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Broadcast ENGINEERING®

THE JOURNAL OF DIGITAL TELEVISION®

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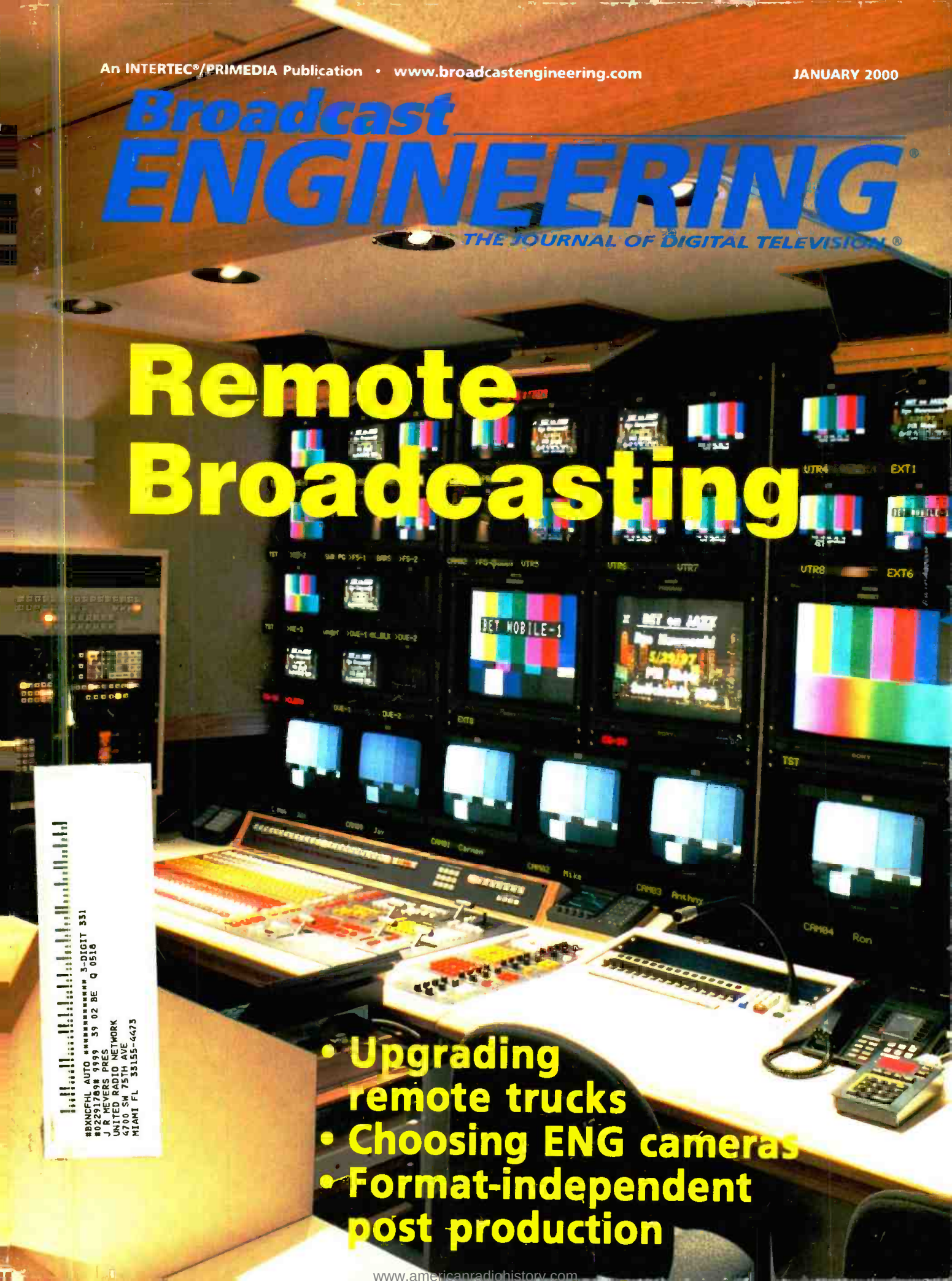

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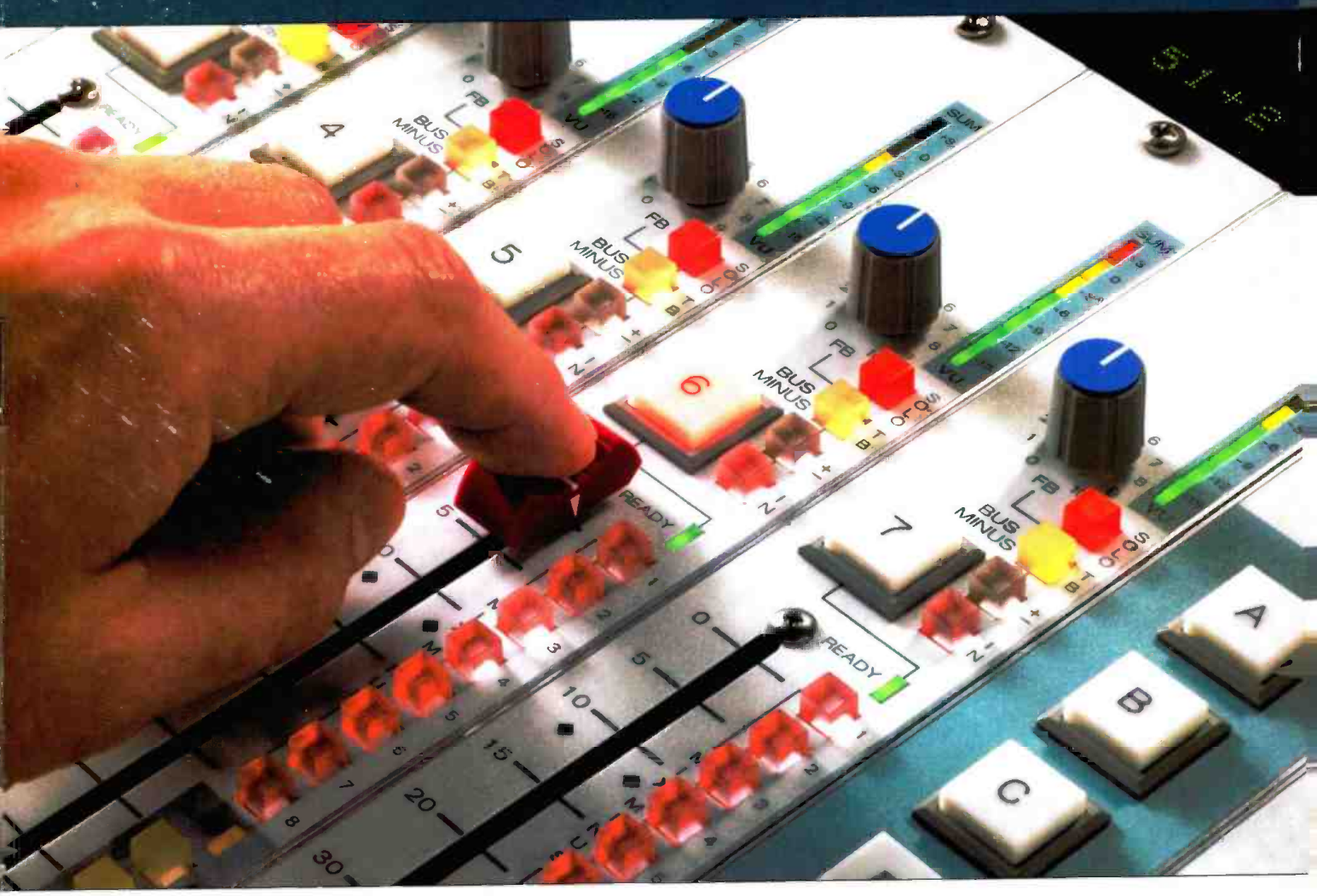

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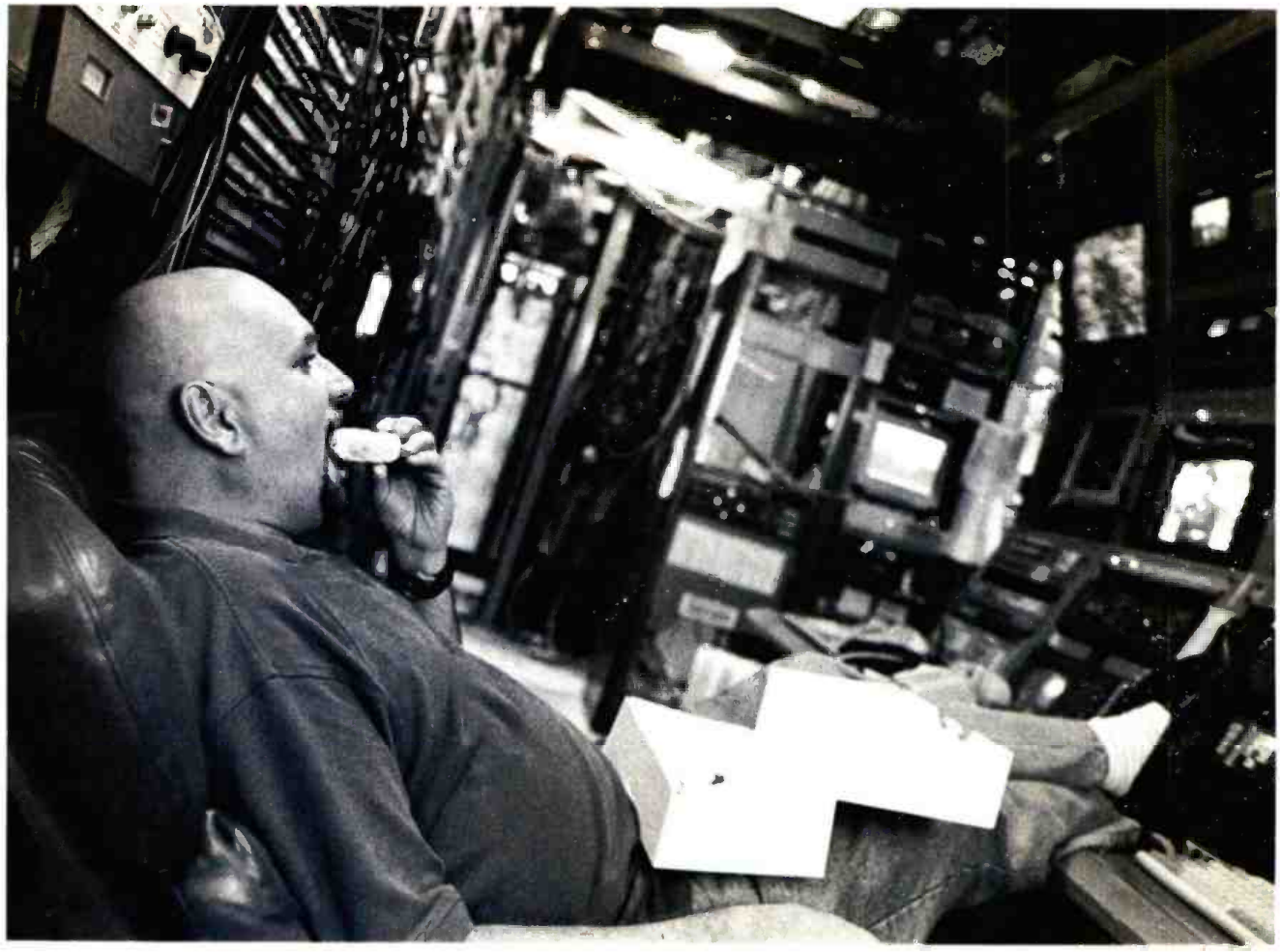

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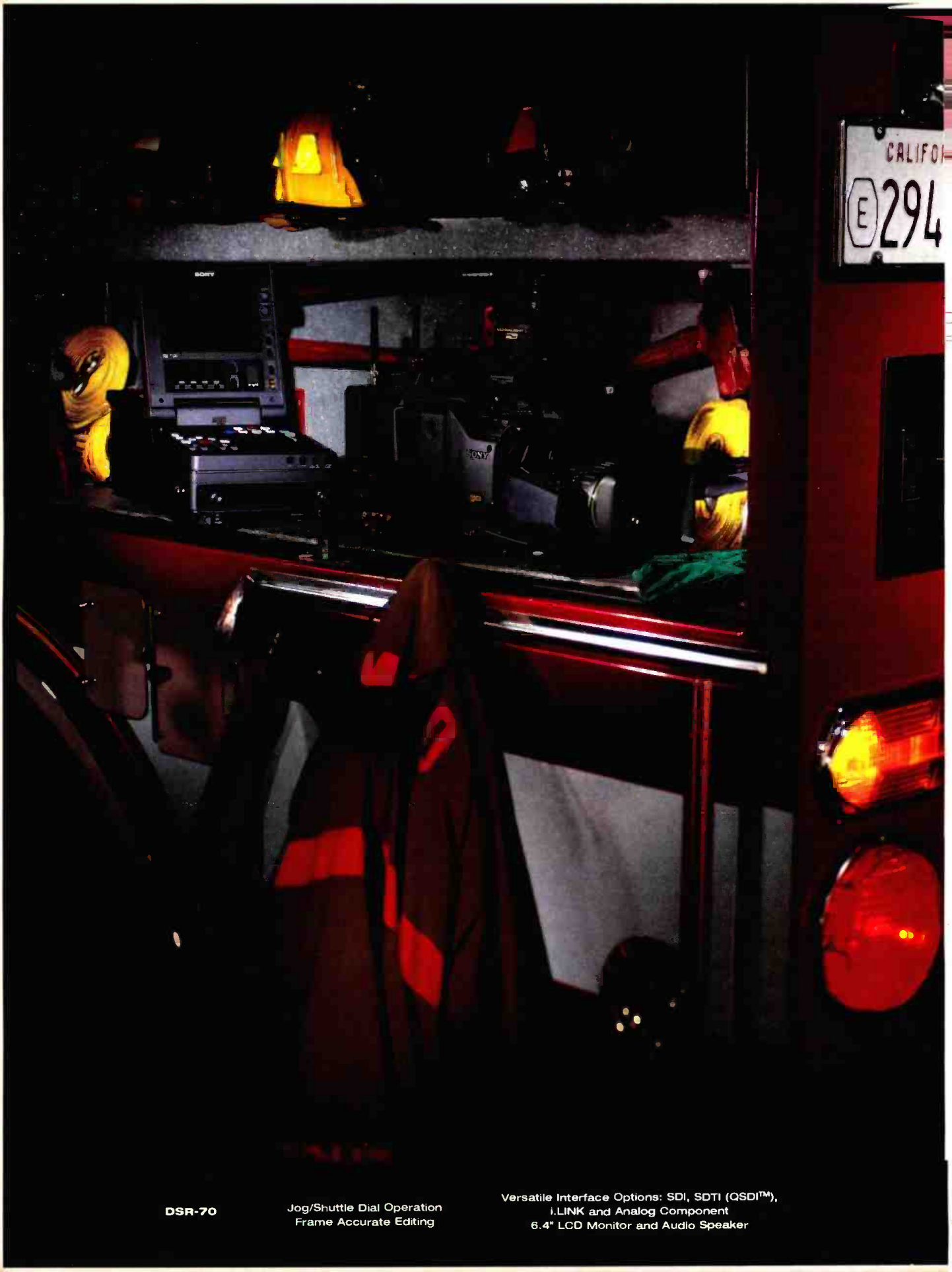

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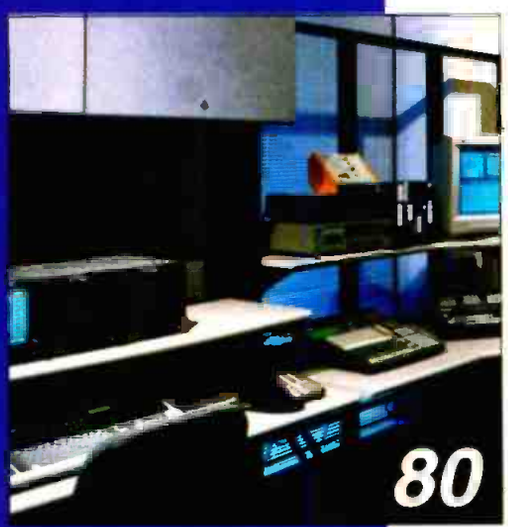

Features

Beyond the Headlines

NEWS

FCC UPDATE

EXPERT'S CORNER/VENDOR VIEWS

Digital Handbook

TRANSITION TO DIGITAL

COMPUTERS AND NETWORKS

ASK DR. DIGITAL

(continued on page 8)

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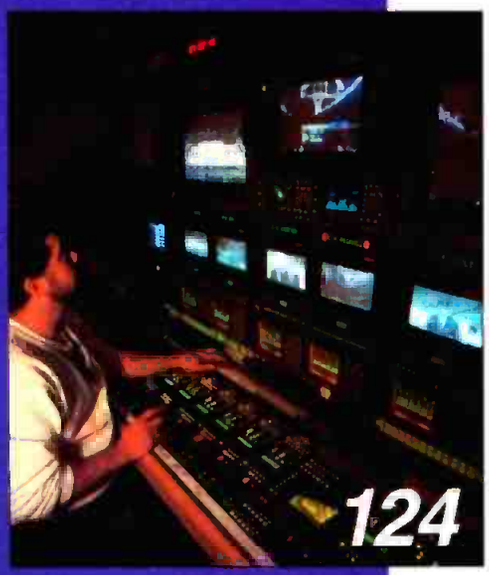

Systems Design & Integration

New Products & Reviews

Departments

ON THE COVER: *Engineers face the challenge of upgrading their production vehicles as the demand for digital video, and production units such as BET's OBV, increases. Photo courtesy of Communications Engineering Inc.*

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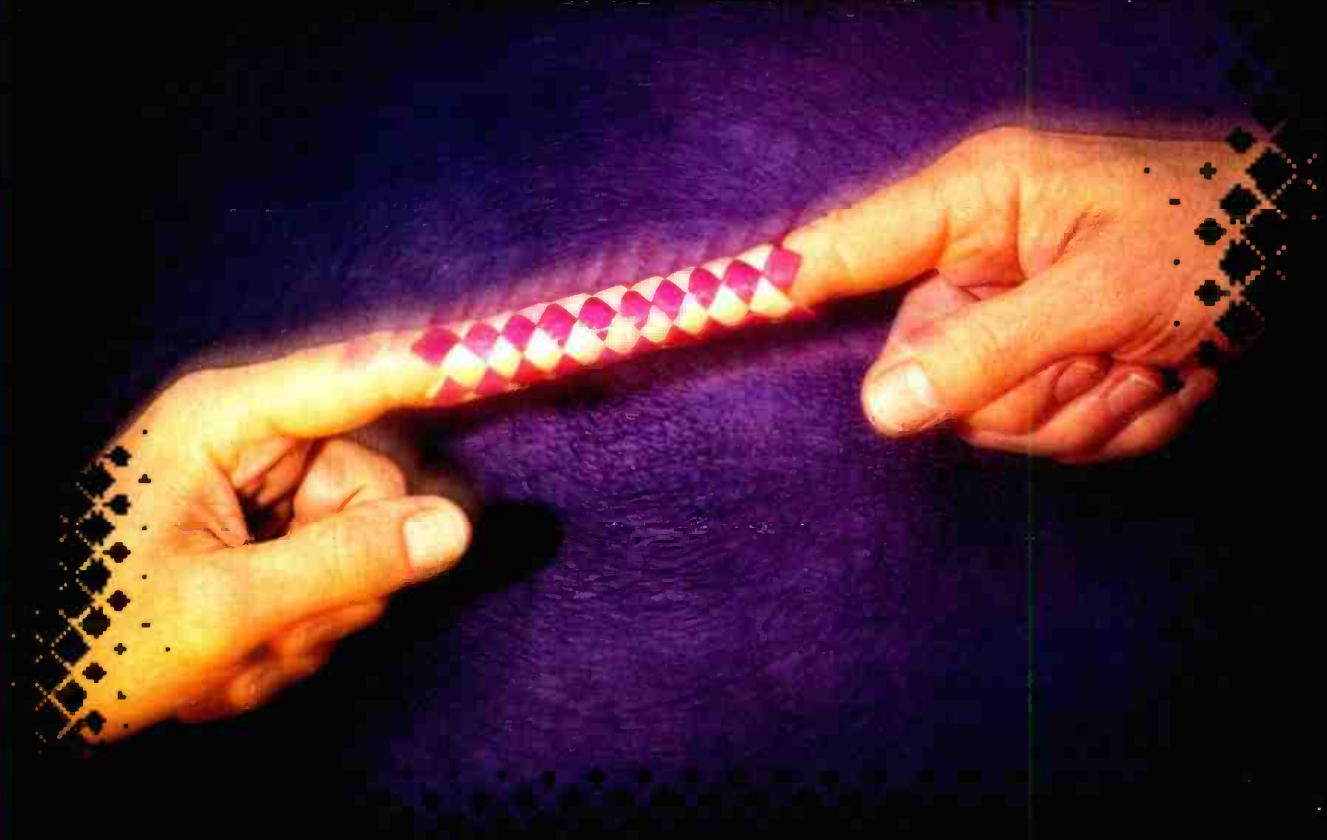
FREEZE FRAME

A look at the technology that shaped this industry.

Predict the future

We asked readers to predict our HD future way back in 1991, but times have changed. What do you see for DTV and broadcasters in 2000? Name the key events that'll occur this year and you could win a Broadcast Engineering digital t-shirt. Enter via e-mail or on our website. Selected entries will receive a T-shirt.



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Editorial

New Year's resolutions

Are you one of those types who sets New Year's resolutions? I'm not. Oh, I give some thought to a couple things I could work on: I'll run an extra 500 miles this year. I promise to take most of my vacation instead of giving back three weeks like I did in 1999. Maybe I'll even decide to return to school, maybe work on a Ph.D.

In the end, I'll think about these and other issues, but I won't do anything about them. Sort of like many stations with DTV.

At the recent DTV99 conference in Chicago (sponsored by *Broadcast Engineering*) an unscientific poll was taken on the number of stations that had begun the conversion to digital. Before I give you the results of that poll, here's some background on why the results are so important.

Michel Proulx from Miranda was discussing the issues surrounding a digital infrastructure, and he reviewed his company's experience in surveying image quality from HD stations. In one U.S. city, four DTV stations were on the air and each claimed to be transmitting HD signals. To protect the guilty, I won't identify the city or stations.

Miranda identified local viewers in the area with HDTV sets. They were contacted and asked a series of questions about the image quality they were getting from each of the four DTV stations. The results should shock those station engineers planning on upconverting NTSC to HD.

In every case, viewers perceived the images upconverted from NTSC to HD as inferior to images upconverted from the two stations with a digital infrastructure. In other words, NTSC to HD was perceived as inferior to a CCIR 601 upconverted image. Duh!

Unfortunately, the shortcuts taken by these two stations (and many others in other cities) will hurt the perception that HD brings an improved image quality to the viewer. You can't transmit multichannel yet, so what have you got to position your station above the competition? Nothing but image quality.

If you attempt to transmit HD signals, you better be sure that they really *are* HD signals. Consumers with those $4000 TV sets are going to be critical. If you don't deliver, they'll notice it and turn elsewhere. Admittedly, there aren't a lot of choices right now, but if you don't do better than a $300 DVD player, your viewers won't stay tuned. DirecTV, EchoStar and digital cable will snatch them away.

And the results of Mr. Proulx's audience survey? Based on my quick tally, the audience response to his question regarding the number of attendees who had a digital infrastructure was only about 10 percent. That means there are a lot of stations, perhaps as many as 90 percent, with plenty of upgrading to do.

So, while you're planning for 2000, perhaps focusing on that DTV RF system, don't forget that you need to feed it. Think digital from source to transmitter. Upconverting *never twice the same color* will never be HD. To paraphrase Abraham Lincoln, you can fool some of the people all of the time with fake HD, but you can't fool all the people for very long with upconverted NTSC.

Brad Dick

Brad Dick, editor

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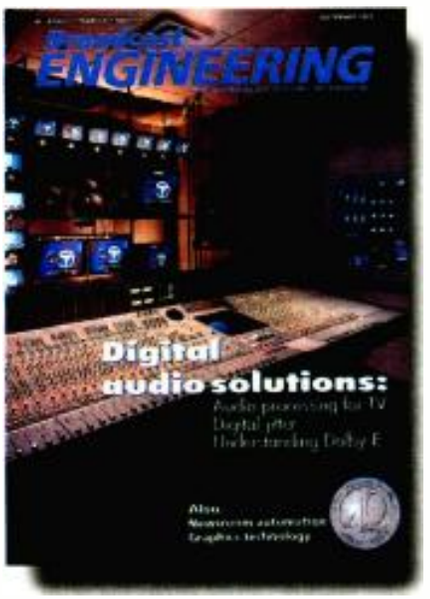

Don't change ATSC specs

As far as I understand, the current transmission system was designed to deliver HD and DTV signals to a consumer at home, in a process that started over a decade ago. Now, in a classic example of Monday morning quarterbacking and 20-20 hindsight, we have a manufacturer complaining that he cannot use the system to surf the web, answer his email and make phone calls. Nor can it program his microwave oven or bake bread. It wasn't designed to do that. Mobile application is another matter altogether, and there are already transmission systems and spectrum space allocated for that function.

Unfortunately, the "rules" are changing faster than anyone can keep with them, especially a political animal like the FCC. There is an old maxim in the engineering design world that says by the time you are finished with your design and have built the first model it is already obsolete. But if we keep changing our design to stay with current developments, then nothing will ever get built.

Charles Repka
ABC lab engineer
New York City

Charles:

You're right with respect to what the original (ATSC) system was designed to do. However, I submit, the arena has changed. If television broadcasting is to survive and profit, then the rules applied "today" must meet the business needs of "today."

If that's the case, then maybe it's time to be sure that the rules allow stations to survive, even if that means changing them so new services can be provided.

Brad Dick
Editor

Everyone's an expert

As a 16-year member of the Audio Engineering Society, I must take exception to your editorial in the November 1999 issue of Broadcast Engineering magazine.

I do not doubt that you have encountered some "experts" who would argue they can "hear the differences in wire" and debate endlessly on how they can actually "feel the difference" in sound between 48kHz and 96kHz sampling rates for digital audio. It has been my experience that individuals such as these rarely have a high level of training or experience. I do, however, object to the condescending manner in which you put them in the same category as all other AES members, some of whom have been responsible for the most significant advances in the professional audio standards that we all take for granted today. Now in its fifth decade, and with sections in 47 geographic regions around the globe, its membership of leading scientists and engineers has earned the AES acceptance as the leading organization dedicated to the advancement of audio technology. Interested parties can learn more about the AES at its web site, www.aes.org.

As someone with extensive experience in recording studios as well as video facilities, I read Broadcast Engineering because I continue to strive to broaden my knowledge of the industry. I find useful articles in almost every issue. Your editorial has served no purpose that I can see and almost certainly has tarnished your image to other serious audio professionals and AES members.

Sincerely,

Sal Chandon

Another viewpoint on experts

As a long-time member of AES, let me say that your editorial in the November issue of BE is right on! Whenever I attend the AES show, my biggest fear is slipping on the snake oil that seems to be all over he floors. I too have heard the Golden Ears talking about how DC to light isn't enough bandwidth for REAL audiophiles. (It does puzzle me, though, that an entire other set of snake oil vendors are insisting that we must return to amplifier designs of 60 or 70 years ago if we want REAL quality, but that's another story.) I get a real kick from the "audiophiles" who write letters about how they replaced all the nasty old Mylar capacitors in their Thunderboomer 1000 with caps using beaten yak hide dielectric or whatever and the sound improved 1000 percent! That's the main reason I still subscribe to Audio Electronics (the old Audio Amateur).

Anyway, keep up the good work and thanks for the laughs. By the way, I know you're not kidding about the RLT, BLT and GLT. I was at the latest show, too.

Best Regards,

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News

DOD wants public debate on 8VSB

BY LARRY BLOOMFIELD

In early December, the Department of Defense announced it wants public discussions and new tests comparing the ATSC modulation standard 8VSB and the alternative COFDM standard. The announcement came after the DOD conducted its own tests of the two modulation standards, and months after a group of television stations, led by Sinclair Broadcasting, petitioned the FCC for multiple DTV modulation standards.

Stephen Long, chairman of DOD U.S. Imagery and Geospatial Services Video Working Group, raised concerns about potential problems with the 8VSB standard as mandated by the FCC in their Fourth Report and Order. The Video Working Group (VWG) was chartered to establish video imagery and related standards for DOD and address the long-term fiduciary responsibilities broadcasters have to their communities and their ability to respond in times of emergencies. This comes under the all-familiar heading of the Emergency Alert System (EAS).

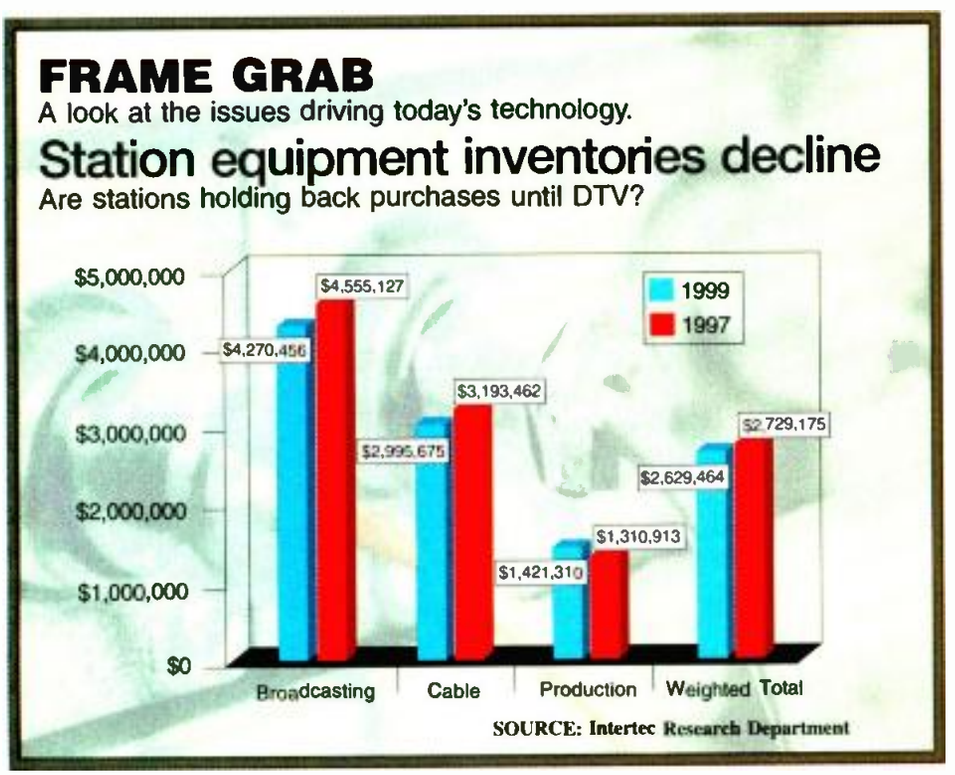
Long said there are "concerns about our national capability to employ digital television broadcast systems to communicate with the public during civil and defense emergencies." The DOD noted that 8VSB's reliance on large, highly directional antennas for over-the air reception may jeopardize the ability to communicate with the public during emergencies. Those antennas would be among the first things likely to be destroyed in adverse weather conditions, natural disasters and "other hostile propagation environments."

The DOD noted that 8VSB's reliance on large, highly directional antennas for over-the air reception may jeopardize the ability to communicate with the public during emergencies.

In its statement, the DOD notes, "The COFDM digital modulation system appears to be a robust modulation system, which would significantly improve the ability to guarantee reception in routine and national emergency environments. It has been implemented by a majority of other countries around the world and provides digital television broadcast capability, including the ability to use small, portable and mobile antennas."

"I was told by one DOD source that DOD had performed similar tests to those Sinclair had performed in Baltimore and had obtained similar results, which caused them (DOD) concern," said Mark Hyman, vice president of corporate relations for Sinclair Broadcasting.

Sinclair Broadcasting spent months conducting a series of test comparing 8VSB and COFDM in Baltimore, with preliminary results showing COFDM provided better reception particularly when dealing with multipath issues. But Sinclair's petition stopped short of calling for the replacement of 8VSB, with the signatories asking the FCC to allow COFDM as an alternative modulation scheme.



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The National Guard and other military organizations are nearly always called on to assist local, state and federal agencies in times of emergency. With the charter to provide domestic support in times of national emergency, such as natural disasters and issues of National Security, DOD would want the best way to provide communications logistical support during these instances.

It goes without saying that you can lose a great deal of picture quality into the snow before an analog television signal becomes unusable. This is not true of digital; either good picture exists or there is none, not to mention the sound, too. Anything that might jeopardize over-the-air reception in times of emergency is not acceptable.

DOD is not advocating the abolishment of the 8VSB standard in favor of COFDM. Instead it simply wants a public debate, and recently announced 8VSB receivers "are welcome and encouraged" so the improved 8VSB receivers can "be fairly evaluated as part of the proposed open, public debate." ■

TV stations make HDTV visible

While small market television is wondering how it's going to implement and pay for the basics of a digital television plant, approximately 100 television stations have made the leap into the DTV arena. Most are in the midst of a major effort to find anything that will get not only digital television off the ground but also the chief enhancement of that service, high definition.

The burden of getting digital and HDTV off the ground and into the homes of the American-viewing audience does not rest solely on the shoulders of broadcasters. It must be a cooperative effort with every link in the television chain from stations to the set manufacturers and the very stores that sell them.

In addition to the many enhancements that digital television brings with it the next step is to get it all before the public. If presented properly, each participant in the public DTV/HDTV displays should leave with the idea that they must have a new digital-ready TV set.

When color first came on the scene, color TV sets were placed in showroom windows, bars and other public venues of all sorts, sizes and description, almost any place of easy public access. The same was true of the large screen TV sets when they came out. Not everyone has purchased a large screen TV set, but those somewhat predisposed to do so were certainly a lot closer once exposed to the real thing.

ABC affiliates have been promoting HD and "Monday Night Football" in restaurants and sports bars in Georgia, California, Oregon and Florida covered by an ABC station.

As of last month, CBS had more HDTV programming on the air, weekly than the rest of the networks combined. CBS averages 13 hours of HDTV weekly, if you include an occasional movie of the week and the occasional specials.

Steve Panosian of Samsung said his company recently did a joint promotional event with CBS that included the placement of 55-inch HDTV sets in 12 different Hard Rock Cafes across the country. The occasion was the airing of a recent rock 'n roll revival show. When asked if the sets were still there, Panosian said that interest was there on Hard Rock's part. Samsung appears to be serious about this kind of thing. They not only put out the dozen HDTV sets; they also underwrote a portion of the show.

Jim Gilbert, chief engineer of WPVI in Philadelphia, said the station opened the "6 ABC Studio Store" as a public relations promotion in the King of Prussia Mall. The station has "about two dozen monitors inside, with four or five on the outside and one HDTV off the air, on which passersby can watch the Sunday night lineup, like Disney and Monday Night Football." Gilbert said estimates show about 1 million people a month pass by and see what they are doing.

The King of Prussia Mall venue, perhaps the largest mall on the East Coast, also serves WPVI as a news bureau location, with camera. They have a fiber back to the station that can carry news inserts or other types of feeds. Two fibers from the station feed weather information and other public service material for the two dozen monitors located throughout the mall.

The burden of getting digital and HDTV off the ground and into the homes of the American-viewing audience does not rest solely on the shoulders of broadcasters.

Sim Kolliner, director of engineering at WCAU-TV, told us of a fitness festival in Philadelphia where his station went all out with a 63-inch Sharp HDTV set with an AC-3 sound system that was all fed from a server. Kolliner said, "The response from the approximately 5000 people who saw it was tremendous." ■

TV via the Internet

One San Diego-company sees the Internet and PCs dominating the production, distribution and delivery of digital and high-definition video in the near future.

"The future clearly shows a converging path between the Internet and video delivery," said Dr. Ronald D. Fellman, president & CEO of San Diego-based Path 1 Network Technologies Inc. "At some point in the future, the consumer will expect video content to be delivered via the Worldwide Web."

Fellman see a very bright future for television, the Internet and in the choices viewers will have. The hundreds of channels of programmed entertainment will be replaced with even more video selection choices, with much of that

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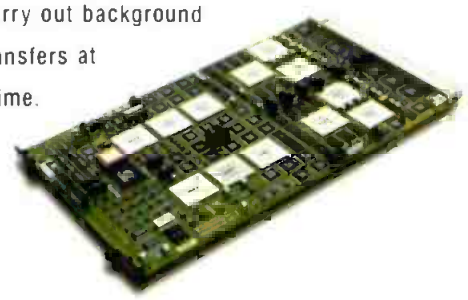
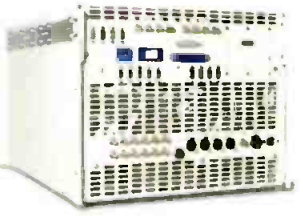


background power

Editbox FX processes plug-ins in the background leaving the editor free to concentrate on the job in hand. It is all done on an open render engine that's more powerful than most other edit systems' main platforms.



fast, easy user interface

The user interface is entirely designed for the job. With an array of operating interfaces that adapt to the editor's natural way of working.

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Editbox FX is built for optimum performance in the on-line world of broadcast and post. Every disk, chip and card is checked, then checked again, every solder joint is x-rayed individually. This all adds up to supreme reliability. And in the event of a power failure it will get you back to exactly where you left off, fast. It's a package, designed for more editing, less worry.

power.tools

Editbox FX has everything you'll ever need for any editing job, and more. All the elements of Editbox FX are developed together to work together - editing, six superlayers, keying, effects, paint, tracking, color correction - the lot.

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Directors change their minds, so do their clients. Any element, in any layer, can be instantly changed at any time - without a laborious re-build.

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Editbox's powerful fix-it tools have made it the director's best friend - the best keying, color correction, paint and DVE in the business. With Editbox FX, problems become creative opportunities.

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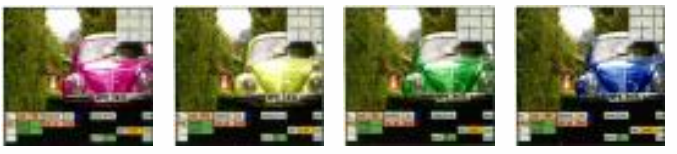

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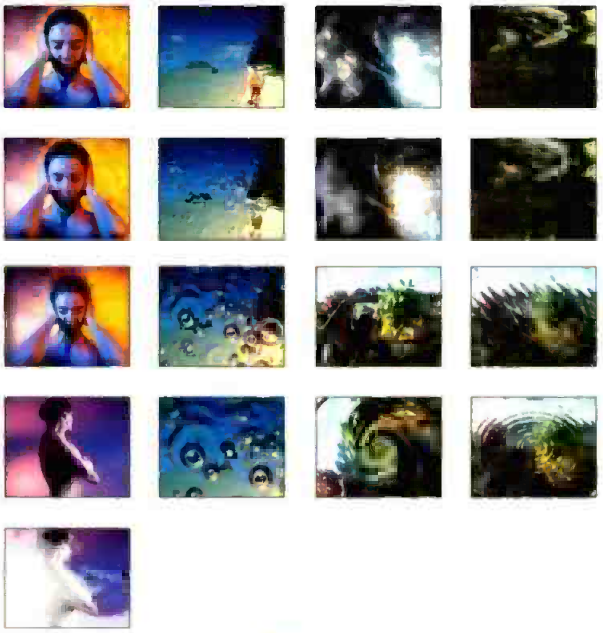

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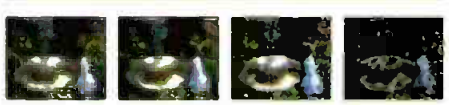

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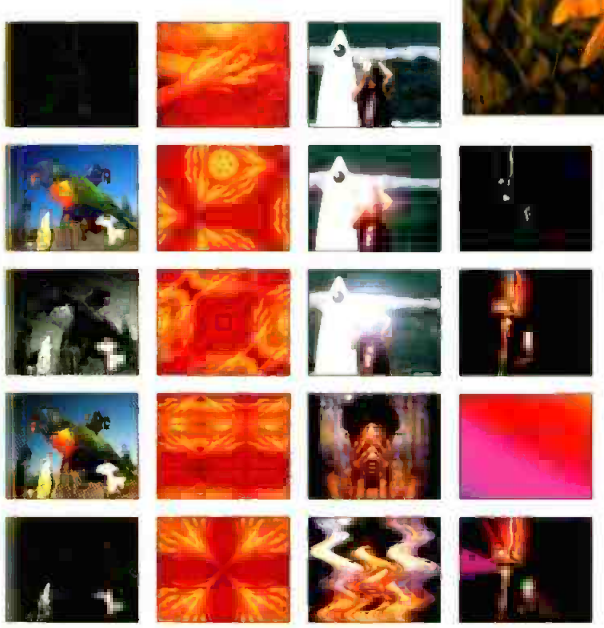
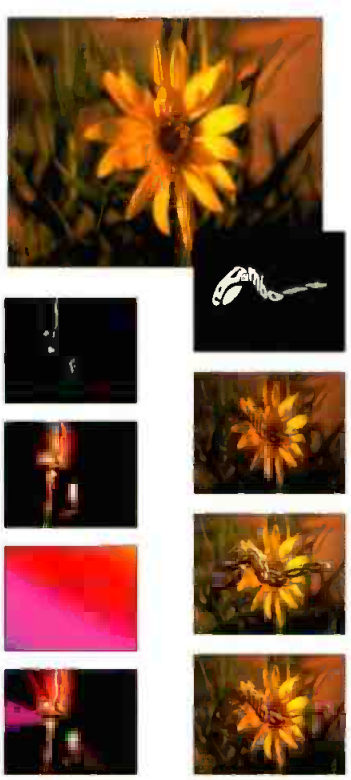
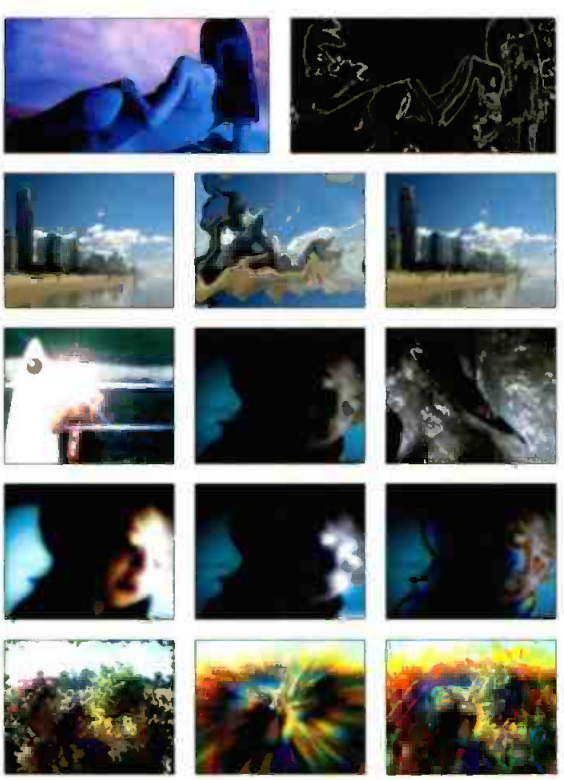

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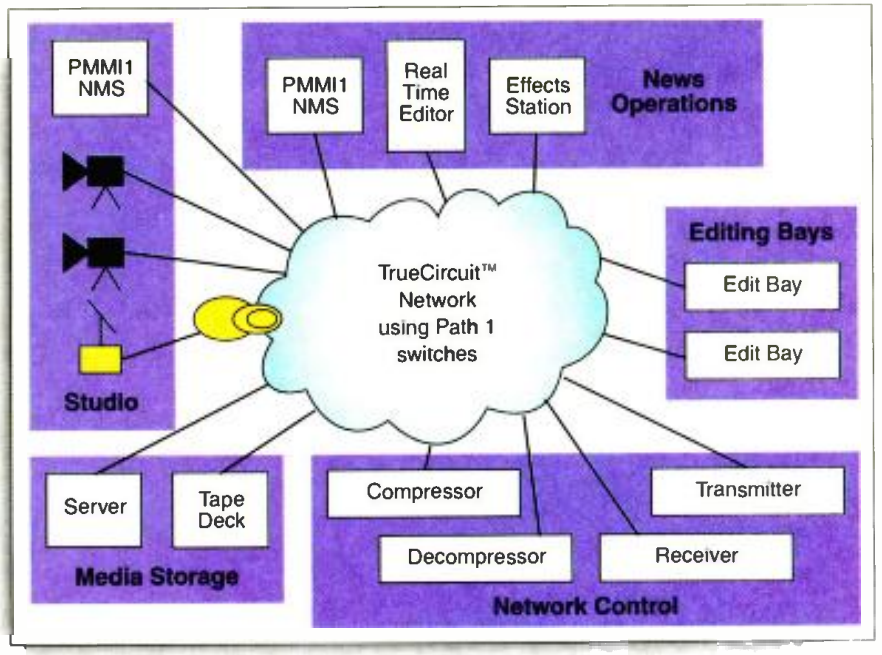

Figure 1. A studio production environment tied together with a TrueCircuit-equipped Ethernet/IP network. In the future, audio/video production equipment will also tie together all other existing IP equipment such as the studio website, data server, desktop PCs, IP phones and other Internet equipment.

entertainment being interactive

In the past, video over the Internet has been of poor quality with jerky, postage-stamp size pictures. But Fellman and others say improvements in bandwidth, networking and distribution will ensure the adoption of Internet protocol delivered video.

In the future, Fellman says, video will be scripted on an IP-enabled computer, recorded with an IP-enabled (digital) camera and transported via IP networks through every stage of editing and distribution. While distribution has be the obstacle toward adoption of IP distribution, Fellman says developments in IP networking ensures a rapid progression toward increased bandwidth, reduction in both costs and size, alternative modes of transport and guarantees in the areas of Quality of Service.

Fellman says the increasing bandwidth "to gigabit and 10Gb will give the capability of transporting uncompressed HD video." He added that the reductions in cost and size will come from single chip interface devices, currently either on the market or underdevelopment, that will ensure "even the lowliest devices are network enabled." When asked about the alternative modes of transport, Fellman said RF will increase adaptability and will enable real-time services via isochronous channels. An isochronous channel is one that is capable of transporting real-time, periodic signals.

Digital television facilities regularly transport video material with upwards of several gigabits between various areas of their plants as we speak. It is when this bandwidth-hogging material leaves their facility that concerns most broadcasters. Stating what appears to be the key and most obvious, Fellman says that his company's QoS technology solves this challenge for IP networks by providing time-interactive video transport with negligible added latency or jitter, while remaining fully compatible with existing standard QoS Internet protocols.

There is no question that other approaches are available to address these issues. So why stay with the older technology? Fellman says: "Internet Protocol (IP) has the ubiquitous advantage of being in nearly every computer and throughout the Internet. These new advances in IP technology are currently pushing IEEE 1394, FibreChannel and specific digital video transport schemes to the brink of extinction in the same way that AppleTalk, FDDI and SNA have fallen. The impetus comes from the vast monetary and human capital behind IP networks."

Dan Firef, director of set-top box marketing at ATI Technologies, sees Internet broadcasting coming like a freight train. "It's quite clear to me that people will want this and they'll find a way. No one is doing it now, but when someone does it right, everyone will want to emulate them." Others at ATI have said broadcasters are really moving slowly to integrate these auxiliary services. There's no question that any delay could be costly. Firef said that in his personal opinion, "TV broadcasters are losing viewers to the Internet." ■

Translators: The forgotten TV service

As smaller market stations begin the transition to digital, many see vast parts of their audience being taken away through the lack of FCC attention to translators and other auxiliary methods of delivery.

These auxiliary services include thousands of devices serving a very large part America and output anywhere from a few watts to a kilowatt. The FCC rules currently governing "secondary services" encompass low power television (LPTV) facilities found in many metropolitan areas and thousands of translators.

The locations of LPTV facilities are fairly evenly spread across the country, but translators appear to be a phenomenon limited to the western United States. Some broadcast directories include the number of translators each station has in addition to information regarding resources, personnel and the number of cable systems that carry a given station. Nielsen even sees this as an important reporting factor in viewing audiences.

In speaking with the National Translator Association, engineering managers responsible for large numbers of translators and equipment manufacturers, it appears that the FCC seems to have neglected addressing this part of the television industry. Two concerns, which have not been addressed, facing broadcasters who rely on translators are the role these devices will play in digital television and how the Satellite Home Viewers Act will impact over-the-air reception.

David Hale of Larcan LTC says there is a lack of understanding about TV translators and what they do. "Translators provide the lowest cost method

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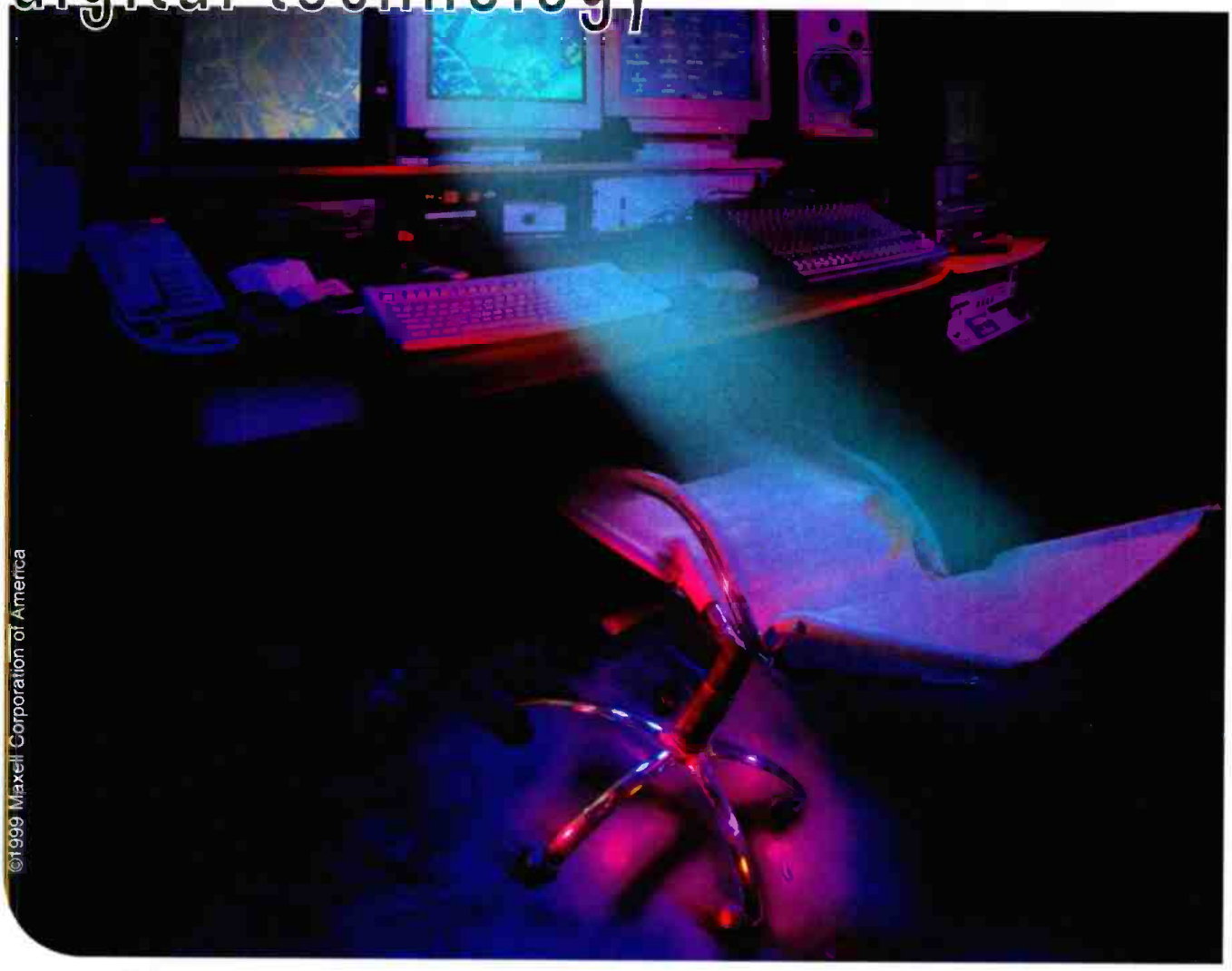

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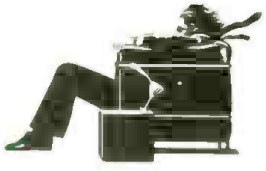

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of off-air signal delivery in areas not reached by primary channels." In addition, they "provide the link between major population areas and smaller cities/towns and are the cable feed for these areas."

R. Kent Parsons, vice president of the National Translator Association said translators have been around delivering local television programming since 1955. The current numbers (see Table 1.) show just how far they've grown, according to the FCC, in their efforts to provide "non-subscription signals to rural communities in this country." Parsons said, "While it is desirable to have access to satellite-delivered local signals, it must be noted that many small independent stations are not available on the dish. Also, out in these remote rural areas, cable systems rely on translator stations for their local programming sources." One cable company in Utah distributes to a small community after receiving their signals at the end of six translator hops.

Translators are a natural extension of the free over-the-air concept of broadcasting. Replacing the current translator delivery with satellite's local-to-local is not feasible on a not-for-profit basis. In addition to this, both DirecTV and EchoStar, the two major players in the direct-to-home (DTH) satellite services say there is no way, currently, they can provide 1616 local television stations to all local markets.

Currently there are not DTV rules for translator sites such as this one near Salina, UT.

"It should be kept in mind that areas with TV service primarily via translators are usually not as affluent as urban areas," says Hale, "and the monthly cost of having a satellite dish is a luxury that is view as a not affordable or necessary by most households."

John Webber, chief engineer of KTVQ-TV in Billings, MT, paints a very dim picture for the future of television in general in his neck of the woods. "How am I, a small-market television station, ever going to recoup the cost of the DTV transmission system I'm forced to have on the air by mid-2003?" Webber said. "I'm not going to get any more eyeballs with it ... in fact, I stand to eventually lose half of my present audience altogether because of the current non-plan for DTV translator service. At best, I'll simply fragment my exist-

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TV for the blind

The FCC has proposed a rule mandating TV stations devote their secondary audio program channel to "audio descriptive services" for the blind.

The commission has set into motion their rule-making process that will require the top-network affiliates in the top-25 markets to carry an "audio descriptive service" for the blind on their secondary audio program (SAP) channel. Comments on MM-99-339 were due on Jan. 2 of this month; the reply comments will be due Feb. 23.

According to the American Foundation for the Blind, there are 1.6 million blind people in the U.S., but as many as 9 million with vision problems who could benefit from this kind of television services.

WGBH in Boston has been narrating such shows as "Masterpiece Theater," and "Nature" since the mid-1980s and has done some additional descriptive services for some older movies, which can be seen on "Turner Classic Movies." There are many PBS stations that already offer this service on a regular basis, but the Federal Communications Commission (FCC) is looking at a more aggressive approach than just the occasional cable, satellite or PBS offerings.

According to WGBH, the costs ranges upwards to $5000 per hour to add this kind of descriptive enhancement. And yet, the Narrative Television Network, who has done thousands of hours of this kind of thing for nearly every venue of television distribution, says it costs them about half that much. "When these figures are compared to the total cost of production, they are only a very small fraction of the overall costs," said Charlie Crawford, executive director of the American Council of the Blind.

As beneficial as this service will be, there are, none-the-less, a few inconsistencies in this new rule making. First, this is relatively easy to implement in digital television, but the FCC says they plan to require it only of analog stations. However, the FCC also asked for comments about an "audio descriptive service" for the blind in the digital service as well.

Many stations currently use their SAP channels to serve large parts of their market with dialogue in other languages. This is particularly true in markets like Los Angeles and New York with large Spanish -speaking populations. Some stations have agreements with other service providers and use their SAP channel to deliver totally different programming than is being broadcast by the television station. One example is how one television station in San Francisco uses their SAP channel to extend the range of a classic music FM station.

In any event the proposed rule, a part of a broader FCC effort to make technology more reachable to people with disabilities, will take several months, if adopted, before it would go into effect. ■

Larry Bloomfield is a former chief engineer and industry consultant located in Morgan Hill, CA.

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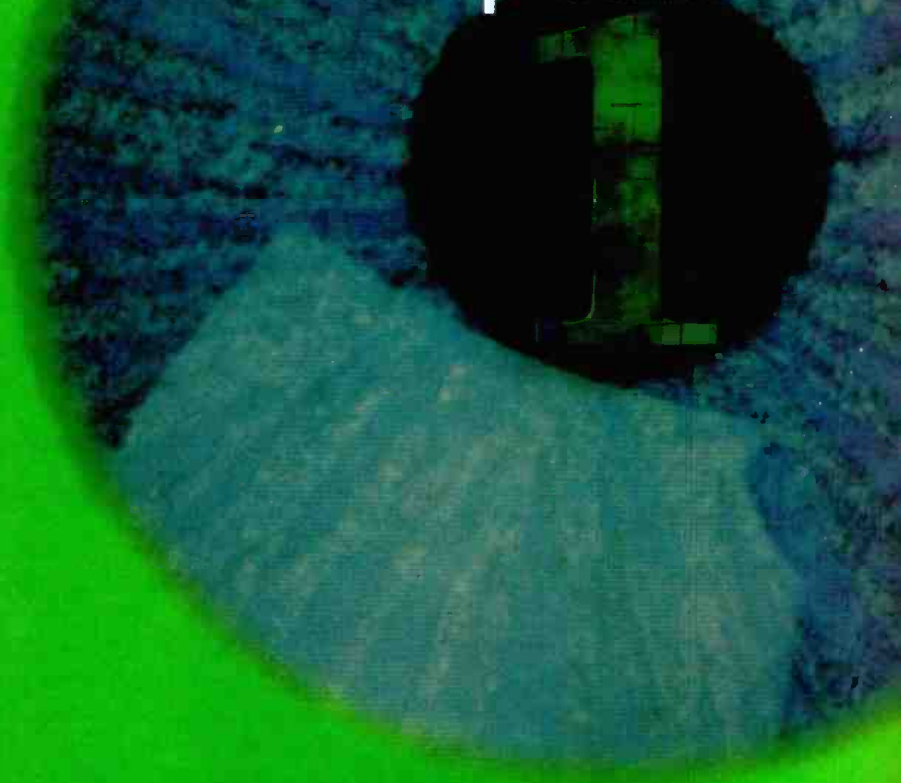

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FCC Update

FCC proposes use of video descriptions

BY HARRY MARTIN

The FCC is proposing that commercial television broadcasters in the top-25 television markets and the national TV networks introduce video descriptions in their transmissions to allow persons with visual disabilities to better follow the visual action in television programs.

Video description involves the insertion into a TV program of narrated descriptions of settings and actions that are not otherwise reflected in the dialogue, such as the movement of a person in a scene. Video description is typically provided through the use of the Secondary Audio Programming (SAP) channel so that it is audible only when that channel is activated through a TV set or a VCR with SAP capability.

The Commission said video description would make television programming more accessible to the more than eight to twelve million persons with visual disabilities as well as one and a half million children between the ages of six and 14 with learning disabilities. It also said there could be a secondary audience for persons without disabilities who are doing several things at once, who need to attend to something during a program, or who leave the room during a program.

The Commission said that the proposed video description rules are generally modeled after existing closed captioning rules, but that because video description technology is not as developed as closed captioning technology, it would proceed incrementally to implement video description requirements so as to not impose a significant burden on video programming distributors.

In the NPRM, the Commission said that it is proposing to initially limit video description rules to analog broadcasters, but that it intended to apply the requirement to digital broadcasters in the future. It said that the flexibility inherent in digital technology may make the provision of video description even easier and less costly. However, it said that the conversion from analog to digital television broadcasting is currently in transition and that it did not wish to wait for the digital transition to be complete before adopting video description requirements.

The Commission also asked for comment on eventually applying video description rules to all video programming distributors, including TV broadcast stations, cable operators, direct broadcast satellite operators, home satellite dish providers, open video system operators, satellite master antenna television operators and wireless cable operators using channels in the multichannel multipoint distribution service.

Due to the many complaints received concerning its current dial-up system, the Commission has decided that it will move to what promises to be an easier Internet-based system.

Dateline

Television stations in the following states must file their biennial ownership reports on or before February 1, 2000: Arkansas, Kansas, Louisiana, Mississippi, Nebraska, New Jersey, New York and Oklahoma. Commercial stations must use the new Form 323 which seeks gender and race information on persons with attributable interests.

BAPS replaced/online filing

The Commission has replaced its old Broadcast Application Processing System (BAPS) with a new computerized record-keeping system known as the Consolidated Database System (CDBS) for mass media applications. The new CDBS contains application data for AM, FM, FM translator, TV, DTV, LPTV and TV translator stations.

The benefits of the new system include the fact that it will provide information about existing stations and electronic representations of granted construction permits, licenses and authorizations of license assignments and transfers of control. In addition, CDBS will provide information as to the status of pending applications for new stations, modifications, and assignment and transfer of control applications, as BAPS did previously. CDBS will not be available on line until the first quarter of 2000.

The Commission also has announced that it is making changes to its Universal Licensing System (ULS), which is used for applications in the Wireless Telecommunications Bureau. This Bureau handles all microwave auxiliary applications and tower registrations. Due to the many complaints received concerning its current dial-up system, the Commission has decided that it will move to what promises to be an easier Internet-based system. The staff hopes that this system will be available in the first quarter.

The Commission's staff also is anticipating that electronic filing for broadcast applications will be an option by the end of January 2000. The Commission's staff has stated that use of the electronic filing system will significantly reduce processing times for modification applications. Once the electronic filing system is in place, there will be a six-month period during which its use is optional. After that time, electronic filing will become mandatory. ■

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

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The risk of delaying your digital buildout

BY JIM SALADIN, SENIOR ASSOCIATE EDITOR

So, you've decided to wait. Join the club. With the November deadline having come and gone, the FCC's numbers say that while about three-quarters of commercial stations in all markets have filed for DTV construction permits, of that number, only 84 are on the air. Granted, not every station is required to be on the air, but the numbers say that a significant segment has decided upon a wait-and-see policy.

With DTV's significant risks and uncertainties, it's certainly plausible that wait-and-see is the correct attitude. Transitioning to digital is undeniably expensive, and unless your station has infinitely deep pockets, do you really want to risk your budget on a broadcast chain that is in a relatively early stage of its evolution? What if the FCC does decide to take another look at modulation? Do you go multichannel? What if you bet the farm on HD and viewers don't buy it? On a technological timeline, a year is a long time and two might as well be twenty. You could know everything you need to know if you can just wait a little longer.

So, what are the risks if you decide to wait? Knowing that will at least help you calculate the costs. We've asked Andres Gonzales of Andrew Corporation and Tom Canavan of A. F. Associates to offer some guidance on this important issue: What are this risks of delaying your DTV buildout? ■

VENDOR
Andres Gonzales, Andrew Corporation

For hundreds of broadcasters, delaying the DTV buildout is certain to present a barrage of setbacks. Theoretically a station can lose its digital license, or worse — imagine attempting to buy your own license back at an FCC auction simply because you filed late. A straightforward technical advantage of having filed early (or even on time) is the ability to optimize coverage, because late filers will be faced with a greater number of interference issues. As a colleague of mine put it, " It's like the land rush to the West; the early settlers got the Ponderosa, the late claimants got the desert."

"Bonanza" aside, as the DTV consumer market develops, it's possible that viewers will form viewing habits early. Consumer growth is already exceeding expectations. According to the Consumers Electronics Association (CEA), factory sales of digital television sets totaled 21,432 units for October, bringing 1999 year-to-date sales to 74,847 and total units out-the-door to 88,023 units. Over-the-air broadcasts are now available in more than 71 markets and satellite and cable companies are galloping into the arena. At the end of the day, stations that delay their buildout could miss out on ratings and revenues.

Filing early is planning ahead. With all the equipment needed for DTV transition, there clearly will be a proportional correlation between increased demand, tighter deadlines, and higher prices. For example, as of November 1999, only 35 percent (600) TV stations had filed DTV construction permit applications and only 220 had been granted permits. Late comers will be at a disadvantage when negotiating production slots and prices.

What about available tower space, or the need for a new tower? We already know that there are major group owners holding signed deals for the best remaining vertical real estate, and contracts with reputable tower manufacturers and installation companies that will control a large amount of their capacity through until 2002. Inexperienced installers, as most of us know, generally cost more money in the long run. And that's just the towers.

Budgets affect every broadcaster. In particular, small to medium group owners, public/ETV groups and independents face the compounding burden of obtaining finances, since these businesses rely on smaller amounts of capital. For commercial stations, capital is determined by market size. For Public/ETV stations, capital comes from government funding. Advanced planning is particularly critical for this group.

The DTV transition will escalate demand for property, buildings, antennas, or even studio equipment, and many manufacturers will be at or near production capacity for these products and services. As the deadline gets closer, the ability to negotiate prices diminishes. And, of course, the above scenarios deal only with the controllable factors of DTV transition. You've then got to add to the mix uncontrollable factors, such as snow, wind or hurricanes.

What's a station to do?

I recommend filing as early as possible and that you should carefully select your vendors. Select a manufacturer (be it for tower, transmitter, or antenna and transmission line suppliers,) then sit down with their representatives and work out mutual commitments. Reputable manufacturers' representatives will appreciate your schedule and help you to create realistic plans. They are honest about their capacity and ability to meet agreed dates. Can your chosen manufacturer provide tried and tested solutions that are DTV proven? That's important, too.

The good news is that it's not too late to "stake your claim." There are reputable manufacturers who are eager to work with you to create a successful, innovative solution that will bring your DTV requirements home and on schedule. ■

Andres Gonzales is an applications engineer with Andrew Corp., Orland Park, IL.

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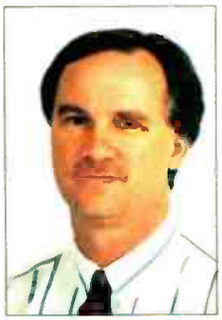


EXPERT

Tom Canavan, A.F. Associates

Federal deadlines notwithstanding, broadcasters stand to lose out on the many benefits of going digital if they delay. Server-based systems bring with them many productivity and efficiency improvements over tape-based systems. Nonlinear editing creates clip-sharing abilities that allow operators in different edit suites to access the same material without having to duplicate or exchange videotapes. Multiple versions of stories can be created quickly and easily, and last-minute changes can be accommodated without a complete re-edit session. Bar coding or material IDs enable asset management systems to store find and transfer clips as needed. Even where a digital signal is converted on the receiving end, the high-resolution capture of a digital recording improves the picture and sound quality.

Program providers can maximize bandwidth on transmission delivery systems, especially satellite bandwidth capacity, by taking advantage of digital compression and multiplexing practices, and thereby opening new revenue sources. Digital transmission techniques deliver a signal that is much more resistant to interference, and digital encryption is more secure than its analog counterpart. The structure of the digital signal permits the detection of many problems at an early stage, as well as some automatic backup of the signal to correct the problem.

Most broadcasters do not have the financial wherewithal to build brand new digital facilities, and converting to digital in an existing facility still involves considerable expense. The investment is not only in dollars, however, but in time as well: for planning, design, implementation, installation and training. The more thought that goes into a phased-in transition process, the more likely a facility would operate reliably and adaptively over the long term. Budgetary considerations often begin with a new antenna and transmitter. Then, plans have to be made to convert studio equipment to digital in stages, to make costs, as well as operational disruptions (installation and training) as manageable as possible.

Broadcasters need to define the core areas of their operations and prioritize according to which areas can benefit the most from going digital. The first priority is often the master control and/or technical infrastructure (such as routing, distribution, signal monitoring, etc.). Other considerations are the condition of existing analog equipment: how long can they physically — and economically — last? When will the station have to pass through a network HD signal? Does local material need to be inserted over that network signal? Is reducing operating costs a major concern?

The business advantages of converting to digital are vast, but as such, they need to be managed as expertly as possible. Broadcasters need to stay on the air, improve quality and efficiencies, and capitalize on revenue-enhancing opportunities. System integrators are ideally positioned to offer the optimum design, transparent installation and acute deadline and budgetary responsiveness required to make each of these things occur successfully. ■

Tom Canavan is president of A.F. Associates, Inc., Northvale, NJ.

Transition to Digital

PSIP table editing

BY BRAD DICK, EDITOR

Building a Program and System Information Protocol (PSIP) table isn't something to be undertaken lightly. You need both the program information data and some method of assembling it into a coherent form for processing by the multiplexer—and then the viewer's receiver.

Stations may elect to develop that information in-house, or contract it to an outside firm, much like described elsewhere in this article. Developing the ATSC PSIP can be handled by several vendors. The hardware is usually referred to as a PSIP Table Editor and Injector.

The produced signal not only allows receiver IRDs to automatically tune to desired services, but more importantly, allows services broadcast to be grouped together into categories along with relevant schedule information. Combined, this information then becomes the basis for the development of Electronic Program Guides (EPGs) by third parties. While stations need not concern themselves with this aspect of DTV services, let's look closer at the sub systems in a PSIP editor.

System components

The ATSC-PSIP signal is described in ATSC document A/65, which is available at: www.atsc.org/Standards/A65/. It provides, in minute detail, the characteristics of the PSIP signal that all terrestrial (and cable) broadcasters must provide. Typical information to be transmitted includes: channel designation, start/stop times, service provider, classification, even program ratings. The PSIP signal forms the very basis for proper tuning of your viewers' receivers and the development of Electronic Program Guides (EPG). Specifically, A/65 describes six tables, which carry this information:

- The Master Guide Table (MGT) defines the type, packet identifiers and version for all other PSIP tables, except for the system time table, described below.
- The System Time Table (STT) provides current date and time of day.
- The Rating Region Table (RRT) defines the TV parental guideline system.
- Virtual Channel table (VCT) defines the MPEG-2 programs embedded in the transport stream.
- Event Information Table (EIT) defines information such as title, start/length for a defined virtual channel.
- Extended Text Table contains advanced textual descriptions about channels and events.

Organizing the confusion

Just getting this information together is a challenge. Even if you have it, getting it into a compatible form for transmission is another matter. This is where you need a PSIP table editor and injector.

A PSIP editor typically includes a graphical interface allowing the user to verify the data obtained from other sources (program name, length, etc.) and then enter user-specific information like VCT on which the program will be carried.

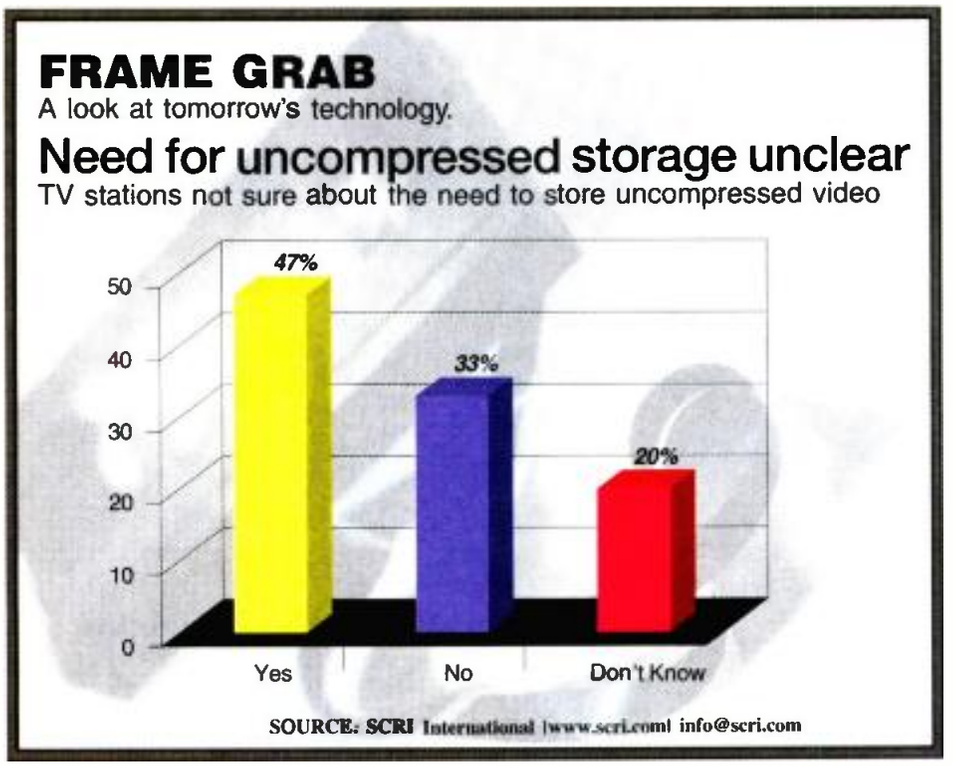
PSIP editors typically provide several types of edit windows because the data editing has to be carried out in different formats. An edit window may show the main values of any selected table item. The operator can then tab to the correct field and change any desired data.

Key to a good working solution is a Global View window so operators can verify that each table is correctly linked to its parent/child table for proper program identification and control. Other windows may provide selected editing functions combined with importing features so the tables can be edited with relative ease.

Data verification

The final task of any PSIP editor is to verify the data is correct. Typically two types of verification take place; intra-analysis and inter-analysis.

Intra-analysis will confirm that the data entered, either by the operator or imported from external sources, conforms to the standards for that partic-



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ular table. For instance, text data would be acceptable for a program name, where numeric data would be required for a program length field. More sophisticated checks are also performed.

Inter-analysis checking verifies conformance and consistency between all table files. Any mistakes will be flagged and the operator can make the necessary corrections.

PSIP coding has yet to become a fact-of-life for many DTV stations. At the recent Broadcast Engineering DTV'99 conference, a check of five DTV stations showed that only two were even transmitting PSIP information and only one had made a serious attempt at being sure it was consistently accurate. The others could be described as far short of a working solution.

For now, stations should budget for PSIP insertion equipment while considering, perhaps, a larger-scale solution to the task of data generation. The answer for many stations may be third-party solutions, where economy of scale overrides the advantages of being able to make last-minute "tweaks" on their datastream. ■

Send questions and comments to:
brad_dick@intertec.com

Program System Information Protocol

BY MARVIN BORN

PSIP is a substream of the auxiliary data channel in the ATSC's Grand Alliance DTV transport datastream. One only need look at one of the DTV services automatic program guide or a local program listing to see PSIP's end result. PSIP is the electronic program guide of DTV.

Stations compile their program information, either from log information or manually input data. This data is then formatted into the PSIP protocol, fed to the DTV encoder where it is multiplexed into the digital TV broadcast data and then sent out to the world. From this datastream, ATSC-compatible receivers make a table of program information that typically contains about 14 days worth of program information. How the information gets into the system is one story and how it gets to the home is another, more technical story.

The general steps for an NTSC station's listing in print media are deciding what's going to be on, getting that information to program information clearinghouses, and then waiting for the information to appear in print.

Digital means change

With DTV and its multichannel and/or HD capabilities, most stations will eventually have to do two or more program listings. That means an even greater demand on a manpower pool that, because of the other demands of DTV, is already frighteningly shallow. To make the system successful, engineers need to embrace a functional system that is a minimum drain on the station's bottom line.

There are two ways to program PSIP equipment. The local method would be to install a PSIP embedder in your ATSC encoder and feed it via a PC server. A computer workstation running compatible software can be used to manually enter the list and then, via a station's LAN, feed the PSIP server. This information could be updated as often as desired, from every hour to once in a blue moon, as dictated by changes in programming and station-by-station judgements as to the value of accurate information vs. the cost of updating. Designers and manufacturers of such equipment who can minimize the cost of operation will be the winners in this market. Equipment is a one-time capital cost, while manpower is a reoccurring fixed cost. For most stations, providing PSIP data is a manpower-intensive process, involving spreadsheets and fax machines. As such, it is expensive and time-consuming. PSIP works, but there has got to be a better way.

The better way

Harris, along with Lucent and Tribune, is developing a fully automatic PSIP system called PSIP Plus (www.psip.com).

In the Harris system, station information is collected as usual and sent to Tribune. If there is a separate HD/multichannel program listing, that too is forwarded. This information is then compiled into a separate program guide for each subscriber and that guide data is file transferred through psip.com . The station retrieves the information and loads it automatically into the PSIP server and finally into the Lucent encoder where it is loaded into the datastream and sent to the home. The last step, a method of compiling logs for their eventual contribution to program information clearinghouses, is in the works.

A local station is capable of generating its own program guide. The station traffic system would be programmed to search for and copy the program name, start and run times from the log into a file. This file can be edited manually if desired or simply forwarded electronically to a clearinghouse company. That clearinghouse would then compile a composite PSIP datastream for each TV market in the country. That composite PSIP stream could then be downloaded to a local PC server and fed to the PSIP multiplexer in the encoder. The system is as automatic as the station needs it to be, with no need for local intervention unless there is a change. Updates could be done locally as often as necessary. For those stations wanting a high level of accuracy, last minute changes or pre-emptions could be promoted via the PSIP within minutes.

At first glance, promotion on the PSIP guide would look awkward; however, people will learn to click on the guide for program information rather than go to the trouble of finding a printed guide and looking up the information for the evening. For those of you who don't believe viewers will use PSIP, just look at the guide button on the typical DSS remote. The guide and channel buttons are the shiny ones.

Marvin Born is vice president at WBNS-AM/FM/TV in Columbus, OH.

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Datacasting

BY BRAD GILMER

The DTV standard allows broadcasters to transmit data as much as 1200 times faster than VBI technology. That rate can be raised even higher if one is willing to sacrifice picture quality. With this capacity, new applications for broadcasting data become feasible. This month we will look at one such application, caching webpages to a user's PC.

Offline and on-air

Here is the proposition — for a fee, you are going to send the top 50 websites to subscribers' PCs. The pages will be stored locally, allowing almost instantaneous retrieval. What are the steps you would need to take to do this? What hardware would you need?

The first step in the process is to retrieve the data from the Web and store it locally for broadcast. Second, the data is scheduled for transmission. Third, the commonly used TCP/IP protocol must be translated to UDP/IP, a multicast address must be set, and *forward error correction* (FEC) must be added (more on these steps later). Fourth, an ATSC *program identifier* (PID) must be assigned to the data channel. Finally, the data must be added to the ATSC bitstream.

Let's take a moment to examine some of the issues surrounding protocol conversion for data broadcast.

Most traffic on the Internet uses *transmission control protocol* (TCP) running on top of *Internet protocol* (IP), sometimes written as TCP/IP. TCP has two characteristics that make it very desirable for the Internet, guaranteed delivery and point-to-point communications.

TCP guarantees delivery by using a two-way connection between computer systems. The computer sending the data packet receives an acknowledgement that the packet has been properly received. If it does not receive this message, it tries again until the packet gets through. The broadcast environment is different. It consists of a single sender connected to hundreds or even thousands of receivers.

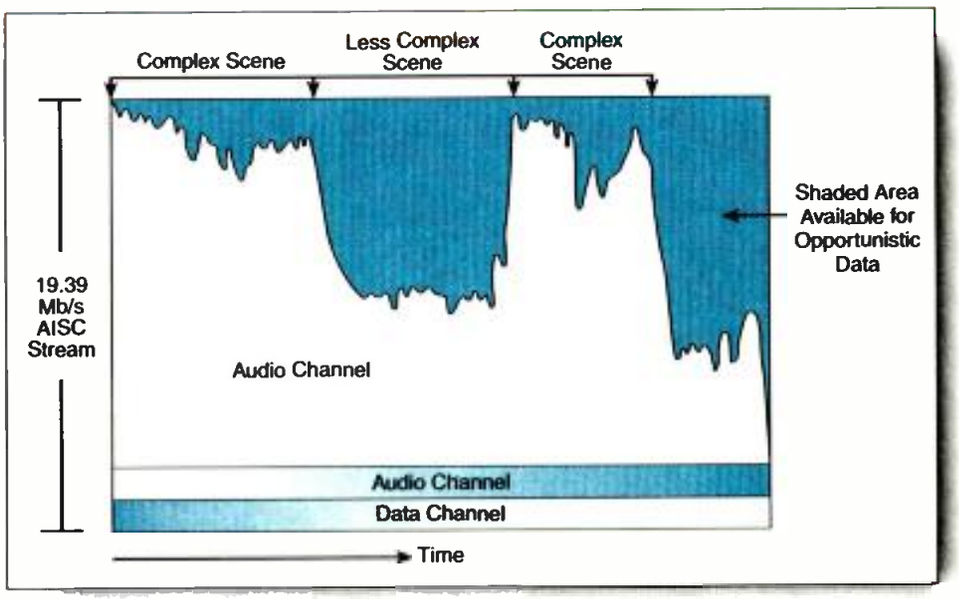

Figure 1. Over time, the number of bits used within the ATSC bitstream varies. Using variable bit rate (VBR) compression, complex video scenes require more bits than simpler scenes. The unused bits (shaded) can be used for opportunistic data. A specified portion can also be set aside for data if desired.

It is impossible for TCP to verify that all of these receivers received the data packet intact. One solution is to use *user datagram protocol* (UDP) running on top of Internet protocol, commonly written as UDP/IP. UDP supports multicast, an addressing scheme that allows point-to-multipoint broadcasting in an IP environment, and it does not require a return path from the receiver. While UDP resolves the issue of multicasting, it does not take care of errors. If the data is corrupted on its way to the receiver, the receiver has no way to request that the data be resent. One way to address this problem is to use forward error correction (FEC). FEC deals with errors by repeating data packets a preset number of times, giving the receiver several chances to receive the data intact. The data is transmitted with a checksum so that the receiver can determine if the data was corrupted during transmission. If the data was corrupted, the receiver throws out the data and waits for it to be sent again.

By reading this column regularly, you know that specific vendors or model numbers are rarely mentioned. In this case, however, it may be useful to cite specific hardware.

SkyStream of Mountain View, CA is a manufacturer of data broadcast technology. Harris Broadcast is the exclusive distributor for SkyStream products for broadcast. Their product, JetStream is a combination of software packages that allows the broadcaster to collect and transmit all sorts of computer-based information.

- JetWeb is an application used for retrieving Internet information and storing it locally. The user can select target websites and set the level of pages within the site to be retrieved. The software also modifies the URLs so that the pages are properly reconstructed for local browsing.
- JetQueue is an application used to transmit scheduled services to the home PC. It can transmit any file including webpages, Java applets, and banner advertising. In an interesting twist to the new Emergency Alert System (EAS), the system can also be programmed to pop up emergency warning messages.
- JetControl is an application that is used to schedule tasks for the other programs. JetControl is similar to the front-end of an automation system. Running a play list, it directs which

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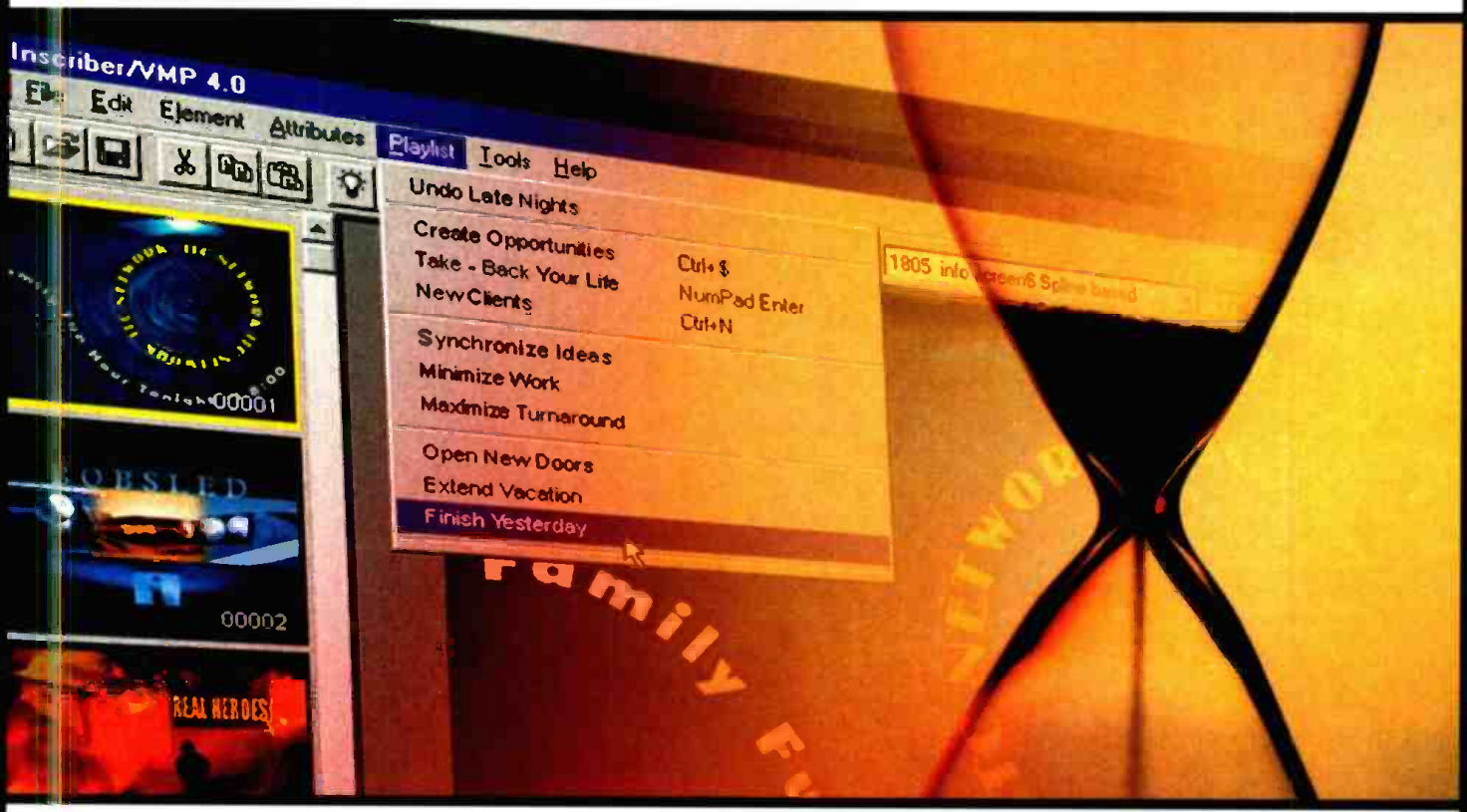

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streams of data should be played out at what time, and when data should be retrieved from the Web.

• The SkyStream DBN-25 takes TCP/IP output of the JetStream server and translates it to UDP/IP and adds FEC. The DBN-25 then inserts the data into the ATSC stream for broadcast.

There are two ways to get your data into the ATSC stream. One is to make room for it within the ATSC multiplex and the other is to wait for available bits and insert the data as these opportunities come along. Figure 1 illustrates both of these concepts and is a representation of the 19.39Mb/s ATSC bitstream over time. At the bottom, a portion of the bandwidth has been reserved for both data and audio. This bandwidth is guaranteed and will not change. The video is being compressed using MPEG-2 in Variable Bit Rate mode or VBR. VBR allows the transmitted bit rate to vary with program content — complex scenes require more bandwidth, simple scenes take less bandwidth. The shaded area above the compressed video represents opportunistic data space. When a simple scene comes along, there is unused bandwidth available at the output of the ATSC encoder. Most encoders pad the output with null packets to increase the output bit rate to the required 19.39Mb/s. (Null packets are packets that contain no data.) SkyStream has created a smart device that looks at the output of the ATSC encoder. It detects null packets and replaces them with packets from the JetQueue.

Every ATSC program stream contains a PID. The PID is used to make sure that video, audio and any associated data remain together as a complete program. In our example, Web data is broadcast separately from video or audio that happens to be being transmitted at the same time. For this reason, the data broadcast must have a different PID from the television program. The DBN-25 takes care of this PID assignment.

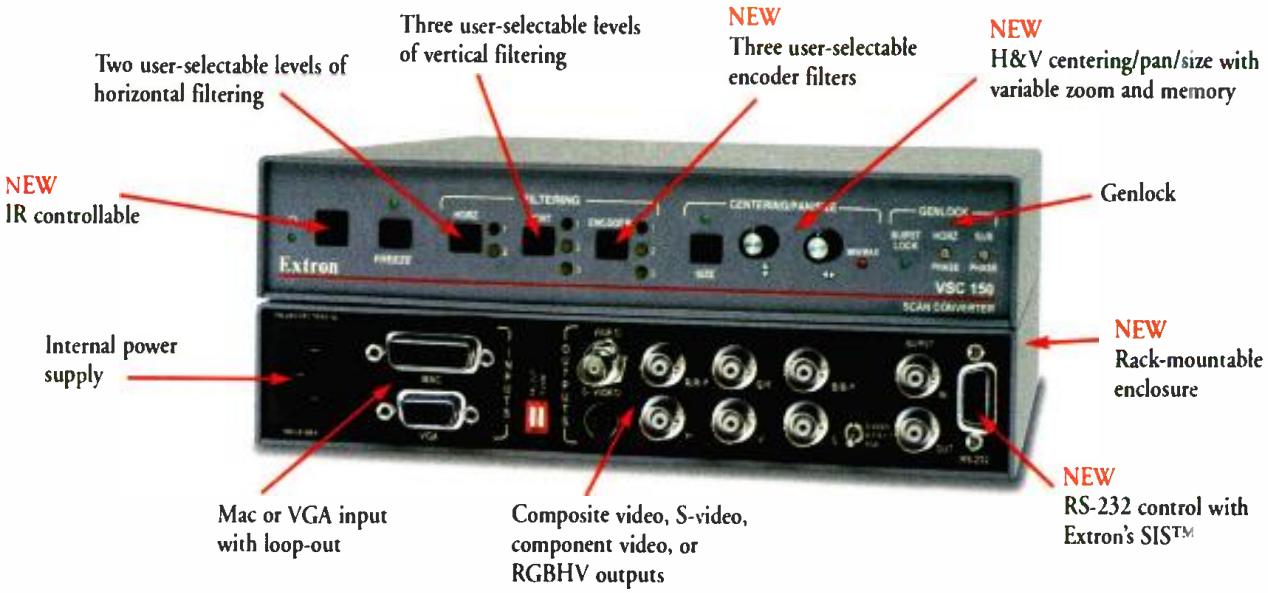
Packet reception

Now that the DTV signal contains your Web data, what do viewers need in their PCs to receive the datacast? First, viewers will need a DTV tuner. Tuners are available from a number of manufacturers including Hauppauge, LGC, TeraLogic, Zenith and Philips. Next, client software such as the JetStream Client from SkyStream will need to be installed. Finally, for this application, a Web browser is needed to view the cached files.

The client software runs in the background downloading information from your datacast. Once the user is subscribed to your data service, files are cached to a directory the user selects, usually the cache directory for the Web browser. When the user starts the Web browser and selects a cached site, it appears almost instantaneously. Sites that are not cached are downloaded via the Internet, with its attendant delay.

This is just one example of how this particular technology can be used. The same approach could be used to stream video or audio to a PC or to stream interactive data to an intelligent television. There are a lot of ideas floating around, but one thing seems clear. Internet users seem willing to pay for immediacy, whether that is in terms of performance, e-commerce, or the ability to find information quickly.

Brad Gilmer is president of Gilmer and Associates, a management and technology consulting firm.



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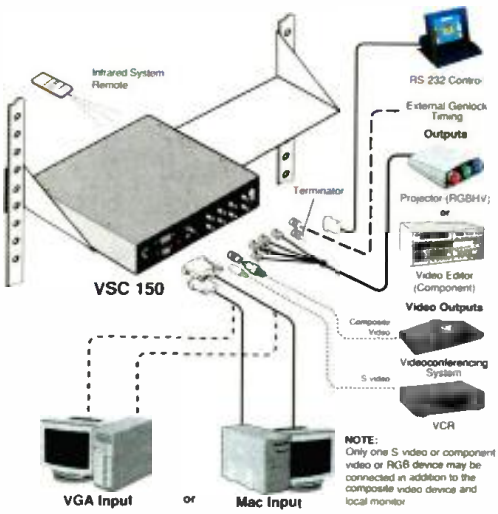

The VSC 150 part number is 60-312-01.
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Ask Dr. Digital

Customer service makes a difference — just ask Avid

BY STEVE EPSTEIN, TECHNICAL EDITOR

I've recently been reading about the financial problems being encountered by the Avid Company. It is a shame that a producer of such excellent equipment should be in such fiscal straits, but I think I know why. As an owner of a Media Composer there have been times that I've needed a question answered, and do you know that Avid will not talk to you on the telephone without a several thousand dollar service contract? They will not even give you the time of day. If you buy a new Avid, you only have 90 days to ask questions before they shut you down.

I go back to the days of the Ampex Editor, Editec, RCA TEP, CMX, and Convergence editing systems. It seemed that back in those days, the equipment vendors were your partners in success, actively supporting both you and their equipment. What a shame; Avid is the progenitor of its own demise. What a shame!

Patrick O'Brien
Chief Engineer
KATC-TV3
Lafayette, LA

I couldn't agree more. I had hoped to include a response from Avid, but as of press time, they had not responded. I suppose that shouldn't have been much of a surprise. Times have changed and customer service has been forgotten (or simply avoided) by many of today's companies. That very fact is much of the reason behind this column. I am here to help you get the kind of support you need to keep your facilities running smoothly. At the 1995 and 1997 NABs I presented papers on customer service and included in those papers were warnings about dealing with companies that were new to, or did not understand, the broadcast industry. Many of those same companies were manufacturers of nonlinear equipment that had come out of the computer industry — many of those same companies are no longer around.

For companies coming from the computer industry, I think the problem is two-fold. First, they do not understand the 24-7 nature of the broadcast business.

Software is an interesting product in that you can sell it, and you still have it to sell again.

Second, in the Mac and PC worlds, the concept of simply rebooting the system to fix problems seems to be acceptable. That concept is not universal within the computer industry as evidenced by the growing popularity of Linux and open source software.

Hardware is one thing, software is something else entirely. Software is an interesting product in that you can sell it, and you still have it to sell again. Some have compared it to prostitution. A very good book "Code Complete" by Steve McConnell, states that good software is never finished. Features can always be added, and the code can always be tweaked. All of us have gotten used to installing patches and upgrades to software. For those seriously into computers, upgrades can become an almost daily passion. From the manufacturer's side, constant code revision and support are very expensive. The same is true on the customer side, however, on the consumer side, you can add lost time, revenue and the cost of making the repairs/upgrades. Is it worth it? I don't know, but I am beginning to have my doubts. The problem gets worse when software companies see those revisions as a lucrative market that can be used to keep, and milk, customers.

All the time I save using computers seems to disappear when I have to spend the weekend rebuilding an ailing system. The more systems I have, the more likely I am to spend a weekend rebuilding one of them. Good backups can make the task quicker, but it does not eliminate the need to do it. Depending on where the problem is, the backup may simply reinstall the problem on the system.

Maybe though, there is light at the end of the tunnel. With the potential breakup of Microsoft looming and the downsizing of companies that have not provided support for their customers, maybe the rest of the companies out there will get a clue. Our IS department has recently begun treating us as customers – rather than annoyances. Last week they waited to take down the servers (and stop production) until 10:00 p.m. rather than doing it at 4:30 p.m. the way they used to. How's that for customer service?

Next time before you buy a piece of equipment, call the manufacturer's customer service number on a weekend or at 8 p.m. on a Friday—plenty of time before the 10 p.m. newscast, and see what kind of response you get. Do some digging, talk to current customers and find out how well they are supported. Certainly the up-front cost of broadcast equipment is substantial, but in many cases, it is minimal compared to the costs involved after the sale. Consider how much it will cost to replace that piece of gear if it has to be thrown away because it is no longer supported.

As always comments and questions are welcome. Send them to *drdigital@compuserve.com*. Or, if you simply want to place a vote of no confidence in the computer industry, 9800 Metcalf, Overland Park, KS 66212. ■

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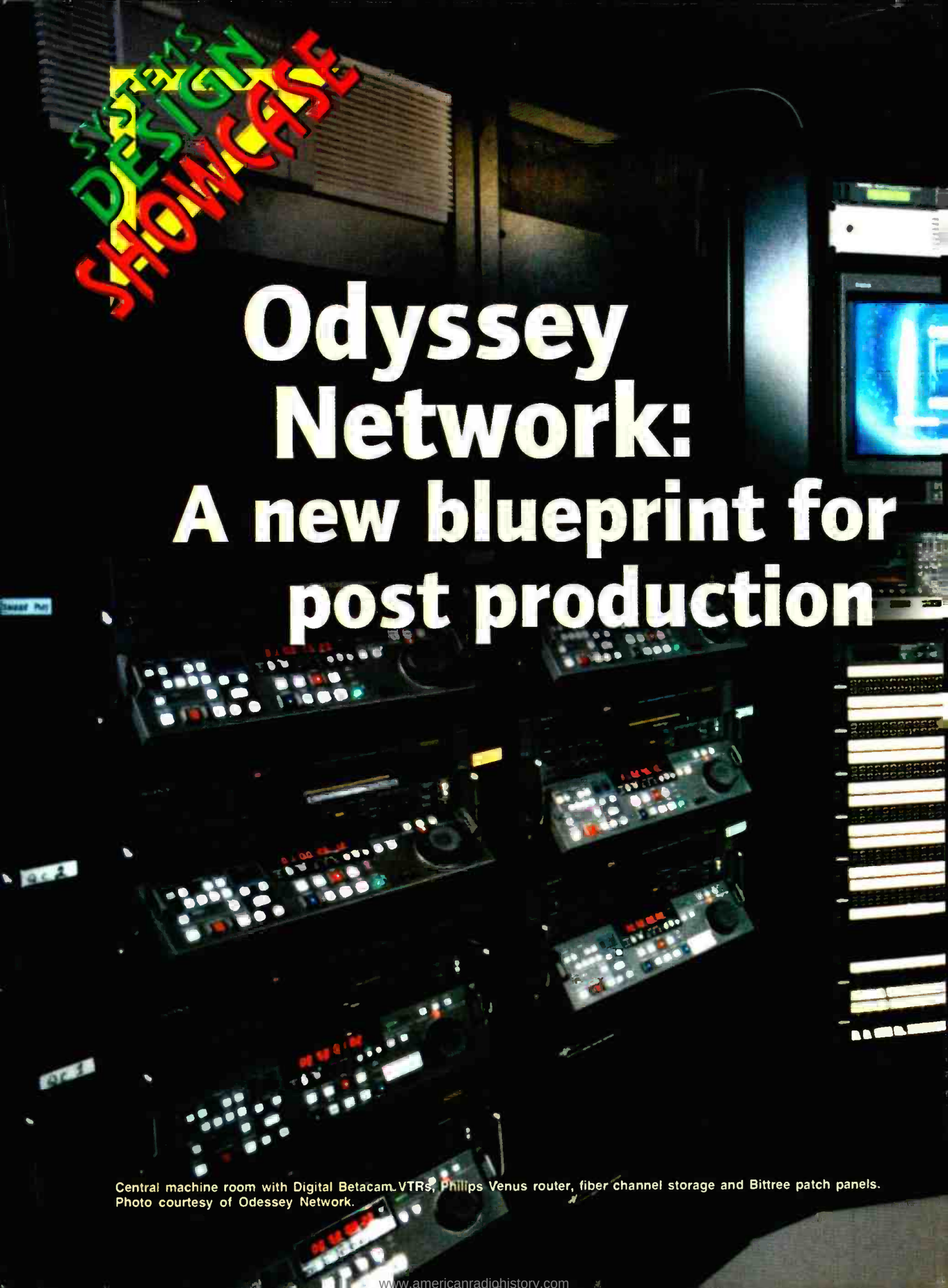


Central machine room with Digital Betacam VTRs, Philips Venus router, fiber channel storage and Bittree patch panels. Photo courtesy of Odessey Network.

Mark Stolnitz and Ken Spickler

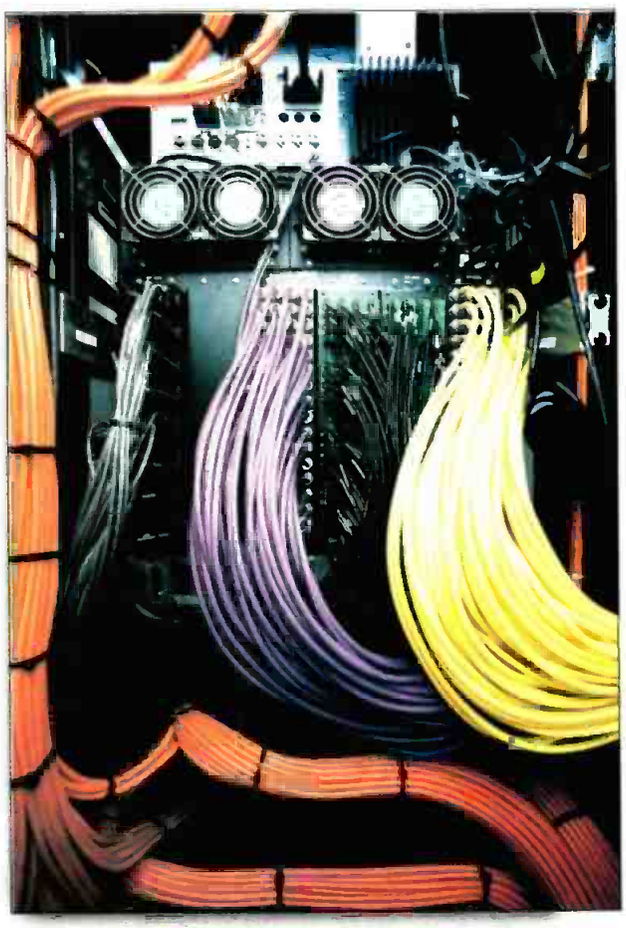
Odyssey Network is a 24-hour-a-day program service that provides a diverse slate of high-quality, family entertainment programming to a national audience of nearly 30 million subscribers. When The Jim Henson Company and Hallmark Entertainment became new partners in Odyssey in November 1998, joining Liberty Media Corporation and the National Interfaith Cable Coalition, the company planned a rebirth with a revised program schedule that debuted on April 4, 1999.

Odyssey Network

An online editor at the controls of Avid Symphony on Windows NT. Photo courtesy of Odyssey Network.

Odyssey seized this opportunity to establish its own in-house post production facility at its headquarters in Studio City, CA. The essentials would include a tape library, offline edit suites, graphics and effects platforms, an online bay and central machine room — all the usual suspects for a complete post production capability. In this case, however, the timing of the installation was such that Odyssey could take advantage of the latest advances in desktop post production for editing, graphics, effects and digital storage and networking to create a state-of-the-art facility that would be a showcase of economy and efficiency.

Mark Stolnitz, Odyssey's director of creative editorial services, selected 3 Point Digital, the Burbank-based reseller for Avid Technology systems, to specify the equipment packages and provide the integration services. The design team chose three Avid Media Composer 1000s for offline editing. Two Avid Softimage Media Illusion suites would feed the offline bays with graphics and effects. These bays in turn would feed an Avid Symphony for uncompressed online finishing. A central machine room, networked to each of the graphics and edit bays via digital routers, would house the tape decks and digital storage. Finally, Odyssey required a linear online bay for formatting shows from their vast library of tape-based programming.



The unseen art of systems integration: rear of the Philips Venus router. Photo courtesy of Odyssey Network.

A seamless transition

With the basic elements decided, the task now was to accomplish the build-out without interrupting Odyssey's normal operations. In preparation for the transition, 3 Point Digital set up the three Avid Media Composer 1000s and the Avid Symphony off-site so that creative services could begin building programming in preparation for the April 4th deadline. Ken Spickler, 3 Point Digital's senior systems engineer, created the central machine room layout in VidCAD and duplicated the floor plan in 3 Point Digital's Burbank facility. Racks were situated based on the schematics. The routers, VTRs, patch bays and other hardware were all inserted and cables were cut to fit. Meanwhile, the electrical contractor installed the wire ladders and troughs at Odyssey's Studio City location. 3 Point Digital cable installers then began pre-wiring the bays to the machine room. The Avid suites and the machine racks all converged at the new site over a long April 2 weekend. By April 4 the reborn Odyssey cable television network debuted its new schedule and the technical transition was seamless.

Offline

The centerpiece of each of the offline bays is an Avid Media Composer 1000 with serial digital I/O. The Media Composers are each equipped with a Tascam DA60 DAT with timecode, the Digidesign audio plug-in suite and a JL Cooper Fadermaster enabling the editors to create finished audio tracks. All VTRs are housed in a central machine room along with fiber channel storage networked to the Media Composers via Avid MediaShare/FC. A Blue ICE board in each system accelerates graphics rendering.

Graphics

The two graphics suites, featuring Avid Softimage Media Illusion and Marquee, are powered by SGI Octane systems. The Media Illusion, a nonlinear, tree-based graphics and effects

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Odyssey Network

platform and Marquee, a 3D titling package, provide finished graphics and effects to the off-line and on-line bays. The Media Illusion readily imports timelines from the Media Composer projects, and automatically conforms and recreates the effects from the original uncompressed sources.

Online

An Avid Symphony, running on Windows NT, anchors the three off-line rooms to provide an uncompressed digital on-line finish. The nonlinear online capability of the Symphony makes it an ideal platform for re-versioning. When the original promo is completed, Stolnitz archives to Digital Betacam several versions at different levels for use later if a program comes back for a rerun. The first is a fully mixed submaster, but without the topical audio or graphics. Rather than having to rebuild the entire project all over again, the editor redigitizes the promo at full res into the Symphony, puts on the new tags, then outputs it again. Another submaster actually consists of two tapes, a Digital Betacam and a DTRS multitrack audio cassette, via a Sony PCM-800. The PCM-800 gets a full eight-track split audio and the Digital Betacam gets just the picture without any graphics.

Keep it central

Sharing resources between creative services and operations was one of the primary objectives in the design of the facility. Rather than set up each of the nonlinear bays as a standalone edit bay with its own VTRs, the central machine room was designed around eleven Digital Betacam VTRs and a Philips Venus routing switcher.

Because operations use VHS for doing dubs, the router needed to handle analog composite video as well as analog audio. A Philips router with multiple levels that could accommodate serial digital video, analog composite video, analog audio, as well as machine control, provided the solution. Four channels of digital audio were handled by a pair of NVision NV3064 75-ohm AES routers. Bittree patch bays provide complete backup for the routers, should they ever become disabled.

180Gb of shared fiber channel storage is networked via Avid MediaShare/FC to the three Media Composers. Controlling the Avid media by fiber channel provides the flexibility to go from room to room without having to lay anything off to tape. Offline material is digitized at a low resolution of AVR3s, which allows nearly 30 hours of storage. The graphics suites and the Avid Symphony also have fiber channel storage in the machine room. Locating the storage in the machine room reduces the noise level produced by drives and fans in the edit bays.

Desktop online and graphics suites coupled with shared storage and networking solutions enable broadcasters like Odyssey to create a highly efficient infrastructure that may be the blueprint for the future of post production.

Managing the media

Centralized storage also eliminates the nightmare of sneaker-netting removable drives, not to mention the additional personnel that would be needed to keep track of the drives. Each of the editors manages the media from their own desktop. Managing this volume of data requires a simple scheme of creating profiles in the Avid for the drives. One profile is for month "A" and a second for month "B." Loading up profile "A" allows access to specified drives. When month "B" comes along, new material is digitized to that profile. Month "A" just keeps getting older and older. When it comes time to use that space again, month "A" media is wiped out, the drives are restriped and ready for loading the third month's worth of material.

How sweet it is

The finished audio tracks are completed right in the Media Composer 1000s. Eight tracks of digital audio, in and out in real time, coupled with audio plug-ins from Digidesign, enable the editors to create sophisticated sweetened audio finishes. For example, the Focusrite ds plug-in helps a voice-over pop out over the background without losing the background. Music is imported from compact disc via the

180Gb of shared fiber channel storage in the central machine room. Photo courtesy of Odyssey Network.

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CPU's CDROM drive, and is stored as a computer file. Since CDs lack timecode, redigitizing from specific in and out points would be nearly impossible. Importing audio as a computer file guarantees accuracy every time.

The editors output the audio as a finished two-channel full mix to Digital Betacam, which is then digitized into the Symphony. Using the original project file created on Media Composer as an EDL, the picture is digitized uncompressed and married to the audio, then output to the master reel that goes to New York for playback.

Linear backs into the future

While nonlinear is the backbone of creative services, there is no escaping the simplicity of a linear bay when it comes to formatting. Significant portions of the facility's operations are devoted to reformatting programs from Odyssey's extensive libraries for broadcast. What began as a bare-bones suite for punching black holes into programs swiftly evolved into a more fully equipped edit bay as Odyssey's program editing needs became more complex.

An Abekas 8150 switcher, Sony BVE-9100 edit controller, Graham-Patten D/ESAM 230 audio mixer, Videotek color corrector, along with a Pinnacle Deko 100 character generator, completed the linear online edit bay.

In addition to formatting, operations also needed the ability to time compress or expand some show segments to match the programming slots. For this, Odyssey added Sony's Program Play board to one of the facility's Digital Betacam playback VTRs.

Since the facility integration was completed in April, some additions have been made. An internal CATV distribution rack was added, sending network satellite and router feeds to office televisions. A fiber connection to a local satellite uplink facility was also added, enabling last-minute projects to be beamed to New York without the need of a courier.

Odyssey recently upgraded the Avid Media Composer 1000s to the new Meridian-based Media Composer 1000XL. Since the Meridian takes in uncompressed video, this makes each of the three offline bays an online bay. The editor who starts the project now finishes the project himself, further streamlining the workflow. There is no potential for anything being lost in the translation between the offline editor and the online editor. The time savings more than compensates for the single-stream capability of the Mac-based Meridian system, which must render any transitions. Additionally, the MediaShare/FC storage subsystem has been upgraded to the new Avid Unity MediaNet, which allows greater control over media management, as well as integration with Avid Symphony in an upcoming release.

The Odyssey Network is an early adopter of new technologies that enable broadcasters and production companies to take control of their costs by bringing post production in-house. Desktop online and graphics suites, coupled with shared storage and networking solutions, enable broadcasters like Odyssey to create a highly efficient infrastructure that may be the blueprint for the future of post production. ■

Mark Stolnitz is director of creative editorial services, Odyssey. Ken Spickler is senior systems engineer at 3 Point Digital.

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Charles Zabilski, V.P. of Operations, Odyssey
Claud Ferguson, V.P. of Engineering, 3 Point Digital
Ken Spickler, Sr. Systems Engineer, 3 Point Digital

System Integration Team:

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Rick Purvis, Integrator, 3 Point Digital
Greg Laurichesse, Integrator, 3 Point Digital
Ryan Philips, Integrator, 3 Point Digital
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Patrick Bravo, Avid Engineer, 3 Point Digital
Shaun Dow, Avid Engineer, 3 Point Digital-San Diego
Jeff Quayle, Avid Engineer, 3 Point Digital
Sean Yarbrough, Avid Engineer, 3 Point Digital
Billy Woody, SGI Engineer, 3 Point Digital

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Sony DVW-A510 Digital Betacam VTPs (4)
Sony SVO-1620 VHS VCRs (9)
Sony PCM-800 8 ch. Audio Tape Recorder
Sony BVE-9100 Edit Controller
Abekas 8150 Digital Switcher
Tektronix WFM-601A waveform monitors (6)
Tektronix WFM-601M waveform monitor
Tektronix 764-02 digital audio monitors (8)
Tektronix SPG422 master sync generator
Avid Media Composer 1000 NLEs (3)
Avid Symphony NLE
Avid SoftImage Media Illusion workstations (2)
Pinnacle Deko100 character generator
Videotek SDC-101 serial digital corrector
Graham Patten D/ESAM 230 digital mixer
Philips Venus 4-level 32x32 router
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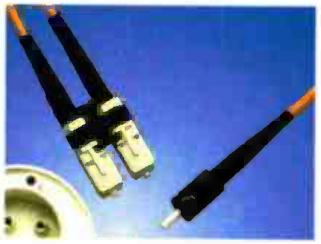

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Transmission & Distribution

Keeping it legal

BY DON MARKLEY

Now that the holidays are over and the bills paid (or at least considered thoughtfully), it may be time to revisit the transmitter site and check on a few of the basics. One parameter that is of great significance to any operation is the operating power into the antenna. When it is too cold to do much outside in a large part of the country, read the regulations regarding power measurement (hopefully not for the first time) and check to see both that the power output is correct and that the method of power measurement being used is also correct.

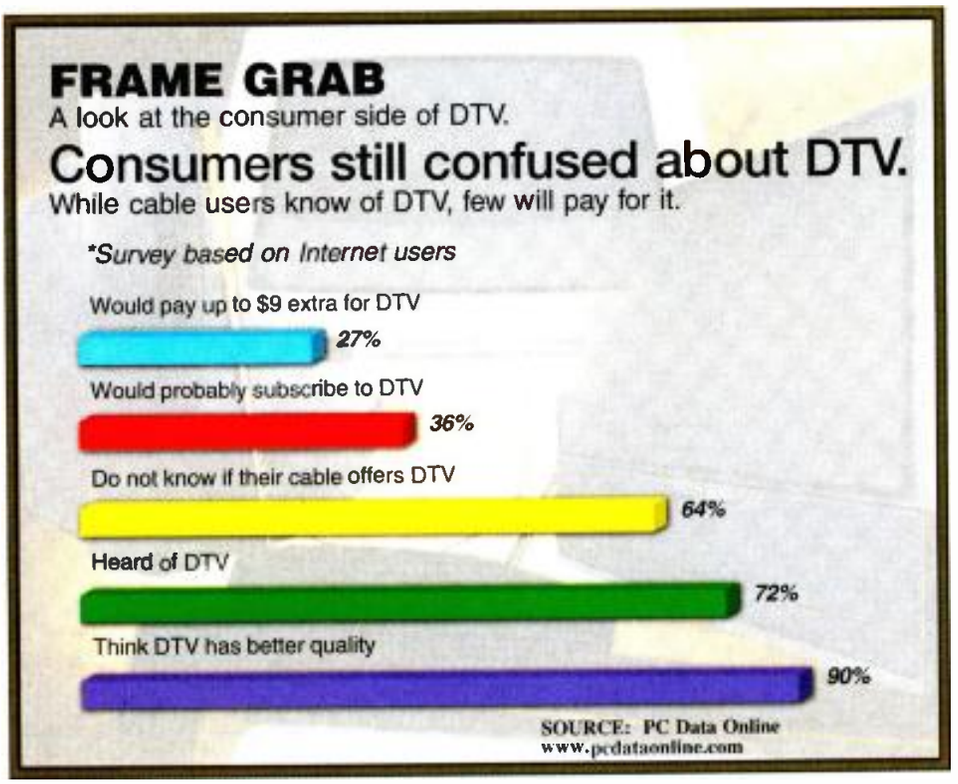
Power calibration

For television power calibration, the preferred method is the use of a calorimeter with a station load. The rules specify the type of modulation to be used during measurements. For those who have forgotten their high school physics or for those who's class was somewhat lacking (this author's high school physics wasn't totally convincing in even such basics as "the earth is round"), a review of the principles involved might be in order. The calorimetric method simply uses a flow meter to measure the rate at which coolant is passing through the load. Laboratory grade thermometers are then used to measure the temperature of the coolant going into the load and leaving the load. When the temperature difference and flow rate are known, the amount of heat supplied to the coolant from the load, as supplied by the transmitter, can be calculated as modified according to the type of coolant in use.

The principle is simple. By definition, one calorie is the amount of heat that must be supplied to one gram of water to raise its temperature one degree Celsius. Next, 14.33 calories are equal to one watt. With lots of conversion factors, a constant will be found that directly correlates flow rate of the water in gallons per minute and temperature change to watts. The one kicker here is that the specific heat of the coolant will not be equal to that of water if antifreeze has been added. The solution is simple. Check two areas. First, check the antifreeze used. The specific heat should be given in terms of the mixture that is being used in the transmitter. That can then be used to determine the correct conversion factor from the information contained in the instruction book for the calorimeter. If in question, call the manufacturer of the calorimeter and tell them what type of chemicals you are using and what the percentage of that chemical is in the coolant. They will then be able to supply the correct conversion factor.

Transmitter power should be calibrated from 80 percent of authorized power to 110 percent. If the transmitter can't make 110 percent of authorized power, a not unusual occurrence, the meter is to be calibrated at the highest possible power and that value is to be marked on the meter. If the station should subsequently be found to be operating with an indicated power greater than that value, it would be cited for overpower operation even if it doesn't appear to be greater than normal tolerances. The aural transmitter output meter can easily be calibrated using the calorimeter. The modulation type or amount is not significant as the FM aural signal power doesn't change with modulation (if it does, you have a real problem in the transmitter).

There are some fairly obvious requirements. This includes the fact that the load is to have the same impedance as the transmission line. That refers to the transmission line supplying energy to the load, not the one on the tower. Many stations use 50Ω line around the transmitter and filters, changing to 75Ω line or waveguide after the patch panel. In some cases, the dummy load may be supplied energy via waveguide. Yes,



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waveguide loads are manufactured and they are quite good. However, they aren't nearly as much fun as coaxial loads as they aren't as spectacular when they burn out. This brings us back to the first and most important point in the use of water-cooled dummy loads. Please, turn on the water before you turn on the transmitter. Or better yet, having an interlock to ensure this is a good idea.

First for the AM station which is usually ignored as long as the pattern, if directional, doesn't vary more than can be excused by weather. Power for non-directional antennas is simply measured by the square of the antenna current times the antenna base resistance. The resistance value is shown on the license and is to have been determined by measurement with an impedance bridge. As long as nothing has been changed on the tower, the resistance can be considered to be constant. Any change will first show up as a change in the apparent transmitter efficiency and by a change in the transmitter tuning. If such a change is noticed, power should be measured by the indirect method until the base impedance can be remeasured and the antenna tuning unit readjusted. This is covered very clearly in Section 73.51 of the Rules. The critical point here is that the direct method is always to be used unless an obvious problem exists. Steps are then to be taken to return to the direct method as soon as practical.

Directional AM stations are different in that the power is determined at the input to the phasing equipment at the location known as the common point. That is the input to the initial impedance matching network that matches the input impedance of the power divider(s) to the coaxial line from the transmitter. Again, this can be assumed to be a constant as long as the parameters of the array are constant. As with the non-directional antenna, a change in the common point impedance will first show up as a change in the apparent efficiency of the transmitter and/or a change in the transmitter tuning for normal operation. If a dummy load exists, a first check should be to operate the transmitter into the load to determine if the change has been in the common point impedance or in the transmitter.

The thing that makes AM so easy with regard to power measurement is that good RF ammeters are readily available. While thermocouple meters are certainly acceptable, the toroidal current meters such as those from Delta Electronics are preferable, as they are much less susceptible to damage from lightning.

FM transmitters can be operated by either the direct or the indirect method. When the transmitter first comes from the factory with the meter nicely calibrated, the direct method is applicable. However, unless the station has a dummy load and either a through-line power meter or a calorimeter, the station will have to revert to the indirect method whenever anything occurs which might affect the accuracy of the output power meter. This is discussed in Section 73.267 of the rules for both commercial and non-commercial stations. The only way to calibrate the power meter is through the use of a dummy load. The rules state that the load must be essentially resistive and have impedance equal to that of the transmission line. The problem here is that the dummy load may actually be further from 50Ω than the antenna if the antenna has been properly field tuned. If the station has a load, have it checked the next time your consultants are on site with a network analyzer to determine its accuracy as that directly affects the overall accuracy of the final output power meter adjustment.

Note one item when reading the rules. For FM, the meter is to be calibrated from 90 percent of power to 105 percent of authorized power that covers the normal operating tolerance.

Most FM stations do not have a dummy load. Therefore, most FM stations will find themselves eventually operating by the indirect method when it becomes apparent that the output power meter no longer is totally accurate. While the output power meter will always have a calibration adjustment, it should not be tweaked without confirming the power into a dummy load unless indirect power measurement is used. For those stations co-located with a television transmitter, it is advisable to plumb the FM into the load occasionally to be able to maintain direct measurement operation. Again, it's all covered in the rules.

For television stations, the rules are very specific with regard to visual power and lacking in detail with regard to the aural signal. The output power meter is to be calibrated when the transmitter is initially installed and as necessary to maintain the correct operating power. The requirements are a bit more detailed than for FM and are found in Section 73.664 of the rules. One point here is that there no longer is a specific period for meter calibration. The old requirement of every six months was eliminated in one of the deregulation rule makings. But, like many of the other deregulation changes, the station still is responsible for the accuracy of the metering system and a citation will still be issued if the station is found to be operating outside of the authorized power values as found in Section 73.1560.

There is a saying among pilots who fly retractable gear aircraft. There are pilots who have landed with the gear up and there are pilots who will someday land with the gear up. There are no other kinds (except for your author who wisely quit flying before that costly mistake). A similar saying could be applied to station technicians. Forgetting to turn on the coolant to the dummy load will happen someday. Therefore, a wise precaution is to keep a spare load element on the shelf so everything doesn't grind to a halt in the middle of the night as a strange smell wafts through the transmitter building. ■

This brings us back to the first and most important point in the use of water-cooled dummy loads. Please, turn on the water before you turn on the transmitter.

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

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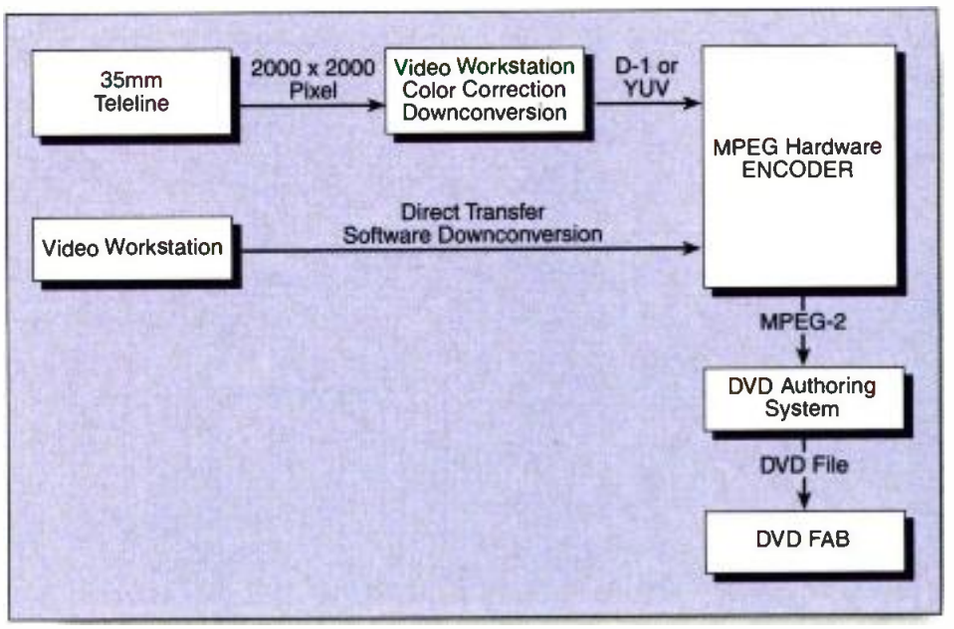
DVD production systems

BY UWE SPERLING

DVD is a major breakthrough for video quality delivered directly in the homes of the end users. It has never been easier to operate and use a medium containing the highest quality audio and video. The biggest advantage of DVD is the fact that the user doe not have to turn the disc. Both DVD and CD have the storage capacity for a movie or an album on one side at only a fraction of the physical size of their predecessors. Home theaters benefit from this technology by generating pictures for screen sizes up to 180 inches that matching the image quality of average movie theaters. However, DVD does not mean high quality pictures in general, and the quality can be even worse than VHS-copies.



Production of film-based DVDs

Source material dependent

The impact of the source material quality is dramatic and really makes the difference between a high-end DVD product and something that is inferior to anything seen before. The major Hollywood companies' nightmare of a garage DVD production facility copying major film releases and producing illegal copies may come true. That garage will be equipped with a VHS-tape recorder, a macrovision decoder and the cheapest MPEG-2 encoder available, possibly an offline software encoder. The resulting copies produced in some garages in the Far East are re-entering the market in lower qualtiy than the original VHS tape — but it is a DVD.

The highest quality DVDs can be achieved with film-based source material due to the high resolution of 2000x2000 pixels of modern telecines transfers. The 35mm film material for today's transfers is of high quality and does not need extensive preprocessing for noise reduction. This is not true for older movies where all kind of noise, dust grain or mechanical damage to the film is present. The quality of these DVDs is determined by the used preprocessing equipment and the skills of the operator. Video processor manufacturers have reacted to this demand and offer a wide range of equipment for this purpose. The fact that the MPEG-2 compression algorithm is based on changes in content from I-Frame to I-Frame makes it highly sensitive to noise. Noise is random in nature and interpreted by the encoder as active programming, which is changing every field. Therefore the better the noise reduction the better the compression algorithm will work, resulting in lower bit rate and better image quality. Modern MPEG-2 encoders encode with a variable bit rate, which means that the signal is processed according to its complexity. DVD has 4.7GB storage capacity for one layer and modern productions use both available layers which are specified in the standard. At a constant bit rate of 6Mb/s the resulting play time for one layer without any audio and interactive data would be approximately 104 minutes. Dolby multichannel audio requires 384kb/s, thus an one-layer production does not leave any space for featurettes or any other popular DVD cookies. There is a freely available tool on the Internet at www.visualdomain.net for displaying the bit rate of any DVD.

The newest generation of movies created almost entirely in computers offers a lossless transfer to DVD which is resulting in overwhelming quality verified by "A Bug's Life." The high-resolution animated video is downconverted to 720x480 (NTSC) or 720x575 (PAL) and then software encoded directly to an MPEG-2 datastream. No noise or any other known analog artifacts of moving pictures can be introduced using this technology. One advantage of film-based source material is the later NTSC 3:2 or the 2:2 format of PAL. Film has a structure of 24 frames per second, which must be converted to 50 or 60Hz field rates. This transformation results in two or three consecutive fields having exactly the same content thus no encoding is required at all. The MPEG-2 decoder simply repeats the first field using a special flag indicating the similarity and then creating 3:2 or 2:2 formats. Home theater PCs equipped with graphics adapter like the G400 from Matrox or the ATI Rage Fury, which are sold with Software DVD-decoders like WINDVD or Cinemaster, take advantage of this described scheme. The playback results of these setups while outputting high-resolution upconverted video signals at

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their VGA outputs feeding high-resolution monitors or projectors are free of any deinterlacing artifacts and produce film like images, which are superior to any other upconverter technology available today.

The DVDs produced for industrial purposes are usually derived from video cameras. Current technology is using the interlaced video programming from D-1, component, Y/C or even composite video sources. The hardware encoder will have to deal with these complex signals and part of the DVD quality will be determined by the analog processing of the input stage. If a D-1 signal is available no other processing than re-equalization and retiming is required by the electronics. If it is a composite signal from a Laserdisc or VHS-tape then color blurring and dot crawl may be visible later on the DVD. The MPEG-2 datastream is component in nature so the input stage has to transform all signals into a digital component signal like CCIR 656, which is then accepted by the hardware encoder chip as a valid input signal.

Authoring

The encoder hardware or software generates a MPEG-2 file that has to be processed by an authoring system for DVD production. When DVD encoding is selected in the encoder program the process automatically generates a seperate audio file which can contain up to six channels. Authoring systems are usually very complex and difficult to operate software packages which require specially trained operators. They combine the MPEG-2 stream and the audio file into a Video Object file, which is the actual DVD datastream.

Many companies have specialized in DVD production that focuses on the authoring. Interactive DVDs have often very sophisticated designs and interactive menues which have to be embedded in the VOB-file, which is later burned in the physical device.

DVDs can have up to 17GB of space if they are dual layer, dual sided. Two-sided single layer or one-sided dual layer DVDs are currently available. Many newer movie like "The Matrix" switch layers in the middle of the film, which is sometimes visible as a small glitch during playback. Usually DVD playback devices cannot be positioned on other frames than I-Frames which contain all picture data, where P- or B-frames only represent the changes. The new Pioneer Professional DVD 7300D has proven the opposite. The unit is recalculating the data so each frame of the 25 of PAL or 30 of NTSC is available using RS-232 commmands or the step forward/back button, no matter if the selected frame is I-, P- or B-Frame. This is was a longtime bottleneck of DVDs because the standards group never thought that DVD would play a major role in the professional buisness and, therefore, did not implement a frame-accurate timecode feature.

In the future, DVD burners will be as inexpensive as today's CD burners, and everybody will have a non-linear MPEG-2 encoder with a IEEE 1394 interface to the digital camcorder that will give them the ability to produce DVDs for their video archives. ■

Uwe Sperling is director of engineering for Comm-tec Labs and Works

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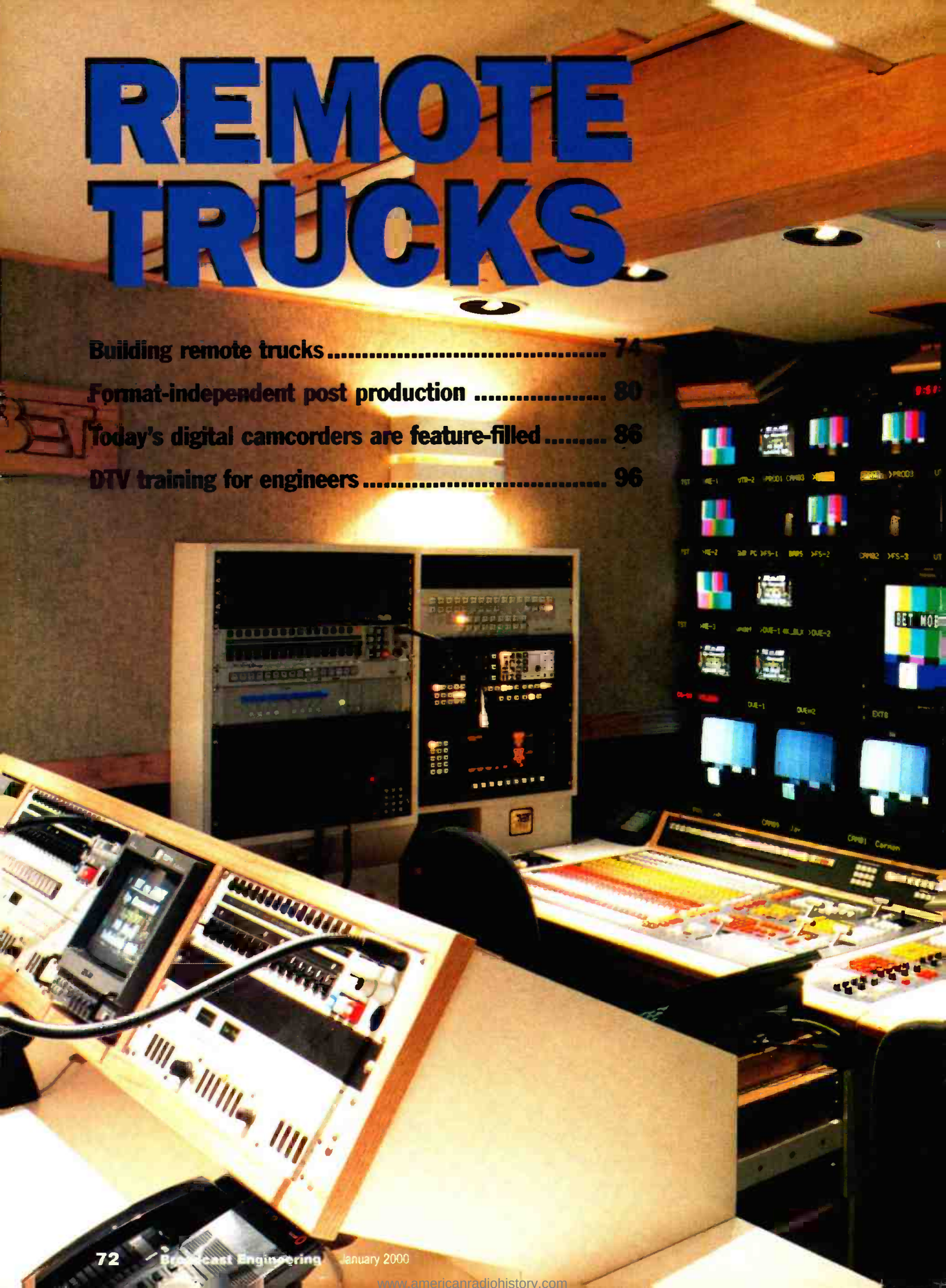
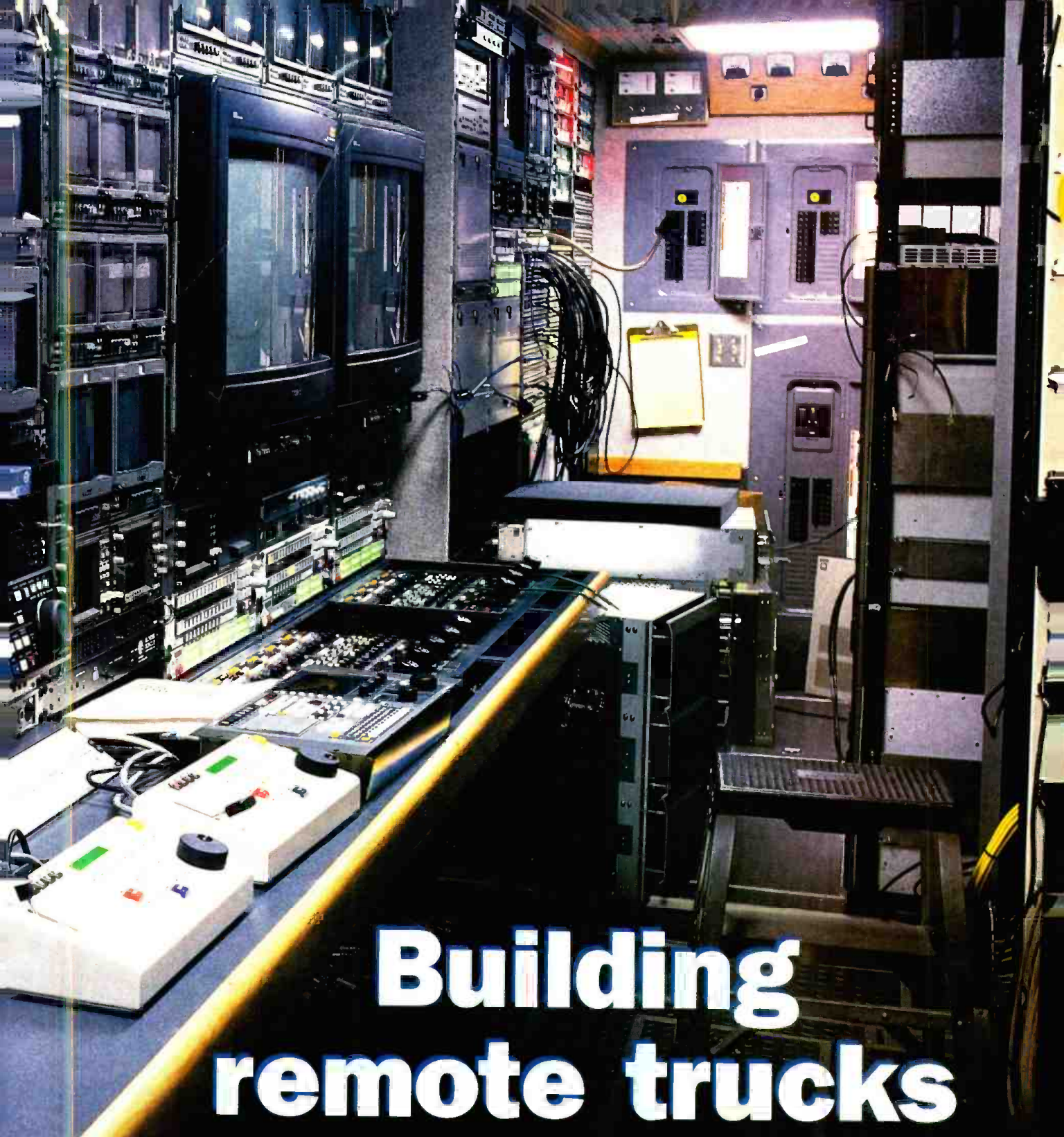
REMOTE TRUCKS



Upgrading your analog truck or creating a hybrid vehicle can allow you to meet your client's demands for digital production capabilities while giving you time to make the leap to a true digital vehicle, such as National Mobile Television's HD unit designed by Bennett Systems and integrated by Sony Electronics. Photo courtesy of Concept: Benson and Rice.



Building remote trucks

By Barry Bennett

Television stations, Congress, and indeed all members of the broadcast community are wrestling with the cost and implementation issues of digital television. Mobile production units, or remote trucks, have their own unique issues, which are equally, if not more, complex than those facing TV stations. For trucks, the ideal goal is to acquire a signal in the highest quality format, maintain that level of quality from lens to I/O panel, and provide a means to get that signal to the point of transmission, such as a TV station. That mission sounds pretty straightforward, doesn't it?

REMOTE TRUCKS

Well, it is — until one considers that the majority of trucks on the road today are analog units surviving in the new age of digital. Methods for upgrading or replacing these aging trucks is the topic of this article, which looks at this issue from several perspectives including technical choices in the video systems and the physical issues facing a would-be upgrader. Marketing needs or demands, the costs and complexities of upgrading vs. replacement, as well as the specific digital format required or desired will also be discussed.

When considering an upgrade, consider your future production needs. Upgrading to a 4:3 digital capability may be less costly and allow you to keep the existing equipment and trailer. Photo courtesy of Bennett Systems.

Preliminary considerations

A few thoughts on format issues are in order before we proceed with the upgrade decisions. In particular, there are two issues to consider with regards to your present and future needs. Those are the questions of 4:3 vs. 16:9 production and the issues of true high definition in whatever flavor suits you. For those that require either 16:9 or true HD, it is unlikely that any upgrade path will be suitable. You will be better served by building from scratch, at least as far as the video system is concerned. It even gets a little more complex than this surface analysis, since you'll be no doubt dealing with additional audio channels, perhaps even digital audio etc. For this article, we will be considering a cost-effective upgrade path to 4:3 digital capability, assuming that a 16:9 or HD upgrade will require new cameras, monitors, tape decks, and assorted other graphics and effects devices. In other words, this means a brand new, from-the-ground-up, mobile unit as opposed to a much less costly upgrade of an existing one. These two needs, 16:9 and HD, requiring a completely new truck, are beyond the scope of this article. However, you may wish to make allowances for a future HD upgrade in the design of your new digital system.

With acquisition, transmission and consumer format issues still not fully resolved, what can truck owners and operators do during this transitional period? As with all issues of this complexity, it depends. Vastly different upgrade paths exist; one is a simple Band-Aid approach whereby the older analog truck remains largely unchanged internally and the final output signal is simply converted to the desired format for transmission and distribution. This is not an upgrade in the true sense of the word, but may sufficiently meet your client's needs for the time being. Although as with all conversions, there will be a signal quality penalty. This may be a prudent, cost-effective and certainly quick solution for an operator of an existing truck or trucks that may still be in the middle or late stages of debt retirement.

It is likely that the day is fast approaching where purely digital trucks are demanded, particularly as more of them hit the road.

However, if your clients have told you that you must have a digital truck to secure their business, this scenario probably will not succeed. It is also likely that the day is fast approaching where purely digital trucks are demanded, particularly as more of them hit the road. Another consideration here is the longer-term implications of the digital truck. If your budget and schedule allow, a new digital truck may be the only solution that makes long-term sense for you. But since we are discussing upgrading here, a brand-new, from-the-ground-up digital unit will not be considered.

There are interim solutions possible that can meet both the needs of the digital client and the budget of the single or multiple truck operator in this transitional period. There are a large number of purely analog trucks out there that cannot simply be retired. Neither costs nor production schedules would allow this. Essentially, the decision being faced here by the truck owner/operator is to either replace the truck or trucks with all new digital units, or attempt an upgrade in one of several hybrid forms.

Primary issues

There are a few primary technical and physical issues facing the truck upgrader, in addition to those of cost and marketability. Technical issues include digital video in whatever form, aspect ratio (4:3 vs. 16:9), and, of

course, digital audio. This audio question could be (and indeed has been) the topic of numerous articles, and will not be discussed in detail here. However, it does need to be carefully evaluated and factored into your decision-making process.

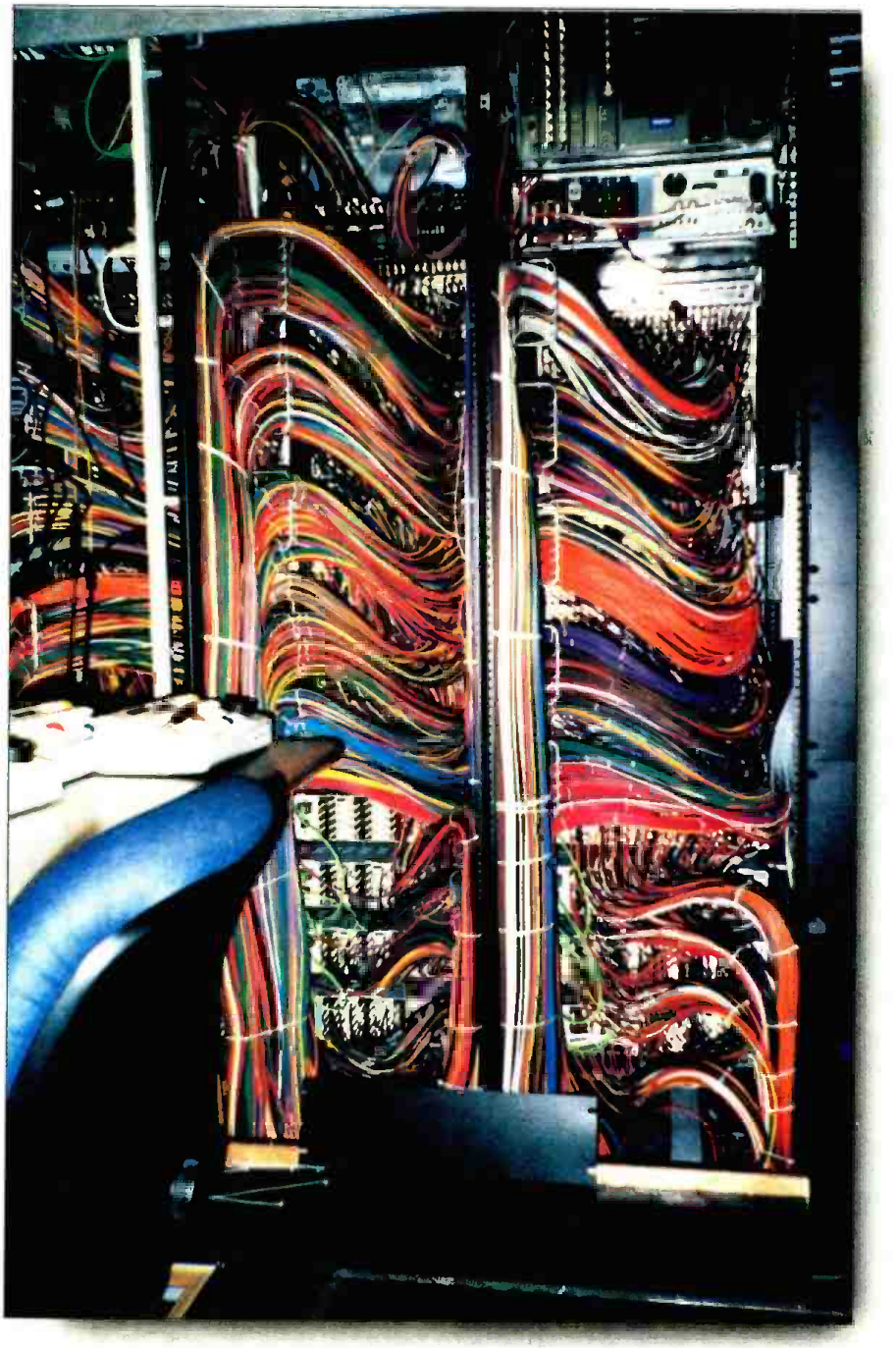
The physical decision is deceptively simple: do you need an expando or is a straight truck sufficient for your needs? In essence, you need to determine if: (1) the basic existing trailer and interior are in sufficiently good condition to warrant an upgrade; (2) the existing trailer needs to be converted to an expando, and; (3) is the equipment in good enough condition to consider keeping and re-using it for a few more years.

Because the primary focus of upgrading the truck is to implement a digital video system, let's begin with the technical issues. The most direct route to this upgrade is the installation of an entirely new digital core. The analog video wiring and terminal equipment will be removed and a new digital infrastructure will be installed to accommodate the existing equipment as well as prepare for digital equipment replacement in the future. Because this is a truck upgrade as opposed to a truck replacement, most of the major equipment will be retained and converted to digital until such time as your budget allows for major equipment replacement or you are driven by marketing forces to complete the conversion to all digital.

While it is perhaps physically possible to retain some of the analog wiring, experience in rebuilding has shown that it is much faster, and therefore more cost effective, to simply replace it. Perhaps a few of the cable bundles can be retained, such as those that run the length of the truck or those that can be easily identified and reused. Of course, you must also evaluate the existing wiring for its digital capability, and in all likelihood you will be either replacing or augmenting the existing patch bay with digital bandwidth panels.

We will consider that the entire video system will be removed and replaced by a digital one, retaining whatever parts of the analog system are dictated by your needs or budget. For the purpose of this discussion, audio and ancillary systems will remain essentially unchanged, although this would probably be a good time to do those little things you have been meaning to get around to and upgrade the rest of the systems at the same time.

Defining the specifics a little more closely, the core digital system will include a purely digital signal path for all of the primary processing. New equipment will include the production switcher, which is really the heart of the video system, and digital distribution amplifiers and processors. The router, more or less the circulatory system of the truck, should also be carefully considered. While the production switcher replacement is necessary, the router needs to be carefully evaluated as to cost, function and future. It will most likely turn out that a digital router is required at this time, even though for the immediate future we are retaining the major analog production equipment, i.e. cameras and lenses, tape decks, graphics and effects devices.



Analog vehicles should be completely rewired to handle digital video signals. Existing equipment can be replaced as client demand and your budget allow.

REMOTE TRUCKS

The cameras, tape machines, graphics systems, still store and other retained analog devices will be converted to digital, at both the input and output where necessary, and integrated with the new digital core. For all intents and purposes, this is now a digital video truck, although digital purists may take issue with this concept. Remember, the concept here is to upgrade the quality of our truck within a budget, and allow for equipment replacement later.

Wherever possible, the conversion to digital will be accomplished in the component analog domain, preserving the highest possible signal quality during the conversion process. The converters on the market today make this essentially transparent and cost effective as opposed to outright equipment replacement. Savings may also be realized through the use of cheaper converters for some of the non-critical paths, such as VHS decks, tuners, timecode burners, and other non-critical video sources.

An analog layer will be retained to handle monitoring and other utility functions such as camera return and utility feeds. If rack space permits, retaining the old analog router can enhance this upgrade considerably, as it can be used for monitor routing and several utility functions. Hopefully, the existing router can be controlled via a common bus with the new one. Even if this is not the case, the analog router can still serve a useful purpose. As the outside world is still moderately to severely analog in nature, interface capabilities must be provided for other trucks and systems encountered on the road.

A brief word on conversions, since this will be the key to the transitional period until you convert all equipment to digital. Each piece of equipment must be evaluated as to whether it makes sense to convert it or replace it. These decisions will vary widely from truck to truck depending on your existing equipment's type and condition, as well as your future plans and budget. A good example of this type of decision is your frame synchronizers. As we're going digital, you will need to convert at least the output, and perhaps the input as well, of these devices. It may make more sense from a cost perspective in this particular case to simply replace them with multiformat devices, as this will also serve to enhance your trucks capability. This is only one example of the decisions you'll face during the planning stages of your upgrade, and each decision must include marketability, present and future cost, and overall function.

The physical decision is deceptively simple: do you need an expando or is a straight truck sufficient for your needs?

Trailer issues

Now, let's explore the physical trailer upgrade issues. You can either: (1) keep your straight truck and rewire it for digital video; (2) Convert your straight truck to an expando and rewire it for digital video, or; (3) Build an entirely new trailer with a digital core, and retain your cameras, tape machines, effects and graphics for the immediate future.

The first big issue to consider is the primary question in considering an upgrade: "Do you need an expando or a straight truck?" This issue will be dictated both by your clients demands, and your plans for the future of this truck. If you currently have a straight truck and you need an expando, you are facing an another big decision — either replace the entire trailer or attempt to have the existing trailer converted. The first option is simple, although the more costly. The second option, while less costly, is much more complicated.

If you will in fact be retaining your straight truck, the primary physical issues facing

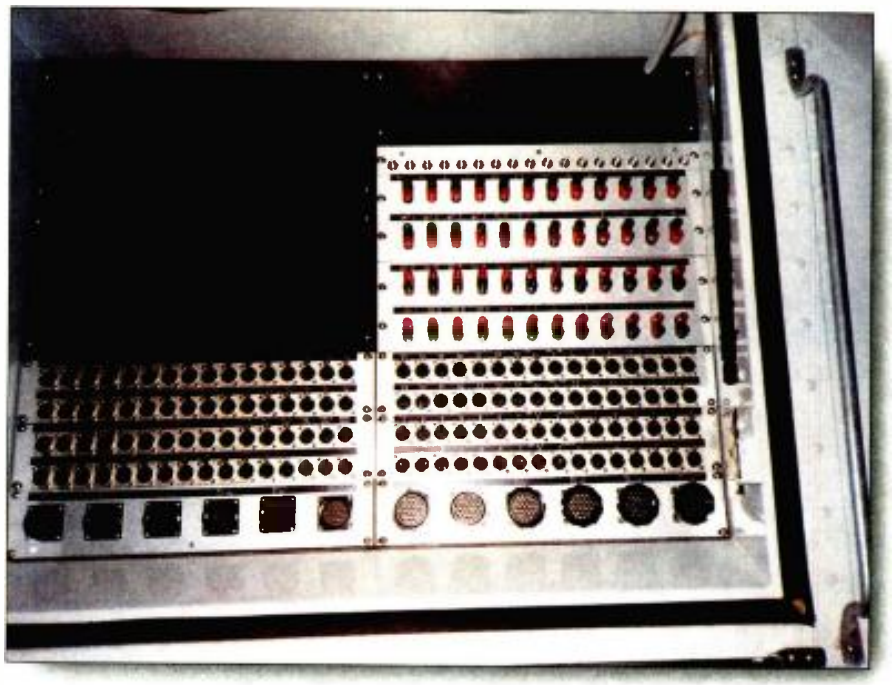
Before beginning an upgrade, carefully consider the floorplan for the vehicle's trailer. In an expando unit, production monitor sightlines must be carefully considered.

you are rack space and the interior appearance and ergonomics. As we'll be gutting the engineering or transmission area, and perhaps the tape and video areas as well, it may be a good time to do an interior overhaul as well. This could include relocation of some racks and modification of the floor plan if it is required in your particular truck.

You probably will need to make several compromises in an expando conversion, if indeed it proves feasible for your existing trailer as opposed to a new build. The existing trailer layout and structural strengths and weaknesses will need to be carefully evaluated. For instance, if you have to gut the entire truck to install this expando conversion, it may make more sense from both a financial and scheduling perspective to simply build a new trailer.

In addition, is the structure of your existing straight truck such that an expando modification is even feasible? As a sidebar to this question, does the existing interior layout lend itself to having an expando section essentially spliced in? These structural issues more or less underlay the entire decision regarding whether to attempt an expando modification or build an entirely new trailer.

The existing floor plan must be analyzed with respect to this proposed expando section. At a minimum, the production area of the trailer must be expandable, as that is where your clients will either relax in total comfort and praise you and your company for their consideration and thought or scream bloody murder at persons real and imagined for "sticking them" with this truck. For the purpose of discussion, we'll consider that only the production area will be converted to an expanding section. Each truck being evaluated for upgrade in this fashion needs to be analyzed as a unique entity. There is no one solution for all situations. Structural engineering analysis will be necessary to ensure that the modified trailer can withstand the new stresses imposed by having its side cut out. In all likelihood you will lose some storage space in the lower belly bay due to the necessary steel structure. And of course, there is the issue of headroom. ... An expando may shorten your ceiling height, and could impact on your air conditioning system. Sightlines for the monitor wall viewing must be carefully considered as well. Depending on your particular interior layout, it may or may not make sense to include other areas of the truck in the expanding area, although at some point the structural integrity may not allow further modifications.



The majority of internal connections are available through patch panels for convenience and maximum flexibility.

While it is perhaps physically possible to retain some of the analog wiring, experience in rebuilding has shown that it is much faster, and therefore more cost effective, to simply replace it.

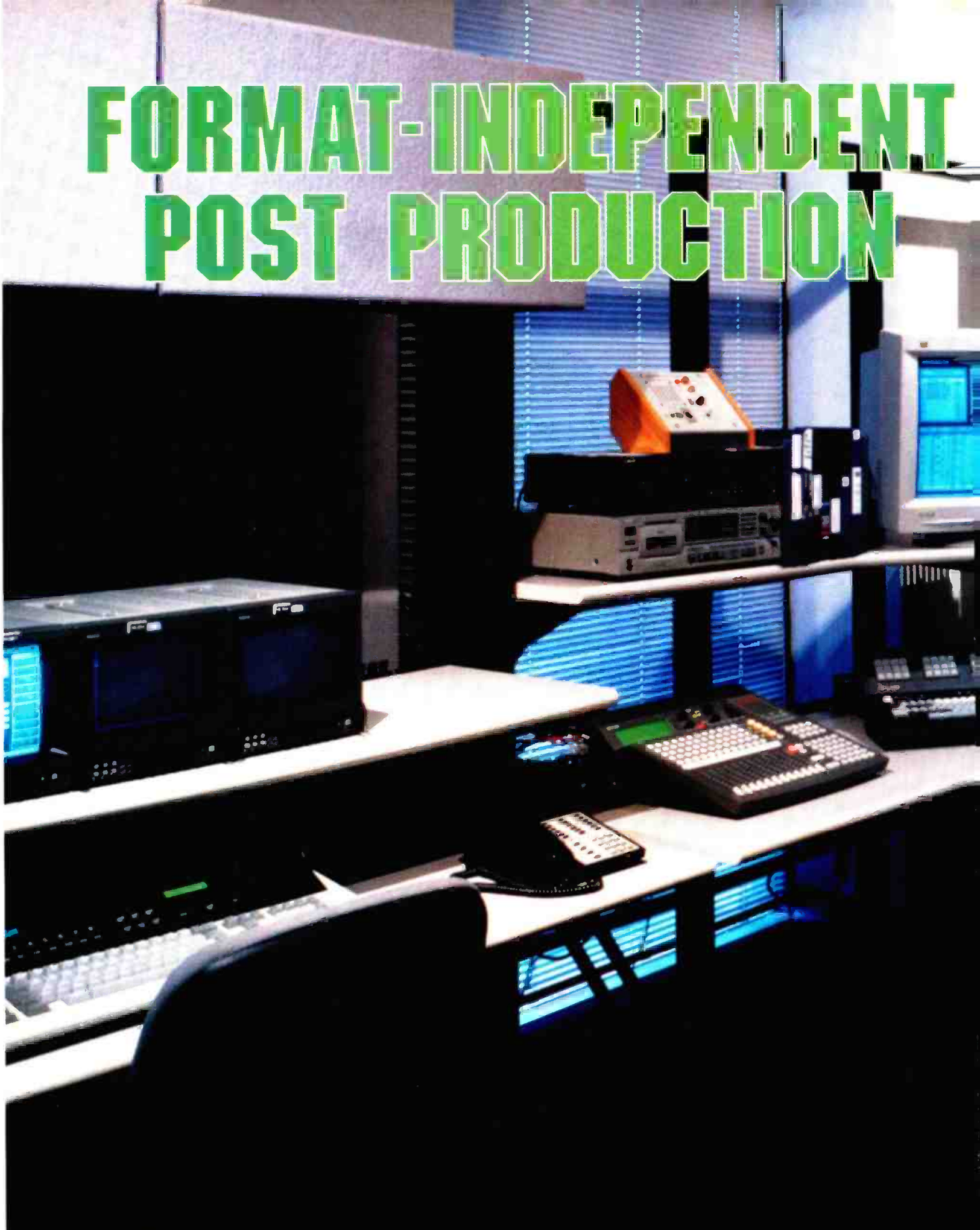
To sum up this process, what we have accomplished by this process is the conversion of an older, analog truck to an upgraded digital video production unit within a limited budget. We have replaced the switcher, router, probably most of the terminal equipment, and virtually all of the video wiring. We have converted the remainder of the major production equipment to digital, while preserving the highest quality possible. We've retained an analog layer for internal utility use and external support, and we have either substantially upgraded the trailer's interior, appearance and functionality, or replaced the trailer with a new one.

If you have retained your old trailer, this upgrade has been accomplished for approximately 30 percent of the cost of a new truck. If a new trailer was included, that figure may exceed 50 percent. Of course, these are estimates; every upgrade is going to be different. The ability to simply replace the analog equipment when the time comes is now a transparent process; simply remove the old equipment and converters, and install the new. No major rewiring will be necessary, as it has all been included and installed as part of the upgrade process.

Your clients will enjoy the benefits of digital production, and you have not broken your bank with a several million-dollar expenditure. You've accomplished this while at the same time allowing for the final upgrade step at a point in the future. ■

Barry H. Bennett is president of Bennett Systems, Sunbury, OH.

FORMAT-INDEPENDENT POST PRODUCTION



Post-production facilities, such as Fox Sports Net, should prepare to work with a variety of television formats and be able to output to any given format. Photo courtesy of Technical Industries Inc.

By Bob Pank

The changes introduced by the ATSC digital television standard give broadcasters the freedom to choose video formats. As they select and adopt their entries (see Table 1), the days of the single U.S.-wide 525/60i at 4:3 aspect ratio picture standard are going fast. Many new production formats will soon be in use nationally and internationally, along with a continued requirement to broadcast in NTSC. Format-independent post production aims to handle all the various DTV formats efficiently.

FORMAT-INDEPENDENT POST PRODUCTION

Vertical size value	Horizontal size value	Aspect ratio information	Frame rate code	Scanning format
1080	1920	A, C	1, 2, 4, 5	Progressive
			4, 5	Interlaced
720	1280	A, C	1, 2, 4, 5, 7, 8	Progressive
480	704	B, C	1, 2, 4, 5, 7, 8,	Progressive
			4, 5	Interlaced
	640	A, B	1, 2, 4, 5, 7, 8	Progressive
			4, 5	Interlaced

Legend
Aspect Ratio: *A = square samples, B = 4:3 display aspect ratio, C = 16:9 display aspect ratio*
Frame Rate: *1 = 23.976 Hz, 2 = 24 Hz, 4 = 29.97 Hz, 7 = 59.94, 8 = 60 Hz*

Table 1. Video formats included in the ATSC's digital television standard.

While computer-based systems may offer resolution independence, they typically imply a tradeoff of operational speed and storage duration from fixed resources as pictures get bigger and frame rates increase. With the demands of HD being six or more times greater than today's ITU-R.BT 601 digital signals in terms of picture data, some predict a swing back to tape-based post production and a much reduced toolset from today's offerings - especially compared to those from the more advanced nonlinear online editing systems.

Current dedicated editing equipment is designed for 525/60 NTSC or 625/50 PAL. However, because many VTRs can only operate at a single standard, switching between NTSC and PAL may be difficult or impossible. Increased international demand for programming and edit facilities points out a need for operation at both 525/60 and 625/50. Those with an international view should note the formats supported by Europe's DVB encompass ATSC's Table 3 and adds more — notably a set of 576-line formats as well as 25- and 50Hz frame rates. With individual countries selecting a single SD and HD format from the DVB set, it is likely that world-wide there will be many formats in use beyond the ATSC Table 3.

True format independence

Format-independent post production should be capable of using any standard television format, including HD, while operating with the speed and flexibility of today's ITU-R 601 resolution equipment. The benefits now associated with nonlinear operation, including revising edits at any time, should be provided, as should the modern toolset including keyers, DVEs, color correctors and multilayering.

Rather than supplying systems that can be switched from one standard to another according to the particular job, a wider goal would be to provide facilities with the ability to operate efficiently using any mix of TV-format sources, and to output at any chosen format. Being able to accept work regardless of which TV standards are used is particularly important for post houses wishing to serve a broad range of clients working in a variety of standards. In addition, the ability to mix formats (e.g. between foreground and background) would allow free use of all program assets.

Digital delivery systems using MPEG-2 compression such as DVD and broadcast, combined with larger, higher-resolution domestic displays, will mean the picture quality of finished programs will be more evident to viewers. Post-production systems must be able to deliver the best possible quality regardless of their input and output formats.

Throughout the editing process, editors do not necessarily want to be concerned with the various formats being used as source material. Therefore, there should be a default mode that automatically switches according to the source format. The output will be generated in one format for any particular program. Should there be a need to output in another format, it should be possible without having to re-edit the material.

Care must be taken when designing production facilitis to keep the number of format conversions to a minimum, thus keeping image quality high. Photo courtesy of Sparling

System design

Nonlinear capabilities are needed to offer the broad range of facilities and flexibility available in online editing at 601 resolution. Figure 1 shows the basic functional areas of such a system. These systems are usually built as integrated units rather than a collection of separate single-function boxes. Video is recorded to a disk-based store of about an hour in length (≈75GB for

non-compressed), which provides fast random access to material. Minimally, the store offers a data rate sufficient for one continuous, real-time video channel — 21MB/s. Greater bandwidth will improve the speed of functions requiring access to more than one stream of video (e.g. DVE, dissolves, etc.). For picture manipulation, mixes, wipes, keying, color correction, paint, DVE, etc., stored video is sent to the processor and the result is sent back to the disk store as a new clip. For output, the edited result is played from the store.

The system block diagram of the format-independent facility is broadly similar to fixed-format systems already in use (see Figure 2). For the most part these systems are comparable, but there are great differences in the detail. The major new function allows work from any format to any format, which requires translation of pictures between line and pixel structures — so called up-rezing and down-rezing. Without changing frame rate, this is pure spatial interpolation — resizing. Care in its use can make for better performance and faster operation.

Resizing is an operation that is already commonly available in post production as a part of the DVE — an operation of the video processor. Where there is a need for resizing(or any processing) for creative effect this can be linked with any requirement for source-to-output format change so that only one, not two, size changes are used. This saves time and storage space while helping to maintain picture quality. For material not being given DVE treatment, up/down-rezing can be provided when necessary in the output path. As the output is to be real-time, this dictates that the speed of up/down-rezing should be the same.

For example, if output standard is set to 1080i, and a 480i foreground is chosen by the operator to be composited at exactly half-frame height onto a 720p original background clip, the background is resized and interlaced to 1080i, the 480i foreground is resized to 112.5 percent (540/480) while also compensating for pixel aspect ratio changes. The resulting composite is stored back to the main disk store as a new 1080i clip. (Note that the alternative of working purely in 1080i would involve sizing all items to 1080i prior to composition, with the foreground being up-rezed to 225 percent (1080/480) and then resized to 50 percent of that. This would use more storage, more processing time and risk quality.)

At the end of the edit session, to a large extent, what exists is the original material and a list of instructions on how this should be applied to create the finished program.

Material included in the final program but not requiring any creative processing remains in the store in its native format. On replay, all material stored at 1080i, including the processed clips, passes directly to the output. Other material is up-rezed in real-time, before passing to the output. It is crucial that the method used for up-rezing and down-rezing produces accurate results. At the same time the operation will need to be executed in real-time to avoid disruption of work flow and complications of storage for real-time playout.

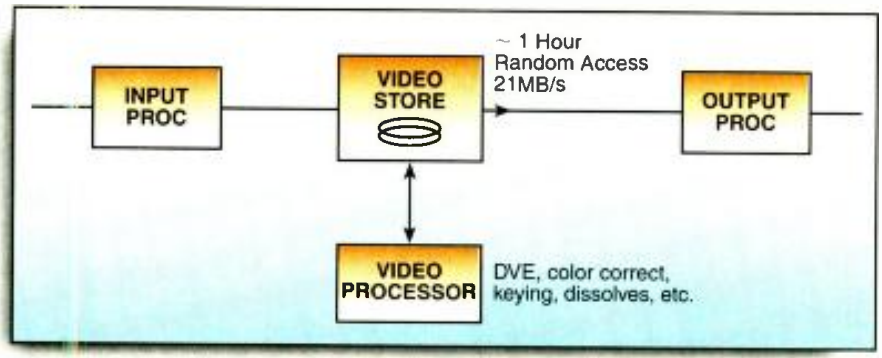


Figure 1. The basic components of an editing system would include storage as well as input and output processors. A video processing unit capable of mixes and dissolves would be used to manipulate stored video, placing the new material back onto the storage system.

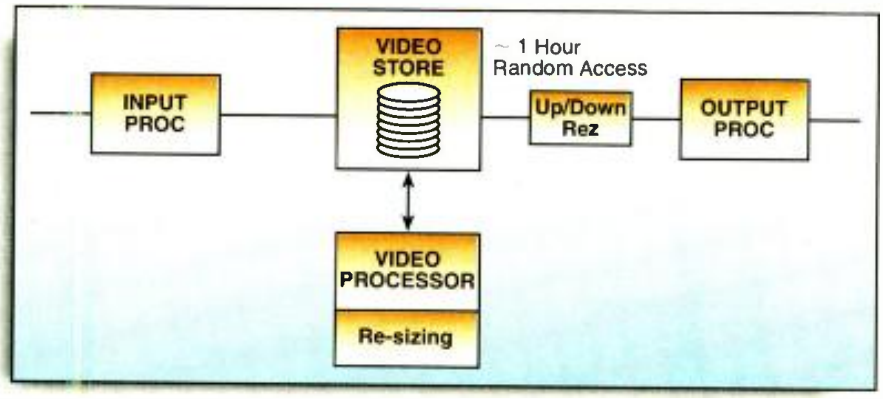


Figure 2. Adding format independence to an editing system can be done by providing intelligent resizing and the capability to translate line and pixel counts to the desired output format.

Image handling

Working with a wide range of formats requires a highly flexible system able to adapt to each format without operator intervention and while continuing to provide acceptable speed. A top-down design approach means that the largest picture format is handled at full operational speed while smaller formats may run quicker. This is favored over a bottom-up design which may be adequate for today's 601 pictures but slow for HD. The greatest bandwidth of ATSC or DVB is demanded by the 1080x1920 system. With a 4:2:2 sampling ratio each picture comprises a total of 4.15Msamples (chroma and

luma), and the rate is 124Msamples/s for a 30Hz frame rate — six times that of 601. All frame buffers, stores and buses need to be sufficient to handle this data. Bottlenecks must be avoided. In particular the high volumes of video data requiring fast processing to maintain creative flow point to a hardware-based design.

The video store must be of adequate length for post production. With an hour of 1080 video requiring half a terabyte (0.56TB for 10-bit sampling), size will be limited by economic considerations. Access to any frame in any order at video rate — known as true random access — has proven to be a great asset to editing at 601 resolution and should be perpetuated with HD operation. With this capability, reordering the replay of frames requires no copying, is instant and can be revised at any time. Such a store can be a development of disk arrays built for 601 video operation with true random access and RAID protection. While the system needs to be engineered to handle HD video, it may also use other formats from the ATSC and DVB standards. These will use proportionally less storage, effectively extending storage time.

Non-compressed video in post production produces the highest quality results possible for whatever source material is used. Compressed systems use less storage but may compromise quality. Much of the source material will be recorded in compressed form and, assuming only intraframe compression (I-frame only) is used, video can be cut at frame boundaries. Any other editing treatments requiring processing, dissolves, wipes, DVE, etc., will first need decoding to baseband. In a compressed system, the result of any such process would need to be recompressed for storage — leading to concatenated compression and possible quality loss.

Compression offters the advantage of storage efficiency while still maintaining thebest achievable quality. With discretionary compression, the source material is stored compressed, ideally directly in its native form, and only decompressed where processing is required. Processed results are stored non-compressed and cut into the final program on replay, requiring frame-by-frame switching between compressed and non-compressed clips. This way store time is effectively increased while the best possible quality is maintained.

Post production systems must be able to deliver the best possible quality regardless of their input and output formats.

Uncommitted editing

Experience with online nonlinear editing has shown the advantages of continuing to work from original material as much as possible through to the finished edit. Besides quality issues and savings of time and storage, it makes revisions easier at any stage during the edit, as well as later if the piece needs to be reworked. This is known as uncommitted editing. Maintaining this efficiency and flexibility in a format-independent environment means source material is kept and used in its native form right up to the replay of the program (except those clips requiring processing, as mentioned previously, which can be re-accessed and adjusted). Note that little, if any, of the program is necessarily stored on the system in the required output standard — even after the editor's work is complete. This means the editor is free to make changes at any time by referring back to originals. The finished program in the required format is only produced as a final operation during replay. Taken to the limit, this would require all editing instructions and video re-formatting to be executed in real-time — imposing a huge technical burden. As already outlined, a practical approach is to complete creative processing first, leaving frame order and video format (up/down-rez) to be resolved at playout.

All parts of the system are required to accurately handle different video formats on a clip-by-clip basis. For this, each clip must be identified with information on picture size and aspect ratio as well as compression status. All clips carry metadata with these details, which is used to switch operation for correct handling of each clip.

Production environments, such as this one at Pinnacle Post Production in Seattle, must be capable of handling a variety of input and output formats. Photo courtesy Sparling.

Well into the future, facilities will need to handle archive footage in analog and digital formats. Pinnacle Post photo courtesy Sparling.

Mult format output and archive

As 1080 represents the highest requirement for output picture size, one possible system solution might be to translate all video to the 1080p/24Hz format and down-rez at the output, if necessary. This could then be used as a universal master format from which all prints could be copied. However the assumption that this would satisfy all ATSC formats is open to question, the 720p/60Hz users could argue the case of insufficient frame rate for fast action. Also, such a scheme would have the largest storage requirements regardless of output needs while imposing up to two possible additional format changes to the output video.

At the end of the edit session, to a large extent, what exists is the original material and a list of instructions on how this should be applied to create the finished program. Somewhat more than an EDL, this is sometimes known as the recipe. New clips may have been created as a result of processing, but full instructions for how these were made are also contained in the recipe (settings for DVEs, color correction, keyers, layering etc.) allowing them to he quickly and exactly reconstructed or altered.

A copy of the recipe on removable media, along with the original source material provides an efficient form of archive. As with a similar scheme already used with 601-format equipment, this allows finished programs to be adjusted and new versions made after the original session has been deleted from the equipment store. This may be the key to a best-practice route to creation of other output formats. Rather than re-rezing the edited master, reloading the archive and setting a new output standard allows a new conform. This makes the best use of the original material for the chosen output format, without having to re-edit or manually re-create the detail of the original work.

Format-independent post production should be capable of using any standard television format, including HD, while operating with the speed and flexibility of today's ITU-R 601 resolution equipment.

Much modern post production equipment can operate at hoth 4:3 and 16:9 aspect ratios at SD. Generally the signal remains the same but images or patterns inserted into the pictures, such as wipes, text, graphics and DVE moves, need adjustment. For operation, it is good practice to be aware of letterboxing and window-boxing (16:9 onto a 4:3 screen) and vice versa —as each removes top and bottom or left and right sections of the picture. Careless repeated actions could leave little original detail in the remaining picture.

So far, attention has been focused on working with TV formats but there could be a case for handling larger image sources, such as those from high-resolution film scans or computer outputs. Handling these in their native format would greatly increase the equipment requirements — and cost — so down-rezing at the input to the required output TV standard makes good sense. The data of the originals is not wasted as the large pictures provide an over-sampled source. Experience of work already completed on 3x2k original digital images from 35mm film, directly converted to 480x720 has produced pictures of exceptional clarity and sharpness. Much of the original quality is effectively translated to the smaller format.

Format-independent post production can be achieved at resolutions up to HD while maintaining all the speed and flexibility of today's top-end SD facilities. Any mix of TV input source formats can be composited, edited and output at any format with the best possible quality, to meet the demands of the DTV world. Although the outlined system makes much use of tried and tested technology, it also requires new developments for areas such as storage and processing as well as attention to architecture and software. With multiformat outputting and archiving included, the scheme offers a practical solution for the multiformat, DTV future. ■

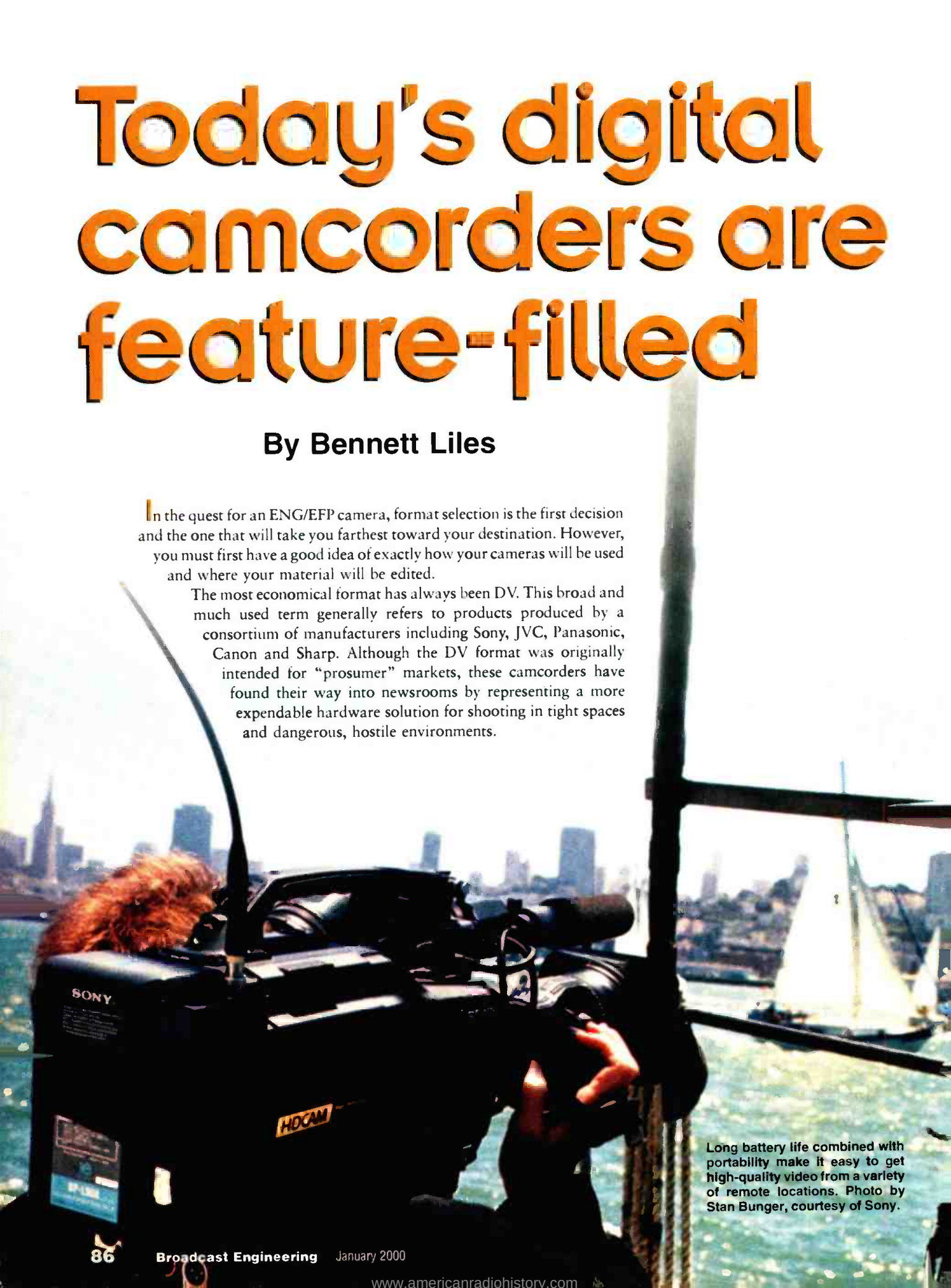
Bob Pank is technical communications manager for Quantel Ltd, Newbury, England

Today's digital camcorders are feature-filled

By Bennett Liles

In the quest for an ENG/EFP camera, format selection is the first decision and the one that will take you farthest toward your destination. However, you must first have a good idea of exactly how your cameras will be used and where your material will be edited.

The most economical format has always been DV. This broad and much used term generally refers to products produced by a consortium of manufacturers including Sony, JVC, Panasonic, Canon and Sharp. Although the DV format was originally intended for "prosumer" markets, these camcorders have found their way into newsrooms by representing a more expendable hardware solution for shooting in tight spaces and dangerous, hostile environments.



Long battery life combined with portability make it easy to get high-quality video from a variety of remote locations. Photo by Stan Bunger, courtesy of Sony.

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Digital Camcorders

The best things about DV cameras are the price and the wide compatibility of tapes. Here, you're generally in the $1000 to $8000 range, and as long as material is recorded at standard speed, your tapes will play on DV, DVCPRO and DVCAM VTRs. For field or house editing, the IEEE 1394 digital I/O link is included on virtually all DV camcorders. Though you may find it called iLink, 1394 or Firewire, this bidirectional transfer method affords dubbed video that is identical to the original. The downside of DV, particularly MiniDV, is that features such as distance-marked focus barrels and manual color balance adjustments are rarely found on such gear. Although many cameras can store shot information on 4kb cassette ICs, camera setup storage isn't found until one moves up into the DVCAM area with its 16kb tape ICs.

Image issues

The smaller CCDs usually used in DV cameras means that most can't quite match the minimum light levels used by DVCAM and DVCPRO models. Good low light capability will cost in the form of the FIT (Frame Interline Transfer) CCDs found on the more expensive equipment. F11 @ 2000lux is a fairly standard spec today. For film folks, that's roughly equivalent to ASA 800 film.

Another scarce commodity below the $8000 mark is a removable lens. These generally begin to appear at around $10,000 to $12,000 and 2/3" bayonet mounts are the standard. A good lens parameter is a 14:1 optical zoom. Although even the DV cameras offer some form of digital zoom, use it sparingly. The picture quality degrades rapidly as the digital zoom is used and it causes the same progressively jerky image as its optical counterpart.

> The term "shoot and protect" refers to using a 4:3 format while shooting for 16:9 and keeping all significant material within the imaginary 16:9 portion of the 4:3 picture.

Digital (or Electronic) Image Stabilization is another feature found even on many DV, DVCPRO and DVCAM models. This detects large-scale movement (the whole frame) and moves the active area of the CCD to compensate. A drawback will be occasional blurring in the direction of the camera movement. Some models minimize this by closing down the shutter slightly, but this results in less light sensitivity on the system. This feature can also cause problems with intentional moves like tilts and pans by grabbing the image and then suddenly letting go, causing the picture to jump slightly. This inexpensive feature is best used when the camera is steady and the subject moves.

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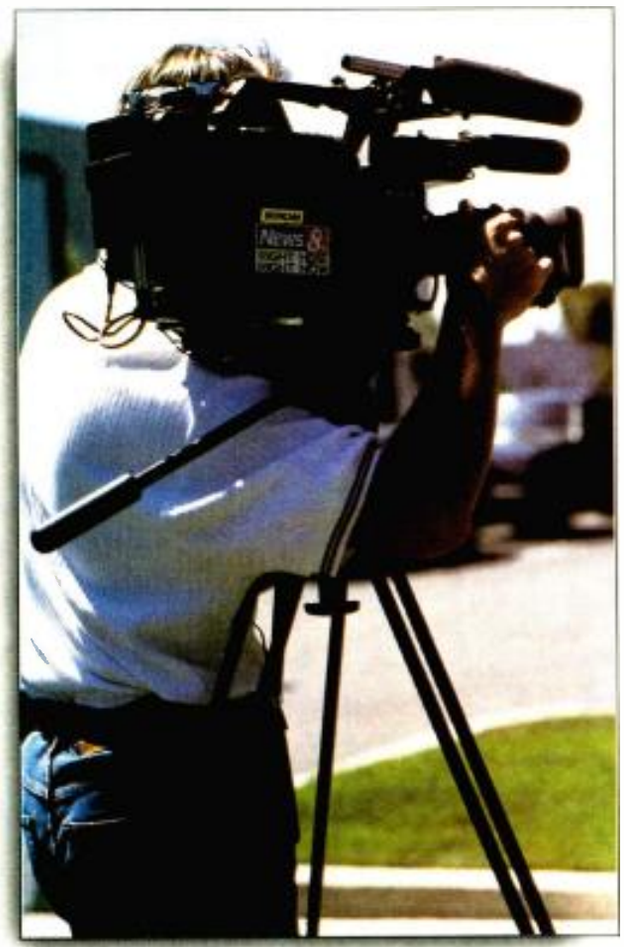
Digital Camcorders

Light weight and low cost allow today's ENG cameras to be carried into a variety of situations, including burning buildings. Photo courtesy Hitachi.

Aspect ratio

Once the step has been made into DVCPRO and DVCAM formats, switchable aspect ratios are available. Although this feature is advertised on some DV cameras, it isn't until you're into higher formats and their price range that "true 16:9" is mentioned. This is a key issue if you intend to do any HD shooting. 16:9 CCDs are very expensive. To cut this cost, most DV cameras and some DVCAM models use cheaper 4:3 CCDs and simply cut off the scanning on the top and bottom to give the simulation of a 16:9 picture. Sadly, this method also reduces vertical resolution by about 25 percent.

"True 16:9" requires 16:9 CCDs for images. These CCDs have side panels that are switched in when the camera is operated in 4:3 mode. This adds viewing area when in 16:9 while giving the normal viewing area in 4:3 mode. The difference is not always stated clearly in camera specs. The term "shoot and protect" refers to using a 4:3 format while shooting for 16:9 and keeping all significant material within the imaginary 16:9 portion of the 4:3 picture.



New technologies such as compression have allowed cost-effective digital acquisition. Photo courtesy Sony.

For making pictures involving computer displays, there are several features available on DVCPRO/DVCAM and better units. Clearscan or synchro-scan are names for a feature that matches scan rates to eliminate or at least minimize flicker. Using longer shutter times can work here but it always helps to shoot a flat panel, LCD screen when possible. These have less flicker to begin with and have become a favorite of videographers.

Easy setup

One of the most eagerly awaited and popular features on ENG/EFP cameras is one that first appeared on digital audio boards and ADAT machines. Camera parameters can now be stored in two ways. In one arrangement, all the setup parameters are transferred to a removable RAM card. The card can then be used to set up the camera just as it was before or to enter an identical setting on one or more additional card-capable cameras. This is also used when several EFP cameras are outfitted for studio use. In the DVCAM format, engineers have borrowed a slick feature from the ADAT recorders. In this arrangement, the camera setup features are recorded on the VAUX data area of the DVCAM tape. When the same tape is inserted into that camera or another one with the feature, the camera setup parameters are "played" into the camera for an immediate matching setup.

> Format is first. Talk to your clients and post partners.

Higher-end camcorders also have a remote connector that is RS-232 enabled so that a shooter can manage the setup file data from a personal computer and transfer the data to another shooter anywhere.

Fancy features

Dynamic Shot Management and ClipLink are proprietary terms for another

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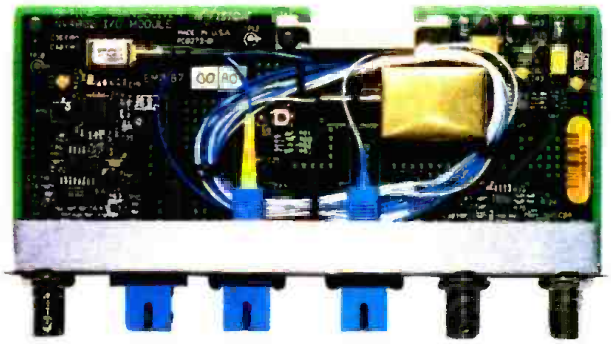

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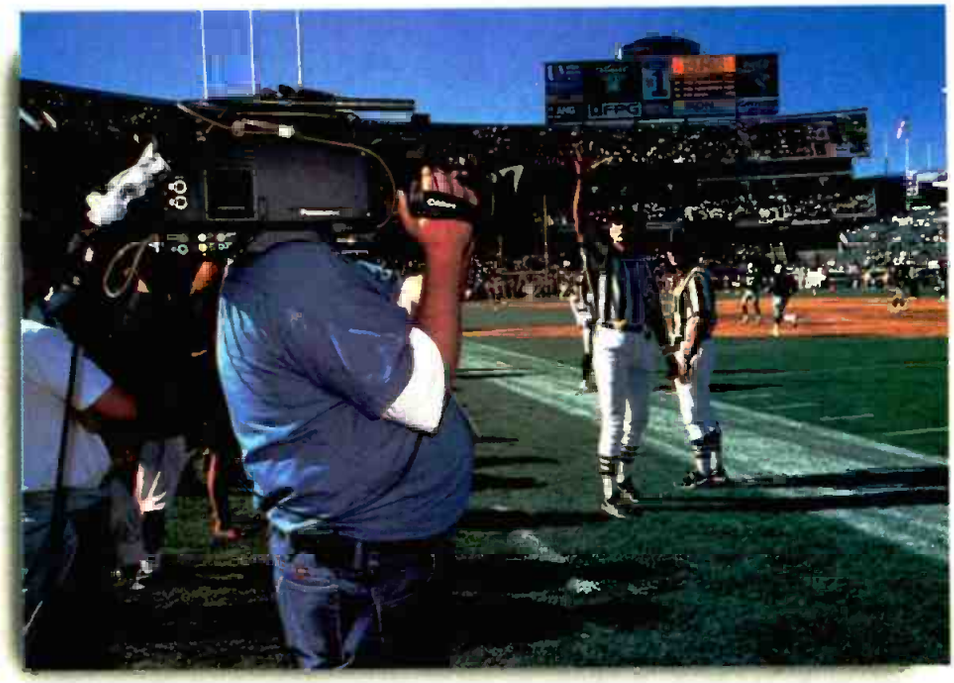

Television cameras have been used to cover sports for many years. Today's systems provide high-quality images from numerous vantage points on and off the field. Photo courtesy Panasonic.

data-to-tape scheme that dramatically simplifies and speeds the editing process. Valuable shot information is recorded onto an IC memory chip incorporated into the DVCAM cassette so that the good shots can be pre-selected during acquisition. Each first frame can be recorded as a thumbnail icon and then used for shot I.D. in drag-and-drop, nonlinear editing. The in and out points are also logged. This capability usually requires the purchase of an optional board for the camera. On the DVCPRO cameras, the feature is referred to as "Picture-Link." This is a high-end feature that can be found on camcorders in the $18,000 range and up.

One result of communication between shooters and engineers has been a very nice feature for preserving image continuity. Known as Freeze Mix, it involves storing the first frame of each take into memory. But instead of using this first frame as an editing mark, it is superimposed over the present viewfinder picture so that a previously recorded scene can be composed very closely to the original shot already on tape. While it's a handy feature for studio cameras, this feature finds its primary use in ENG/EFP.

One of the best examples of how far we've come with digital signal processing in cameras is found on the top end models. This feature involves image modification and it is referred to as "Dual Contouring" or "Skin Detail Contouring". It is, in essence, selective

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enhancement for a designated area of the picture. By softening lines and creases, this feature offers on-camera talent an electronic facelift. It does this only in the portion of the frame designated with the Area Detection Cursor on the viewfinder screen. The rest of the picture area remains sharp and clear. During movement, the effect tracks the skintone areas of the shot.

At the top end of features, picture quality and price are the DVCPRO50, DVCPRO HD, HDCAM and Digital Betacam formats. On most of these models you can expect to find all the features you'd ever want. Many include light metered battery and audio levels. One feature of these units, which is especially useful for ENG, is a viewfinder indication of what button the user is touching. Backward compatible with Beta SP, the Betacam SX models pair with field editing units and use slower tape speeds for less head wear.

There are several parameters to keep in mind when shopping for ENG/EFP cameras. Format is first. Talk to your clients and post partners. Consider the number of CCDs. This will be either one or three but most of the units available today have three. The size of the CCDs is the next factor and that can range from ¼" to 2/3". The third factor is the number of pixels per CCD, ranging from 270,000 to 680,000. On all three of these figures, higher numbers mean better picture and higher price. Of course, lenses have a huge impact on picture quality and since all but the cheapest DV cameras offer interchangeable lenses. Finally, fire up the camera and look at the picture. ■

Bennett Liles is an engineer with Georgia Public Broadcasting.

Camcorder buyer's checklist:

Here are a few things to remember when considering your ENG purchase. Consider your needs carefully and honestly; having too much camera is sometimes as bad as not having enough.

Format: How will the cameras be used? Which format for editing and final destination? What do your clients and post partners use?

Cost & compatibility: DV is cheapest and (at normal speed) the universal format. DVCAM and DVCPRO cameras have most features for the money.

Reliability: Slower tape speeds mean less head wear and lower tape costs. Betacam SX leads here. Backward compatible with Beta SP.

Shooting for HD now or later? Cameras with switchable aspect ratios have most of the other features as well, but the price is high.

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DTV training for engineers

Stephen M. Bauder

Broadcast engineers are facing challenges without comparison in the history of television. The opportunity exists to implement the revolutionary technologies of digital television. The rapid adoption of DTV depends in large part upon a corps of well-trained and knowledgeable broadcast engineers, but unfortunately many engineers do not have a clear understanding of the skills, abilities, and knowledge necessary to facilitate that revolution. In an effort to better understand these issues, a study of the skills needed to become a successful broadcast engineer was undertaken in late 1998.

The Harris/PBS DTV Express visited 40 cities during a 15-month educational tour of the U.S. The technical/operations seminars covered issues allied with multi- and datacasting, interactivity, digital production, and transmission. Photo courtesy of Harris Broadcast.

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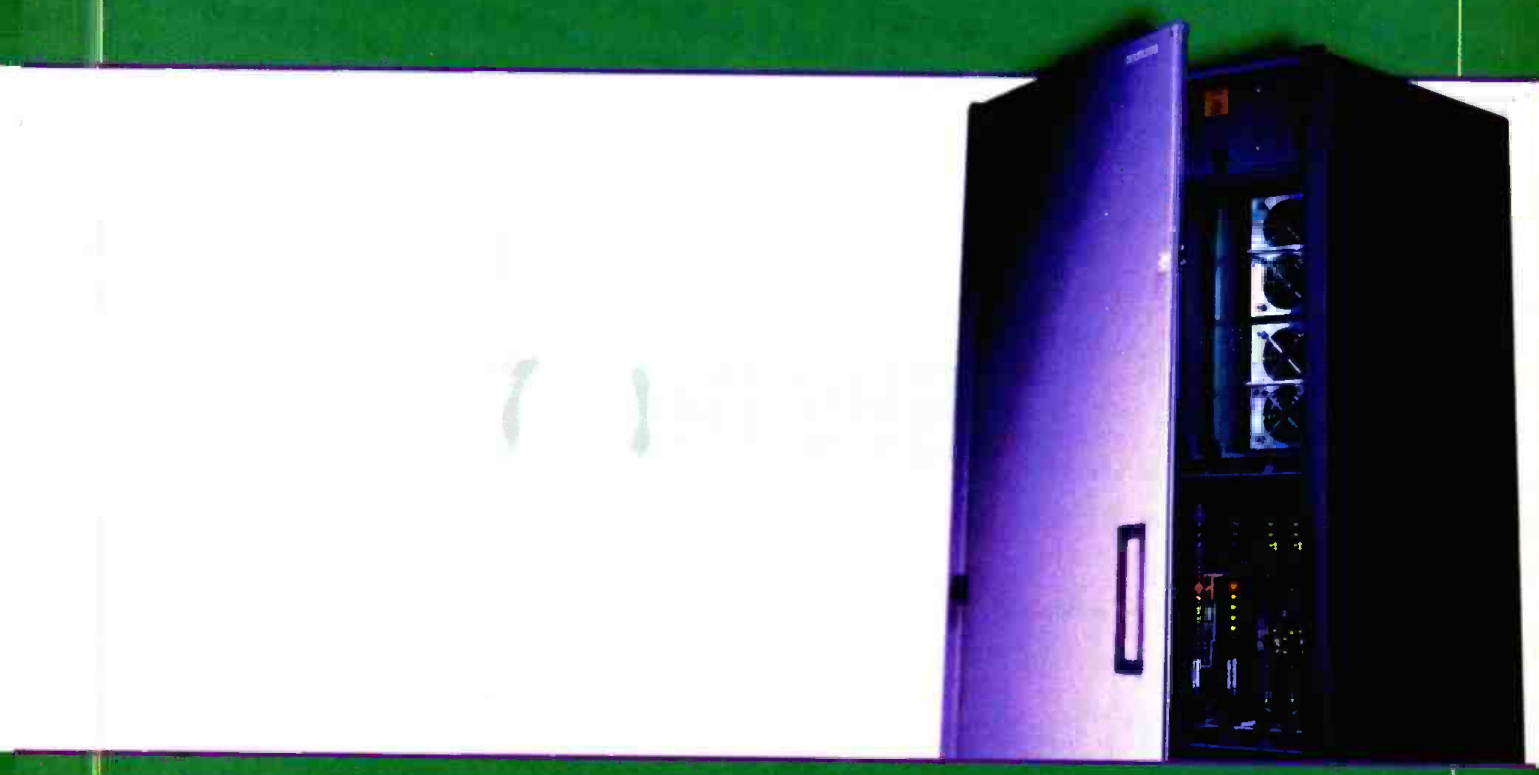

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DTV training for engineers

Three DTV engineer skill inventories were developed: transmission, studio/production and core skills. Survey participants were asked to rate each skill for importance and proficiency. The responses were tabulated and each of the three inventories was ranked for importance and proficiency.

The gap

Because many skills that were ranked very important were also ranked very proficient (e.g. safety and best-practices related skills), a third set of inventories was derived from the importance and proficiency inventories in order to provide a direct measure of the need for training for each skill. These are referred to as "gap" inventories because they are a result of subtracting each skill's proficiency mean from its importance mean. The resultant "gap" is a simple metric that can be used to gauge the need for training in a given skill. For example, "Able to use precision 8VSB analyzers/demodulators such as the Tektronix RFA 300" was rated very important by the respondents (mean = 4.33 on a five-point scale with five being most important), but not very proficient (mean = 2.25 on a five-point scale with five being very proficient). Subtracting the proficiency mean from the importance mean yields a substantial gap of 2.08. For skills with a proficiency mean equal to or greater than the importance mean (i.e. very proficient at a skill that's not very important), there is no gap and probably little need for training.

Rank	Competency	Importance mean	Importance sd	Proficiency mean	Proficiency sd	Gap
1	10. Able to use DTV test signal generators with digital video generator and analog wideband generator capabilities such as the Tektronix TG2000.	4.41	0.61	2.27	1.20	2.14
2	9. Able to use precision 8VSB analyzers/ demodulators such as the Tektronix RFA 300.	4.33	0.77	2.25	1.23	2.08
3	25. Possess working knowledge of ATSC certification of consumer-grade DTV receivers and set-top converters.	3.06	0.96	2.06	1.13	1.00
4	26. Possess familiarity with differing characteristics of consumer grade DTV receivers to tolerate multipath, brute force overload, rejection of TV signals on the taboo channels, tuner noise figures, and tuner sensitivity.	3.29	0.94	2.35	1.12	0.94
5	11. Able to specify, install, operate and maintain digital video and audio microwave systems.	3.92	0.79	2.98	1.25	0.94
6	12. Understands desired-to-undesired signal ratios required for digital vs. analog modulated microwave systems.	3.71	0.74	2.96	1.22	0.75
7	41. Able to explain DTV production and transmission systems operations and technical details to television producers, management, lay people, and technical people so that they understand how best to implement and use digital television systems.	4.08	0.95	3.40	1.00	0.67
8	20. Willing to stay abreast of DTV developments by reading trade journals and periodicals regularly.	4.55	0.64	3.90	0.78	0.65
9	42. Able and willing to keep good records of installations, maintenance, modifications, and test results.	4.50	0.61	3.98	0.70	0.52
10	37. Able to never lose sight of common sense as it applies to problem solving.	4.42	0.70	4.06	0.75	0.37

Table 1. The 10 core skills most in need of development. For the most part, the skills above are a matter of keeping current with industry developments — the most easily acquired of the study's skill sets.

Core skills

Table 1 shows the 10 core skills with the greatest gap between the importance and proficiency means. Two of the core skills (ranked 8 and 9) probably require very little training. You can acquire these skills simply by choice. Either you will keep up with industry developments by reading leading trade journals or you won't. The ability to keep good records of installations, maintenance, etc. is also simply a matter of choice. Lack of time is not a good enough excuse to shirk either of these skills. If you don't choose to make time for them, you'll likely be relegated to maintaining legacy systems (NTSC systems, analog VTRs, etc.) until either you or the system retires.

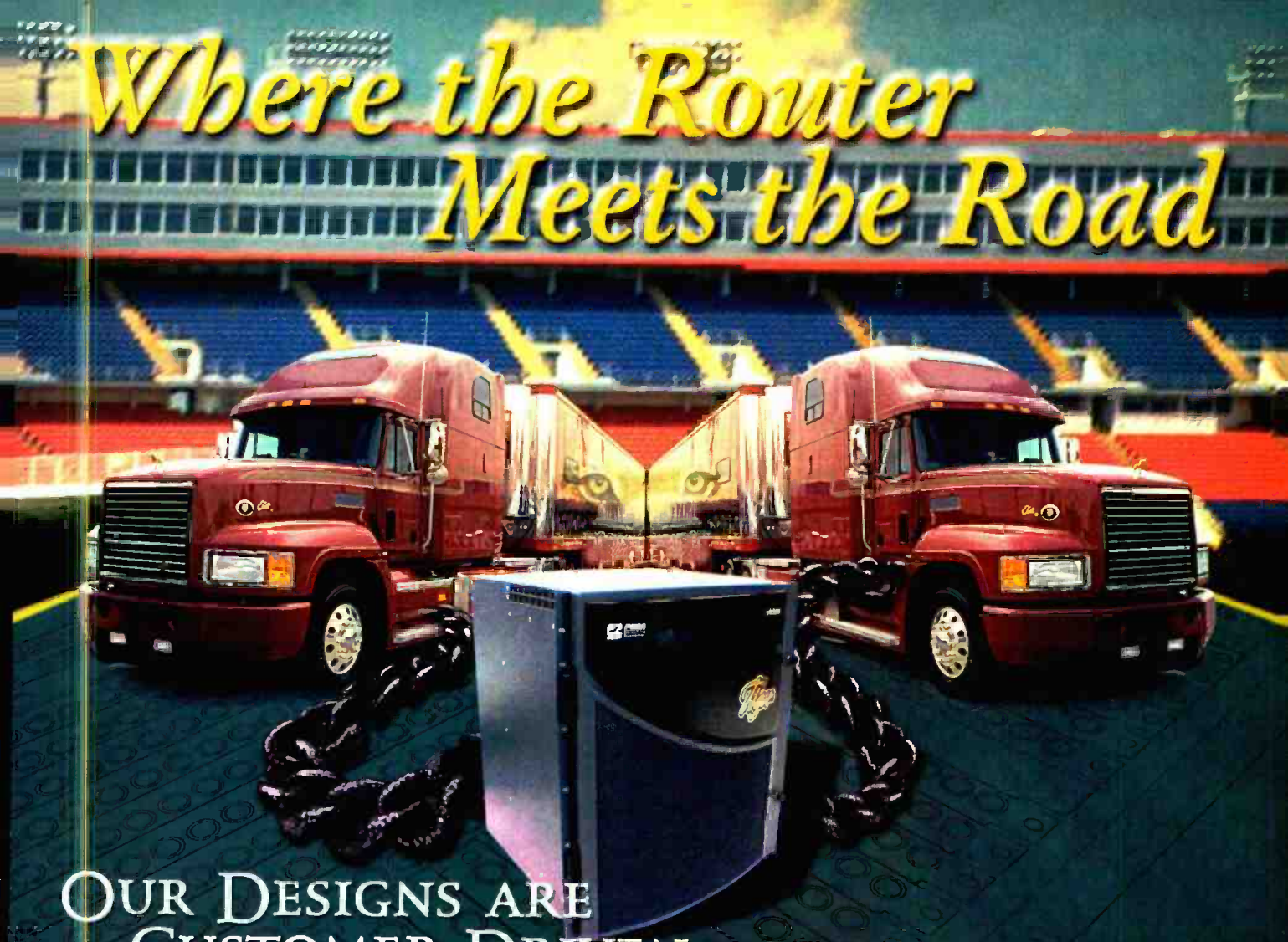
The 10th core skill from Table 1 is an easy one. Either you have it or you don't. You likely wouldn't have made it to where you are today without it ... just be careful not to neglect it.

Six of the remaining skills in Table 1 are objective, "hard" skills, based upon facts, technology, and hardware. Learning the facts and technology can develop them. Two of the technology-related core skills are directly related to test equipment operation (1 and 2) and two (3 and 4) are DTV receiver related.

"Soft" skills

The seventh-ranked skill from Table 1 is a subjective, "soft," people/relationship-based skill. Other so-called "soft" skills from the core inventory include "Possess sense of humor," "Able to provide service with a smile," "Able to project a competent and professional demeanor," and "Able to get along well with other department personnel." Survey participants rated themselves not very proficient at these skills, most of which they also rated as not very important. Let's face it, some engineers are really lousy at these skills, perhaps because the skills can't be mastered by reading service manuals or spec sheets. These are people skills, and some engineers (like those in any other profession) aren't "people" people.

Where the Router Meets the Road



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DTV training for engineers

The classroom settings and seminars provided by several manufacturers and universities allow attendees to develop the hard, technology-based skills as well as a support community among other, similarly trained engineers. Photo courtesy of Harris Broadcast.

Studio/production skills

Table 2 lists the 10 studio skills most in need of development. Each is an objective, hard skill and directly related to the technologies of DTV. Seven of the 10 pertain to digital or DTV standards and datastream manipulation. Virtually none of the 10 existed more than a half dozen years ago. The studio skills show a much greater need for training and development among the sample group than either core or transmission skills. Twenty-seven of the 28 studio skills show a need for training and development among the sample group. Furthermore, 15 of the studio skills show a gap of 1.00 or greater, whereas only three core and nine transmission skills have a gap of 1.00 or greater. The greater need for training and development in the studio skills is likely due to the lack of maturity in several of the studio technologies.

It is interesting to note that the studio skill most in need of development, "Able to make and interpret simple 8VSB measurements" is actually a transmission-based skill. The expert panel thought it was important to include this in the studio inventory so that studio/production engineers making measurements of the demodulated 8VSB signal at the studio could perform a minimal amount of transmission-system troubleshooting. The survey respondents (who were studio/production engineers) agreed.

Skills 2, 3, 4, and 8 from Table 2 each deal with technologies that are not yet fully mature. Intimate knowledge of these developing technologies is marketable and differentiates one as an exceptional DTV engineer. It is certainly worth the effort to stay abreast of developments in these areas.

Rank	Competency	Importance mean	Importance sd	Proficiency mean	Proficiency sd	Gap
1	58. Able to make and interpret simple 8VSB analyzer measurements.	4.23	0.78	2.51	1.30	1.72
2	50. Understands and can compensate for audio and video latency.	4.18	0.78	2.78	1.23	1.40
3	56. Understands upconversion and downcoversion between various audio/video formats.	4.26	0.76	2.86	1.21	1.40
4	53. Understands metadata as associated with the ATSC encoded signal (PSIP, EPG, AC-3, etc.).	3.73	0.91	2.37	1.22	1.36
5	70. Able to specify, install, operate, and maintain digital audio and video storage systems including tape, disk, and optically based systems.	4.32	0.77	3.07	1.25	1.25
6	46. Possess a detailed understanding of MPEG-2, including test signals, diagnostics, the hierarchy of the transport standard (such as main profile/high level), and the differences between other levels and profiles.	3.82	0.95	2.59	1.02	1.23
7	55. Understands basics of the 19.4Mb/s datastream.	4.17	0.82	2.98	1.30	1.19
8	54. Understands image artifacts associated with various bit rates and formats.	3.93	0.93	2.75	1.24	1.18
9	48. Understands and can utilize analog component and digital 4:2:2 systems.	4.36	0.72	3.23	1.16	1.14
10	47. Possess a basic understanding of relevant digital audio and video standards and standards setting bodies including SMPTE, ITU, AES/EBU, Dolby Digital (AC-3), ANSI/EIA/TIA.	4.11	0.92	3.00	1.24	1.11

Table 2. The 10 studio and production skills most in need of development. Because this group deals largely with evolving technologies, constant updates in training and vigilance with regard to technological development is necessary.

Transmission

Table 3 describes the ten transmission skills in most need of training and development. As with the studio/production skills, these are all objective hard skills directly related to the technologies of DTV. Again, none of these skills existed until the early 1990s. Four (1, 2, 4, and 8) are test and measurement skills, four (1, 2, 3, and 5) are 8VSB related, and four (7, 8, 9, and 10) are propagation/interference related. Unlike the studio/production skills discussed above, the technologies related to these 10 skills are near maturity (with the possible exception of 8).

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DTV training for engineers

Sixty of the 64 transmission skills show a need for training and development among the sample group, with nine showing a gap of 1.00 or greater.

Solutions and strategies

So far the discussion has been limited to a review and interpretation of the research as it applies to the survey respondents. No individual will have the same training and development needs as the sample group. Let's shift the discussion to your training and development needs and ways in which you can pursue opportunities to develop those needs. The first requirement in becoming skilled in the skills of DTV broadcast engineering is a firm understanding that no one else is going to do this for you. You've got to take the initiative and strike out on your own. Don't expect your employer to provide the resources and time necessary for the development of your skill-set. Some employers may, but most won't simply because they don't know your requirements. Do you?

Set aside an hour or so to evaluate your existing skills relative to the skill requirements identified by this research. Evaluate your need for training and development in each skill, keeping in mind both your existing proficiency and the skill's importance ranking. For example, if you don't have a clue as to how to read and interpret FAA sectional charts but you see that it is ranked dead last in importance on the transmission skill inventory, you may not want to devote a lot of energy developing that particular skill.

Identify resources

Resources for DTV technology-related skills are numerous and include structured training from equipment manufacturers, literature, structured school including trade schools and universities, organizations like, SMPTE, IEEE, NAB and SBE, trade journals, symposiums, seminars, trade shows, and conferences. There are also a wide variety of books available from publishers like McGraw-Hill, Prentince-Hall, Focal Press and Intertec Publishing.

Resources for the development of the people/relationship-type skills are also numerous. Taking classes in management, sales, and leadership at your local community or technical college may be a good starting point. Spending a bit of time reading good management and organizational leadership books may also provide the insight you need.

Create an action plan/timeline

Once your training and development needs are documented and you've figured out what resources are best suited to meet those needs, you should create an action plan to address those needs. The first step of the action plan likely should be a request to your employer for sufficient funds and time necessary to pursue your documented training and development needs. Even with support from your employer, you should still expect a significant personal time commitment.

Other action plan items may include a review of the topics covered in upcoming conferences, seminars, and trade shows so you can plan to attend the most appropriate events; reviewing your DTV Express training materials; attending Harris' "Introduction to HDTV" class; and utilization of other resources identified previously.

Acquiring the skills necessary to participate in the implementation of DTV may seem like a daunting task. The purpose of this article is to get you to step two of the somewhat tongue-in-cheek (but actually more truth than fiction) "Six Steps of Knowledge" model:

1. Not knowing you don't know.
2. Knowing you don't know.
3. Knowing you know.
4. Not remembering you know.
5. Not remembering what you know.
6. Not knowing you don't know. Return to step 2.

This is an exciting time for those involved in the field of DTV engineering. So much is undefined, yet so many things are possible. Now is the time to prepare yourself to meet the challenges of new technologies and unexplored possibilities. ■

Rank	Competency	Importance mean	Importance sd	Proficiency mean	Proficiency sd	Gap
1	77. Able to utilize 8VSB signal measurement techniques.	4.49	0.61	2.46	1.17	2.03
2	138. Able to measure compliance with the 8VSB spectral mask.	4.29	0.90	2.59	1.19	1.69
3	75. Understands 8VSB signal parameters.	4.43	0.65	2.89	1.10	1.54
4	88. Understands the basics of MPEG-2 including test signals, DTV demodulators, and how to observe test signals.	4.15	0.80	2.65	1.10	1.50
5	76. Understands 8VSB modulator and exciter theory.	4.19	0.78	2.73	1.07	1.46
6	89. Familiar with the basic ATSC formats and their image configurations.	4.03	0.84	2.90	1.05	1.13
7	139. Understands *de minimus* interference policies as applicable to DTV.	3.56	0.91	2.43	1.12	1.13
8	90. Able to perform DTV field strength surveys taking into account interference and noise limitations.	3.74	0.92	2.71	1.21	1.03
9	137. Able to access and understand interference ratios.	3.72	0.81	2.72	1.21	1.00
10	136. Basic understanding of the principles of the Longley-Rice propagation methodology as used in DTV allocation studies.	3.31	0.86	2.53	0.97	0.78

Table 3. The 10 transmission skills most in need of training and development. Unlike Studio/Production, these skills pertain to mature technologies, so training here is likely to have a longer shelf life than in other areas.

Steve Bauder is chief engineer for Wisconsin Public Television/Radio's WHWC-TV/FM in Menomonie, WI

Acknowledgement: The original research project was funded by SBE. Appreciation is expressed to the following for their help with the project: Doug Garlinger, Fred Baumgartner, Dane Ericksen, David Felland, Charles Rhodes, Edmund Williams, Jim Borgioli, and David Carr. Thanks to Michael Scott for his 'Six Steps of Knowledge model."

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Field Report

Snell & Wilcox's ShakeOut: A new approach to wobbly pictures

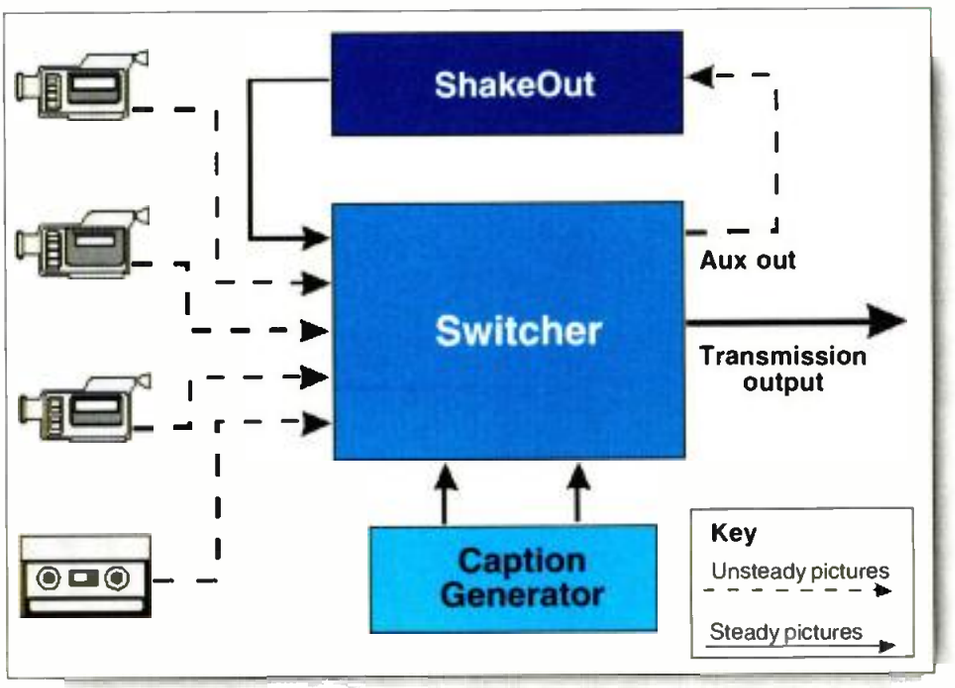
BY PAUL HANIFAN

Much advanced technology has been thrown at the problems of television broadcasting: standards conversion, HD up- and downconversion, digitization, encoding and decoding (MPEG or otherwise). It's rare, these days, to find a product that offers a genuinely new approach to a problem. ShakeOut is just such a product.

In broadcasting, there are some things so innate, so everyday, that they are taken as almost inherent, such as shaky pictures. ShakeOut has been designed specifically to overcome the problem of subject unsteadiness in a TV picture. ShakeOut's purpose is to provide rock-steady pictures without the need for expensive camera bases. More to the point, it gives the director a choice: a shaky picture if shaky pictures are required, steady pictures if shaking is just going to be a nuisance.

A few crucial points: ShakeOut is not a tracking system. If you want to shoot a shuttle heading into space from Florida, ShakeOut will not cause the camera to follow its path upwards. It is neither a mechanical system nor a feedback control system. ShakeOut solves picture instability problems purely by electronic analysis of the input video. It puts no limitations on lenses and requires no modifications to cameras. ShakeOut provides users with a one-box, single-pass solution to these problems and is designed to fit into an existing infrastructure with minimal disruption. It works in real time with a delay of just two frames and a minimum of user adjustments.

Because it operates by analysis of the incoming video signal, ShakeOut has one outstanding advantage over camera-based systems: it works as well with pre-recorded material as it will with live action. So, how does it work?



ShakeOut eliminates the problem of high levels of unwelcome camera shake with one pass through a sophisticated, online box to provide stable, viewable pictures free from any unsteadiness.

Ph.C phase correlation

At the heart of ShakeOut is Ph.C — the unique Snell & Wilcox phase correlation motion estimation technology

For anyequipment that seeks to identify and quantify movement, motion analysis is vital. Phase correlation is an advanced motion estimation technique. Developed by Snell & Wilcox, Ph.C operates on a unique and powerfully effective principle, using an advanced mathematical technique based on familiar Fourier transforms methods.

The Fourier transform is vital to the concept of phase correlation. In the one-dimensional example shown, a line of luminance — which in the digital domain consists of a series of samples — is a function of brightness with respect to distance across the screen. The Fourier transform converts this function into a spectrum of spatial frequencies (units of cycles per picture width) and phases.

In addition to its accuracy, phase correlation has a number of unique benefits that make it the most powerful and advanced motion estimation technique for real-time processing of television pictures. Phase correlation is, for example, immune to the effects of luminance variation, such as objects moving into shadow. It also has high noise immunity. This allows ShakeOut to work with archive or amateur shot video.

The detected camera motion, over a period of time, is analyzed to identify whether the motion is wanted, in the case of a zoom, pan or tilt, or unwanted as in camera shake. This allows ShakeOut to calculate an unsteadiness correction vector, with both horizontal and vertical components, to subpixel accuracy.

Measuring unsteadiness

Ph.C provides vectors that describe the motion within blocks of the picture. Within each block, up to three motions

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may be detected, each detected to an accuracy of 1/32 of a pixel. In ShakeOut, the unsteadiness process is in two parts.

The first stage — global vector selection — involves preprocessing to remove blocks from plain areas. The phase correlation process gives not only up to three vectors accurate to 1/32 of a pixel from each of 80 blocks in the screen, it also gives information proportional to the confidence in the accuracy and dominance of the measured vectors within the blocks. From this information, it is possible to immediately reject vectors derived from plain areas such as sky, deep shadows, etc., on the basis that these will yield noisy or inaccurate vectors.

The dominant vector from each of the remaining valid blocks is fed into a two-dimensional histogram function. The resulting histogram will give clues as to the motion characteristics of the input video.

Finding the unsteadiness

Unsteadiness correction is performed by moving the picture in the opposite direction to the calculated unsteadiness factor, so that objects once again line up in the correct place.

In order to prevent blanking from entering the active picture area, ShakeOut overscans the picture slightly, typically by about five percent to eight percent. This enables the unit to have a degree of freedom to move the picture without introducing border artifacts. The picture can be moved horizontally and vertically within the boundary set by the overscan ratio to subpixel accuracy.

ShakeOut uses motion-compensated, temporal–spatial interpolation apertures to maintain vertical bandwidth and to reduce alias artifacts such as interlace twitter.

Although ShakeOut performs de-interlacing and picture resizing in a single process, it is easier to think of the process as two separate operations.

It is possible to treat each field separately but, because each field only contains half of the TV lines, half the vertical bandwidth immediately will be lost and the signal will have become spatially aliased. Overscanning only seeks to magnify this resolution loss.

The filter response of a temporal-spatial filter is only optimal if the adjacent fields are aligned spatially with the current field, as in a static scene.

A sequence containing unsteadiness, however, represents a special case. In effect, this is a sequence-containing movement that must be corrected and viewed as a static scene. The viewing eye therefore expects the picture to be as sharp and clear as if the original image had been stable.

When a standard linear spatial-temporal filter is applied to a sequence, the unsteadiness will cause the temporal samples to become misaligned. This can, in some cases, accentuate the effects of line structure and interlace twitter produced by the spatial filter. It is thus necessary to use a motion-compensated filter aperture to align the temporal fields, in order to produce the optimal filter response.

Snell & Wilcox has used proprietary techniques in temporal filtering in high-definition upconversion, aspect ratio conversion and standards conversion products. ShakeOut is capable of differentiating in real time between wanted motion and unwanted unsteadiness. The result is pictures as steady as those produced by studio cameras from OB sources under the most unfavorable conditions.

ShakeOut also has a further benefit for the digital broadcaster. With digital transmission, available bandwidth is one of the broadcaster's most valuable assets, one to be used as frugally as picture quality considerations allow.

In stabilizing the picture, ShakeOut naturally removes a large amount of unwanted motion. Without ShakeOut, this motion will be encoded by the compression system, resulting in a bandwidth demand far higher than that required for a clean signal. In addition to providing the viewer with stable, viewable pictures, ShakeOut also provides significant bit-rate savings for MPEG-encoded systems.

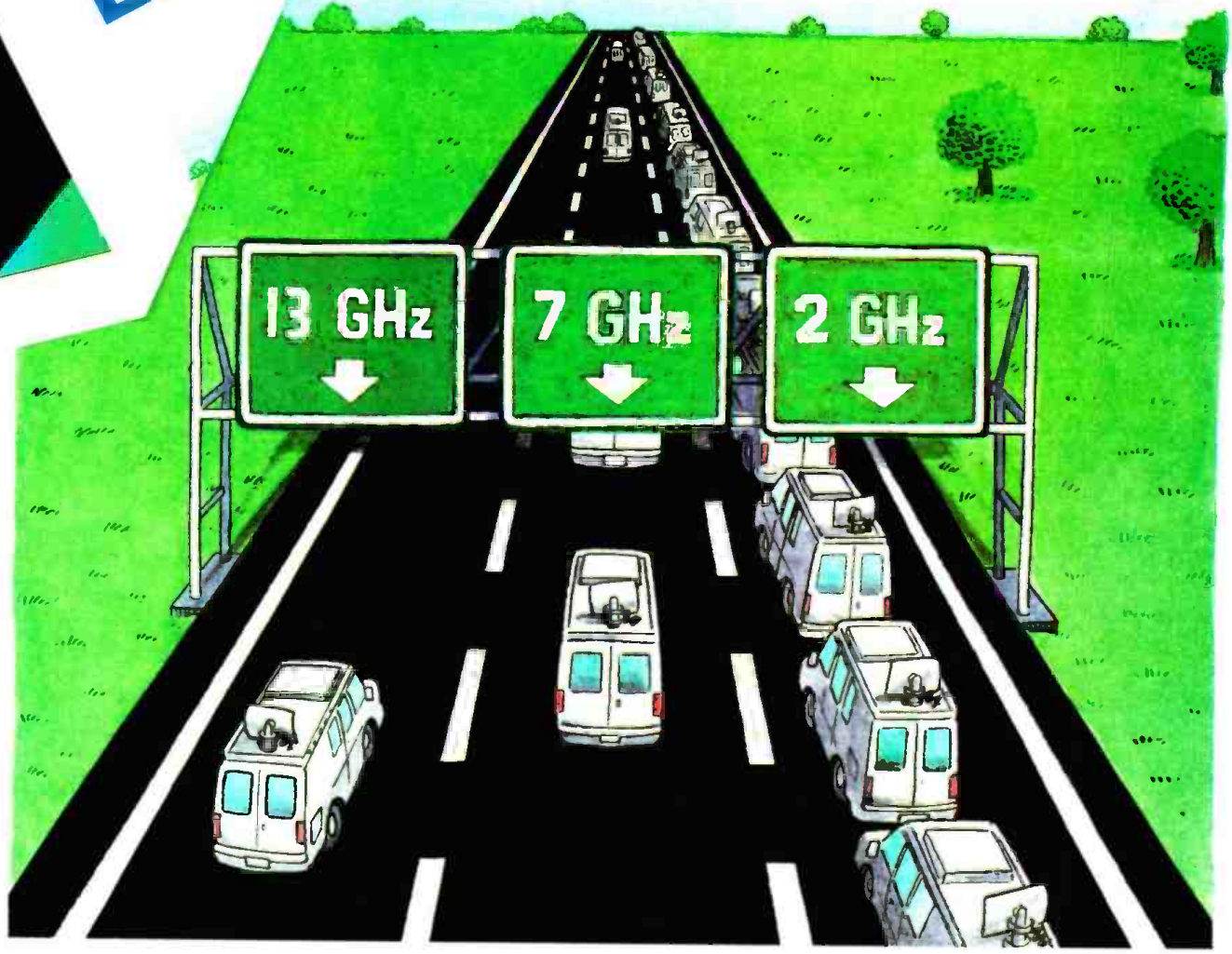
For more information on Snell & Wilcox's ShakeOut, circle 492 on the Free Info Card. ■

Compact and easy to configure, ShakeOut will provide clear and stable images from the most unsteady sources so that pictures from OB locations are as watchable as those from studio cameras.

Because it operates by analysis of the incoming video signal, ShakeOut has one outstanding advantage over camera-based systems: it will work as well with prerecorded material as it will with live action.

Paul Hanifan is a business and technology writer for Snell & Wilcox.

ENG congestion Ahead



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Applied Technology

Interra's Surveyor: The electronic quality assurance assistant for DVD

BY PAUL COLLINS

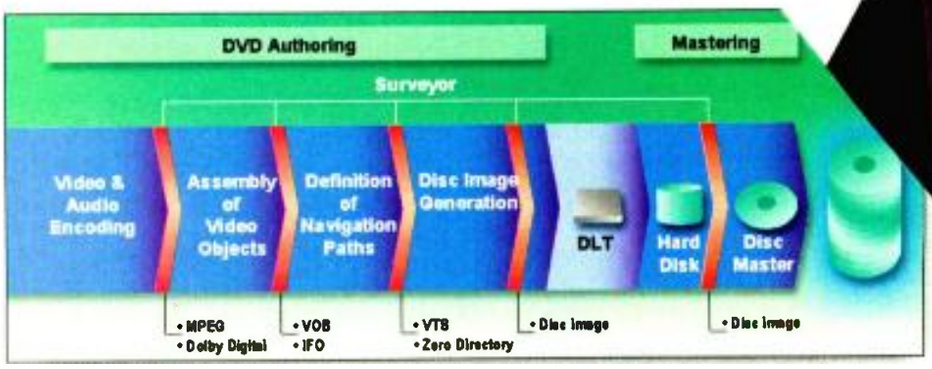
DVD production is increasing each month. The home entertainment industry continues to embrace this emerging standard and there has been dramatic growth in the corporate and museum exhibit categories. This sharp uprise in activity has forced all parties involved in the DVD production process to take an even closer look at an issue that has no clear-cut resolution: Who is responsible when check discs — or even the finished product — come back with links that lead to nowhere, chapters that crash one player but not another, or scenes that become so pixilated, it looks as if you are watching the digital disintegration of life itself? More important, can this be avoided altogether?

When these common DVD issues arise, where does the blame — and financial responsibility — lie? Does the customer, in a worst-case scenario, take action against the production house that developed the title? The makers of the authoring software? The maker of the check disc? The replication house churning out the finished product? What about the media makers?

Until recently, production/authoring houses were very limited in the resources available to check the DVD specifications they followed during the authoring process. Now, as the industry matures, quality assurance tools are emerging.

In answer to some of these DVD production needs, Interra Digital Video Technologies Inc., based in San Jose, CA, has created a software package named Surveyor (for Windows 98, Windows 95 and Windows NT 4.0+). This is a comprehensive DVD analysis tool that provides preventive maintenance and quality control during the DVD authoring process.

The goal of Surveyor is the improvement in productivity for DVD title producers. The need for such a tool is necessitated by a number of factors: the complexity of adhering to intricate DVD industry specifications; masking of the complexity of error-free DVD assembly by authoring software that seeks to make the user interface as simple as possible; the expensive nature of untangling problems once the DVD check-disk stage has been reached.



Interra's Surveyor: DVD Authoring and Mastering process

Surveyor's seamless integration into the DVD production process can sidestep costly and expensive DVD production nightmares by identifying problems at every stage of constructing a DVD title. With its error detection, trouble-shooting and quality assurance capabilities, Surveyor is an indispensable tool designed to meet the production needs of authoring and pre-mastering professionals.

While the software is easy to use, it is rich in features that allow a systematic means to inspect all data elements in the DVD assembly process. Interra engineered this program so that it can analyze DVD disk images, zero Directory structure, titles (VTS), multiplexed VOBs, Program Chains (PGCs) and elementary video and audio streams in such a way that it can test for compliance with MPEG-1, MPEG-2 and Dolby Digital components of the DVD-video specifications.

Additionally, the software has the ability to perform its diagnostics and specify necessary repairs largely unattended while its second-by-second status display provides DVD technicians with detailed information about the integrity of the DVD data and structure. To run the Surveyor programs, the user simply opens a DVD data object, assigns it to a project, selects a test template and begins the analysis.

The user may set new test parameters for the files, apply a previously defined test template, or do nothing and allow the default test to function automatically.

During the authoring of DVD titles, the most effective use of the quality control functions of the software comes through its seamless integration during the concurrent DVD assembly process. This allows the constituent elements of a DVD title to be check[illegible] ed at several [illegible]ages of the authoring and pre-mas[illegible]ring process. Interra's researchers fo[illegible]d that the problem of locating errors [illegible]he latter stages of production wa[illegible]e the more common and exper[illegible]culties DVD authors encounte[illegible] software was planned to h[illegible] and then correct[illegible] troubles early on i[illegible]dentify – DVD professionals [illegible]ntial software being desig[illegible]

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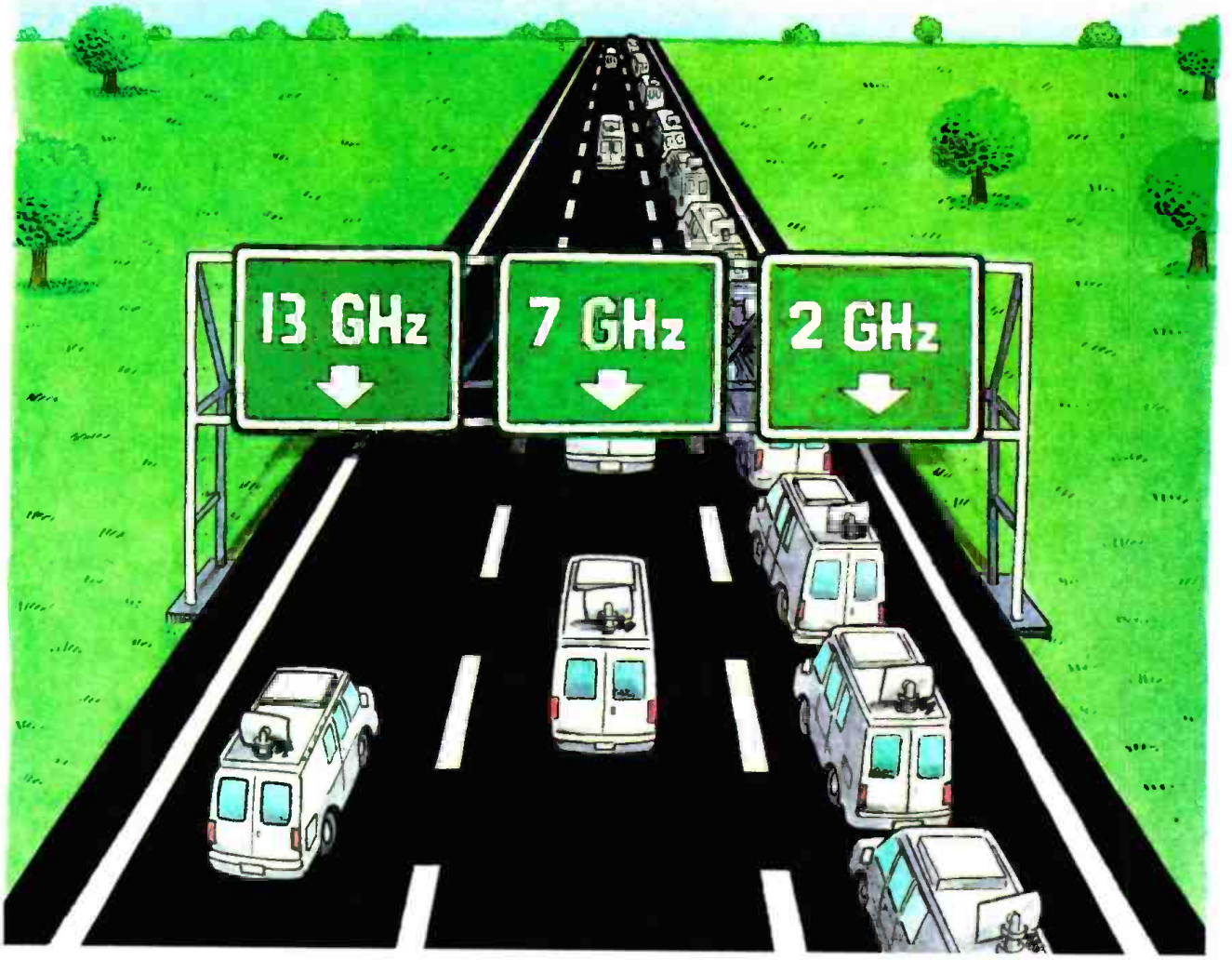

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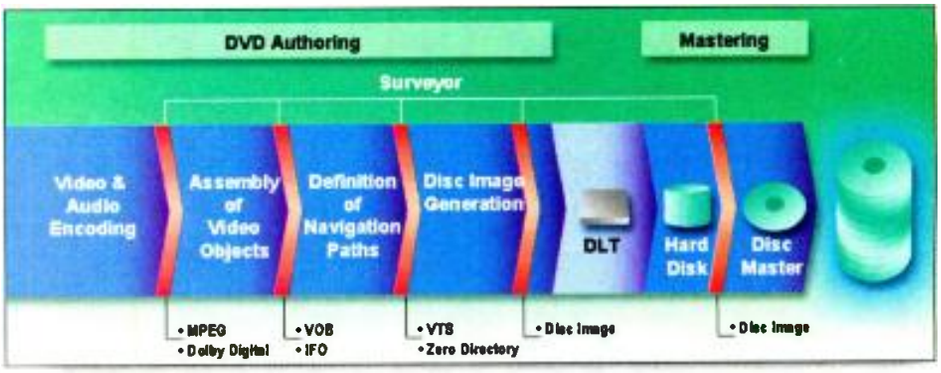

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During the authoring of DVD titles, the most effective use of the quality control functions of the software comes through its seamless integration during the concurrent DVD assembly process. This allows the constituent elements of a DVD title to be checked and corrected at several stages of the authoring and pre-mastering process. Interra's researchers found that the problem of locating errors in the latter stages of production was one of the more common and expensive difficulties DVD authors encounter. Thus, the software was planned to help authors identify – and then correct – those potential troubles early on in a systematic way.

Interra's research into the needs of DVD professionals also led to th software being designed to allow

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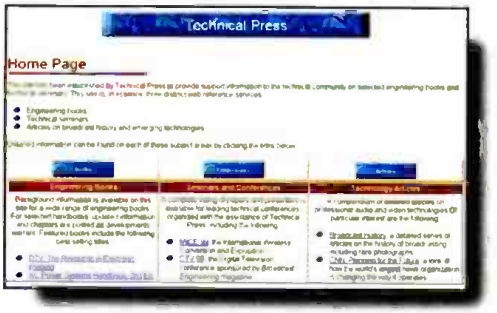

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Technical Press is a web-based reference site that supports more than a dozen video engineering books, including *DTV: The Revolution in Electronic Imaging.* Also available are articles on digital video technologies and applications, and a detailed series on the history of broadcast engineering.

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CommScope, Inc. is the world's leading manufacturer of coaxial cable and specializes in precision twisted pair and optical transmission cables. CommScope provides the Audio/Video professional with over 30 years of experience in the manufacture of high performance transmission media.

the flexible use of its program elements at any stage of the DVD production process. This allows problems to be identified early on so that intricate backtracking of errors is avoided.

The software works by analyzing the data in the DVD data structures according to DVD video standard specifications. It is a file analysis system that can select a file residing on any mounted drive and then perform a suite of checks on the data objects.

Integrating quality control into this complex DVD production process as described optimizes the process and assures increased throughput in the DVD authoring environment so that undetected errors do not cause production delays. It also reduces additional costs that ultimately affect the efficiency and bottom line profits for the DVD producer.

Surveyor's specific features

A powerful feature of the software's quality control tools is flexibility. The software can be used at any stage of the production process to highlight problems with any specific data element in the DVD title. Surveyor's designers constructed the program for versatility so that its tools can be used by different DVD professionals for distinct tests relevant to specific areas of responsibility. For instance, the software is used early on to test the video and audio contents encoding, while at the other end of the production process, the DVD disk mastering facility can use the software to check the entirety of the DVD title.

The detailed testing provided by the software lets DVD producers check a wide variety of data object structures for conformance with the DVD specifications. For example, the software checks that VOBs and VTS – the complex interleafed video, audio, still frames and instruction elements of a DVD title – conform to DVD specs.

After studying the needs of DVD producers, Interra determined that the following elements would be important features to include in the software: comprehensive report capabilities, dynamic status display, stream viewer, offline processing, customizable test templates, project identification, built-in de-multiplexing and Dolby digital decoding, adjustable error severity settings, copy protection verifications and error location pointers.

With these functions all in place, Surveyor software offers a simple-to-use, but highly effective, housekeeping tool that offers essential quality analysis for DVD professionals who want the peace of mind that was previously unavailable due to a lack of tools for quality assurance. In this way, Surveyor pays for itself many times over through its timesaving content analysis and problem prevention abilities.

Finally, as this young industry struggles with understanding the intricacies of DVD specifications and how they translate in the real world, the emergence of an electronic quality assurance assistant can help the industry to generate the kind of quality discs that will build confidence in the DVD format. And, for authors, engineers and reproduction houses it means one less obstacle to overcome. Interra's website, www.interra-video.com, provides more details on other DVD products.

For more information on Interra's Surveyor, circle 490 on the Free Info Card.

Paul Collins is director of marketing for Interra Digital Video Technologies.

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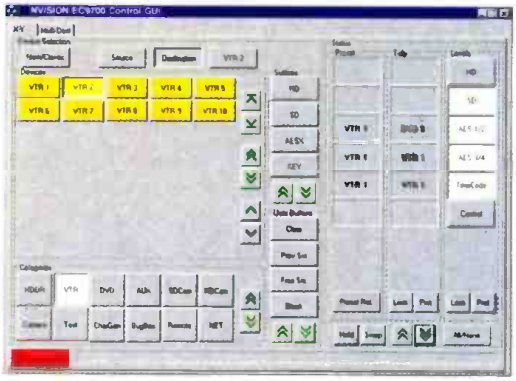

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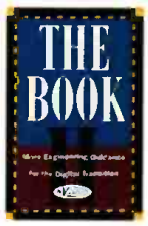

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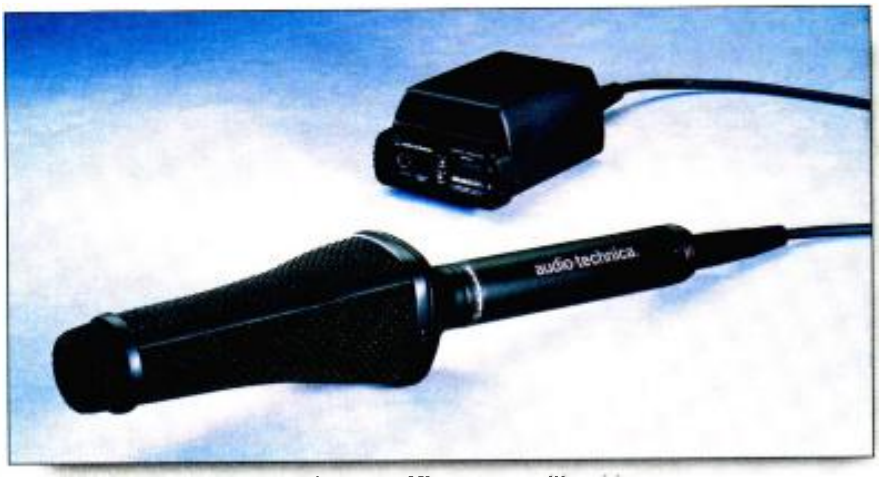
ENGINEERING ELEGANCE

Applied Technology

Audio-Technica's AT895 DeltaBeam Adaptive-array Microphone Systems

BY BOB GREEN

Every broadcast professional is aware of the ubiquitous "shotgun" microphone; its undisputed utility in various audio production applications is well established. Likewise, a closely related tool, the combination parabolic dish/long-range mic, is a staple for sporting events and remote news reporting. These specialized microphones have their strengths, as well as weaknesses. Now there is an alternative microphone technology that offers superior performance and improved operating versatility for many audio acquisition situations: the Audio-Technica AT895 Adaptive-array Microphone. This is a new tool that can take its place in the sound engineer's production toolbox (and conceivably replace the shotgun mic and parabolic dish in many circumstances).



Audio-Technica's AT895 Adaptive-array Microphone with cable.

AT895 Adaptive-array Microphone Systems incorporate a revolutionary DSP-controlled five-element microphone array that provides adaptive directional audio acquisition. The output of the array is manipulated and filtered by acoustical, analog and digital means to enhance the pickup of a sound source from a desired direction (relative to unwanted background noise or interference), providing signal cancellation of up to an impressive 80dB. Although primarily designed for long-range sound pick up, the AT895 functions equally well for handheld interview use in high-noise environments.

The AT895 is a new tool that can take its place in the sound engineer's production toolbox (and conceivably replace the shotgun mic and parabolic dish in many circumstances).

The AT895 system comprises two basic components: the AT895 microphone and the AT895CP Control Pack. The mic is an all-analog design incorporating A-T's well-known line + gradient MicroLine condenser interference tube element, with four additional cardioid elements mounted in a coplanar diamond configuration, plus five mic preamps. The five discrete amplified signals are sent down a special 6-conductor detachable shielded cable to the companion Control Pack. The Control Pack provides power, digital signal processing and control for the system. It features a three-position switch that selects from three discrete operating modes, a filter switch with flat, high-pass and band-pass settings, a monitor headphone jack with volume control, an LCD battery indicator and a power switch with indicator. The analog signal's output from the Control Pack is at mic level (-23 dBV).

Using DeltaBeam technology — a groundbreaking optimization of acoustic, analog and digital design — the system substantially reduces background acoustic interference while offering improved sensitivity, increased pickup distance and higher gain-before-feedback when compared to currently available professional mic technology. The DSP algorithm used in the AT895 is tailored to adjust itself so that the microphone's ability to reject noise is not dependent upon its physical size, as is the case with a shotgun. Therefore, it is able to reject off-axis noise as well at 200Hz as it does at 2kHz. The AT895 features an impressive 80dB maximum off-axis rejection; compare this with a typical professional shotgun mic's best off-axis rejection of around 30dB. This unique capability of DeltaBeam technology provides a useful tool for discriminating specific sources in high-noise environments. A comparison of tests for acceptance angles reveals

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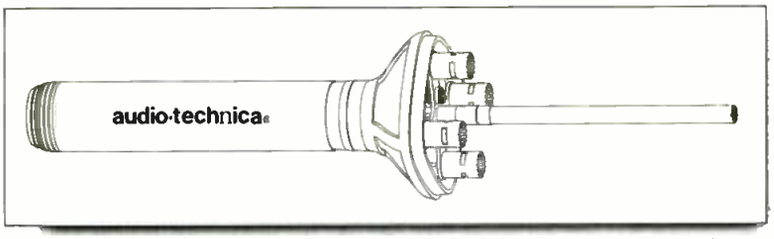
that the AT895 can offer an extremely narrow 20 degrees (from 200Hz to 2kHz), while a typical shotgun can normally achieve only about a 60 degree beamwidth. This laser-like performance is a substantial improvement over the conventional technology of current field audio-acquisition components and techniques.



Beneath the grille, the Audio-Technica AT895 Adaptive-array Microphone houses five discrete microphone elements.

In addition, DeltaBeam technology offers reduced susceptibility to mechanical noise, wind noise and "racking" — the undesirable effect of amplitude and phase changes that results from even the slightest movement of a long-range mic. The new design also minimizes the audibility of proximity effect as well as the nearfield effect on the low-frequency directionality of the array.

Last but not least, the AT895 Microphone, measuring only 14 inches long and weighing just 16 ounces, is easier to use than typical parabolic dish microphones and even some ungainly and long interference tube-type shotgun mics.

On the job, the AT895 offers three modes of polar pattern operation: a Full-field adaptive mode for the narrowest response angle; the Planar-adaptive mode for a narrow pattern in only the vertical plane; and the Line + gradient mode for a wider pattern in less noisy environments. When using either one of the two adaptive modes, signals from the MicroLine element and either one or both pairs of the corrective cardioid elements are used. These signals are processed in the Control Pack by both analog and digital means to provide continuously adapting rejection of off-axis sounds. This means that, as the off-axis soundscape changes (either in intensity or directionality), the microphone system compensates for those changes. Even off-axis wind noise is interpreted as unwanted and is thus suppressed. In the nonadaptive Line + Gradient Mode, only the signal from the MicroLine element is used. The four cardioid elements and the adaptive circuitry are still functioning; however, the correcting signals are not applied to the central element's signal.

AT895 power sources can be from an AC Adapter using an industry-standard 4-pin XLR connection, an Anton-Bauer or similar type 12-14V battery source, or three 9V batteries in a click-on battery housing that snaps onto the Control Pack for completely self-contained operation.

The AT895 is available as the AT895/RK Remote Kit for field use and as the AT895/MK Mount Kit for studio and fixed-installation applications. The remote kit includes the AT895 Microphone, the AT895CP Control Pack, click-on battery housing, pistol-grip shock mount, zeppelin-type windscreen, special 6-conductor shielded cable (ten feet long) and a carrying case. In addition to offering the same AT895 Mic and Control Pack, the AT895/MK Mount Kit includes a shock-mount stand clamp with 5/8-inch 27 threaded stud, a multi-input AC power supply with 120V IEC detachable power cord and an extra-long, six-conductor shielded cable (25 feet). A conversion kit for adding necessary components to turn a mount kit version into a remote one is available as an option, as well as a kit for mounting the AT895 Mic to a Fisher boom. All components of the AT895 systems are available individually for system enhancement or "field spares."

In addition to its obvious uses for broadcasters, the new AT895 will undoubtedly find practical uses in other difficult audio acquisition applications including film/video, surveillance and specialized field recording. Regardless of the specific application, the substantial performance benefits of this unique adaptive array technology will unequivocally make the acquisition of sound sources in less-than-ideal circumstances much easier and will result in substantially improved audio quality. ■

For more information on Audio-Technica's AT895, circle 491 on the Free Info Card.

Bob Green is an engineering supervisor at Audio-Technica U.S., Inc.

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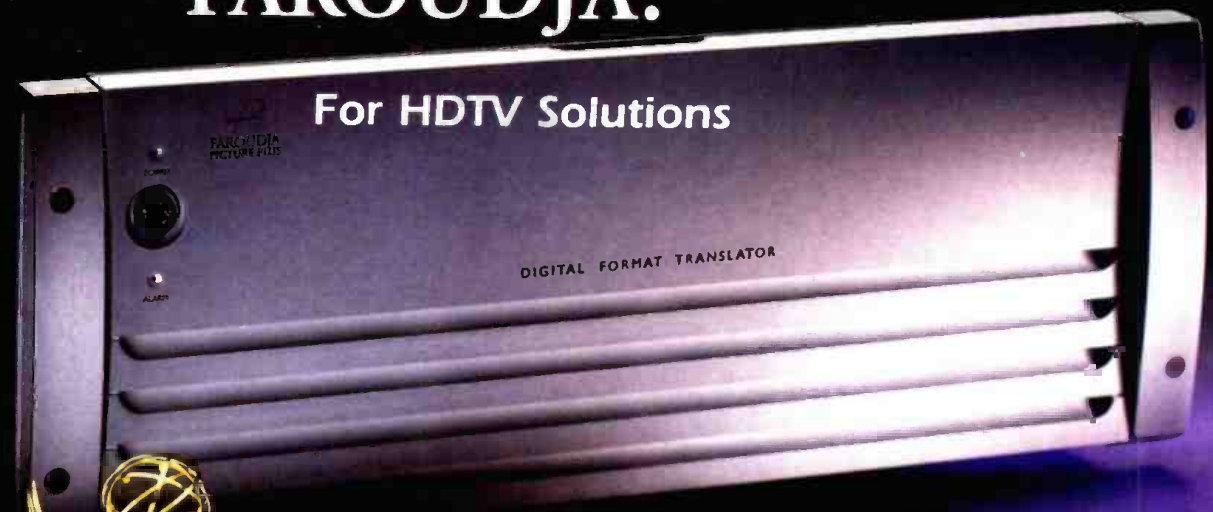

On June 24, 1998 Yves Faroudja, founder and chief technical officer of Faroudja Laboratories, was awarded the prestigious Charles F. Jenkins Lifetime Achievement Award from the Academy of Television Arts & Sciences for the development of key patents in the area of video processing, encoding, decoding, enhancement and noise reduction.

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Field Report

HD Vision and WRAL roll out HD production mobile

BY CHARLES PANTUSO AND SUSAN DAHLIN

HDV-5, the HDTV production truck for the new millennium, recently hit the road offering HDTV production to local broadcast stations at an affordable rate.

The HDTV production mobile is a joint venture between WRAL Digital, owned by Capitol Broadcasting Company, Inc. (CBC), DTV Resources, Inc., owned by Leis Industries Limited, and HD VISION, Inc. HDV-5's initial project was coverage of the first live NCAA college basketball tournament in HD, the "Food Lion MVP Classic." The tournament was produced and broadcast in 1080i HDTV by Harris Broadcast Communications Division, WRAL Digital and RAYCOM Sports and was offered nationwide at no cost to all television stations currently broadcasting in HDTV.

In an effort to speed the transition to digital, members of the NATPE/HDTV consortium share HDTV program material between stations. The addition of the new production mobile affords those same stations an opportunity to produce more HDTV programming. Consortium members receive attractive rates — comparable to the cost of an NTSC truck. The consortium is made up of a variety of DTV stations across the country.

It is hoped that other HDTV stations will take advantage of the mobile and provide viewers with more digital programming to watch. HDV-5 is one of four HDTV mobiles in the U.S. currently available for rent.

Available equipment

The truck comes equipped with four Sony HDC-700 studio cameras with Canon 65x1 lenses and four Sony HDC-750 portable cameras with Canon 18x1 lenses. The mobile is prewired for 12 cameras, with additional cameras rented when required. Vinten Vector-70s and Vector-700s support the HDC-700s and Vinten Vision-22s, and Sachtler Video-80s are provided for the handhelds.

HDV-5 normally rolls with four Sony HDW-500 HDCAM-format recorders. HD VISION can supply two additional HDCAM recorders and four Panasonic HDD5 recorders if requested. Three Ash-Vale SM-2A dual-VTR slow-motion controllers are included in the standard package.

The mobile contains a Snell & Wilcox HD1024 1-1/2 ME production switcher with integrated still store, two DVEs, three keyers, three chroma keyers, three expanded border generators, seven color correctors and four positionable frame buffers.

Camera contol on HDV-5 is prewired for 12 cameras, including four Sony HDC-700 studio cameras and four HDC-750 portables, with additional cameras rented when required. Photo courtesy WRAL-TV.

A pair of Mackie Digital 8-Bus (d8b) mixers are cascaded to provide 48 analog inputs, 48 digital inputs, digital and analog stereo and eight-channel surround outputs. On-board Dolby encoding and decoding equipment supports both AC-3 transmission compression and E-type production compression. 360 Systems Digicart and TCR-8 recorders provide for industry-standard two-channel playback, as well as discrete eight-channel stem handling for 5.1 surround mixing. Separate Multimax monitor processors for the production and audio control rooms provide complete control of the monitoring environment from mono through stereo and 5.1 surround. M&K Professional monitor speakers, subwoofers and bass management are used in the mobile. The M&K speakers are driven by Bryston 4B and 8B power amplifiers. A Tascam DA98 provides for eight-channel recording, playback and layback using an industry-standard format. The audio system is prewired for up to five additional DA-98 series machines, supporting up to 48 channels of on-board tracking for music productions. RS-422 controllable CD players and a cassette deck round out the audio capabilities of the mobile.

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IOT

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A Clearcom Matrix-3 Plus intercom system provides the communications hub for the mobile, which is fitted with ten 29-key LED display stations and ten nine-key LED display stations. Twenty drops of external RTS PL are supplied by four PS-31 power supplies and an SAP1626 assignment panel. BP-325 belt-packs and Beyer DT-108 and DT-109 headsets round out the PL capabilities.

The mobile has eight channels of powered IFB with RTS IFB beltpacks and Telex in-ear headsets.

Video waveform monitoring is by Leader Instruments, selected for its real analog display, which is generally preferable for adjusting camera setup. Leader also supplies MASTER SD-SDI and HD-SDI test generators.

All picture monitoring is full HD quality, not downconverted for NTSC display or scan converted for flat panel computer display. This provides the best environment for producers to evaluate actual HD images for framing and composition, and CRT monitors provide correct colorimetry, an area where current LCD flat panels fall short. All evaluation-grade monitors are the new Sony BVM-D multisync series, so the mobile can be upgraded to multistandard operation with a future camera upgrade.

On-board graphics is done by the Collage (formerly Pixel-Power) Clarity-HD graphics system. The Clarity includes a built-in paint system, as well as a complete still-store. Its substantial on-board processing power supports dramatic real-time HD graphics transitions.

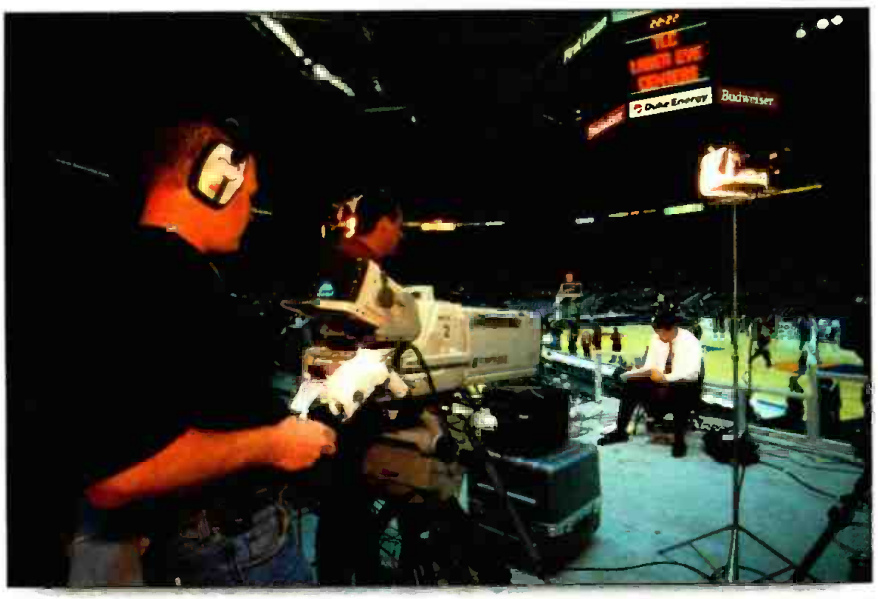
All picture monitoring in HDV-5 is full HD quality, allowing the director and TD to evaluate the framing, composition and overall image quality without making allowances for the shortcomings of LCD flat-panels or NTSC downconversion. Photo courtesy WRAL-TV.

The Snell & Wilcox HD1024 switcher includes an integrated 32x20 HD-SDI routing switcher that provides all of the HD routing in the mobile under control of the Philips Jupiter control system. Additional Philips Venus frames provide 96x96 AES routing, 32x32 SD-SDI routing, 32x32 NTSC-video routing, 32x32 stereo analog audio routing, 32x32 timecode routing and a 64-port data router for machine control and downconverter-upconverter control delegation.

A complete Sony BVE-9100 editing system provides state-of-the-art linear editor control of the mobile's VTRs and audio recorders.

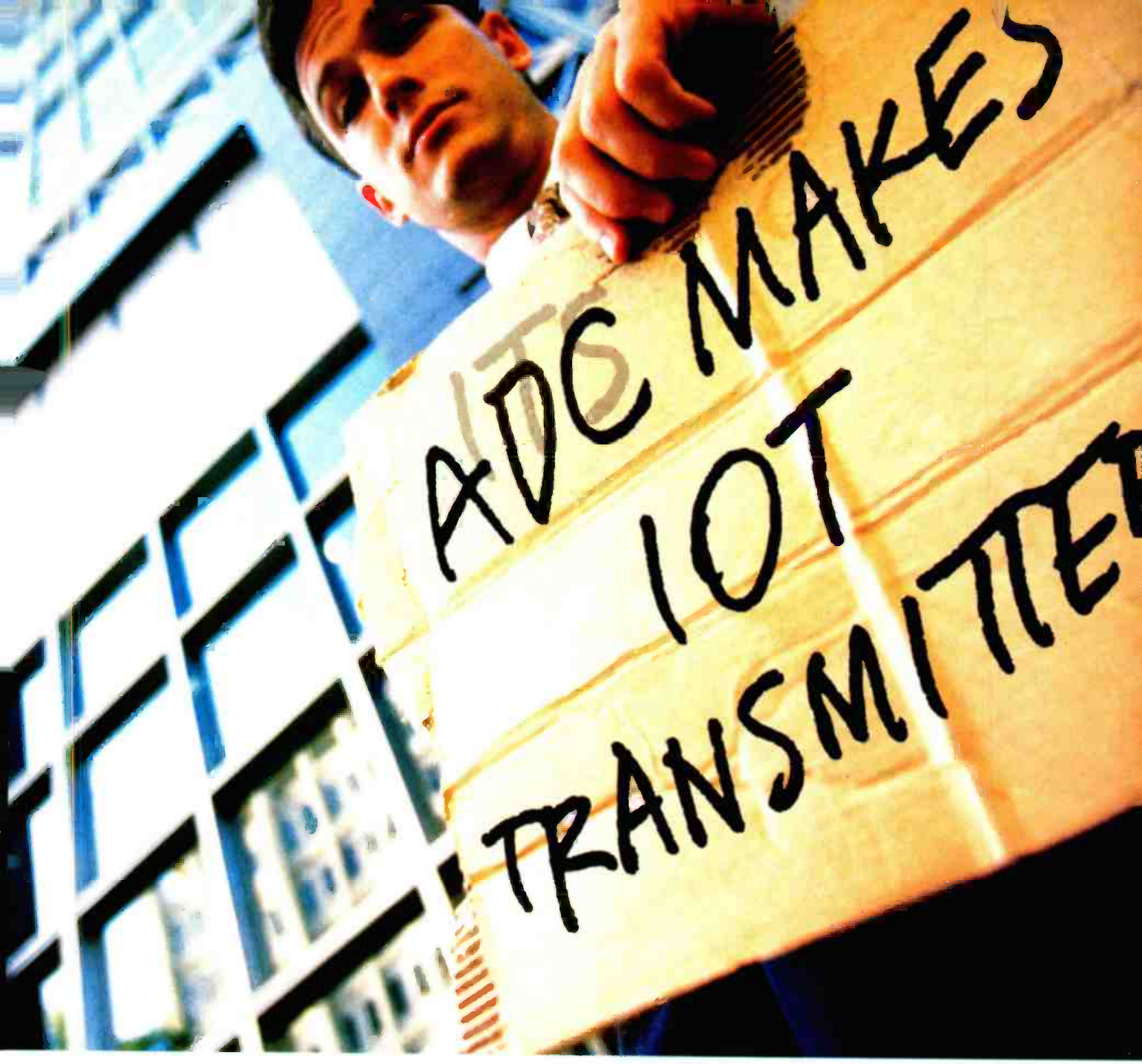
Downconverted serial digital and NTSC outputs are provided for all cameras and VTRs, as well as all of the program feeds, which should facilitate easy integration with side-by-side SD shoots. For integration with other HD mobiles, copies of all HD signals are available at the I/O panel, as well as tally inputs to all of the cameras so that tally can be from an external source when appropriate. The programmable VASGO Limited Source ID and Tally system can be tailored to accommodate any mix of internal and external tally, either on-air or iso, as required by the production.

HDV-5 is usually booked for five-day periods, giving local stations an opportunity to tie in several events. For example, the first live HDTV production at WRAL-TV was scheduled around a football game, baseball game, concert in the park and cooking show, affording the station more mileage on the cost of the rental. It is recommended that Consortium member stations should revisit the live events that are going on in their region (i.e., parades, sporting events and concerts) and look for tie-ins to promote HDTV. ■



Consortium members shoot and share content between stations in an effort to speed the transition to digital among consumers, as well as provide training in HD production. Widely popular programming, in this case NCAA basketball, makes this a good showcase for the benefits of HD. Photo courtesy WRAL-TV.

Charles Pantuso is chief engineer, HD Vision. Susan Dahlin is marketing director, WRAL HD.



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Transmitters: from tetrode to solid state

BY DON MARKLEY

The onset of DTV brought with it the promise of new and exciting developments in all areas of television. Cameras would become even more exotic; the pocket protector crowd would develop even more elaborate and useful digital signal whiz-bangs; and new, exciting transmitters would bring us improved efficiency, unparalleled reliability and new, low prices. The first two have happened and the input ends of the transmitters have made really significant changes. The big output ends of the transmitters that we all love almost seem to be bogged down in a static state.

When the transmitter folks first broke free from tetrodes, the four-cavity klystron seemed to be the precursor of great things to come. That proved to be the case. The five-cavity klystron was a great move, accompanied by improvements in the older fours. This technology became predominant in high-power systems. The efficiency was slowly improved through pulsars and the introduction of the gridded klystron. The industry then moved on through klystrodes and MSDC systems leading to the klystron du jour – the IOT.

When DTV called for the production of another 1700 transmitters, the assumption was that the huge demand would produce a quantum leap in the development of high-power amplifiers. Certainly, the current offerings of exciters demonstrate a significant improvement in the state of the art. However, the final amplifiers seem to be represented by a huge mass of IOTs, frosted with a thin coating of solid state systems and sprinkled with a scattering of diacrodes.

The development of high-power solid-state transmitters is pushing against a barrier much like the speed of sound. The promise inherent in new technology such as silicon carbide devices has not come to fruition. The reasons are varied but are mainly controlled by cost. The more conventional solid-state devices work very well but are still limited for the higher powers by cost. That seems to be the limiting factor holding the industry to the use of the IOT as the primary amplifier type (again with a scattering of Diacrodes).

The promise inherent in new technology such as silicon carbide devices has not come to fruition.

The big problem is fairly straightforward. DTV requires a very linear amplifier. The current exciters are highly capable of correcting for distortions that may be introduced by an IOT. At least one manufacturer even corrects each IOT individually for maximum linearity of the total system. It simply is not practical to do that when the amplifier consists of a string of solid-state devices reaching from here to way over there. Therefore, those devices must be operated in a mode so linear that the precorrection is limited to that which will apply to the sum of the devices. That means that they can't be pushed very hard, resulting in operating them at less than the maximum possible power. That, in turn, means that more devices are needed for the required power output.

Now for the good side. The current crop of amplifiers is great. The linearity of both the IOT and the diacrode offers excellent performance for DTV at an acceptable efficiency. The reliability of those systems approaches that of a concrete block with only minimal required adjustment. Perhaps part of the problem in developing new technology is that the existing technology works so well at an acceptable cost. It is going to require a real breakthrough to move the old-fashioned, vacuum-based systems to one side to be replaced by some processed sand when looking at average power output levels of 25kW or more. So far, the murmurings heard around the industry don't indicate such an onrushing development.

The forward error correction in the modern exciters offers excellent performance for DTV. The exciter, while extremely complex, has certainly developed beautifully. The only negative is that the station technician must plan on attending school for the particular manufacturer in use. It isn't possible for a shade tree mechanic to repair these systems. One must think in ones and zeroes rather than in terms of 6H6s. While the reliability of modern systems is vastly improved when compared to equipment of even 10 years ago, the repair of those systems has become much more complex if taken beyond the expediency of swapping cards until it works. The stability of the modern systems with all of their digital circuitry is truly a wonder. On the other hand, if they start regurgitating bits on a mountaintop in Montana at 3 a.m., you have a real problem. Don't worry, this problem can be dealt with but it is absolutely necessary to get the training to move from strictly analog to digital systems. We have survived the change from all-vacuum tubes to totally solid-state equipment and from monochrome to color. We will probably survive the total conversion to digital, although I'd worry about that technician on the mountaintop who has to listen to telephone menus that lead only to voice mail. ■

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

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Transmitters: By the numbers

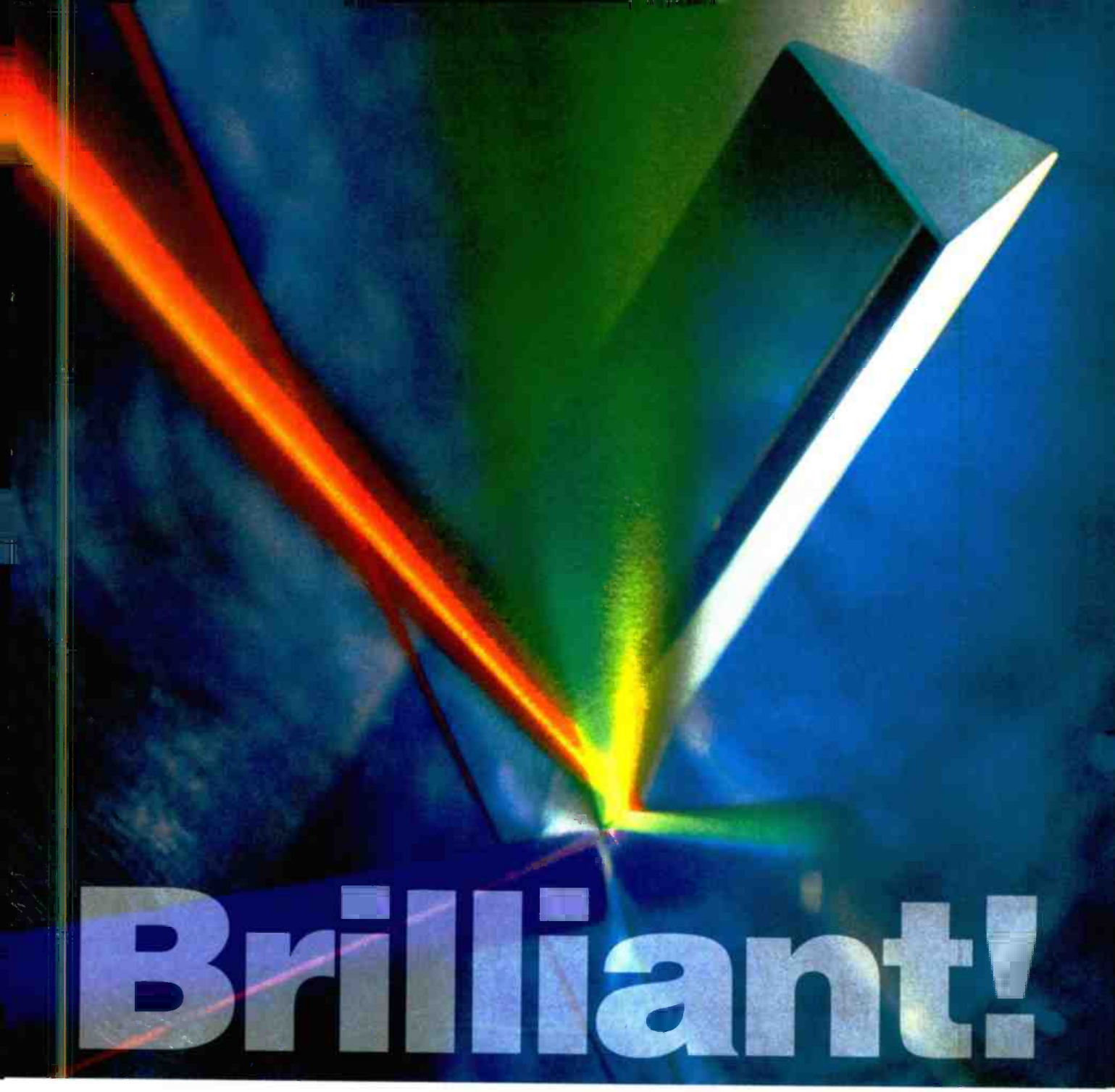
NTSC Transmitters

Company	Model	Power Range	Band	Efficiency	Amplifier	Cooling method	Free Info #
Acrodyne	Renaissance Series	30kW-240kW (peak visual, 10% aural	UHF	Not Provided	Diacrode	Air/Water	401
	ARS30/2 (Adjacent Ch. Tech.)	30kW	UHF	Not Provided	Diacrode	Air/Water	402
	ARS60/4	60kW	UHF	Not Provided	Diacrode	Air/Water	403
	Broadband Solid State (NH500 Series)	5kW (average)	UHF	Not Provided	Bi-polar	Air	404
	Broadband Solid State (NH6000 Series)	40kW (peak visual, 10% aural)	UHF	Not Provided	LDMOS	Liquid	405
	VHF Sold State (NM500 Series)	5kW (peak visual, 10% aural)	VHF	Not Provided	MOSFET	Air	406
	TR Series (Solid State)	5kW (peak visual, 10% aural)	UHF	Not Provided	Bi-polar	Air	407
	TR Series (Tetrode)	5kW to 25kW (peak visual, 10% aural)	UHF	Not Provided	etrode	Air/Water	408
	TL Series (Solid State)	2kW (peak visual, 10% aural)	UHF or VHF	Not Provided	Bi-polar	Air	409
	TRU/10KDM	10kW	UHF	Not Provided	Diacrode	Air	410
ADC Broadcast Systems	Visionary Series	20kW - 420kW	UHF	Consult factory	IOT (one to six)	Air or Water/Glycol	411
	Innovator Series	5kW - 120kW	UHF	Consult factory	Solid State-LDMOS	Air or Water	412
	800 Series	10W - 6kW	UHF	Consult factory	Solid State-BJT	Air	413
	840A	10kW	UHF	Consult factory	Diacrode	Air	414
	300/400 Series	10W - 1kW	VHF	Consult factory	Solid State-FET	Air	415
Advanced Broadcast Syst.	ABS-TC40IXM(A)	30-60kW	UHF	40% @ black; 71% avg.	IOT	Water/Air	416
	ABS-TC70IXM	70-280kW	UHF	42% @ black; 71% avg.	IOT	Water	417
	ABS-TC20I1MA	20kW	UHF	41% @ black; 72% avg.	IOT	Air	418
	ABS-TC30IXMA	30-60kW	UHF	43% @ black; 72% avg.	IOT	Air	419
Comark	IOX	10kw-300kW	UHF	73% @ 150kW	IOT (1-6)	Air or Water	420
	Optimum	500W - 60kW	VHF	45%@ 30kW	Solid State	Air or Water	421
	Ultimate	500W - 60kW	UHF	45%@ 30kW	Solid State	Air or Water	422
Continental Electronics	SpectraStar 700D Series	1kW - 40kW	UHF/VHF	25%	LDMOS /UHF; MOSFET/VHF	Air	423
Larcan	M Series	10W - 6kW	VHF	Varies with power	Solid State	Air	424
	MX & XLS	1W - 2kW	VHF/UHF	Varies with power	Solid State	Air	425
	HDR	10kW to 120kW	UHF	Varies with power	IOT	Air/Water	426

DTV Transmitters

Acrodyne	Renaissance Series	1kW-100kW	UHF	Not Provided	Diacrode	Air/Water	427
	ARS30/2	kW	UHF	Not Provided	Diacrode	Air/Water	428
	ARS60/4	4kW	UHF	Not Provided	Diacrode	Air/Water	429
	NV500 Series	kW	UHF	Not Provided	Bi-polar	Air	430
	NV6000 Series	10kW	UHF	Not Provided	LDMOS	Liquid	431
	AuD Series (Solid State)	2kW	UHF	Not Provided	Tetrode	Air/Water	432
	AuD -5D	4-5kW	UHF	Not Provided	Diacrode	Air	433
ADC Broadcast Systems	Visionary DT Series	12.5kW - 180kW	UHF	Consult factory	IOT (one to six)	Air or Water/Glycol	434
	Innovator Series	2.5kW - 60kW	UHF	Consult factory	Solid State - LDMOS	Air or Water	435
	DT800 Series	5W to 3kW	UHF	Consult factory	Solid State BJT	Air	436
	DT840A	10kW	UHF	Consult factory	Diacrode	Air	437
Advanced Broadcast Syst.	ABS-TCD40IXMA	10.5-21kW average	UHF	46% avg.	IOT	Air	438
	ABS-TCD50IXMA	13.7-27.5kW average	UHF	48% avg.	IOT	Air	439
	ABS-TCD70IXM	19-38kW average	UHF	45% avg.	IOT	Water	440
	ABS-TCD130IXM	35-140kW average	UHF	46% avg.	IOT	Water	441
Comark	Advantage Series	10-100kW	UHF	Consult factory	IOT	Air	442
	DCX	10-100kw	UHF	Consult factory	IOT	Air or Water	443
	Optimum	125W-15kW	VHF	Consult factory	Solid State	Air or Water	445
	Ultimate	125W-15kW	UHF	Consult factory	Solid State	Air or Water	446
Continental Electronics	SpectraStar 700D Series	1kW-40kW	UHF/VHF	25%	LDMOS/UHF; MOSFET/VHF	Air	447
EMCEE	TTU2500HD	2.5kW	UHF	Not Provided	LDMOS Solid State Driver Tetrode PA	Air	448
Harris	DCD20OL1	5kW	UHF	30kW maximum	Solid State -LDMOS	Air	449
	DCD40PL2	10kW	UHF	60kW maximum	Solid State -LDMOS	Air	450
	DCD60PL3	15kW	UHF	90kW maximum	Solid State -LDMOS	Air	451
	DCD80PL4	20kW	UHF	120kW maximum	Solid State -LDMOS	Air	452
	DCD100PL5	25kW	UHF	150kW maximum	Solid State -LDMOS	Air	453
Itelco	V Series	1W-100kW	VHF/UHF	Varies	Solid State, tetrode, IOT	Air/Liquid	454
LARCAN	Landmark	8kW-100kW	UHF	Varies with power	Solid State/IOT	Air/Water	455
	MD Series	1W-10kW	VHF	Varies with power	Solid State	Air	456
	Lo-Power	100W-5kW	UHF	Varies with power	Solid State	Air	457

For more information on these products circle the corresponding number on the Free Info Card.



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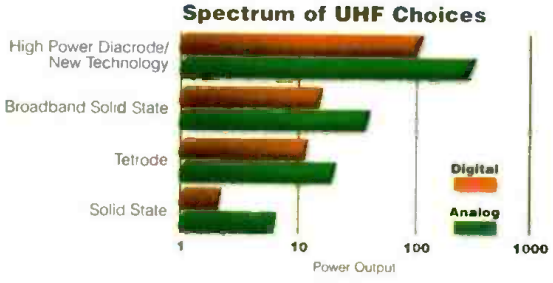

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HD graphics-to-video-out solution

SGI Onyx2: this video solution combines the 3D graphics capabilities of Silicon Graphics' Onyx2 workstation with real-time digital HD output, allowing broadcasters to generate graphics in HDTV formats for virtual sets, template graphics and real-time character generation; 650-960-1980; fax: 650-933-0819; www.sgi.com/go/broadband

Circle (463) on Free Info Card

Automatic mirroring software

Grass Valley Group Profile InSync: this software provides failure protection using a high-speed Fibre Channel network to automatically synchronize the content of any two Profile XP Media Platforms or Profile PDR200/300/400 digital video servers; supports JPEG, MPEG, DVCPro and HDTV formats; 800-998-3588; 800-547-8949; fax: 503-627-7275; www.grassvalleygroup.com

Circle (464) on Free Info Card

New transmitter platform

EMCEE Broadband Wireless Access Transmitter Accessory: this DS transmitter can be used interchangeably as a single channel transmitter for video distribution and supercell Broadband Wireless Access (BWA) applications or as a broadband multichannel transmitter for distributed architecture BWA and moderate power video distribution in both analog and digital formats; 800-233-6193; 570-443-9575; fax: 570-443-9257; www.emceebrd.com

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Equipment leasing program

Tektronix eQuip Finance: this leasing program offers a wide variety of lease types to match the total solution to each customer's specific equipment and financial needs; the program also allows cost-saving bundling of maintenance agreements, software and integration; 800-426-2200; 503-627-7111; fax: 503-222-1542; www.tekronix.com

Circle (466) on Free Info Card

Web streaming solution

Pinnacle StreamGenie: this new portable webcasting solution streams live video program over the Internet; designed to leverage emerging broadband on the Internet using next generation codecs and servers such as RealProducer7 and RealServer7 from RealNetworks that will broadcast quality video over the Internet; 650-526-1600; fax: 650-526-1601; www.pinnaclesys.com

Circle (467) on Free Info Card

Mastering and editing software

Digital Audio Research CD Mastering and Fine Edit: the CD Mastering facility can be accessed from within the OMR8's internal editing software; it enables tracks to be prepared for mastering with the OMR8 controlling the CD-R burning process; the Fine Edit function allows two alternative takes to be viewed side by side and edited at waveform level with high-resolution zoom; +44 1372 742848; fax: +44(0)1372 743532; www.dar.uk.com

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Windows NT workstation

Intergraph Zx10 ViZual Workstation: this workstation offers 64-bit PCI buses — all wide, dual-independent—for maximum throughput and future 64-bit technologies; features Intel Pentium III processors 733/133MHz; has up to 8GB of PC133 ECC SDRAM for reliable memory; 800-763-0242; 205-730-2000; fax: 205-730-6445; www.integraph.com/ics

Circle (469) on Free Info Card

Nonlinear editing software

Fast Multimedia 601 PrintDVD: this software option offers professional editing with the use of MPEG-2 with DVD applications and is now possible within the modular concept of the 601 system; the DVD-compatible data streams created by 601 PrintDVD can be played directly into 601-DVDVirtuoso and DVDConductor; 800-249-FAST; 425-354-2002; fax: 425-354-2005; www.fastmultimedia.com

Circle (470) on Free Info Card

DTV demodulators and decoders

Thomcast/Comark ATSC Professional Demodulator: this demodulator can be used at cable headends to receive broadcast ATSC DTV signals for insertion into local cable systems; it can be used in conjunction with other THOMCAST products such as the Amber remultiplexer; when paired with Zenith's ATSC Professional Demodulator, will product HDTV pictures on a variety of monitors from the most inexpensive computer monitors to a full 16.9, 1920x1080HDTV display; 413-569-0116; fax: 413-569-0679; thomcastcom.com

Circle (471) on Free Info Card

MPEG-2 interface converters and processors

Thomcast/Comark Turquoise: this interface converter and processor performs multi-interface signal conversion and handles multiple interface standards, including DVB-PI ASI, DVB-PI SPI LVDS & ECL, DVB SSI, SMPTE 310M and M2S; allows for a genlock input signal such as GPS for maximum stability of the output signals; performs transport stream processing with packet format conversion and input/output bit rate adaptation based on stuffing packet and restamping management; succeeds the THOMCAST D6002 family and includes all of the D6002 functions; 413-569-0116; fax: 413-569-0679; thomcastcom.com

Circle (472) on Free Info Card

MPEG-2 transport stream server

Viewgraphics DTVxstream: this server combines MediaPump XL technology with the Hewlett Packard NetServer LPr 2RU rackmount PC server; provides a bidirectional DVB-ASI, DVB-LVDS or DHEI interface that handles high bandwidth bi-directional multiplexing and demultiplexing stream processing, clean-cut splicing, table generation and transmission and supports bit-rates over 150Mb/s; 650-903-4900; fax: 650-969-6388; www.viewgraphics.com

Circle (473) on Free Info Card

Single- and double-ear headsets

Clear-Com Systems CC-95 and CC-260: these headsets are designed for intercom applications; feature custom foam-filled ear cushions that provide acoustic isolation in moderate noise level environments; the flexible boom arm features a specially designed, noise-canceling microphone; 510-496-6666; fax: 510-496-6699; www.clearcom.com

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Video/Audio fiber optic multiplexer

Multidyne DVM-2000: this 12-bit video and 24-bit audio fiber optic multiplexed offers state-of-the-art performance exceeding RS250C short-haul and broadcast specifications; will support one video, up to 6 audio and data channels; the transmitter and receiver modules plug into a 10-channel frame with redundant power supplies are available as stand-alone units; 800-4TV-TEST; 516-671-7278; fax: 516-671-3362; www.multidyne.com

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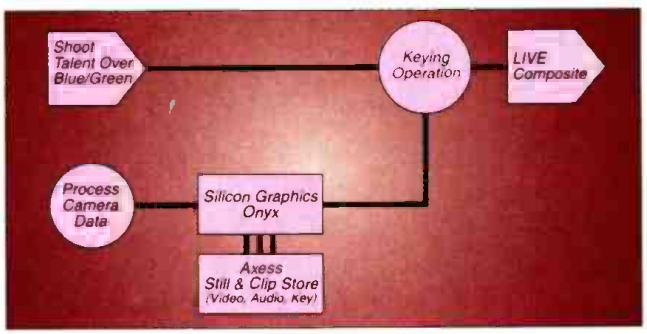

NT real time, 3D virtual set solution

Accom ELSET Live: ELSET Live-NT is a 3D virtual set system that features live video I/O, Distance Key and Infinite Blue Box. The system can incorporate live video panels or tectuyres into scenes with camera position information. System allows camera operator to control both camera and virtual set during production; 650-328-3818; fax: 650-327-2511; www.accom.com

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Digital newsgathering system

Adaptive Broadband MRC CodeRunner.2: this digital newsgathering system features applications for news operations facing narrower channels or potential digital transmissions, including COFDM, QPSK, 16QAM and FSK modulation techniques; initial model operates in 2HGz band; digital operation provides 6Watts for DOFDM, QPSK operation; 978-671-5700; fax: 978-671-5903; www.adaptivebroadband.com

Circle (477) on Free Info Card

Frame synchronizer

Crystal Vision SYN102: this frame synchronizer features two operational modes — synchronizer and delay line; a remote freeze function can be used in either; has both horizontal and vertical output timing adjustment, with a full two fields of adjustment; +44 1223 506 515; fax: +44 1223 506 514; www.crystalvis.com

Circle (479) on Free Info Card

Graphics and character systems generators

Collage Graphics Software Version 2.0: this software includes new animation effects, increased support for networking and enhancements designed to satisfy dual-channel requirements for on-air applications; 561-395-4000; fax: 561-395-4065; www.pixelpower.com

Circle (478) on Free Info Card

Digital audio workstation

SADiE Cedar DeThump: this digital audio workstation, the newest member of the Cedar family, complements the SADiE Cedar DeNoise and DeClick plug-ins; is designed to remove low frequency energy bursts from an acoustic signal; uses the data surrounding the thump to build a picture of what the low frequency signal data should have been prior to the thump; 615-327-1140; fax: 615-327-1699; www.sadie.com

Circle (480) on Free Info Card

Automatic mixer

Shure Brothers SCM410: this four-channel automatic mixer is suited for smaller installed and transportable systems; has many of the performance attributes of Shure's eight-channel SCM810 mixer pulled into half of a rack space; features include adjustable low-pass filters (25Hz to 320Hz), high frequency shelving filters for each channel, four balanced XLR inputs, a single balanced XLR output, an unbalanced RCA auxiliary-level output, and a peak output limiter and master output level control; 800-25-SHURE; 847-866-2200; fax: 847-866-2279; www.shure.com

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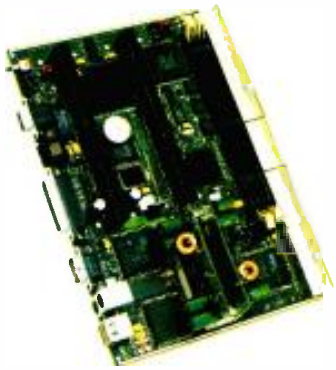

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Circle (180) on Free Info Card

Distribution matrix

AutoPatch Epica-256: this matrix switcher is aimed at applications that require large growth capability; features modular architecture allowing designers to start as small as 16 inputs by 16 outputs and scale the system up to a full 256 x 256 per signal type in the field; ultra wideband bandwidth specifications are 300+MHz in a fully loaded condition; 800-622-0246; 509-235-2636; fax: 509-235-2646; www.autopatch.com

Circle (482) on Free Info Card

Digital Video Exciter

LNR Communications Digital video exciter: this DVE occupies only one rack unit of height, creating a lightweight, highly portable system ideal for digital satellite news gathering applications as well as hub uplinks, teleports and flyaway stations; fully MPEG-2/DVB compliant, end-to-end solution (video in/RF/out), plug and play replacements for existing analog equipment; supports PAL and NTSC formats; 888-LNR-7858; 516-273-7111; fax: 516-761-5454; www.lnr.com

Circle (483) on Free Info Card

Enhanced videographics software

Inscriber VMP Studio: an enhanced version of Inscriber's Video Media Producer software product for the Chyron Duet platform; tightly integrated creation, display and management product; includes an online CG, digital still store, Xtreme motion effects software and alpha-aware paint capabilities; uses the fast NT platform and real-time Open GL graphics capabilities of the Chyron Duet; 800-363-3400; 519-570-9111; fax: 519-570-9140; www.inscriber.com

Circle (484) on Free Info Card

Patching system

ADC Telecommunications Uni Patch RS-422: this patch-by-exception system has the combination of AES compliance with a reliable RS-422 patching interface and modular design; a normalled switching system built for 30,000 insertion/withdrawal durability and 10-pin switching; features gold-plated long cantilever beam springs and grade FR-4 printed circuit boards; 800-366-3891; 612-938-8080; fax: 612-946-3292; www.adc.com

Circle (485) on Free Info Card

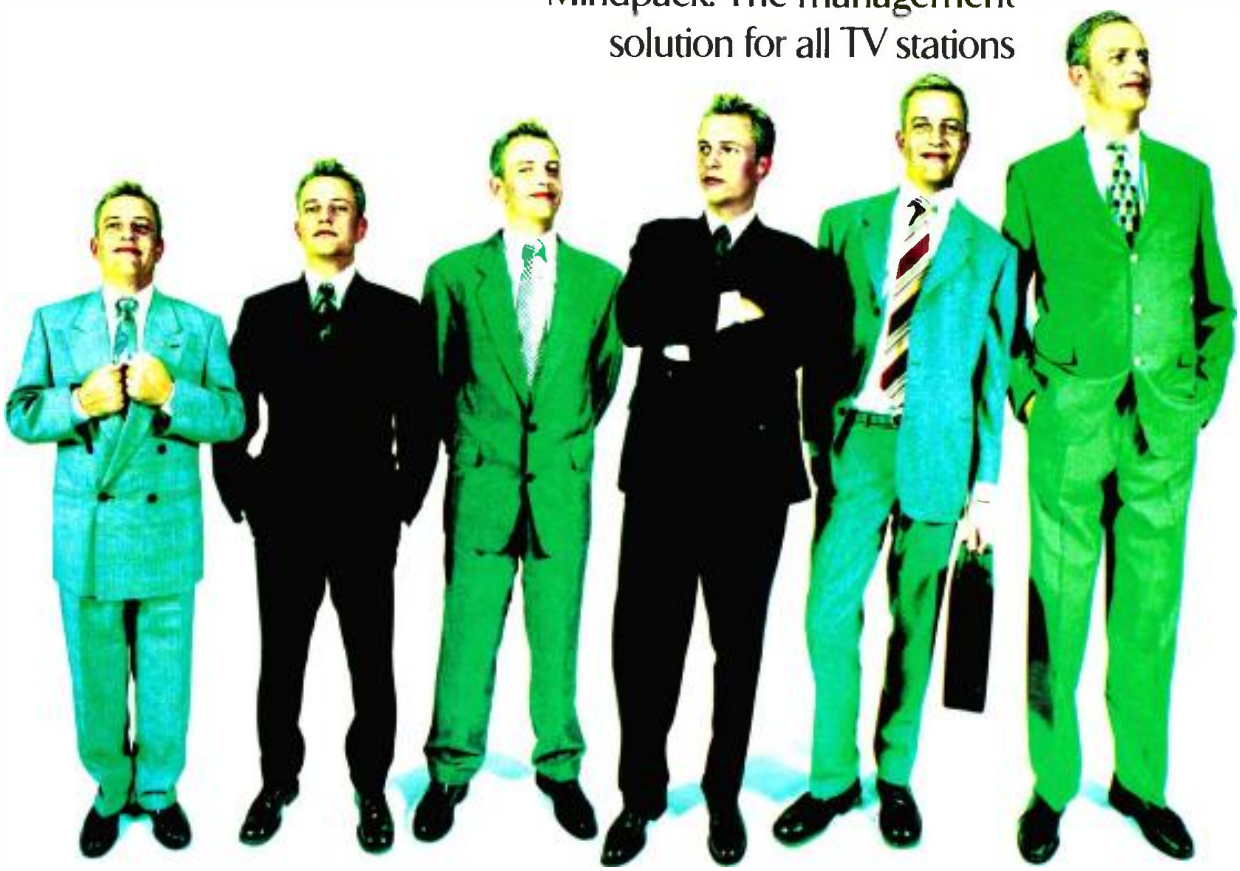
Updated product guide

Neutrik Product Guide: this new product guide includes colorful product features, part numbers, specifications and technical data; the table of contents lists the product lines using color coding to coordinate each product line with its page in the catalog; lists approximately 550 model numbers, including XLR circular and panel mount connectors, micro and miniature industrial connectors, AC power connectors and various accessories; 732-901-9488; fax: 732-901-9608; www.neutrikusa.com

Circle (486) on Free Info Card

The Channel Management System that grows with you

Mindpack: The management solution for all TV stations



Whether you're a small TV station or a multinational broadcasting company, reliable, cost-effective channel management is essential. Mindpack is a convenient, scaleable channel management system that grows as you grow - from single channel to multi-channel operations. And at a price you can afford.

Mindpack has been specially designed to cater for networks and channels broadcasting on analogue and digital platforms.

It comprises full rights management, including budget modeling and finance, a media library, and planning and presentation scheduling, in one fully-integrated package. And all of this with the reliability that comes from years of fine-tuning to meet the demands of today's TV stations.

So when your business is head and shoulders above the rest, Mindpack will always be there to support you.

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MEDIA COMMERCE TECHNOLOGIES

Circle (154) on Free Info Card

Re-writable CD-RW discs

HHB Communications CDRW80 and CDRW74: these discs feature wide power margins, ensuring compatibility with a wide range of professional CD recorders, while a Silver-Indium-Antimony-Tellurium phase change recording material delivers more than 1000 erase/record cycles and a secure archival life in excess of 100 years; 310-319-1111; fax: 310-319-1311; www.hhb.co.uk

Circle (487) on Free Info Card

Commercial-grade CD players

Marantz PMD330, 331 and 340: these CD players are able to play CD-RW discs recorded on CD-RW compatible recorders; models offer a high-performance CD mechanism and state-of-the-art signal processing technology, a multifunction programmable cue button that enables precise control of playback and a 10-digit keypad to access up to 99 tracks; also offers A-B point audio loop playback, audible frame-by-frame search control, single-tack play, index searching and 21 preset functions; each model includes RCA analog outputs, digital (SPDIF format) coaxial output and RC5 remote input/output; 732-901-9488; fax: 732-901-9608 ; www.neutrikusa.com

Circle (488) on Free Info Card

Now Shipping

Tranceivers

AMP Inc. Gigabit MT-RJ Transceiver: this second-generation MT-RJ transceiver is for Gigabit Ethernet, Fibre Channel and ATM OC-12 applications. Operating at speeds up to 1.25Gb/s, the multimode transceivers use low-cost, short-wavelength vertical-cavity surface-emitting laser (VCSELs) and meet the requirements of IEEE 802.3z for 1000Base-SX Gigabit Ethernet. The transceivers have a reach of 550 meters over 50/125-um fiber or 275 meters over 62.5/125-um fiber without the use of mode-conditioning cables; 800-293-4284; fax: 717-986-7575; www.amp.com

Circle (458) on Free Info Card

Universal format converter

Panasonic AJ-UFC1800: this format converter enables broadcasters to convert TV signals between any two user-selectable ATSC-DTV formats; is a self-contained unit; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast

Circle (459) on Free Info Card

MPEG-2 NLE with DVD output

Fast Multimedia 601 Uncompressed, Version 2.1: this nonlinear editing system features YUV color space rather than RGB color space for uncompressed video; this version extends 601's diverse range of application areas to encompass advanced animations and demanding compositing; 800-249-FAST; 425-354-2002; fax: 425-354-2005; www.fastmultimedia.com

Circle (460) on Free Info Card

Compositing and special effects software

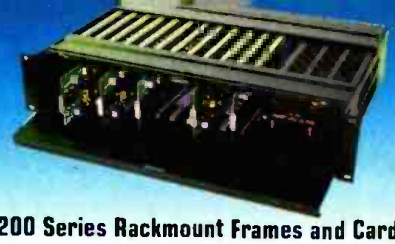
Avid Media Illusion version 6.0: this compositing system features new animation and graph editors that replace previous curves with more flexible bezier curves for editing effect and composite parameters; node cloning provides the ability to quickly and easily create multiple clones of a single process node, allowing changes made to a particular parameter, or an entire process of any one node to be automatically updated to all the associated clones; 800-949-AVID; 978-640-6789; fax: 978-851-0418; www.avid.com

Circle (461) on Free Info Card

Paint and animation system

Avid Avid MATADOR: this graphics system is a resolution-independent 2-D paint and animation system used extensively for rotoscoping, digital matte painting, animation and broadcast design; 800-949-AVID; 978-640-6789; fax: 978-851-0418; www.avid.com

Circle (462) on Free Info Card



8200 Series Rackmount Frames and Cards
The strategic modular solution for distribution and conversion of digital and analog audio and video signals. Models allow for up to 10 or 12 cards plus two power supplies. Interchangeable I/O terminations suit most applications.

Reader Service Card # 170

SMS4 4-Channel Stereo Metering System
Display the levels of any combination of four digital (AES/EBU) and/or analog audio signals simultaneously. Each stereo meter pair comprises two 18 segment LED level displays and a digital audio LOCK indicator. Automatic digital input recognition and circuit selection. Integral power supply.

Reader Service Card # 171

POD11 Digital Audio Meter
This unit features a dual channel, 20 segment LED level display along with 8 signal status LED indicators. Aural monitor outputs, headset or speaker, are provided. Available with 110Ω balanced input on an XLR3(F) connector, or 75Ω unbalanced input on a BNC connector.

Reader Service Card # 172

ABB-1 Audio Bit Buddy ™
Portable, battery powered system for monitoring both digital (AES/EBU, S/PDIF) and analog signals. Digital input monitors sampling frequencies from 30kHz to 50kHz automatically.

Reader Service Card # 173

ABS-1 Audio Bit Spitter
This ABB-1 companion product generates an AES/EBU or stereo analog test tone (400Hz or 1kHz). Digital signals are at 32, 44.1 or 48kHz sampling rates or may be referenced to an external source. Various signal levels may be selected.

Reader Service Card # 174

AMS4 Audio Monitor System
High performance made affordable. Four selectable inputs may be balanced analog stereo, balanced AES3 or unbalanced AES3-ID. Digital signals are automatically identified. Integral power supply.

Reader Service Card # 169

POD13 Dual D to A Converter
This AES/EBU digital to analog converter is available in 75Ω and 110Ω versions. Reclocking circuitry and selectable cable equalization.

Reader Service Card # 175

MP Meter Panels
Up to 4 LED illuminated meters can be contained in a high quality rack panel. Choose from VU, PPM or phase correlation meters. Integral power supply.

Reader Service Card # 176

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Business Wire

Business highlights from broadcast and production

BY SANDRA FERGUSON, EDITORIAL ASSISTANT

ADC recently signed a $20 million agreement to acquire NVISION.

NTV Berlin, a broadcast station controlled by CNN, is now on air with Peak Broadcast Systems' graphics software.

The Grass Valley Group delivered a 1024x1024 and a 1024x128 Series 7000 system to the operations center of EchoStar. Trinity Broadcasting will use the Profile PRO series of video disk recorders for time delay and spot insertion applications.

Panasonic and The Post Group announced a long-term agreement to develop new digital post production processes for the television and film communities.

Iowa State University recently purchased six Hitachi Z-3000W digital 16:9 switchable cameras as part of its one million dollar investment in DTV gear.

JVC announced that Tennessee's PBS affiliate, WTCI-TV, purchased its D-9 line. The Outdoor Channel, based in Temecula, CA, recently invested in D-9 equipment.

Continental Electronics Corp. announced a business unit dedicated to its advanced solid state digital TV transmitter and dual-mode, third-generation modulation systems.

Harris recently completed installation of 53 DPS-470AVs at the Ohio Education Telecommunications Center. Audio Broadcast Group recently became part of Harris' broadcast communications division in Mason, OH.

Standard Communications announced that it entered into a product delivery agreement with Charter Communications. Beginning January 2000, Standard will ship STRATUM integrated network modulators, satellite receivers and stereo generators throughout selected Charter systems.

Soundproof Studios in Los Angeles ordered a Euphonix System 5 digital mixing console. Deluxe Toronto recently installed a dual operator System 5.

Accom was selected by Panasonic to provide 22 Dveous Digital Effects systems for the 2000 Summer Olympics in Sydney. Panasonic selected GeneSys to provide system integration services for broadcasting systems during the 2000 Games.

Snell & Wilcox's Test Card M (TCM) DVB—European standard—and ATSC — U.S. standard — test streams can now be played on Adherent's AD951-II Stream Player, AD952-II Stream Analyzer, AD953-II Stream Station, AD991 Stream Source and MSP100.

The Chicago Digital Broadcast Committee chose Dielectric to design the antenna complex that will top what will become the world's tallest building.

WNJU, Telemundo New York, chose Vibrint's NewsEdit to replace all of its cuts-only tape editing bays. Illinois-based ABC affiliate WSIL-TV3 purchased Vibrint's FeedClip, NewsEdit and NewsQue.

The Standard, a resource for news and information on the Internet economy, is using Virage Interactive services to provide video search capability to its recent Net Returns 2000 conference.

Tektronix announced the opening of the Measurement Store on its website. Tektronix recently announced a new OEM partnership agreement with Media DVX.

Rohde & Schwarz and Acrodyne announced an agreement to market each organization's products in the U.S. and Europe. Acrodyne entered into a long-term strategic agreement for the development, sale and manufacture of digital technology in Asia.

Devlin Design Group recently designed a new set and newsroom for Tulsa's ABC affiliate, KTUL-TV.

Sheffield Audio Video Productions is the first U.S. company to install a Solid State Logic Axiom-MT digital multitrack console in a remote truck.

Chelmsford, United Kingdom-based EEV is to be renamed Marconi Applied Technologies.

DIRECTRIX recently opened a 57,000-square-foot digital playback, storage and transmission facility in Northvale, NJ.

Digital Vision recently opened a new office in Toronto.

NO SHOT. NO STORY.

DIGITAL READY ENG MICROWAVE NOW.

Microwave ENG Reliability that is Second to None.

Analog Today, Digital Tomorrow!

Nucomm introduces the first Digital Ready ENG microwave systems **available now** for immediate implementation.

These highly reliable systems pass all Digital modulation formats including the highly publicized COFDM.

Nucomm radios offer unlimited flexibility. Through the use of the front panel "Smart Display" you can reconfigure the digital-ready radios (i.e. Channel Plan, Power Levels, ASC, Deviation, etc). This is perfect for the FCC's proposed change to the 2 GHz BAS Band.

Nucomm's family of ENG digital-ready radios are available now for your digital migration. They include the tripod or the truck mounted PT/RX6 transmitter and receiver, MMPT6 Mast mount truck system and the CR6 central receiver. All radios are frequency agile.

Going digital?
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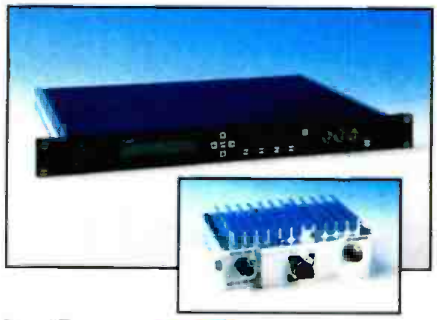

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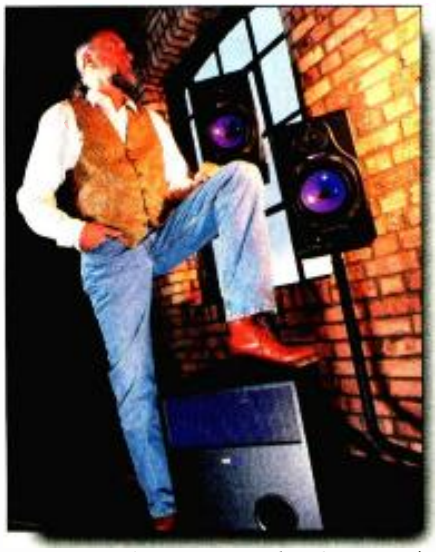
Circle (136) on Free Info Card

Orad announced the opening of its Midwest regional office in Arlington, TX.

Richland TOWERS is scheduled to begin construction of a 1,682-foot AGL supertower in the Orlando area.



Fleetwood Mac's Mick Fleetwood recently chose HHB's Circle 5 monitoring system for a special project.

Xyratex recently acquired a majority interest in San Diego-based Logic Innovations.

PixelPower announced the formation of Collage Graphics Inc.

Gerling & Associates was awarded a contract to construct three remote TV vehicles for the Canadian Broadcast Corp.

People

Leitch appointed Terry A. Canning as vice president of marketing

Sony recently appointed Alec Shapiro as its vice president of marketing communications.

Sony named Robert Ashcroft senior vice president of electronic cinema.

Bob Landingham recently joined Videotek as regional sales manager.

Acrodyne named James Kurimay as its director of world wide technical support.

Consumer Electronics Association promoted Ralph Justus to vice president of technology and standards.

Mark S. Richer was recently named executive director of the Advanced Television Systems Committee.

Screen Shot

Nightly Business Report to update look with Quantel's Moving PictureBox

Nightly Business Report chose Quantel's Moving PictureBox as its solution to create a new, more vibrant visual identity for the program as it enters 2000. The popular program has a long history with Quantel still store technology.

The Moving PictureBox system provides all the key features for live on-air presentations, including dual video outputs with dual moving keys, on-the-fly re-sizing of stills and clips, simultaneous independent recording and clip-to-clip dissolves. Standard storage is 30 minutes of DVCPRO50 video storage/10,000 frames of non-compressed stills.

Screen Shot

Westcoast Video Productions shoots *A Day in the Dirt* with Ikegami and Fujinon

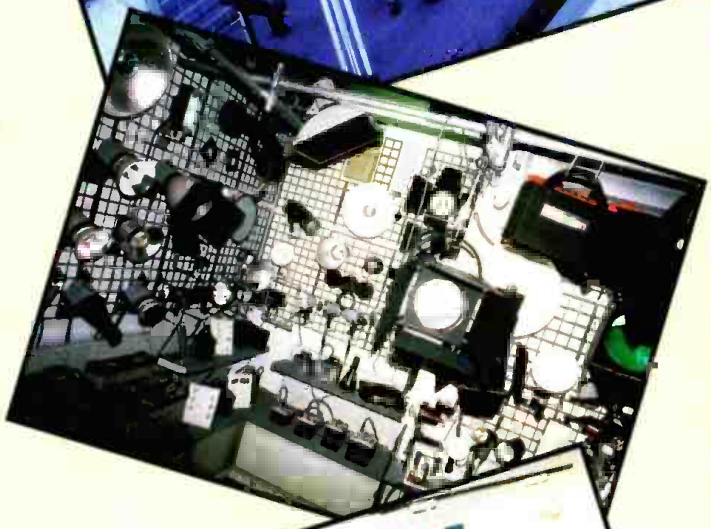
Westcast Video Productions just completed shooting *A Day in the Dirt* bike race in Palmdale, CA, for Youtopi Films. In this annual event where industry professionals, including celebrities and stuntmen, came to race on a three-mile motor cross course, WVP participated by capturing this action on tape.

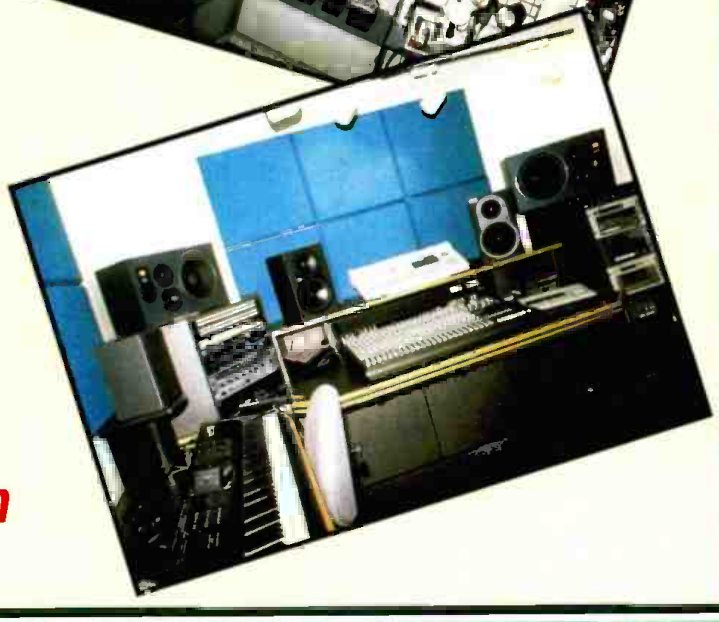
WVP's crew spent an entire day laying 10,000 feet of cable between practice races. WVP used a combination of 12 studio and hand-held Ikegami HL-59 digital cameras, some with Fujinon 55X studio zoom lenses. Two camcorders were used for the interviews in the pits. To get the riders' point of view, two cigar-size video cameras were mounted inside the racers' helmets. A helicopter was also used to capture aerial shots of the race.

The GALLERY

B&H

PHOTO - VIDEO - PRO AUDIO





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QUICK DIAL 74

SONY

DSR-200A 3-CCD Digital (DVCAM) Camcorder

Combining a compact and lightweight body with the superior picture quality of DSP (Digital Signal Processing) and the DVCAM format, the DSR-200A is the ideal acquisition tool for video journalists, event and wedding videographers, stringers and production houses. 500 lines of horizontal resolution, 48k or 32kHz digital audio, three hour record time, and minimum illumination of 3 lux is only the beginning. Other features include 16:9/4:3 capability, Steady Shot, high resolution 1-inch viewfinder, time code operation, time/date superimposition and an IEEE-1394 interface for direct digital output. Offers full automatic as well as manual control of focus, iris, gain, white balance and shutter speed.

- Variable servo 10X optical power zoom lens goes from 5 to 59mm in 1.7 to 24 seconds. The manual zoom rocker is continuously variable right up to where the digital 20X zoom kicks in
- Sony's Super Steady Shot reduces high frequency camera shake without compromising image quality. SteadyShot uses horizontal and vertical motion sensors that allow it to work accurately while zooming, moving (even shooting from a car), and shooting in low light conditions.
- Has digital effects including audio and video fade, overlap and Slow Shutter.
- Automatic and manual focus, iris, shutter, gain and white balance. Iris is adjustable in 12 levels from F1.6 to F11, shutter from 1/4 to 1/10,000 of a second in 12 steps. Gain from -3dB to +18dB in 8 steps.
- Zebra Pattern indicator, built-in ND filter.
- Custom Preset function lets you preset, store and recall custom settings for color intensity, white balance (bluish or reddish), sharpness and brightness.
- Stores Photo, Date/Time, Shutter Speed, Iris, Gain and F-stop for easy recall. So if you have to re-shoot, you know your original settings for every scene and frame.
- Records Drop/Non-Drop Frame time code. Time code can be read either as RC time code or as SMPTE time code
- Has a large 1-inch B&W viewfinder with 550 lines of resolution for easy focusing even in low contrast lighting situations. Separate information sub panel displays time code, battery time, tape remaining and other camcorder functions without cluttering up the viewfinder.
- Records 16-bit/48kHz audio on one stereo track or 12-bit/32kHz with two pairs of stereo tracks (L1/R 1, L2/R2), so you can add stereo music or narration.
- One-point stereo electret condenser mic for clear stereo separation. Directivity can be selected from 0°, 90° & 120°
- Automatic & manual (20-step) audio level record controls. Monitor audio with headphones or from the LCD panel which has an active VU meter.
- XLR input connectors for mics and audio equipment.

DSR-20/40 DVCAM Player/Recorders

The DSR-20 and DSR-40 are versatile DVCAM VCRs with compact chassis and a variety of convenient functions for recording, playback and simple editing. They feature Auto Repeat Playback, Power-On Recording/Playback, multiple machine control interfaces and i.Link (IEEE1394) input and output. And, of course, they offer the stunning image and sound quality inherent to the DVCAM format.

I.LINK

- They both offer i.LINK (IEEE1394) input and output. In addition, in the "Digital dubbing including TC Copy" mode, full information of video, audio and time code of the original tape can be copied to another tape. Especially useful when making working copies of the original.

Inputs and Outputs

- They provide a full range of analog video inputs and outputs for integration into current analog-based systems. They both offer composite and S-Video input/output, while the DSR-40 (only) offers a component output as well. The DSR-20 is equipped with analog audio inputs and outputs (RCA), the DSR-40 with RCA inputs and XLR-balanced output. These connections in combination with their i.LINK interface allow a smooth transition to an all digital system in the future.

Record/Playback Functions

- Automatic repeat function for repeated playback. After reaching either the end of the tape, the first blank portion or the first index point, the DSR-20/40 automatically rewinds the tape, then starts playing back the segment again.
- They are capable of searching for Index Points, which are recorded on the tape as "in-point" marks every time a recording starts. They can also search for photo data recorded on a DVCAM cassette by the DSR-200A/300/PD-100, or where the recording date has been changed.

Reference Input

- External sync input enables synchronized playback with other VCRs. Especially important in A/B Roll configurations. In addition, the DSR-40 only allows adjustment of H-sync and SC phase via the menu.

Control S Interface

- The DSR-20/DSR-40 have a Control S input allowing control via the optional DSRM-20 Remote Control.
- The DSR-20 adds a Control S output connector allowing two or more (up to 50) DSR-20s to be daisy-chained and controlled from one DSRM-20.

DSR-20 Only

- The DSR-20 can be powered by AC or DC.
- Equipped with Control L interface, the DSR-20 can perform Simple Time Code-based editing when connected to another DSR-20 or other similarly equipped VCRs/cameras.
- In addition to Control L, the DSR-20 also incorporates an RS-232 interface for remote control of basic VCR functions from a PC.
- Supplied with the RMT-DS20 Wireless Remote for control of basic VCR functions.

DSR-40 Only

- Equipped with an RS-422A interface, the DSR-40 can perform as the editing player in A/B roll or cut editing system.
- It also has a simple recording function which can be controlled either manually or via its RS-422A interface.
- The DSR-40 is not equipped with a synchronization capability, the editing accuracy is performed by pre-roll and play.

DSR-30 DVCAM Digital VCR

The DSR-30 is an industrial grade DVCAM VCR that can be used for recording, playback and editing. DV standard 4:1:1 sampling digital component recording with a 5:1 compression ratio provides spectacular picture quality and multi-generation performance. It has a Control L interface for editing with other Control L based recorders such as the DSR-200A DVCAM Camcorder or another DSR-30. It also has a continuous auto repeat playback function making it ideal for kiosks and other point of information displays. Other features include high quality digital audio, IEEE-1394 Digital interface and external timer recording. The DSR-30 can accept both Mini and Standard DVCAM cassettes for up to 184 minutes of recording time, and can playback consumer DV tapes as well.

- Records PCM digital audio at either 48kHz (16-bit 2 channel) or at 32kHz (12-bit 4 channel).
- Equipped with Control L, capable of SMPTE Time Code based accurate editing even without an edit controller. Built-in editing functions include assemble and separate video and audio insert.
- By searching for either an Index point or Photo Data recorded by the DSR-200A camcorder, the DSR-30 drastically cuts the time usually required for editing. The DSR-30 can record up to 135 Index points on the Cassette Memory thanks to its 16K bits capability.
- Audio lock ensures audio is fully synchronized with the video for absolute precision when doing an insert edit.
- Built-in control tray has a jog/shuttle dial. VCR and edit function buttons. The jog/shuttle dial allows picture search at ±1/5 to 15X normal speed and controls not only the DSR-30 but also a player hooked up through its LANC interface.
- DV In/Out (IEEE 1394) for digital dubbing of video, audio and data ID with no loss in quality.
- Analog audio and video input/outputs make it fully compatible with non-digital equipment. Playback compatibility with consumer DV tapes allows you to work with footage recorded on consumer-grade equipment. Tapes recorded in the DSR-30 are also compatible with Sony's high-end DVCAM VCR's.

QUICK DIAL 74

Panasonic

Broadcast & Television Systems

AG-EZ1 3-CCD Digital Video Camcorder

$1695

- Digital recording delivers 500 lines of horizontal resolution with no noise (S/N ratio is 54dB)
- 10:1 power and 20:1 digital zoom lens. Both zooms are adjustable in four speeds (3.5-15 sec.) For extreme close-ups the lens can focus up to 1/4" from the subject
- Audio is also digital, using PCM (Pulse Code Modulation) for quality that rivals CDs. Choose between two-channel 16-bit recording or two sets of 12-bit stereo, with the second set reserved for uses such as narration
- Huge 1.5" 180,000 pixel color viewfinder provides 400 lines of resolution and displays all automatic and manual functions on demand
- Variable speed shutter from 1/60-1/8000 of a second
- Built-in SMPTE time code generator
- Digital Electronic Image Stabilizer (DEIS) compensates for jittery videoespecially when the digital zoom is employed
- Digital Photo-Shot lets you record a still-frame for six seconds, while audio continues as normal. 290 still pictures can be recorded on a single 30-minute tape.
- Three ways to easily find previously recorded scenes:
  - TopScan plays back the first few seconds of each segment, providing a handy way to review an entire tape.
  - Record/Review rewinds the camcorder and plays the last 10 seconds of the last recorded scene
  - Indexing encodes the first scene shot on a given day, to quickly find the starting point of each day's shooting

SONY DSR-300 3-CCD Digital (DVCAM) Camcorder

The most advanced DVCAM camcorder, the incredibly affordable DSR-300 incorporates three 1/2-inch CCDs, DSP digital technology and is the only one-piece camcorder in its class with 100% total digital transfer between the camera section and the VCR section.

High Performance:

- Three 1/2-inch 410,000 pixel PowerHAD CCDs provide high quality acquisition with increased sensitivity plus "FIT like" reduced vertical smear of -110dB.
- Delivers high quality, artifact-free images. Offers an outstanding 800 lines of horizontal resolution, a sensitivity of F11 at 2000 lux and a true minimum illumination of 0.5 lux. It also features an advanced LSI Digital Signal Processor (the same one used by the DXC-D30) for a high S/N ratio of 62dB.
- Hyper Gain mode using DPR (dual pixel readout) allows shooting in extremely low light with virtually no noise.

Digital Signal Processing:

- Skin Tone Detail and Correction- Offers a more natural appearance by smoothing details in the picture. A feature normally found in much higher priced cameras. Skin Tone Detail and Correction reduces and controls wrinkles in the selected skin area without changing the other areas of the image.
- TruEye and DynaLatitude- Just like in the DXC-D30, this feature allows the camera to reproduce natural colors with a wide dynamic range of contrast.
- Black Stretch and Compress: Emphasizes the contrast in dark areas of the picture without any color changes that would require color correction in the editing process.

Digital Functions:

- Very similar to the DSR-1, the VCR section includes SetupLog, FreezeMix and EditSearch functions. SetupLog automatically records status of the camera settings onto the DVCAM cassette throughout the shooting process. FreezeMix and EditSearch allow you to search for a certain scene and retake if necessary by superimposing the recorded image to the live image in the viewfinder.
- ClipLink logging is also available using the optional DSBK-301 interface board. ClipLink records index pictures on the tape as well as shot list data, logging function (reel #, time code, take # and OK/NG (No Good) shot information.

NEW!

JVC GY-DV500 1/2-inch 3-CCD Professional DV Camcorder

The world's first DV camcorder designed from the ground up for professional ENG work, the GY-DV500 combines the convenience and cost-effectiveness of Mini DV with the performance and features you need. It 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). Ruggedly constructed with a rigid diecast magnesium housing providing the durability professionals crave, the GY-DV500's compact design and light weight (less than 11 lbs. fully loaded) makes it extremely portable. 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.

Professional Specifications

- Applies JVC's DSP with advanced 14-bit video processing to bring out more natural details, eliminate spot noise, accurately reproduce dark areas, and restore color information in dark areas.
- CCDs are equipped with advanced circuitry to virtually eliminate vertical smear when shooting bright lights in a dark room. Ensures efficient light conversion with a sensitivity of F11 at 2000 lux.
- CCD Defect Correction function evaluates white defects with the lens closed and then stores their addresses in memory. When the camera is turned on, the data is sent to the DSP for storage and real-time correction.
- Black Stretch/Compress function ensures accurate reproduction of black areas on the screen. Advanced color matrix circuits give even difficult images a very natural appearance.
- Multi-stream parallel digital pipeline processing at 40 MHz creates an ultra-smooth gamma curve, calculated using a true log scale algorithm. The result is a dynamic range of 600% to accurately reproduce fine details and colors in shadows or highlights.

Professional Performance

- Multi-zone iris weighting system gives priority to objects at the central and lower portions of the picture for accurate auto exposure under any condition, even if a bright subject moves into the picture.
- Adjustable gamma for adjusting the "feel" of the picture according to taste. Adjustable detail frequency for setting picture sharpness for a bolder or finer look.
- Viewfinder status display uses characters and menus to display selected information, including audio indicator, tape and battery remaining time, VCR operation and warning indicators. Camera settings and setup parameters can also be checked at a glance. A built-in menu dial lets you quickly navigate through the viewfinder menu.
- Highlight Chroma Processing maintains color saturation in highlights. The result is natural color reproduction, even in bright highlight portions of the picture.
- Smooth Transition mode ensures a smooth transition with no jump in color or light level taking place when manually changing gain or white balance settings

Professional Audio

- To complement its superior video performance, the GY-DV500 offers outstanding digital PCM sound. You can choose between two 16-bit 48-kHz channels or two 12-bit 32-kHz channels with a dynamic range of 85 dB.
- In addition to camera mounted mic, has two XLR-balanced audio inputs with 48v phantom power and manual audio control. Phantom power can be switched off when not in use.
- Side-mounted speaker lets you monitor audio in playback and recording modes without headphones. The speaker also delivers audible warnings.

VIDEO and PRO AUDIO

TO INQUIRE ABOUT YOUR ORDER:
800 221-5743 • 212 239-7765
OR **FAX** 24 HOURS:
800 947-2215 • 212 239-7549

New Address:
420 Ninth Ave. *(Bet. 33rd & 34th St.)*
New York, N.Y. 10001

B&H
PHOTO - VIDEO - PRO AUDIO

FUJINON ENG LENSES

With ENG camera technology evolves faster and faster, delivering ever higher performance in ever smaller bodies, it has been increasingly difficult for lens manufacturers to improve quality while keeping size and weight to a minimum until recently. With Aspheric Technology (At2) Fujinon has succeeded in manufacturing superior quality lenses that are both smaller and lighter than lenses of conventional spherical design. From the widest angle to the highest telephoto, Fujinon's broadcast hand-held style lenses offer unparalleled features and performance. In fact, they are so advanced and so optically superb they will reshape your thinking about how well a lens can perform

Fujinon's broadcast hand-held lenses feature the very latest in optical and mechanical design, and manufacturing techniques. New EBC (Electron Beam Coating) reduces flare and improves contrast, while AT2 Aspheric Technology improves corner resolution and reduces chromatic abberation. And all except the 36:1 Super Telephoto offer the exclusive "V-Grip" and Quick Zoom.

A15X8EVM Standard Zoom Lens

A versatile performer in a compact package, offers AT2 inner focus, Quick Zoom and the "V-Grip" 7495.95

A20X8EVM Standard /Telephoto Zoom Lens

Combines additional focal length with AT2, inner focus, Quick Zoom and the "V-Grip" 11,499.95

CHYRON PC-CODI & PC Scribe

Text and Graphics Generator and Video Titling Software

PC-CODI incorporates a broadcast quality encoder and a wide bandwidth linear keyer for the highest quality, realtime video character generation and graphics display. A video graphics software engine running under Windows 95/NT, PC Scribe offers a new approach and cost effective solution for composing titles and graphics that is ideal for video production and display applications. Combined, their a total solution for realtime character generation with the quality you expect from Chyron.

PC-CODI Hardware:

- Fully-antialiased displays • Display and non-display buffers
- Less than 10 nanosecond effective pixel resolution
- 16.7 million color selections • Fast, realtime operations
- Character, Logo and PCX Image transparency
- Variable edges: border, drop shadow and offset
- Full position and justify control of character and row
- User definable intercharacter spacing (squeeze & expand)
- Multiple roll/crawl speeds • Automatic character kerning
- User definable tab/template fields
- Shaded backgrounds of variable sizes and transparency
- Software controlled video timing
- User definable read effects playback: wipes, pushes, fades
- NTSC or PAL sync generator with genlock
- Board addressability for multi-channel applications
- Auto display sequencing • Local message page memory
- Preview output with safe-title/cursor/menu overlay
- Composite and S-video input with auto-genlock select

PC-Scribe Software:

- Number of fonts is virtually unlimited. Also supports most international language character sets. Fonts load instantly and the level of anti-aliasing applied is selectable.
- Adjust a wide range of character attributes. Wide choice of composition tools.
- Characters, words, rows and fields can color flash
- Character rolls, crawls and reveal modes. Speed is selectable and can be auto timed with pauses. Messages can be manually advanced or put into sequences along with page transitions.
- Multiple preview windows can be displayed simultaneously
- Transitions effects include: cut, fade, push, wipe, reveal, peel, zoom, matrix, wipe, spiral, split, weave and jitter.
- Import elements to build graphics. This includes DLE objects, iNFiNiT! RGBA and TGA with alpha channel. Scribe also imports and exports TIFF, JPEG, PCX, TGA, BMP, GIF, CLP, ASCII, IMG, SGI, PICT and EPS formats.

PC-CODI and PC-Scribe Bundle 2995.00

TRUEVISION/Avid

Professional Video Production Workstation

Incorporating the award-winning TARGA 1000 video card and Avid MCXpress NT non-linear editing software, this fully-configured workstation meets the needs of production professionals, corporate communicators, educators and internet authors.

TARGA 1000 Features:

The TARGA 1000 delivers high processing speed for video and audio effects, titling and compositing. Capture, edit and playback full-motion, full-resolution 60 fields per second digital video with fully synchronized CD-quality audio.

- Compression can be adjusted on the fly to optimize for image quality and/or minimum storage space. Has composite and S-video inputs/outputs. Also available with component input/output (TARGA 1000 PRO).
- Genlock using separate sync input for working in professional video suites
- Audio is digitized at 44.1KHz or 48KHz sampling rates, for professional quality stereo sound. Delivers perfectly synchronized audio and video

MCXpress Features:

The ideal tool for video and multimedia producers who require predictable project throughput and high-quality results when creating video and digital media for training, promotional/marketing material, local television and cable commercials, CD-ROM and internet/intranet distribution. Based on Avid's industry-leading technology, it combines a robust editing functionality with a streamlined interface. Offers integration with third-party Windows applications, professional editing features, powerful media management, title tool and a plug-in effects architecture. It also features multiple output options including so you save time and money by reusing media assets across a range of video and multimedia projects

TARGA 1000/MCXpress Turnkey Systems:

- 300-watt, 6-Bay full tower ATX chassis
- Pentium ATX motherboard with 512K cache
- Pentium III- 450 MHz Processor
- Matrox Millenium II AGP 4MB WRAM display card
- 128MB 10ns 168-Pin (DIMM) S-DRAM
- 18GB 10GB IDE System Drive
- Seagate Barracuda External 9.1GB SCSI-3 ultra-wide capture drive
- Adaptec AHA-2940U2W Ultra Wide SCSI-3 controller card
- Teac CD-532e 32X EIDE internal CD-ROM drive • 3.5" floppy drive
- Altec-Lansing ACS-48 3-piece deluxe speaker system
- Viewsonic G771 17" (1280 x 1024) monitor (0.27mm dot pitch)
- Microsoft MS Mouse • Focus 2001A keyboard
- Avid MCXpress for Windows NT • Windows NT 4.0 operating system
- Truevision TARGA 1000 or 1000 Pro Video Capture Card

With TARGA 1000 ..... $5995.00
With TARGA 1000 Pro (component input/output) $6495.00

KNOX VIDEO

RS4x4/8x8/16x16/16x8/12x2
Video/Audio Matrix Routing Switchers

Knox's family of high performance, 3-channel routing switchers are extremely versatile, easy-to-use and very affordable. Housed in an ultra-thin rackmount chassis they accept and route (on the vertical interval) virtually any video signal, including off-the-air and non-timebase corrected video. They also route balanced or unbalanced stereo audio. The audio follows the video or you can route the audio separately (breakaway audio). Each of the switchers offers manual control via front panel operation. They can also be controlled remotely by a PC, a Knox RS Remote Controller, or by a Knox Remote Keypad via their RS-232 port. Front panel LEDs indicate the current routed pattern at all times. Knox switchers are ideal for applications such as studio-feed control and switcher input control, plus they have an internal timer allowing timed sequence of patterns for surveillance applications as well.

- Accept and routes virtually any one-volt NTSC or PAL video signal input to any or all video outputs.
- Accept and route two-volt mono or stereo unbalanced audio inputs to any or all audio outputs.
- Video and audio inputs can be routed independently , they don't need to have the same destination.
- Can store and recall preset cross-point patterns. (Not available on RS12x2.)
- Front panel key-pad operation for easy manual operation.
- Can also be controlled via RS-232 interface with optional RS Remote Controller or Remote Keypad.
- Front panel LED indicators display the present routing patterns at all times.
- An internal battery remembers and restores the current pattern in case of power failure.
- Internal vertical interval switching firmware allows on-air switching.
- Housed in a thin profile rackmount 1" chassis.
- Also except the RS12x2 are available in S-Video versions with/without audio.
- Models RS16x8 and RS16x16 are also available in RGB/component version.
- With optional Remote Video Readout, the RS16x8 and RS16x16 can display active routes on a monitor at remote locations, via a composite signal from a BNC connector on the rear panel.
- The RS4x4, RS8x8 and RS16x16 are also available with balanced stereo audio. They operate at 660 ohms and handle the full range of balanced audio up to +4 dB with professional quick-connect, self-locking, bare-wire connectors

LEADER

Manufacturing test and measurement equipment for over 40 years, Leader Instruments is the standard which others are measured against for reliability, performance, and most important—cost effectiveness.

5860C WAVEFORM MONITOR

A two-input waveform monitor, the 5860C features 1H, 1V, 2H, 2V, 1 s/div and 2V mag time bases as well as vertical amplifier response choices of flat, IRE (low pass), chroma and DIF-STEP. The latter facilitates easy checks of luminance linearity using the staircase signal. A PIX MON output jack feeds observed (A or B) signals to a picture monitor, and the unit accepts an external sync reference. Built-in calibrator and on-off control of the DC restorer is also provided.

5850C VECTORSCOPE

The ideal companion for the 5860C, the 5850C adds simultaneous side-by-side waveform and vector monitoring. Featured is an electronically-generated vector scale that precludes the need for fussy centering adjustments and eases phase adjustments from relatively long viewing distances. Provision is made for selecting the phase reference from either A or B inputs or a separate external timing reference.

5100 4-Channel Component / Composite WAVEFORM

The 5100 handles three channels of component signals, plus a fourth channel for composite signals, in mixed component / composite facilities. Features are overlaid and parade waveform displays, component vector displays, and automatic bow-tie or "shark fin" displays for timing checks. Menu-driven options select format (525/60, 625/50, and *1125/60 HDTV), full line-select, vector calibration, preset front-panel setups and more. On-screen readout of scan rates, line-select, preset numbers, trigger source, cursor time and volts.

5100D Digital Waveform/Vectorscope

The 5100D can work in component digital as well as component analog facilities (and mixed operations). It provides comprehensive waveform, vector, timing and picture monitoring capabilities. Menu driven control functions extend familiar waveform observations into highly specialized areas and include local calibration control, the ability to show or blank SAV/EAV signals in both the waveform and picture, the ability to monitor digital signals in GBR or YCbCr form, line select (with an adjustable window), memory storage of test setups with the ability to provide on-screen labels, flexible cursor measurements, automatic 525/60 and 625/50 operation and much much more.

5870 Waveform/Vectorscope w/SCH and Line Select

A two-channel Waveform/Vector monitor, the microprocessor-run 5870 permits overlaid waveform and vector displays, as well as overlaid A and B inputs for precision amplitude and timing/phase matching. Use of decoded R-Y allows relatively high-resolution DG and DP measurements. The 5870 adds a precision SCH measurement with on-screen numerical readout of error with an analog display of SCH error over field and line times. Full-raster line select is also featured with on-screen readout of selected lines, a strobe on the PIX MON output signal to highlight the selected line, and presets for up to nine lines for routine checks.

5872A Combination Waveform/Vectorscope

All the operating advantages of the 5870, except SCH is deleted (line select retained), making it ideal for satellite work.

5864A Waveform Monitor

A two-input waveform monitor that offers full monitoring facilities for cameras, VCRs and video transmission links. The 5864A offers front panel selection of A or B inputs, the choice of 2H or 2V display with sweep magnification, and flat frequency response or the insertion of an IRE filter. In addition, a switchable gain boost of X4 magnifies setup to 30 IRE units, and a dashed graticule line at 30 units on screen facilitates easy setting of master pedestal. Intensity and focus are fixed and automatic for optimum display. Supplied with an instruction manual and DC power cable.

5854 Vectorscope

A dual channel compact vectorscope, the 5854 provides precision checkout of camera encoders and camera balance, as well as the means for precise genlock adjustments for two or more video sources. Front panel controls choose between A and B inputs for display and between A and B for decoder reference. Gain is fixed or variable, with front panel controls for gain and phase adjustments. A gain boost of 5X facilitates precise camera balance adjustments in the field. Supplied with a DC power cable.

Designed for EFP and ENG (electronic field production and electronic news gathering) operations, they feature compact size, light weight and 12 V DC power operation. Thus full monitoring facilities can be carried into the field and powered from NP-1 batteries, battery belts and vehicle power. Careful thought has been given to the reduction of operating controls to facilitate the maximum in monitoring options with the operating simplicity demanded in field work.

CORPORATE ACCOUNTS WELCOME

Circle (160) on Free Info Card

The GALLERY

Professional Services

Classifieds

For Sale

Classifieds For Sale

TV TRANSMITTER FOR SALE: RCA TT25 FL CH3 25KW INCLUDES VSB, AURAL & VISUAL HARMONIC FILTERS, SPARE EXCITER & MODULATOR, NEW SPARE BLOWER MOTER & NUMEROUS NEW SPARE PARTS. AVAILABLE APRIL 2000 CONTACT ROD REID PH. (705) 734-3300 FAX (705) 733-0302 E-MAIL rodr@thenewvr.com

Circle (203) on Free Info Card

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Classifieds Services

Circle (202) on Free Info Card

Classifieds Help Wanted

ENGINEERS

Turner Broadcasting System has career opportunities for experienced television engineers. These career positions demand an extensive background in equipment maintenance, digital video and audio, and knowledge of computer systems and networks. Please mail or fax your resume and cover letter to:

CNN
THE WORLD'S NEWS LEADER

Jim Brown, Assistant Vice President of Engineering Services
Turner Broadcasting System, Inc.
One CNN Center • P.O. Box 105366
Atlanta, GA 30348-5366
Fax: 404-827-1835 • Phone: 404-827-1638
TBS is an equal opportunity employer

Recipe for Success
You'll Find Exciting Opportunities at Food Network!

Responsibilities: Maintain through periodic overhaul and emergency repair (troubleshooting) the broadcast equipment of the network including cameras, VTR's switchers, special effects units, character generators and monitors.

Requirements: 2 year electronic technical school or equivalent, 3 years experience in braadcast and production and post production industries, flexible shift schedule.

We offer a competitive salary, excellent benefits and a great working environment.

Fax resume with salary requirements to:
SR, (212) 398-0850 Or Email: humanresources@foodtv.com
Visit us at www.foodtv.com

food NETWORK

DIRECTOR OF ENGINEERING: Tribune Broadcasting's WXIN/WXIN-DT, the Fox affiliate in Indianapolis, is an exceptionally maintained technical facility seeking an exceptional leader to oversee all technical planning, installation, and maintenance of studio and field equipment and NTSC and DTV transmitters. Requirements include functional experience in digital technology, computers, microwave systems, and broadcast related equipment; knowledge of FCC rules and regulations; three or more years of successful supervisory experience; with a college degree and SBE certification preferred. Mail resume, salary history and cover letter, noting desired position and referral source, immediately to: Human Resources, WXIN-TV, 1440 N. Meridian St., Indianapolis, IN 46202-2305 EOE.

TELEVISION ENGINEER: Post-production facility in Austin, TX has an immediate need for an individual with at least 2 yrs experience in servicing BetaSP tape machines. Component level troubleshooting of audio, video, and digital equipment is also required. Please send résumé with salary requirements to: 501 Group, 501 N. IH-35, Austin, TX 78702 attn: Bill Kalenda EOE

MAINTENANCE ENGINEER: Digital WXIN-TV a Tribune Broadcasting Station has an immediate opening for a Maintenance Engineer. The successful candidate will have strong hands-on maintenance experience in digital technology, computers, microwave systems, and broadcast-related equipment. Knowledge of FCC rules and regulations. A minimum of three years experience in TV Engineering. Good people and communication skills a must. College degree and SBE certification preferred. Mail resume, salary history and cover letter, noting desired position and referral source, immediately to: Human Resources, WXIN-TV, 1440 N. Meridian St., Indianapolis, IN 46202-2305. No phone calls please. EOE.

The National Digital Television Center - LA has an opening for the following positions: **HPA Maintenance Engineer:** Job duties include, but are not limited to: maintenance on all HPA & transmission facilities, and maintaining compression & encoders for satellite transmission of signals. Successful candidate must have; ability to install & wire RF equipment, identify, understand & resolve system problems, and a knowledge of C/ku band satellite & compression techniques. Two years of electronics training is preferred, however equivalent experience will also be considered. **Production Engineer:** Responsible for constructing and maintaining studios for production, edit facilities, & master control in a multi-channel TV facility. Duties include: install, maintain, and repair all types of audio & video equipment to include: professional audio mixers, analog & digital production switches, routers, intercom systems, cameras & other associated prod equip. Min. Qualifications: Associates degree in electronics or its equivalent. 3 plus years of broadcast video & audio equip operation & repair exp. Exp in maintenance & repair of multiple format broadcast video tape machines. An interview, drug test & background check req'd for successful candidate. **Please fax resume to 310-207-4128, attn: HR or email** thib@ndtcla.com **Please no phone calls.**

WBTV, a pioneer CBS affiliate in Charlotte, is looking for an experienced **Broadcast Project Engineer.** The qualified applicant must be able to conceive, design, and manage engineering projects. Good installation skills are a must. Also, the applicant must be skilled in all areas of broadcast maintenance. This includes broadcast VTR's, switchers, cameras, terminal equipment, and ENG RF equipment. Duties will require component level troubleshooting and replacement. FCC license and SBE certification a plus. Minimum 5 - 7 years experience. Please send resume and salary history to: Human Resources, Jefferson-Pilot Communications, 1 Julian Price Place, Charlotte, NC 28208, Fax: 704-3-74-3626, E-mail: ccloud@jpc.com (EEO)

RF DESIGN ENGINEER: Design and development of Video and low (less than 100 MHZ) RF Frequency Division Multiplexing TV Camera Control Systems. **Experience:** 3 to 5 years of analog circuit design. **Special Requirements:** Analog RF and video experience. Broad knowledge of broadcast, communication and audio/video systems. **Inquiries:** Please respond: www.telemetricsinc.com.

Classifieds

Help Wanted

A LARGE TV STATION IN THE SOUTHWEST is seeking an exp. **RF Supervisor** to manage, maintain and operate RF sites, equipment and installs. Project manage DTV/NTSC xmitter, line and antenna removal, install and operation. Supervise RF Engineers. Assist in developing and implementing Capital and Op budgets. Candidate must have 2 yrs coll/tech. Deg., in elecs. Min. 5 yrs broadcast equipment maint exp. FCC General RT Lic. SBE certification pref. Must be able to maintain xmitter, translators; sat receive equipment, lift/carry 70lbs. OT, weekends, travel and holidays req. Know computer config. related to broadcast sys. Must work with all departs to support all eng. functions. Work in a fast paced environment on multiple projects. EOE/M/F/D/V. Competitive wages/benefits and a great place to work. Qualified applicants send resume and salary history to: Personal/Confidential, Classified Ad Coordinator, Broadcast Engineer Dept 797, 9800 Metcalf Ave, Overland Park, KS 66212-2216.

BROADCAST ENGINEER: Are you looking for an opportunity to grow and learn in a brand new, state-of-the-art technical facility? You could be on our team supporting and maintaining automation systems, servers, routers, switchers, related cabling, and eng field gear. Broadcast or related equipment maintenance experience is required along with technical school, college degree or the equivalent experience. Ability to develop a working knowledge of NT and UNIX operating systems is necessary and operational knowledge of microwave, satellite, fiber systems, and automation software is a plus. Be a part of the future of local television news in our new, digital facility in desirable Austin, Texas. Fax your resume today to: Human Resources, News 8 Austin, 12012 N. MoPac Expwy., Austin, TX 78758; Fax: 512-485-6186. We are an equal opportunity employer M/F/V/D.

CHIEF ENGINEER: WOKR, Rochester, New York, is seeking a professional with a BA, BS or combination of equivalent work experience. FCC General Class License and SBE Certification desirable. Must be computer literate with knowledge of most operating systems. Successful candidate will be responsible for all engineering/plant functions. Resume to Human Resources ENG, WOKR-TV, PO Box 20555, Rochester, NY 14602-0555. WOKR-TV is an EEO employer. Minorities and women encouraged to apply.

Classifieds Help Wanted

THE WEATHER CHANNEL, Atlanta, GA, is looking to add the following **Broadcast Engineering** positions to our team:
Sr. Digital Video Engineer - Seasoned Broadcast Engineer to provide expert information on audiovisual standards, technologies, open digital television systems, as well as other implementations and applications based on MPEG-1, 2, JPEG, M-JPEG, DV and ITU-T standards for broadcast studio production and post production. SDTV and HDTV experience is a plus. Individuals must have both strategic and hands on expertise, 10 years industry experience.
Broadcast Project Engineer - Project management, technical engineering support, vendor and customer management, and developing engineering standards. 5-7 years related broadcast industry experience required.

Looking for a bright and sunny future? Come work with us. Please Email Resumes to Jobs@weather.com, or fax attn: HR to 770/226-2959, and reference "Engineering BC" in subject of response. Visit our web site at Http://www.weather.com for more information.

WE PLACE ENGINEERS
Employer Paid Fees.
20 Years personalized & confidential service.
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Dime Bank , 49 S. Main St., Pittston, PA 18640 USA
Phone (570) 655-7143 • Fax (570) 654-5765
website: keystoneint.com
We respond to all
Employee & Employer Inquiries
ALAN CORNISH / MARK KELLY

ENGINEERING MAINTENANCE TECHNICIAN: JOB #92399 WSYX/WTTE in Columbus, Ohio has an immediate opening for an Engineering Maintenance Technician. Duties include maintenance of all broadcast and related equipment including switchers, DVC Pro VTR's, ENG/EFP equipment, VHF and UHF transmitters, etc. College degree and 2-3 years of broadcast equipment maintenance preferred. Experience with PC's especially with NetWare and Windows NT a definite plus. Qualified applicants should send resume and cover letter to: WSYX/WTTE-TV, P.O. Box 718, Columbus, Ohio 43216, ATTN: Human Resources. Please state referral source and job number on resume. No phone calls please. Women and minorities are encouraged to apply. Pre-employment drug testing. EOE M/F/D

FT STUDIO TECHNICIAN: Formal schooling in Electronics Theory. 5 years experience in Broadcast TV bench technician. Send resume to: KOB-TV, Job #32-99, 4 Broadcast Plaza, SW, Albuquerque, NM 87104. EOE/M-F.

HARBOUR MARINE SYSTEMS, worldwide leader in Broadcast and CATV on board cruise ships has immediate openings for a Broadcast Television Engineer and Technician. Proficiency in analog and digital broadcast and editing systems, satellite downlinks, and CATV distribution is required. The position is based in Miami, FL. Send resume with salary history/requirements to Urbano Menendez, Technical Manager by fax 305.358.1235 or email urbano.menendez@hmsweb.com

TV MICROWAVE TECHNICIAN: Arkansas Educational Television Network, the PBS system serving Arkansas, seeks a RF technician to maintain full power television transmitters and microwave STL equipment. This position is based in Arkadelphia, Arkansas. Candidates should have formal education equivalent of a high school diploma; plus two years vocational or related training in electronics, plus two years experience in electronic repair and maintenance. Proven maintenance experience, ability to independently trouble shoot, knowledge of digital audio/video transmission equipment, and FCC general class license is desirable. Valid drivers license, minimum requirements for the state vehicle safety program, and extensive in-state travel required. Submit a State Application, current resume with cover letter, three professional references and salary history to: AETN-Human Resources Supervisor, PO Box 1250, Conway, AR 72033. Application review begins January 31, 2000. AETN is an AA/EO/ADA employer. Minorities, and Women are encouraged to apply.

GET OUT OF THE SNOW! Join us in the nation's fastest-growing, most exciting market. Las Vegas network affiliate is looking for an experienced, talented **MAINTENANCE ENGINEER** to help us move into the digital world. We offer competitive pay and factory training, and a fast-paced/exciting work environment....all In a great place to live! Benefits include dental/health/life Insurance and 401(k) plan. Please send resume to John Holland, Dir. of Engineering, KVBC, 1500 Foremaster Lane, Las Vegas, NV 89101. No Phone Calls Please. E.O.E.

Rates

Advertising rates in Broadcast Engineering are 146^{00} per column inch, per insertion, with frequency discounts available. There is a one inch minimum.

Ads may also be purchased By-The-Word for $2.25 per word, per insertion. Initials and abbreviations count as full words. Minimum charge is 45^{00} per insertion. Frequency discounts and reader service numbers not available for by-the-word classified space.

To reserve your classified ad space, call Brian Huber at
1-800-896-9939
or 913-967-1732
Fax: 913-967-1735
e-mail:
brian_huber@intertec.com

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EOM

Small markets get battered again

BY PAUL MCGOLDRICK

When President Clinton signed the massive budget package that included the satellite provisions for local station carriage, he leveled the playing field for the two domestic satellite companies — and created a selling frenzy for the Christmas season. It has certainly been true that the greatest impediment to breaking through the barriers of mass adoption for EchoStar and Hughes has been the question of local delivery. Most of us feel that cable has been playing with an unequal advantage and it is probably right that moves toward fairness be made, but the changes themselves cause problems.

Neither of these satellite broadcasters is in a position to offer coverage for all the U.S. markets. Informed guesses are that Dish Network will get to about 50 markets while DirecTV will be limited to about 40. While both companies have been able to immediately offer a number of cities — mostly through the transmission of a single network — there is a problem of sheer availability. Where a local market station is already available as a source, that city can be included quickly in the list — as soon as a retransmission agreement has been negotiated.

The story doesn't end there, however. In wording which is a little like must-carry in nature, a satellite provider that offers one network station in a market must offer all the network stations in that market by the end of 2002. PBS coverage seems to be ignored. The real limitation to offering service is in the number of transponders in place now and those that can be in place by that 2002 date. EchoStar seems to be in a position of advantage there although that could change in two years. But if a market is offered in the next year with just one network station, what will happen at the end of the must-carry period? Will the company have to drop the market? Or will some other scenario arise that will allow everyone to wink and ignore it? These are interesting politics the two companies will have to play in and with. But as a viewer I would implore that there be no more additional compression to gain space for these extra services.

The rush of consumers to buy DBS systems this last Christmas season was probably not because of a full understanding by consumers about the number of network stations they would be able receive immediately. And I don't understand where the satellite provision fits in with the legal mayhem of disconnecting ineligible viewers of the previous satellite network offerings. Are waivers still going to be needed by consumers not in the top markets? It doesn't seem to me that the legal situation has changed: If you can receive acceptable network services off-air you would be eligible to watch them from a satellite if your market is covered, but you wouldn't be eligible to receive signals from another market?

In wording which is a little like must-carry in nature, a satellite provider that offers one network station in a market must offer all the network stations in that market by the end of 2002.

The rout is probably on, however, and many tens of millions of customers will be eligible to receive networks from satellite; the cable companies will respond by rolling out fiber as quickly as they can with, probably, even more emphasis on the smaller markets where their battles will be easier. There will also be considerably more emphasis on additional services that they will be able to offer, although many people will still need to be convinced of the cable company's efficiency and reliability. The local telephone companies are generally not very imaginative and continue to insist on selling bandwidth, but at least they are highly reliable.

My major concern in all this is for the small market stations. They are already living on the brink; consolidators have already acquired some. And some of the consolidators have the same financing sources for their expansion — an indication to me that the consolidators will themselves be consolidated, just as has happened so dramatically in radio. The pressure is already on small market stations to build a DTV presence to justify their licenses, and reduced advertising revenues will now compound that as consumers migrate to the satellite reception of programming that they are not generating.

My only local station — 25 miles away but not receivable — is already a consolidated station, using a satellite feed for 99 percent of its output. The other one percent is made by what is an ever-changing staff of trainees who leave for larger stations as soon as the opportunities arise. This poor station is really already on the brink. A few months ago it received another slam with the announcement that an FCC frequency auction had resulted in a direct competitor coming on the scene at a cost of over $300,000. I was talking to a rather naive young cameraperson at a civic event shortly after the announcement and the only concern was "which network will it be affiliated with?" ■

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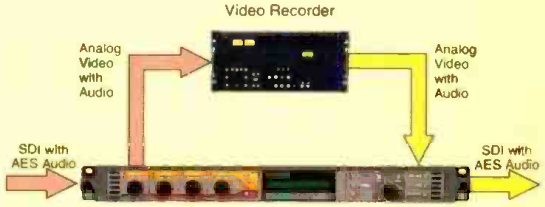

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