability to display closed-captioned television transmissions. The Act also required the FCC to take appropriate action to ensure that closed-captioning services continue to be available to consumers as new technologies were developed. In 1991, the FCC amended its rules to include standards for the display of closed-captioned text on analog NTSC receivers. The FCC said that with the advent of DTV broadcasting, it would again update its rules to fulfill its obligations under the TDCA.

The R&O adopted Section 9 of EIA-708-B, which specifies the methods for encoding, delivery and display of DTVCC. Section 9 recommends a minimum set of display and performance standards for DTVCC decoders. However, based on comments filed by numerous consumer advocacy groups, the FCC decided to require DTV receivers to support display features beyond those contained in Section 9. In addition, the FCC incorporated by reference the remaining sections of EIA-708-B into its rules for informational purposes only.

Manufacturers must begin to include DTVCC functionality, in accordance with the rules adopted in the R&O, in DTV devices manufactured as of July 1, 2002. Specifically:

- All digital television receivers with picture screens in the 4:3 aspect ratio measuring at least 13 inches diagonally.
- Digital television receivers with picture screens in the 16:9 aspect ratio measuring 7.8 inches or larger vertically

(this size corresponds to the vertical height of an analog receiver with a 13-inch diagonal screen).

- All DTV tuners shipped in interstate commerce or manufactured in the United States. This rule applies to DTV tuners whether or not they are marketed with display screens.

The R&O further stated that programming prepared or formatted for display on digital television receivers before the July 1, 2002, date that digital television decoders are required to be included in digital television devices is considered "pre-rule" programming (as defined in the FCC's existing the closed captioning rules). Therefore, programming prepared or formatted for display on digital television after that date will be considered *new programming*. The existing rules require an increasing amount of captioned new programming over a multi-year transition period, with 100 percent of all new non-exempt programming captioned as a requirement by Jan. 1, 2006. This means that as of July 1, 2002, DTV services have the same hourly captioning requirement as NTSC services. The average amount required per day in 2002 is nearly 10 hours (900 hours/quarter). Those stations operating for part of a quarter are expected to meet the prorated or average daily amount.

There are three ways that the stations can originate DTVCC:

- If the DTV captions arrive already formatted and embedded in an MPEG-2 video stream, then the broadcaster is required to insure they are passed through and transmitted to receivers.
- If the DTV program is being upconverted from an NTSC source, then the caption data in the NTSC program must, at a minimum, be encapsulated into EIA-708-B format captions (using CC types 00 or 01) and broadcast with the DTV program.
- If the program is locally originated (and not exempt) and captions are being locally created but are not in DTVCC, then again—at a minimum—the caption information must be encapsulated into the EIA-708-B format.

In the R&O, the FCC also stated that in order for cable providers to meet their closed-captioned obligations, they must pass through closed captions they receive to digital television sets. Also, they must transmit those captions in a format that will be understandable to DTVCC decoders.

Regarding DTV set-top boxes, converter boxes and stand-alone tuners, if these devices have outputs that are intended to be used to display digital programming on analog receivers, then the device must deliver the encoded "analog" caption information on those outputs to the attached analog receiver.

Understanding EIA 608/708

Much of the captioning standard described by EIA-708 includes terminology and concepts unique to digital captioning, often with no direct corollary to NTSC captions. The full standard includes normative and informational references that are essential to understanding digital captioning, and the full text — particularly in Sections 4 (DTVCC Transport Layer) and 6 (Caption Service Layer) — includes detailed definitions and discussion found nowhere else. Particularly helpful are discussions of inclusion of EIA-608-type caption data in the ATSC (DTV) caption transport layer.

EIA/CEA-608 data can be embedded within the video user data of an ATSC compliant MPEG-2 video elementary stream. This exists primarily to facilitate decoding and encoding processes required to convert the DTV video stream into an NTSC compliant video output for use with NTSC receivers and peripherals. Such devices include not only 13-inch or larger receivers manufactured since 1993, but also VCRs and the increasingly popular TV tuner cards for personal computers, many of which include caption-decoding circuitry.

EIA-708 states that the EIA-608 data bytes are not embedded within the DTV closed-caption protocol stack. That is, they are not passed onto the DTVCC packet layer; rather, they are extracted at the DTVCC transport layer and routed to a separate NTSC device equipped with an EIA-608 caption decoder (if present). This allows for simpler closed-caption decoder implementations for DTV-to-NTSC set-top transcoders because the entire DTVCC packet layer datastream does not have to be parsed to find a few bytes of NTSC caption data. EIA-708 provides a simple mechanism to deliver appropriate caption data to DTV and NTSC devices alike.

Native DTV closed captions (with advanced features) are included in the DTVCC *caption channel*, within the DTVCC protocol stack, and are intended for full decode by an EIA-708 compliant decoder. To further understand this process, the following definitions of terms are offered.

- **EIA-608** ("native 608") closed captions are captions formatted and presented in the current analog television system and carried on the two fields of line 21 of the vertical blanking interval. Field one contains CC1, CC2, T1, and T2 (the latter being text services). Field 2 contains CC3, CC4, T3, and T4. CC1 is most often used to carry verbatim English captions and CC3 is increasingly being used for Spanish-language captions and captions edited for young children ("Easy Reader" or "Beginning Reader" captions). The common look and feel of native 608 captions is limited to white block letters within a box-like black background field. Color (non-white) characters, while possible, are only occasionally used due to the 13-year legacy of set-top decoders that cannot display colored captions.
- **EIA-708B** is the standard for conveying caption data in a digital television

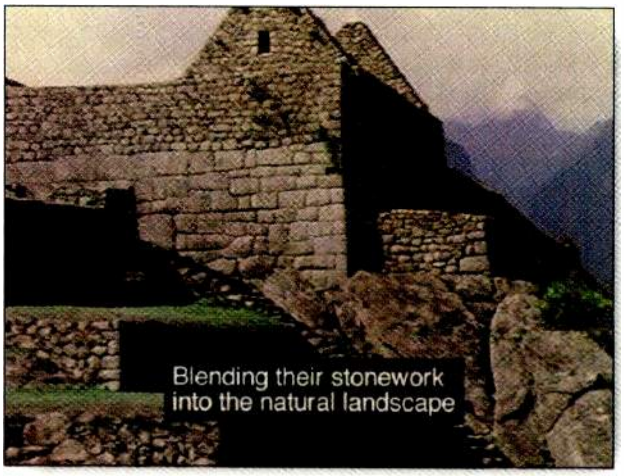
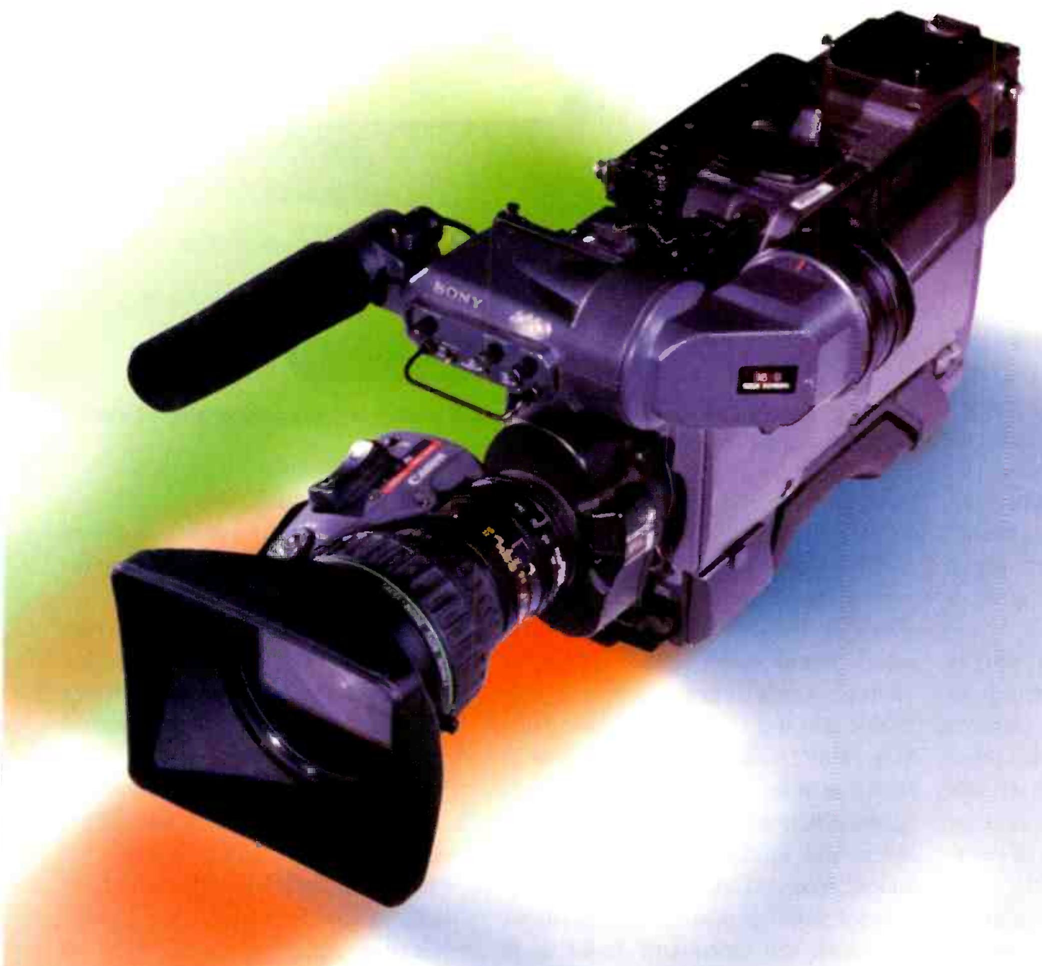


Figure 1. Sample of 708-style closed captioning. Note the variable transparency of the text block. Courtesy of WGBH.



SONY

signal. Because the DTV signal does not have a vertical blanking interval, EIA-708B provides an alternate method of maintaining existing captioned programming services by allowing for the inclusion of "native 608" caption data directly in the digital bitstream. This method provides one solution to the concerns about having to recaption all analog (NTSC) programming destined for conversion for DTV distribution.

- **Transcoded** 608 data is intended to be delivered to a conventional EIA-608 caption decoder, either within a DTV receiver device, or through its analog video output to a conventional television and its built-in EIA-608 caption decoder circuitry. Transcoded 608 captions presented in this fashion look and perform identically to traditional analog captions (native 608).

It is also possible to upconvert 608 caption data to true 708 format, in effect using the original 608 data as source material and employing a limited set of EIA-708 features to present the captions to an EIA-708 decoder. These upconverted 608 captions also maintain the look and feel of traditional analog captions, but are presented and decoded using the true digital construct. This upconversion occurs at the origination point of video program distribution, not in any form of digital set-top box or receiver.

Typically, both transcoding and upconverting are performed by a *caption data server*, a device suggested in the EIA-708 specification and now commonly available and being used on the air by a growing number of DTV stations. Likewise, caption providers in a competitive environment will have incentives to support output of multiple caption formats from a single source file.

The EIA-708 standard also allows for considerably more bandwidth to accommodate new caption features and services (native 708 captions) that will require a new generation of caption decoders as well as new caption authoring tools and upgrades of existing authoring software.

While the analog captioning standard is limited to four caption services and four text services (plus XDS), the digital captioning standard allows as many as 63 caption services. As in the case of analog, there are practical limitations on the number of services that can be offered simultaneously. In the case of DTV, the ATSC A/65 (PSIP) specification limits the number of simultaneous caption services to 16.

SMPTE 333M

To facilitate the implementation of closed captioning for DTV facilities, the SMPTE developed SMPTE 333M, which defines rules for interoperation of DTVCC data server devices and video encoders. The caption data server device provides partially-formatted EIA-708A data to the DTV video encoder using a *request/response* protocol and interface, as defined in the document. The video encoder completes the formatting and includes the EIA-708A data in the video elementary stream.

Other SMPTE standards documents working within the realm of closed captioning include SMPTE 334M-2000, "Vertical Ancillary Data Mapping for Bit-Serial Interface," and SMPTE 341M-2000, "Format for non-PCM Audio and Data in an AES3 Captioning Data Type." SMPTE 291M specifies a method for embedding data in a serial digital video signal. VANC is analogous to VBI in analog video. It is usable in SDI (SMPTE 259M) and HD-SDI (SMPTE 292M). VANC data is sticky in that it accompanies and remains synchronized with the baseband video and audio signals as they are routed, recorded and switched. So-called "sticky data" is content that needs to stay with the video and audio as it travels through multiple plants on its way from the creator to the broadcast facility.

Transitioning from 608 to 708

The chain of closed captioning includes the following elements: production, contribution, distribution, emission, reception, decoding and display. An important part of this "food chain" is the network distribution system used to deliver programming to local stations. The interrelation of DTVCC services in the ATSC transport stream is illustrated in Figure 2

An important component of current efforts to move closed captioning forward is an educational effort on the part of the ATSC, specifically, the Implementation Subcommittee Closed Captioning Working Group (CCWG). The Consumer Electronics Association (CEA) has also launched an initiative in this area under R4.3, Working Group 1. Although the essential elements are all in place for DTV closed captioning, additional operational and interoperability issues remain to be addressed, including a standard authoring format for interchange.

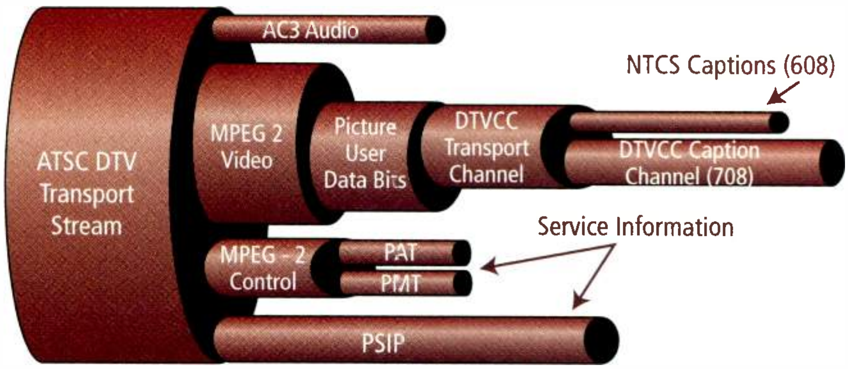


Figure 2. The structure of the ATSC transport stream and the relationship of closed captioning to the overall system.

More information

For additional information on closed captioning, consider the following resources:

- DTV Access Project, www.dtvaccess.org
- A. G. Bell Center, www.agbell.org
- ATSC Standards A/53, the "Digital Television Standard," and A/65, the "Program and System Information and Protocol," available from the ATSC website, www.atsc.org
- CEA standards EIA-608B and EIA-708B, available on the Web from www.ce.org. ■

Jerry Whitaker is technical director of the Advanced Television Systems Committee. He is based in Morgan Hill, CA.

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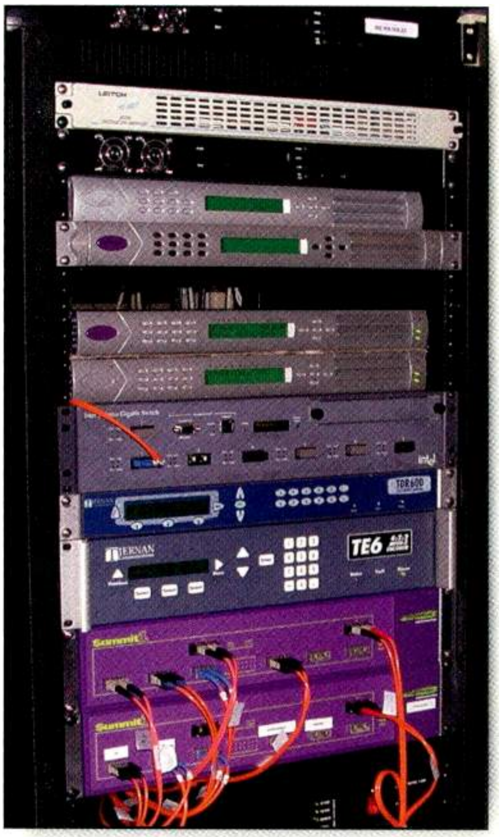
Applied Technology

Path 1/Leitch TrueCircuit QoS technology

BY DOUGLAS A. PALMER, RONALD D. FELLMAN AND STAN MOOTE

The general utility of IP and Ethernet networks is well-known. IP/Ethernet is the backbone of the Internet and is at the core of convergence — the blending of telecommunications with real-time voice, video and data. Despite its successes, however, IP/Ethernet also is the source of delays, lost data and best-effort transport.

Within the broadcast industry, dedicated circuits are used to guarantee the delivery of content from the initial source to the final destination. This guarantee of delivery does not currently exist within the IP/Ethernet circuit technology. Therefore, when looking at how to change the delivery of broadcast and TV content, the question is, "Will there ever be a means to reconcile the dedicated circuits used in television distribution and the broadcast studio with IP networks?" The answer is yes. This article will look at the unique requirements for broadcast-video networking, problems associated with real-time content delivery over IP and solutions to these difficulties, including Ethernet.



Broadcasters must develop new methods of maintaining QoS over IP networks. Technology from Leitch/Path1 has allowed coast-to-coast broadcasts over IP with quality comparable to satellite or ATM.

Broadcast-video networking

IP protocol is by far the most common networking protocol in use by any computer or LAN due to its low cost, widespread installation, and ease of use.

Network services including networking of audio/video/metadata content, control, monitoring, interactivity and statistics gathering, have differing requirements for speed (data throughput) and latency (delay). Each function has its own requirements, but the one area placing the greatest demand on the network is live audio and video delivery.

Live interactive video services and video teleconferencing are intolerant of the buffering that is commonly used in today's Internet video applications. Networks can avoid buffering delays by creating a virtual circuit (channel) that dedicates a portion of a network link to a video stream. Such a dedicated virtual channel, that guarantees the regular and periodic delivery of data and signals, is called an "isochronous channel."

Traditional IP is unable to provide the dedicated real-time data paths or circuits that are essential to live broadcast video applications such as synchronizing voice and audio. Guaranteeing Quality of Service (QoS) is key to overcoming the shortcomings of IP.

Current approaches to QoS for IP

Various methods have been adopted to tie the advantages of isochronous (dedicated) links with the advantages of IP networking. One method is to utilize a hybrid system such as IP over ATM, Fibre Channel or IEEE-1394.

ATM and SONET were developed for backbone transport of data. They establish a logical circuit from end to end, which guarantees quality of service (QoS). They are expensive solutions, however, and unwieldy in a rapid setup or take-down mode such as that often found in a TV studio or broadcast environment. For the foreseeable future, ATM and SONET will be utilized in the WAN environment coexisting with Ethernet IP.

Another method for adding a guaranteed quality of service element to IP/Ethernet is to utilize large amounts of bandwidth and keep the data-transport rate within reasonable bounds to avoid data collisions, traffic jams and lost data.On a small LAN with tightly controlled transmission rates, this queuing is reasonable. On a larger LAN, instabilities quickly develop and "pile-ups" occur at contention points, with unforeseen results.

Fortunately these problems are being addressed with the next generation of switches and routers. These evolving QoS protocols and mechanisms include:

• RSVP/SBM: Part of the IntServ signaling protocol for requesting QoS

guarantees on a per-flow basis. Often used in conjunction with a designated Subnet Bandwidth Manager (DSBM) to control admissions.

• DiffServ: Protocol for offering differentiated services categorizes and prioritizes network traffic by tagging IP packet headers. In contrast with Intserv, DiffServ provides a means for simplifying QoS management on a bulk basis through aggregation.

• MPLS: Multi-Protocol Labeling Switching is a protocol for specifying a fixed route through an IP network.

• COPS: Common Open Policy Service for managing admission policy across networks. COPS is becoming the higher-level network policy management protocol from which a local RSVP/SBM would obtain network policy and admissions information.

The latest technology to enable guaranteed Quality of Service over IP/Ethernet is TrueCircuit from Path 1 Network Technologies, Inc. TrueCircuit gives IP/Ethernets ATM-level Quality of Service by allocating virtual isochronous channels at Layers 1, 2 and 3 under the management of a network operating system. TrueCircuit interacts with all the protocols listed above to actually implement QoS guarantees across a network.

In five years or so, the Internet will probably carry the majority of video programming.

This system was demonstrated at the NAB and Networld/Interop trade shows, where an Ethernet LAN and wide-area network (WAN) with TrueCircuit moved multiple, simultaneous streams of MPEG-2 compressed and 270Mb/s uncompressed digital video. One of the benefits of the mechanism is that it interfaces seamlessly with SONET/ATM. TrueCircuit over Gigabit Ethernet is so powerful that it is capable of precisely synchronizing video equipment to the level that genlocks can be distributed throughout the network domain.

Path 1, in conjunction with Leitch Technology, is developing equipment such as switches, routers, gateways, network appliances, embedded controllers, and control/monitoring software with the TrueCircuit technology embedded. TrueCircuit networks offer inherently secure virtual circuits and synchronization to allow products to be video phase aware. The networks are compatible with standard and evolving IETF and IEEE QoS protocols, such as, IEEE 802.1D, 802.1Q, IETF DiffServ, RSVP/SBM, COPS and SIP. Networks with TrueCircuit allow simple net management functions, with expanding capabilities and a comprehensive control toolset expected soon. The cost of the network is expected to fall to normal Ethernet/IP prices in a few years.

Where the industry is headed

Today, the bulk of video content moves from the producer to the consumer via storage media (tape formats such as VHS, DVD, etc.), radio frequency, cable, satellite downlink or microwave link. In five years or so, the Internet will probably carry the majority of video programming. Because of the huge bandwidths involved in transmitting audio and video, video content will dominate all other Internet traffic volumes. Also, because of new interactive broadcasting services and the ever-present "channel surfer" sitting at the receiving end, rapid delivery will be crucial to user acceptance.

IP/Ethernet is an evolving standard that is rapidly moving into every industry, at higher speeds and lower costs. Gigabit Ethernet is already available over ordinary CAT-5 cabling as well as single- and multimode fiber and coax. New standards-compliant QoS mechanisms are to be released this year to ensure low-latency, low-jitter channel transport of real-time data — with guaranteed QoS standards comparable to ATM. As shown at NAB, IP/Ethernet will soon become the de facto standard within the broadcast industry to bring quality content delivery at an affordable price. ■

For more information about the Path 1/Leitch TrueCircuit QoS technology, circle (450) on Free Info Card.

Dr. Douglas Palmer is the chief scientist and Dr. Ronald Fellman is the CTO of Path 1 Network Technologies, Inc., San Diego, CA. Stan Moote is CTO of Leitch Technology Corp., Toronto.

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Thomson Automation station control systems

BY DAVE STUART

No single opportunity has ever presented broadcasters with as much potential as centralcasting. As FCC rules have relaxed, permitting organizations to aggressively purchase and consolidate broadcast properties, the need to combine the operations of these stations has become paramount with station ownership and management.

Similar to Local Marketing Agreements (LMAs), where one station is responsible for technical operations of a second station in the same market, centralcasting uses a centralized "hub" station to control the operations of multiple stations in multiple markets. With the driving force of economics, centralcasting's main goal is to reduce both the workflow and the workforce of individual stations where most tasks are redundant, while providing secure operational control from a central point — the hub.

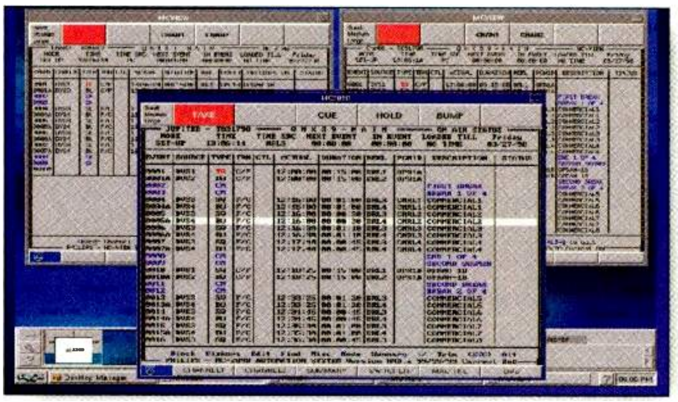
From the hub, various levels of control of the satellite stations can be accomplished. Since control and media play-to-air comes from the hub station, costly satellite feeds from within a station group or network are eliminated. Distribution is accomplished via a wide area network (WAN) interconnecting the stations. The challenge has been how to control this multichannel network of stations seamlessly and synchronously.

Thomson Automation utilizes distributed network architecture and the QNX multi-tasking, real-time operating system to offer custom solutions for automation and control in multichannel playout environments, whether through centralcasting or terrestrial digital television multicasting.

The challenge has been how to control this multichannel network of stations seamlessly and synchronously.

Since the automation system was originally designed as a multichannel system, the decision was made early in the design process to use a distributed intelligence architecture – multiple levels of processors in conjunction with a deferred command structure. Distributed intelligence was required to provide frame accuracy for multiple on-air channels, anticipating the need to send multiple frame-accurate commands to multiple devices simultaneously during a single frame of time.

The top-level processor is the automation computer itself, which manages the media database, device databases and all playlists. The automation computer issues commands to device controllers, the second processor layer. All commands at this level are time-stamped from the automation computer and held by the device controllers until it is time to execute them. The entire system is locked to house timecode, ensuring that all levels of processing are working from the same time base and all commands are synchronous. The third layer of processing resides within the device processor on device serial control cards, each capable of controlling four devices. Each control port has its own Z180 processor for communicating directly with the target device.



Thomson Automation's rundown list on MC View, one of the three available remotely run Java applications, which also include MC Live and MC Remote.

Unlike systems that were first designed as single-channel playout systems and later modified to become multichannel systems, Thomson Automation's three layers of automation processing work together to provide the ability to issue multiple simultaneous frame-accurate control commands to multiple devices. Other automation systems cannot provide this multi-layered processing power because their design is based on single-channel playout, where commands issued on a per-frame basis cannot provide frame accuracy on multiple events per frame.

To ensure reliability, the local area networks (LANs) used for data and control in the system are physically isolated. By utilizing two distinct LANs, data collision between simple data traffic and control command traffic is prevented, thus minimizing instances when the system bogs down due to LAN traffic. The use of dual LANs avoids performance issues as

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system size increases and the number of channels controlled multiplies.

At heart of any automation system is its computer operating system – a system that has to be mission critical. While Windows NT may have a recognizable user interface, it is not designed for use in an environment where uninterrupted revenue streams are mandatory and multichannel, multi-tasking operations require instant command execution and frame accuracy. Based on the real-world needs of an automation system, QNX, a robust, true real-time operating system designed to run in a mission-critical, fault-tolerant, redundant environment, was selected for use in the system.

In a multichannel play environment, it is critical to have backup processors "shadowing" the main computer at all times. In the event of the main computer being taken off-line for any reason, the backup is always hot, meaning it knows where in the event list to begin issuing commands when it takes over. While manual takeover is a two-keystroke procedure, a separate computer system in the Thomson automation system continuously monitors the status of the entire system and seamlessly issues takeover commands if needed.

To ensure that commands are always executed, even in the event of a computer switchover to backup, a deferred command structure issues all commands to the device control level in advance of their execution. Deferred commands are commands that are sent from the automation computer level in advance of airtime. How far in advance these commands are sent is user definable but typically ranges from two to five minutes. Once a deferred command is stored in the device control level, the command will execute even if the automation computer is offline. This ability to issue deferred commands and the hot backup functionality of the automation computer level ensures timecode accuracy.

In multichannel environments, the traffic system plays a key role. Thomson Automation provides a bi-directional interface that converts the traffic file into a form that the automation system can use and also provides one or more reconciliation files to be exported back to the traffic system for billing. This is done in real time, vastly speeding up the reconciliation process and reducing billing time from days to hours.

Whether in group centralcasting environments or single station digital television multicasting master control, Thomson Automation systems stress versatility and LAN/WAN ability in control of all devices, for multichannel playout management and frame-accurate control of resources. ■

For more information on Thomson automation systems, circle (451) on Free Info Card.

Dave Stuart is the manager of sales and marketing for Thomson Automation.

WPIX–TV's digital helicopter

BY RALPH AUGENFELD

It sounds too good to be true: a noise-free digital microwave link for audio and video transmission, using less than half the bandwidth and power of current analog FM technology. How about increased range, an extra stereo audio and data channel, and the transport of digital signals without passing through an NTSC conversion? Even better, almost complete immunity from multipath distortion, with a transmission scheme that seems to thrive on random, reflected bits of signal bounce. For WPIX–TV, in the heart of New York City, the last consideration is an important one; live shots bounce like billiard balls cascading their way to our receive antennas. Now add features such as stable mobile transmission even while driving through (or flying above) the deep RF canyons of Manhattan. This is a news director's dream.

So when it was time for a news helicopter for our new morning show, the WB11 Morning News, we chose a digital COFDM system. Conventional news helicopters are outfitted with a standard FM analog microwave transmitter. Fading, breakup, audio and video noise, limited picture quality and multipath reception problems (ghosting) are all too common. Signals bouncing off reflective surfaces like buildings or mountains cause multipath problems that come in two flavors: static and dynamic. Static multipath interference can be observed when transmitting from a fixed location; bounced signals arrive at the receive antenna a little later than the main signal. This often causes video ghosting, chroma smear, changing hues and audio buzz that can seriously degrade live shots. Microwave transmission from a moving source can be particularly susceptible to dynamic multipath interference, characterized by signal dropouts, moving multiple ghosts, and severe chroma and audio noise fluctuations. COFDM systems thrive on these reflections, adding thousands of QPSK carrier signals back together, utilizing sophisticated forward error-correction algorithms. They basically "eat" the reflections and spit out good signal. Also, current plans by the FCC call for a substantial bandwidth reduction in the 2GHz microwave news band currently used by broadcasters. Looking forward to this eventuality, digital COFDM microwave radios may provide us with a technology that would at least equal the performance of analog systems in this regard. This was an important consideration for us, as was the concept of delivering SDI (and HD in the future) digital streams intact back to the studio. Of course, with these benefits there is the downside of significant processing delay.

A helicopter is a hostile environment for COFDM transmission.

After leasing a Bell "Long Ranger" helicopter from Helinet, Inc., in Los Angeles, we sent it to Wysong Enterprises in Tennessee for integration. Although the avionics package was fairly standard, there was special consideration for our all-digital design plans. Early on we realized that one of the main disadvantages of both the compression and modulation schemes used in digital microwave is its inherent latency. The digital stream may exhibit a delay of anywhere from 20 milliseconds up to two seconds. This means that the talent needs a "mix minus" IFB system; returning program audio should omit the talent's voice to enable chatter with the studio anchors. First, we installed a Modulation Sciences Pro Channel audio modulator into our VHF channel 11 transmitter atop the World Trade Center, enabling the broadcasting of a discrete audio subcarrier to Pro Channel receivers. We then purchased their receive system, which includes reception of conventional off-air video and audio, and installed it in the helicopter for monitoring and IFB. Although talking back and forth to the studio still presents a

The WPIX-TV news helicopter used for the WB11 Morning News.

The middle section of the console of WPIX-TV's new helicopter.

switcher. The addition of two Toshiba talent cameras inside, three Sony POV cameras outside the craft and a portable Sony Digital Betacam VCR rounded out our major video system acquisitions. The smaller cameras are converted to SDI and routed to the switcher.

challenge to the talent, it is somewhat mitigated by this technique.

Next was our choice of a camera. A long lens, a stable gyro system and SDI output were all specified and resulted in the purchase of an Ultramedia III camera ball from Flir Systems. It combines a Sony BVP-570 camera with a Canon 1000mm lens and has the optics and imaging devices mounted in a remote-controlled pod under the nose of the helicopter. The CCU has an SDI output that goes directly into a custom-designed Sony serial digital program

Tandberg was our choice for MPEG compression and COFDM modulation hardware. Its 5100 encoder system, soon to be upgraded to the smaller model 6100, provides source and channel coding in one DC-powered device. The SDI digital signal is fed into the Tandberg, where different compression algorithms may be selected, giving the ability to trade off delay for robustness. This needs to be tweaked for best signal stability vs. noticeable audio/video time delay, but no actual lip sync problems have ever been experienced. The Tandberg modulator has a 70MHz IF output that goes to the digital input of the transmitter.

The microwave transmitter chosen was the Nucomm PT-6 digital radio. It is a compact, high-powered unit that provides a full 12W in analog mode, or approximately 8W in digital. The remote control unit offers a choice of analog or digital modulation, channel assignment and power level. A Nucomm microwave receiver and downlook antenna also were added for receiving ground-based signals. A helicopter is a hostile environment for COFDM transmission. Vibration alone is a major problem for attaining the degree of stability required to pass the digital signal through the front end of the radio. Phase noise and even very slight frequency instabilities are the bane of COFDM transmission. The same is true at the receiving end, where completely redesigned ultra-stable Nucomm CR-6 digital central receivers were installed. Each receiver feeds a 70MHz IF signal into a Tandberg Alteia COFDM decoder and, from there, both SDI and analog NTSC signals are fed back to the station.

The Ultramedia III camera from Flir Systems is equipped with a Sony BVP-570 camera and a Canon 1000mm lens, all contained in the "ball" located underneath the WPIX-TV helicopter.

The transmit antenna system is from N Systems (NSI) and consists of a steerable high-gain pod antenna or an omni antenna, switchable from the transmitter remote control. A GPS satellite receiver with our receive sites programmed into it, and a flux gate compass to determine heading of the craft, each pass their signals to an onboard computer. The signals are compared and the Superpod is driven to automatically point at the chosen receive site. In addition, the NSI computer sends telemetry signals to the Superquad receive antenna system, pointing the dish at the receive site automatically at the helicopter. This is all tied into the NSI MC5 Pro control system, so once the microwave receive technician in the studio begins to acquire a signal from the helicopter, both antennas "lock" on to each other. This works well in both analog and digital modes of operation.

The results? The helicopter was finished just in time for the debut of our morning news show in June 2000 and we flew it from Tennessee to New York. It took until February 2001, however, for full-time digital transmission to begin. When the final bugs were fixed, and the latest versions of equipment were installed, we flew a test flight during the morning show. We expected some improvements, but nothing prepared us for the outcome. The camera produced digital pictures that were clear even to the untrained eye.

I joined the crew for the final test flight to the south to see what our final range would really be. We headed past Atlantic City, about 90 miles out, and continued south. At 110 miles, we climbed to 2500 feet, and the pictures back still looked perfect. Finally, at an altitude of 3000 feet we sent back pictures of the Cape May water tower from a distance of 125 statute miles before running out of signal.

Finally, while the digital COFDM system requires less bandwidth than the current analog one (8MHz vs. 17MHz), we look forward to further refinements that will alleviate the shrinking of an already congested ENG band. Future channel bandwidths of as little as 6MHz will help maintain parity with the current allotment of news microwave frequencies, while retaining the spacing between them. These improvements, along with reduced size, weight and, of course price, will be the icing on the digital cake. ■

Ralph Augenfeld is the engineering manager for WPIX-TV, WB11, in New York, NY.

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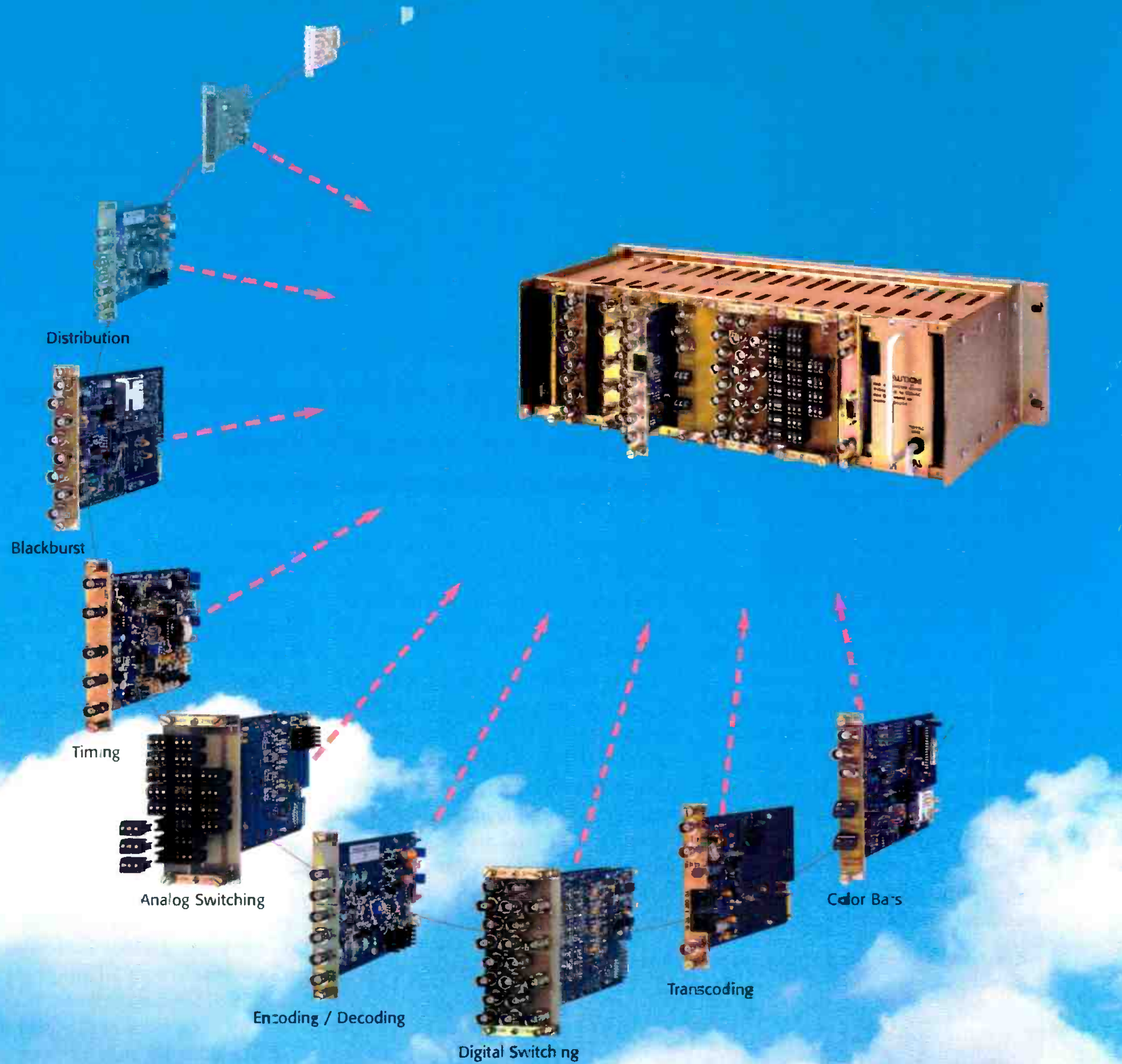

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Field Report

TVA runs smoothly with help from Kaydara's *mediastore*

BY GUY BEAUDOIN

TVA is a French-language television network in North America, broadcasting from its headquarters in Montreal to five regional stations, in addition to two international broadcasts for both the Eastern and Western parts of Canada. TVA produces programming for three major channels: TVA (the main channel), LCN (a 24-hour news channel) and TV-Achat (a 24-hour infomercial channel).

With programming demanding an increasing amount of graphics and animation, we needed to replace our aging still stores with more modern and capable equipment. Our equipment was becoming unreliable, did not support animation, and forced us to import images through a video grabbing process. We could buy a Kaydara *mediastore* unit for the same price as other still stores without clip capability. The still store would enhance the quality of our production, ensuring our ability to develop strong content for the future, while simultaneously saving us time and money.

The media-server system provided support for stills, audio/video clips, animation and CG. Its modular nature and its use of standardized components meant that we avoided compatibility issues and easily integrated the equipment into our existing production network. The fact that it supported both analog and digital I/O and Ethernet networking was a plus, as the whole industry is moving towards digital and this helped to future-proof our investment.

The system is based on the Windows NT file system, so there is no need to import and catalog the media before use or deal with proprietary file types. This allowed us to reorganize our workflow to use a more distributed networked approach. Being able to directly read multiple native file formats helped us to speed up the process of creating content and bringing it to air. We created content in packages like Photoshop, Lightwave, Illustrator, Speed Razor and Premiere. We then transferred the material to the media servers feeding to the live program, saving time and money.

With programming demanding an increasing amount of graphics and animation, we needed to replace our aging still stores.

These tools and functionality can be accessed through a drag-and-drop GUI. The speed with which you can manipulate media using the drag-and-drop interface and keyboard shortcuts becomes a key factor in crunch times when a mistake on-air needs to be fixed. This is an easy process using the system, as soon as your corrected content is ready, you can instantly reload the media directly from the paint system via the network.

In total, we use 10 Kaydara *mediastores* at TVA. Three are integrated into the broadcasting center, used as servers and automated with a Florical system. One is used for content creation and as a backup in case one of the other units fails. The other six units are being used to develop content and serve programming for live news reports, various TV shows, quiz shows, and for creating CG and animation for all these programs.

The Kaydara *mediastore* has been a reliable solution for us, meeting the strenuous demands of the broadcast studio environment head-on, forming a robust backbone for our studio, and the studio of the future. ■

For more information on the Kaydara mediastore, *circle (452) on Free Info Card.*

The Kaydara *mediastore* in use at TVA broadcasting studios.

Guy Beaudoin is the director of engineering at TVA.

Technology In Transition

Audio consoles

BY JOHN LUFF

When television first erupted from the radio only landscape audio mixing consoles used rotary attenuators to adjust the level of the audio. Filtering and other modifications were most often done with outboard devices. Stereo was barely a thought — recording was on ¼-inch (or larger) audio tape recorders at 15 inches per second or more.

Ah, progress! Today a console in a news production studio may have three to six times the number of faders, built-in EQ, high and low pass filters, dynamics (compression and limiting), multiple stereo busses, perhaps surround sound, mix-minus outputs for IFB, complex monitoring matrices, analog and digital I/O, digital memory, perhaps even digital mixing. Complex systems of auxiliary devices can provide effects — reverb, specialized dynamics processing, patching, audio routing switchers, analog and digital converters, and plenty of other peripheral devices are often part of the mixing environment. If you don't have a well-trained audio expert on staff the task of planning a new mixing room, or just revamping a worn-out control room, can be quite daunting. Even with an expert along many video engineers feel considerable trepidation when considering audio consoles that can easily cost over $100,000 and much more for the highest-quality digital consoles.

Video engineers planning a mixing room should take into consideration the intended use of the room, both for the near term and in the future. Photo courtesy AMS Neve.

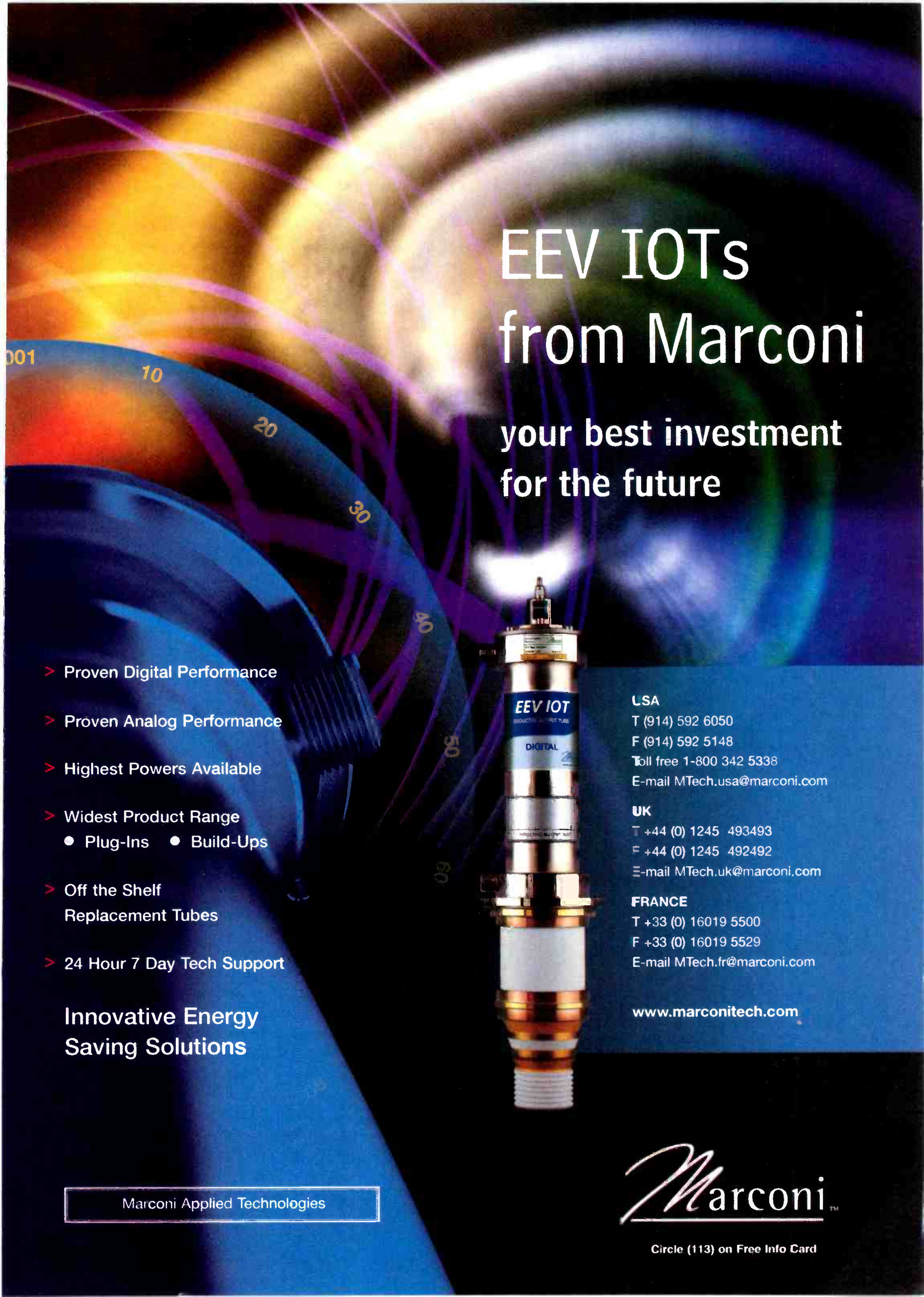
Always include extra inputs. Eventually new consoles will be old and dead inputs will happen.

As in all things, consider the intended use first. Many times the project is a renovation of an existing system. This often includes goals such as improving reliability for the old console for which parts are no longer available. If the need is to build a new facility that will last 15 years until a replacement can be justified (which is not unusual in this business) then perhaps digital options should be thoroughly and thoughtfully evaluated. The march of mixing consoles into the digital era has been quite rapid, and modest digital consoles can be purchased for well under $10,000. Let's look first at applications in television and how they might set the direction for a console evaluation plan.

At the top of the list is to set the physical scale of the product you are seeking. Is this no more than a minor audio production room, or does the console need to be capable of both news and entertainment uses? A studio that does only heavily formatted news might need fewer than 24 inputs on the audio console, with perhaps six to eight microphones, capacity for feeding pre-recorded clips (stories and bumpers), signature music, ENG feeds and maybe a handful of routing switcher outputs for sources that are less frequently needed. How many inputs are used simultaneously for the typical productions will set a minimum size, but always include extra inputs. Eventually this new console will be old and dead inputs will happen. Leaving room for growth now will protect you against future failures. Ask the manufacturer if the inputs use a common circuit board for a group of faders (often about four to six inputs), and add two modules beyond what you think is the minimum needed. One module gets you some growth, the other maintains some redundancy with that growth.

Consider features that are unusual to broadcast (radio and television), like mix-minus outputs. Any console can mix mikes and recorded clips. Today, outside of radio on-air consoles, virtually all consoles have EQ features. But mix minus is heavily used in many broadcast applications where talent needs to receive the mix for monitoring. By the time the video system is done processing the picture you often need to delay the audio to match. Just wait till the news anchor hears his own voice four frames out of sync — best to consider building mix-minus outputs. Some television consoles can provide a mix-minus output for every fader position. Most also allow for delay adjustments on each fader, permitting more flexibility when matching the delays in a complex video system.

Think carefully before rejecting a digital console. Digital consoles in modest sizes do not have to cost more than analog consoles these days, nor are they inherently more complex to install. Manufacturers in North America, the Pacific Rim and Europe have all designed consoles with both analog and AES inputs. They also can provide the analog monitoring and program outputs needed for many installations. If the console is to be useful as production technology continues to become more and more digital it is wise to carefully look at the costs for a digital solution now. That may well prevent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another rebuild in just a few years when the rest of the system is fundamentally digital.

The key to this important development in audio mixing is the rapid progress in DSP technology and specialized silicon implementations for both professional and consumer audio equipment. Take a look at the audio card in a modern computer. Not many parts there, but it allows mixing in the digital environment for a number of real and virtual inputs, for less than the cost of one rotary fader. It is likely that the progression of digital mixing will continue, with more capabilities and lower cost. However as the complexity rises the cost of developing software goes up dramatically, and it is not likely that high-end consoles to reduce in price as rapidly as modest consoles. One could expect that digital consoles will be less expensive in modest sizes, partly because the fabrication and checkout of each console is considerably less expensive for the manufacturer.

It also is valuable to look at the growth in the industry and how it might affect the expectations for consoles in the future. One of the key dynamics in the broadcast industry is the

Just wait till the news anchor hears his own voice four frames out of sync — best to consider building mix-minus outputs.

repurposing of media. Many local TV stations are running a Webcast live or perhaps even a 24-hour news channel. A console that has the ability to mix for several simultaneous uses of the basic program may well be an important consideration. While simple stereo consoles suffice for today's environment, perhaps two or three stereo outputs may be required (without giving up precious sub mix groups). Don't forget the slow but important deployment of surround sound either. While you don't have to have a surround sound console to create the effects and surround channels, panning in the surround is difficult without the proper features.

Finally, look long and hard at consoles with full memory. If the audio console is going to be used for more than one program it is highly useful to be able to set up the inputs, EQ, routing and panning, monitoring, and outputs and then store it to memory for the next production. This also allows multiple operators to have a setup that matches their own style better. Needless to say it also allows rapid reconfiguration if, perhaps, one console is used to mix two back-to-back programs from two studios, as is often the case. As in all things this capability comes with drawbacks. Complex consoles with memory often don't wake up quickly from a power off reset. Consider using a UPS to keep the console from becoming a liability when the unexpected lightning storm causes the lights to flash! ■

John Luff is vice president of business development for AZCAR.

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REFERENCE IMAGE

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Solid State Logic Aysis Air Plus: new version of the Aysis Air digital console; features HSX Control Processor, a high-speed computer offering fast, flexible and intuitive control and recall of mixing situations; status information is seen through the new TFT LCD display; hot-swappable INFO Faders, available as factory option, provide visual and mechanical feedback to the operator; an alphanumeric display presents at-a-glance confirmation of grouping and system status; 212-315-1111; fax: 212-315-0251; www.solid-state-logic.com.

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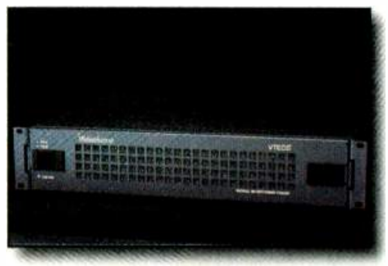

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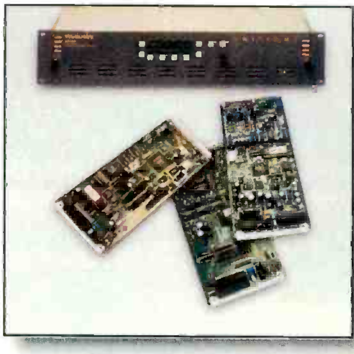

Videotek UNIFRAME: includes the DL-810U serial digital legalizer, the MADA-110U monaural audio distribution amplifier, the SADA-205U stereo audio distribution amplifier and the UDA-110U video distribution amplifier; offers a single 2RU frame that can simultaneously accommodate analog and digital video, analog and digital audio, analog and digital processing, and distribution choices; 800-800-5719; 610-327-2292; fax: 610-327-9295; www.videotek.com.

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DIGITAL VIDEO ROUTING SWITCHER

Datatek D-3000: accommodates all data rates from 30MB/s to 1.5GB/s in a compact rack mounting frame; equipped for 128x128 serial digital video; mounts in only 9RU with a depth of 15 inches; two outputs per destination are included; 908-654-8100; fax: 908-232-6381; www.datateknj.com.

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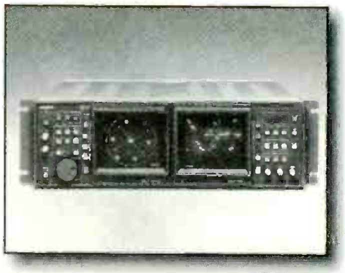

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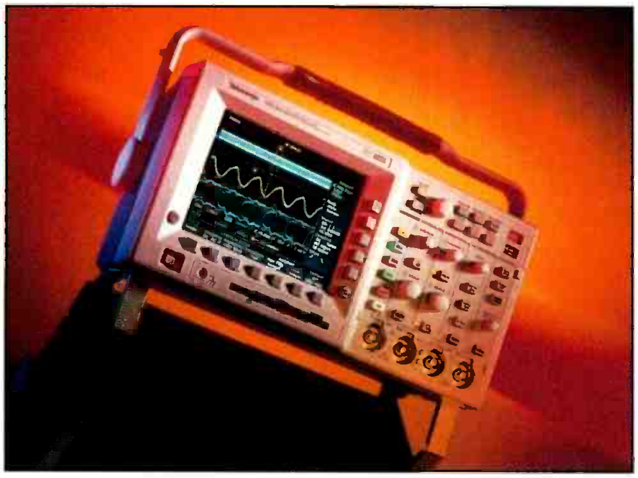

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Canopus StormEncoder: encodes footage in real-time using Main Profile at Mail Level MPEG-2; with variable and constant bit rate options (from 1Mb/s and 15 Mb/s); supports PCM and MPEG Layer I and Layer II formats up to 48khz at 16 bits; 888-899-edit; 408-954-4500; fax: (408) 954-4504; www.justedit.com.

Circle (416) on Free Info Card

NONLINEAR EDITING SYSTEM

Avid NewsCutter Effects 2.5: now shipping worldwide; conforms to D10 and Sony's MPEG IMX format; supports most digital acquisition formats including DV25 and DV50; features auto voiceover and script-based In/Out; 800-949-AVID; fax: 978-640-1366; www.avid.com.

Circle (417) on Free Info Card

PROGRAM QUALITY OF SERVICE MONITOR

Tektronix PQM100: features a single-channel, real-time, monitoring solution; provides automated continuous monitoring of video signals to detect video quality problems in the distribution of compressed digital video information; notifies operators of problems with the video and helps engineers diagnose and document picture quality by detecting picture defects; now shipping; 800-426-2200 code 1229; fax: 503-222-1542; www.tektronix.com.

Circle (418) on Free Info Card

Business highlights from broadcast and production

BY NANCY INWOOD

NBC has made a three-year strategic technology agreement estimated up to $25 million to deploy Grass Valley Group solutions in support of the network's companywide central-casting, news production, media asset management and high-definition playback.

Thomson Multimedia has made an agreement with Royal Philips Electronics for the purchase by Thomson of Philips' Content Creation activity for professional broadcast markets, as part of Philips Digital Networks' MP4Net Group.

ABC Television has purchased a Panasonic DVCPRO HD production system comprised of an AJ-HDC27A and an AJ-HD150 studio VTR. The Panasonic camcorder and recorder will be primarily used to capture and edit high-profile programming.

WTBS, Turner Broadcasting System selected Thomcast's DCX Millennium transmitter system for its digital conversion. In addition to TBS' purchases, the DCX Millennium was the transmitter of choice for two PBS member stations, WEDN in Norwich, CT, and WHRO, the public telecommunications center for Hampton Roads, VA.

The nation's smallest market station on the air with a digital channel, WBOC-TV, Salisbury, MD, has purchased Panasonic's AJ-HDC20A DVCPROHD camcorder and AJ-HD150 DVCPRO HD studio VTR.

WHDT-TV has purchased six AJ-HD2700 1080i/720p switchable VTRs and has three AJ-HD3700H D-5 HD multiformat mastering VTRs from Panasonic. The station will initiate over-the-air HD broadcasting in late July and will be carried by the Adelphia and Time Warner cable system, with a combined potential reach of six million viewers throughout south Florida.

Quantel has moved its North American headquarters to New Canaan, CT. The company's new address is 199 Elm Street, New Canaan, CT, 06840. The new telephone number is 203- 972-3199 and fax number is 203-972-3189.

The New York Times Company will standardize on Grass Valley Group digital switchers, deploying Kalypso Video Production Center and Zodiak systems across its broadcast properties. The New York Times will deploy the systems across its entire station group, which includes WHNT-TV, Huntsville, AL.; KFSM-TV, Fort Smith, AR.; WHO-TV, Des Moines, IA; WQAD-TV, Moline, IL.; KFOR-TV, Oklahoma City; WNEP-TV, Scranton, PA; WREG-TV, Memphis, TN; and WTKR-TV, Norfolk, VA.

WRAL-TV, Raleigh, NC, has chosen a Wheatstone TV-80 series audio console to produce the audio for its HD newscasts. WRAL-TV was the first station in the United States to broadcast an HDTV signal in 1996 and is the world's first news operation to present HD local news on a continuous basis.

Two Solid State Logic consoles were recently added to the National Mobile Television fleet of trucks. The 48-fader SSL Axiom-MT digital broadcast console will be installed in a new all-digital truck that will be used for FOX Sports NFL broadcasts in Dolby Digital surround sound.

Clarification

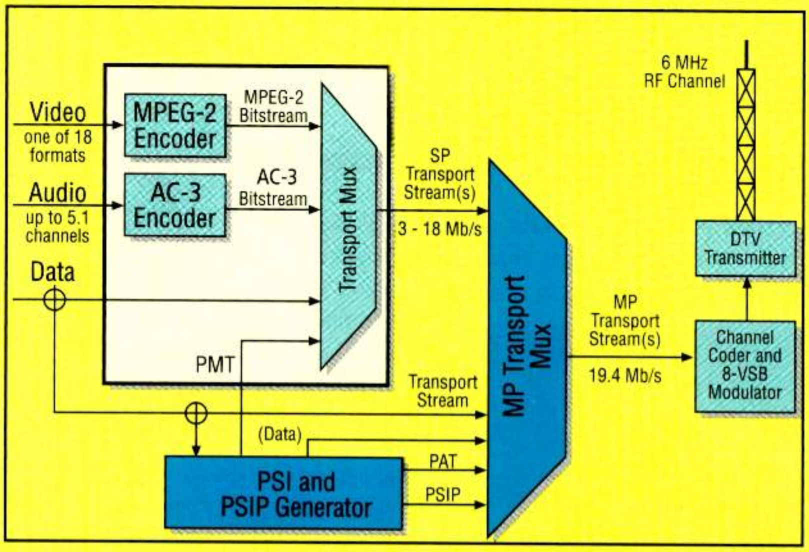

Figure 2 in PSIP 101 (June,2001) was incorrectly labelled. The corrected version is above.


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to register online
visit the website at
www.aes.org

Bexel Corporation has purchased 10 LDK 23HS MKII super slow motion cameras from THOMSON Multimedia Broadcast & Network Solutions. The cameras will be available from Bexel's headquarters in Burbank and their rental locations in New York, Miami, Atlanta, Dallas, Seattle, Washington DC and Orange County, CA.

FloriCal has been awarded the contract by NBC to automate all of the NBC-owned-and-operated TV stations in the United States.

Fox Digital has purchased four Philips' LDK 7000 Digital Cinematography cameras for use in television productions by the FOX group of companies.

TANDBERG Television has acquired AVS. The AVS' RF technology will enable TANDBERG Television to maximize on Digital Electronic Newsgathering global market opportunities.

People

Encoda Systems has appointed Greg M. Jacobsen as chief executive officer. His most recent position was as president and CEO of XOR, Inc., an Internet integration company.

Communications Engineering, Inc. has appointed Bill Beckner as integration manager and Joe Strobel as project manager.

Polo Recuay

Videotek has promoted Polo Recuay to vice president of engineering. Recuay's primary responsibilities will include directing new product development in engineering as well as supporting the existing product line. In addition to Recuay, Videtek appointed Jochen Kuhnen as the International Sales Manager.

Scopus has appointed Steven Bonica as president. He will have full responsibility of Scopus marketing and sales activities in North America.

Don Bird has accepted the position of vice president of sales and marketing for both U.S. and international operations at Avica Technology.

Jerry Gepner

Jerry Gepner has been appointed president of National Mobile Television. As president Gepner will be responsible for all aspects of sales and technology. His prior position was as executive vice president, operations and engineering, FOX Sports Networks.

Noah Meiri has filled the position of president at Orad Hi-Tec Systems. Meiri was previously the managing director at Orad.

A 20-year software development veteran Stephen Chalkley has been appointed the engineering development manager at ANT Limited. ■

Screen Shot

Panasonic cameras used in productions

Colossalvision director David Niles recently has shot two assignments with two acquired Panasonic AJ-HDC27V variable frame rate progressive HD Cinema cameras. In addition to Niles' work the Panasonic AJ-HDC20A DVCPRO HD 2/3-inch 2.2 million pixel FIT 3CCD camcorder was used by South Carolina Educational Television (SCETV) to produce the 23-year-old NatureScene natural history series.

The SCETV purchased the family of Panasonic DVCPRO equipment to support its statewide educational mandate. The network uses a combination of 11 NTSC TV transmitters, one (soon to be three) digital transmitter, digital satellite, Instructional Television Fixed Service, fiber optic and microwave systems to cover all 46 South Carolina counties with open and closed circuit service. Every school in the state has a downlink dish and at least three receivers to access ETV's 32-channel digital satellite system.

Niles' assignments with the cameras have included music videos for the rock band R.E.M, all-female classical music group BOND, and an industrial video for telecommunications supplier Marconi featuring Deborah Norville of "Inside Edition."

SONY

DSR-250 3-CCD DV & DVCAM

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.
- **58mm lens** with **12x optical zoom**
- **Records in DVCAM or DV**, standard tapes or mini. Up to 270 minute recordeding in DV mode onto a 184 min. DVCAM tape
- Manual or automatic functioning: Focus, Iris, Shutter-speed, Zoom, Gain (3 positions and memory).
- **Flip out 2.5" 200,000 dot LCD monitor**, finally available on a professional camera • Time date stamp • Soft shoulder pad
- **Advanced optical stabilization** allowing for a high quality digital zoom out to 24x, with a maximum digital zoom out to 48x
- **Assignable time code** (Rec Run, Free-run, User bit)
- 16 bit 2 channel audio recording, or 12 bit 4 channel
- **Digital in/out** (IEEE1394) and **analog in/out**
- **Still image capture onto memory stick** – Upload graphics from memory stick or USB adapter, software included
- Phantom 48V power • Built in speaker • Directional microphone in pro mic holder, 2 XLR audio inputs
- **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 achieved. 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.

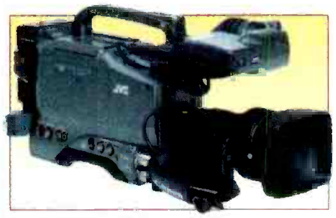
- 880 TV lines of resolution for DXC-D35
- 850/800 TV lines for D-35WS • Two REC tally lamps
- DXF-601W New Viewfinder Switchable 16:9 to 4:3
- VF lens light with on/off switch • 3 level Tally light
- Display characters on/off switch • Take Tally
- Horizontal and Vertical peaking • Die cast aluminum
- Better flare compensation • 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

QUICK DIAL 74

GY-DV500U
1/2-inch 3-CCD Professional DV Camcorder

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



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 Feedback Circuit
- 4:3/16:9 switchable aspect ratio.
- True multi-system monitors they handle four color system signals: NTSC, NTSC 4.43, PAL & SECAM.
- External sync input and 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

OP121 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
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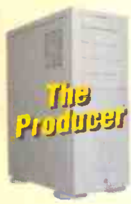

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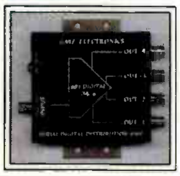

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Midas, An EVI Audio Co.	109	163	156-274-1515	
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Prime Image Inc.	95	153	408-867-6519	www.primeimageinc.com
Radio TV News Dir. Assoc.	106	161	202-659-6510	rtnda.org/convention/2001.shmtl
Reflections in Video	129	187	818-787-4552	
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Branding irons

BY PAUL MCGOLDRICK

Putting brand marks on products is as old as the complete history of manufacturing. Makers' marks have been added to just about everything that has involved humans; they have been carved into the beams of the roofing in homes and the edges of drawers in furniture, they have been signatures on pictures, and they have graced fine jewelry in the form of hallmarks. Even today we them: semiconductor design engineers add caricatures in silicon and automotive engineers placing text behind the seat cushions of a hand-made cars. But most brand marks are meant to be visible — they are boost ymarket recognition, making you better known.

When you see the name "General Electric" you understand that the business, at least initially, has something to do with electrical products. Some of the company's related operations also have names that are obvious in their activity, like the National Broadcasting Company (NBC). But what does a company like Avaya do? Has it built a brand name with a word that is apparently meaningless? If you are a customer of the company's communications products you are probably aware of the name, but if you are not it is probably unknown and completely non-descriptive.

The word "branding" has been coined, and there are now branding managers whose job it is to focus advertising to make their brand better known and recognized. But during the years that brand has been understood for its importance, we also have gone through some really silly corporate name changes that have thrown away the efforts of the few who focused on branding.

The rot started with United Airlines which started off as a three word company — United Air Lines (UAL) — a style that is still used internally for the parent corporation and on things like the company's URL. But in 1987 (April 30) the company changed its name to Allegis. Whatever that name was supposed to mean (and at the time the company boasted that the name was invented by a computer) it was certainly not obvious to its customers. The name stuck for just over a year before the company regained its senses.

We have gone through some really silly corporate name changes that have thrown away branding efforts.

In electronics we have the same inexplicable changes being made. When Hewlett-Packard decided to make the printer manufacturing and sales part of its business a different entity to the rest of the company, it didn't re-brand that remaining business with something obvious. No, it gave the HP name away to the printers even though the company was founded on its test and measurement roots. I still twitch on hearing the Agilent name.

Or how about Agere? What is it? Why, it's Lucent's Microelectronics spin-off. It seemed bad enough losing the Bell Labs name to Lucent in the first place, but then you throw away those years of branding again? Bizarre. The crown jewels of Motorola — its semiconductor product sector — spun off as ON Semiconductor. Why?

Broadcasters also have begun name changing. Independent Television (ITV) started in competition with the BBC in 1955; under the authority of the Independent Television Association (ITA), franchises were awarded by geographical territory, with two franchises for London (one for weekdays, one for the weekend) so that the wealth would be spread about. Franchise renewal times were fraught with deals, lobbying and threats. That didn't work, what with the expenses of expanding, and two players have become dominant — Carlton and Granada. Those are both highly recognized brand names.

Advertising revenues have plummeted in recent years and the expenses of DTV have been dramatic. A little known and singularly unsuccessful digital entertainment channel was branded as ITV2 at its launch. Now the mainstream independent channels are being re-branded as ITV1, which will confuse a lot of people who have no knowledge of ITV2. To add to the pile of confusion, the digital DTV service, ONdigital, (owned by Carlton/Granada) will throw away the marketing it took to create that brand by renaming it ITV Digital. And its Internet on TV service will throw away its ONnet name to become ITV Active. The ITV Digital product name sounds like a DTV re-broadcast of ITV (1 or 2?), while the ITV Active product name sound more like an interactive service of some kind.

But while the public in the UK is being confused by those name changes, the British Post Office renames itself *Consigna*. Yes, branding created with the invention of the Penny Post is to become history. Why don't you Consigna (or, better yet, e-Consigna) me with your worst examples of re-branding, and maybe we'll revisit the topic in the future. ■

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