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May 1999
Volume 41
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Broadcast ENGINEERING
THE JOURNAL OF DIGITAL TELEVISION

## IN THIS ISSUE


# 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 6)*

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**ON THE COVER:** *Home Shopping Network in St. Petersburg, FL showing the Vela RapidAccess video server.*
*Photo by: Jason Marsh Photography, Tampa, FL.*

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# New Products & Reviews



# Departments



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## FREEZE FRAME

A look at the technology that shaped this industry.

### *Do you remember?*

This January, 1984 issue focused on ENG cameras. Selected readers who can name at least three of the cameras (including company and model) covered in the article can win Broadcast Engineering T-Shirts. Hint: there were 13 companies manufacturing cameras at that time. Today, there are seven. Send responses to: brad_dick@intertec.com.

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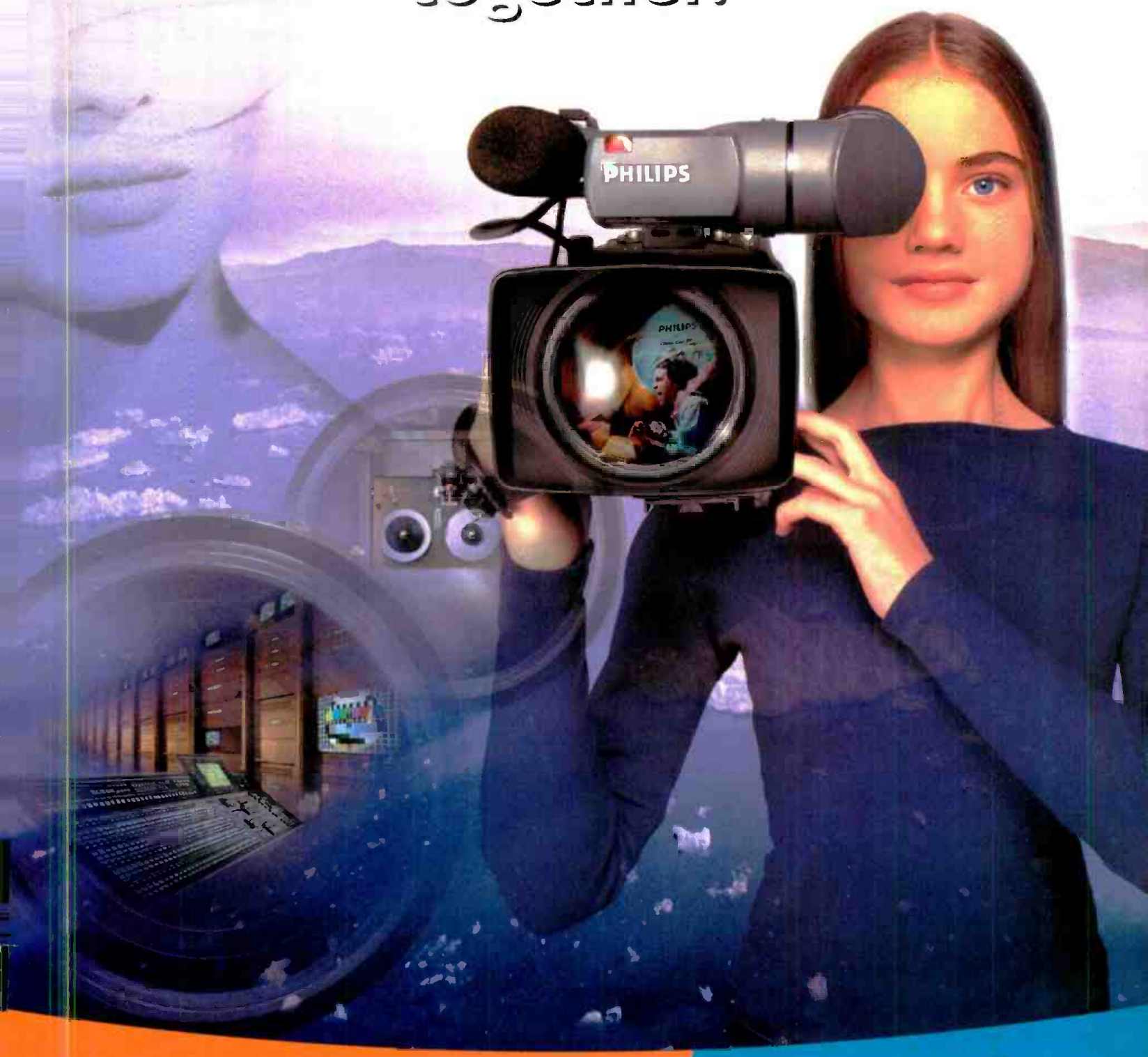


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Editorial

# Kennard's army of lawyers

Did you hear about the guy who killed radio? While scanning some recent news sources, I ran across an article about FCC Chairman William Kennard. In the story, he was called, "The Man Who Killed Radio." The story was about the FCC's recent proposal for *micro radio* whereby just about anyone who can sign their name can have their own radio station. The article was theorizing that Kennard's zeal to promote minority radio station ownership would, instead, kill the entire radio industry. I wonder if he now has TV in his sights.

While speaking at a recent media conference, Kennard described how wise the FCC had been in (not) defining new rules for digital TV. "*When it came time to finalize digital TV standards...many broadcasters and manufacturers were focused on providing clear, sharper and prettier pictures for their audiences...But we at the FCC said that DTV is not only about prettier pictures. So, we left it (standards) open...(giving) broadcasters flexibility in how they use DTV,*" he said.


He then went on to threaten TV broadcasters, warning them away from any attempt to slow the digital process by saying, "*You don't want me and an army of FCC lawyers coming in and telling you what to do.*"

How dare you threaten us Mr. Kennard! What we really have are 1400 TV stations and 85 million TV homes looking for direction, not threats. Secluded in your Potomac tower, you've promoted a system where stations are now required to spend millions for a new tower, transmitter and antenna. Yet after we've made this investment, the 70 percent of our audience which is hooked to cable can't even get the new signal.

The real reason more stations haven't jumped to digital is precisely because the FCC has not adopted standards – especially with respect to reception equipment. Why don't the new TV sets have built-in tuners? It's because there's no standard. Right now, a consumer would need three set-top boxes (all of which don't exist) just to get local TV, cable and satellite. Recording these signals is a whole other set of incompatibility problems.

The FCC didn't used have a problem in setting standards. I recall when the FCC first required UHF tuners in TV sets. Later, the FCC demanded that TV sets include stereo decoding and then closed captioning. What we now have is the Hundt/Kennard philosophy of *no standards are the best standards.*

So, while Kennard doesn't seem to have a problem imposing new taxes on us, when it comes to guaranteeing that our new TV sets will work with both cable and local broadcast signals, he's quick to deny culpability. Kennard and his pack of legal dogs have done little to resolve the remaining issues of digital transmission except blame others. His recent offer to "*facilitate rather than regulate*" is nothing but rhetoric, and really means lack of leadership.

May I suggest, Mr. Kennard, that you fire that "army of FCC lawyers" you've threatened us with and replace them with engineers who will solve the remaining technical problems. Then maybe, just maybe, you won't become known as The Man Who Killed TV, too.

Brad Dick

Brad Dick, editor

**Send comments to:**
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# Reader Feedback


## Peanut protest

Editor:

I just read your editorial on peanuts in airplanes (*BE*, September 98) and had to respond. Perhaps understanding this strain of allergy and its effects could illuminate you as to the deeper issue, as opposed to "peanut haters" you condemned in your article. I have a friend that is allergic to peanuts.

When I first I met him about 10 years ago, he ate a cookie that was supposed to be free of peanuts. His throat started closing down like a video camera iris. He had to be driven to the hospital to have his stomach pumped and he was unconscious when he arrived. The chopped peanuts in the cookie in combination with his allergy almost killed him.

You were in error when condemning "peanut haters." If you think 4:1:1 video sampling is an unforgivable compromise, or thought BetaMax should have proliferated instead of VHS, I can understand. But ranting and raving about being denied a couple ounces of peanuts on a plane ride is over the top.

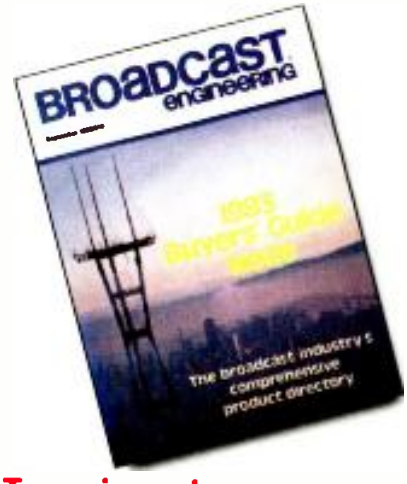
Now if you want to talk about plane passengers with carry-on bags that won't fit in the overhead compartments. ...

Greg Hertfelder
Audio-Visual Project Manager
Cerner Corp.

*Greg:*

Thanks for following up on the peanut controversy. Your description of what happened to your friend is precisely what can be expected when one has an allergic reaction to any of a multitude of chemicals. It's not just peanuts. People can have similar allergic reactions to everything from perfume to cat hair. Adults can carry an eppi-pen, but children aren't so fortunate. For those with allergies, it must be an ongoing challenge to avoid what the rest of us never notice. From that standpoint, banning peanuts would be only a start. But then where would we stop?

Brad Dick
Editor




## Towering winners

February's Freezeframe contest generated more responses – and correct answers – than I expected. The question concerned the September 1983 cover showing the famous San Francisco tower on Mt. Sutro.

Here are a few of the responses from those who not only knew the key date but also had personal experience in the tower's history.

Some of the winners:

The *Freezeframe* in the February 1999 issue of Broadcast Engineering is a picture of the Sutro Tower in San Francisco. Excavation for the tower footings began on Feb. 23, 1971, and the construction of the transmitter building began in June. Broadcast transmissions began in July of 1973.

The tower was fabricated by Kline Iron and Steel of Columbia, SC. It is 977 feet high and 1811 feet above sea level. Harry Jacobs was the director of engineering for Sutro Tower Inc. during the construction and for a number of years after.

Thanks for the trip down memory lane. There were lots of good times.

Larry Pozzi
Director of Engineering
WCPO-TV
Cincinnati

Dear Brad,

I believe actual preliminary construction began in 1971, but due to the L.A. earthquake there was a redesign to upgrade the tower to a 7.0 or 7.5 or so.

I was privileged to have worked at the tower in the 1980s. The elevator used to be quite a trip up and down, as it leans forward to the midsection, and then leans backward going on up. It had a nasty habit of quitting, as the interlocks would shift and give in at that mid point. I always carried a couple of clip leads to jump them out, and had to use them a couple of times.

I took a full-around set of pictures when I knew I was leaving S.F. It was a beautiful, sunny day, and there was even a blimp in the air.Unfortunately, the film processor scratched the negatives when it was developed, and I have never had the good fortune to be in San Francisco on a perfect day with enough time to repeat the shoot.

Best Regards,
Ernie Hopseker

Other readers with the correct answers:

| | |
|---|---|
| Bill Struth<br>Palm Bay, FL | Fred Stetler |
| Dennis Heymans<br>C.O.O.<br>Micro Comm.<br>Manchester, NH | Don Boehert<br>Madison, WI |
| Joe Del Giudice | Rod Levell<br>KCPT-TV<br>Kansas City, MO |
| Kevin Novak<br>Gresham, OR | Dan Roberts<br>Andrew Corp.<br>Orland Park, IL |

Each correct entry wins their choice of a *BE* T-shirt or reprint of the original tower article. See next month's Freezeframe for your chance to win a *Broadcast Engineering* prize.

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act more independently of the White House. He wants the FCC to submit its annual budget directly to Congress. It is currently included in the Office of Management and Budget's request. Furchtgott-Roth said, "The FCC does not need any intermediaries to communicate with Congress." He also has been known to call the administration's plan to impose spectrum-use taxes "irresponsible."

Commissioner Susan Ness says that the FCC could eliminate rule-making delays by boosting the agency's engineering staff. To keep the various rules from getting mired in court fights, she says Congress should require challenges to FCC rulings to be filed with the federal appeals court in the District of Columbia. Ness says that, "Too often we see industry players delay market-opening measures by challenging an FCC decision, or even a provision of the [law] itself, first in one court and then another."

**FCC Commissioner Susan Ness**

Taking a different tack, Commissioner Gloria Tristani praises many of the initiatives that tend to really provoke lawmakers. Her "E-rate" charge included in telephone bills to pay for wiring schools to the Internet is one good example. She says that it will "generate enormous social and economic benefits."

For additional information, see a summary of Chairman Kennard's testimony before a House Subcommittee at: www.fcc.gov/Daily_Releases/Daily_Business/1999/db990317/nrmc9011.html ■

# Modulation battle brewing?

**By Brad Dick, editor**

The intensifying battle over modulation schemes raised its head at NAB99. It shouldn't have come as a surprise that the convention offered fertile ground for both sides of the issue to issue statements on the technologies.

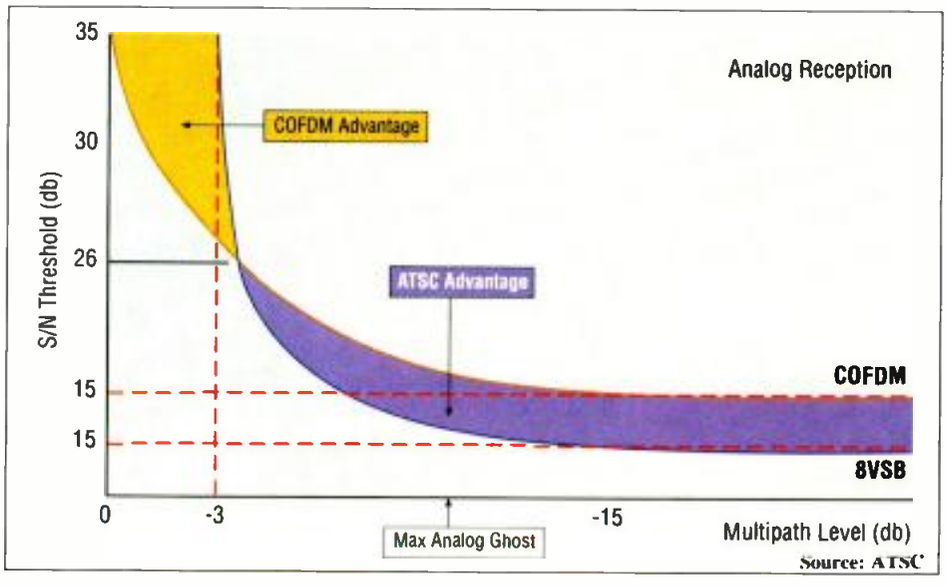
The ATSC issued a written brief summarizing the organization's position on 8-VSB modulation, especially with respect to how it compares to COFDM. The document, Digital Television—FAQ, is available at the organization's website, www.atsc.org.

It didn't take long for the folks at Sinclair Broadcasting to get a copy and come up with their own response. In order to better understand some of the issues, be sure you download a copy of the brief. Here's what Nat Ostroff, vice president of new technology at Sinclair Broadcasting provided *Broadcast Engineering* in response to the ATSC paper:

## The need for more tests

Sinclair finds itself at the center of a heated debate concerning its published findings regarding ATSC indoor reception tests recently conducted in Philadelphia, PA. Perhaps this is to be expected based upon the content of these findings. The broadcast industry is ill served by the inflammatory nature of the current debate.

We wish to state as broadcasters the reasons for our concern and reduce the debate to an open discussion and evaluation of the key issue — real world replication of service. After all, it is our sincere belief that the survival of free over-the-air broadcasting is at stake.




Sinclair was interested in how the reception of multiple ATSC signals would compare to the reception of analog stations indoors. The "criteria for success" of the multiple sites was established. If analog signals could be received with good quality indoors, then DTV would be expected to be received without extraordinary efforts or oversized antennas. This is in keeping with the published Consumer Electronics Manufacturers Association (CEMA) position.

Sinclair Broadcast Group conducted a series of tests in Philadelphia, PA. during the month of March, 1999. These tests were intended to be a "sanity check" on the real world receivability of the ATSC standard as compared to today's analog NTSC standard. The Philadelphia market was chosen because it has four high-power UHF DTV stations on the air, along with a number of analog NTSC stations, all radiating from the same antenna farm. The tests were designed to ascertain the ease of reception of DTV as compared to that of the co-located analog stations. Reception, inside of the City Grade and Grade A contours was the principle area of investigation. Numerous tests and reports have been published on outdoor antenna reception of the ATSC standard signals, but little has been mentioned regarding indoor reception.

## Coverage is the key

Sinclair decided to run reception tests because we believe the assumptions which have guided the ATSC scientific testing method can lead to inappropriate conclusions regarding coverage and a broadcaster's notion of service replication. The assumption that good coverage is sufficiently defined only by

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receivability at the perimeter of the Grade B service area ignores market realities. It is the ease of reception by the consumer of a TV signal inside a station's principal area of economic interest, which is the City and Grade A regions of the station's coverage area, which is of major importance to broadcasters.

If outdoor antennas and rotators are required to receive DTV where simple indoor antennas can receive analog television within these high signal regions, then DTV does not replicate today's coverage. Furthermore, the bright hope of using the DTV signal as a means to support a ubiquitous and wireless data delivery service to personal portable devices, a service that could offer a new economic model to help support the roll out of DTV, may be lost.

It is the very replication of a station's coverage area that was the principal promise made to broadcasters by the ATSC when the FCC presented the standard for adoption. It is a dangerous and foolish oversight if broadcasters concentrate only on reaching out to the fringes of our Grade B and ignore the performance of the DTV standard in our most economically important regions. For this reason, Sinclair set out to determine how the ATSC 8-VSB transmission standard performed, inside the Grade A coverage contour. The initial results have given rise to serious concerns.

Unfortunately, the results of the Sinclair tests were very disturbing. At all of the indoor sites where analog signals could be received, there was little or no reliable DTV reception, even with oversized antennas. The multiple receivers used included consumer products from three different manufacturers and were available to the public.


Nat Ostroff

## Look at the numbers

At NAB99 convention, the ATSC published and distributed a document (Digital Television-Frequently Asked Questions) attacking Sinclair's efforts as "based on a handful of unscientific and probably inappropriate comparisons of analog and digital reception."

In the ATSC response, the organization published a chart from the extensive Australian dTTb report to demonstrate the documented 4dB S/N ratio difference of 8-VSB (for the full reports, see www.commslab.gov.au/lab/lectures/dttbsmpc/sld001.htm). There is no dispute over this figure. However, there is disagreement over the relevance of this figure to the implementation of any practical system. Further examination of this chart within its full intended context (refer to the above URL) shows that, contrary to the ATSC conclusions, the COFDM system is far superior in those reception areas where indoor antennas are most likely to be employed.

At S/N ratios greater than 26db, according to the ATSC provided data, 8-VSB can require greater than 10dB more S/N than COFDM for equivalent multipath levels. In fact the chart shows that, if the ghost is greater than -3dB, the 8-VSB system cannot be received at all, no matter how great the S/N ratio of the 8-VSB signal.

## It's how you read the numbers

Let's look at the relevance of this 4dB S/N difference (19dB-15dB S/N, see chart). There are those who believe that this is a significant advantage for 8-VSB. We disagree. It must be understood that this difference applies only to a limited set of conditions, namely those areas of low signal strength. The 4dB S/N difference for 8-VSB only comes into play in those reception ar-

**The 8-VSB standard is at a great disadvantage in precisely those areas which provide for the greatest value to broadcasters.**

## New scanner rules

Many news departments at radio and television stations use scanners. They also mount them in their mobile units so field crews can listen for breaking stories. But scanners aren't restricted to news bureaus. Are you, or do you know anyone who is, a scanner buff? Well, fundamentally there's nothing wrong with scanners except when it comes to being a listener. The FCC has recently imposed some restrictions on what a scanner is permitted to receive. With the adoption of docket number ET-98-76, Parts 2 and 15, the Commission's rules were amended to "strengthen, improve and clarify regulations prohibiting scanning receivers from receiving transmission from the Cellular Radiotelephone Service."

This document encompasses everything from existing scanners to scanners that might be made in the very distant future. It addresses not only the manufacture of these devices, but any would-be perpetrator who might wish to modify the internal circuitry and/or programming so a scanner can receive cellular calls. They even addressed test equipment that might be needed in the manufacture of cellular equipment that could be used to listen to cellular calls.

The bottom line is not only does the FCC not want you listening to cellular telephone calls, but Congress had directed the action, which includes permanently affixed labels reading: "WARNING: Modification of this device to receive cellular radiotelephone service signals is prohibited under FCC rules and Federal law."

As the station engineer, check your scanners to ensure that they can't receive cellular calls. The Commission didn't make any suggestions on how to disable this function, but then maybe they were leaving that to your creative judgement. In any case, it wouldn't look good if the next time the FCC drops by they cite you for having one of these illegal devices.


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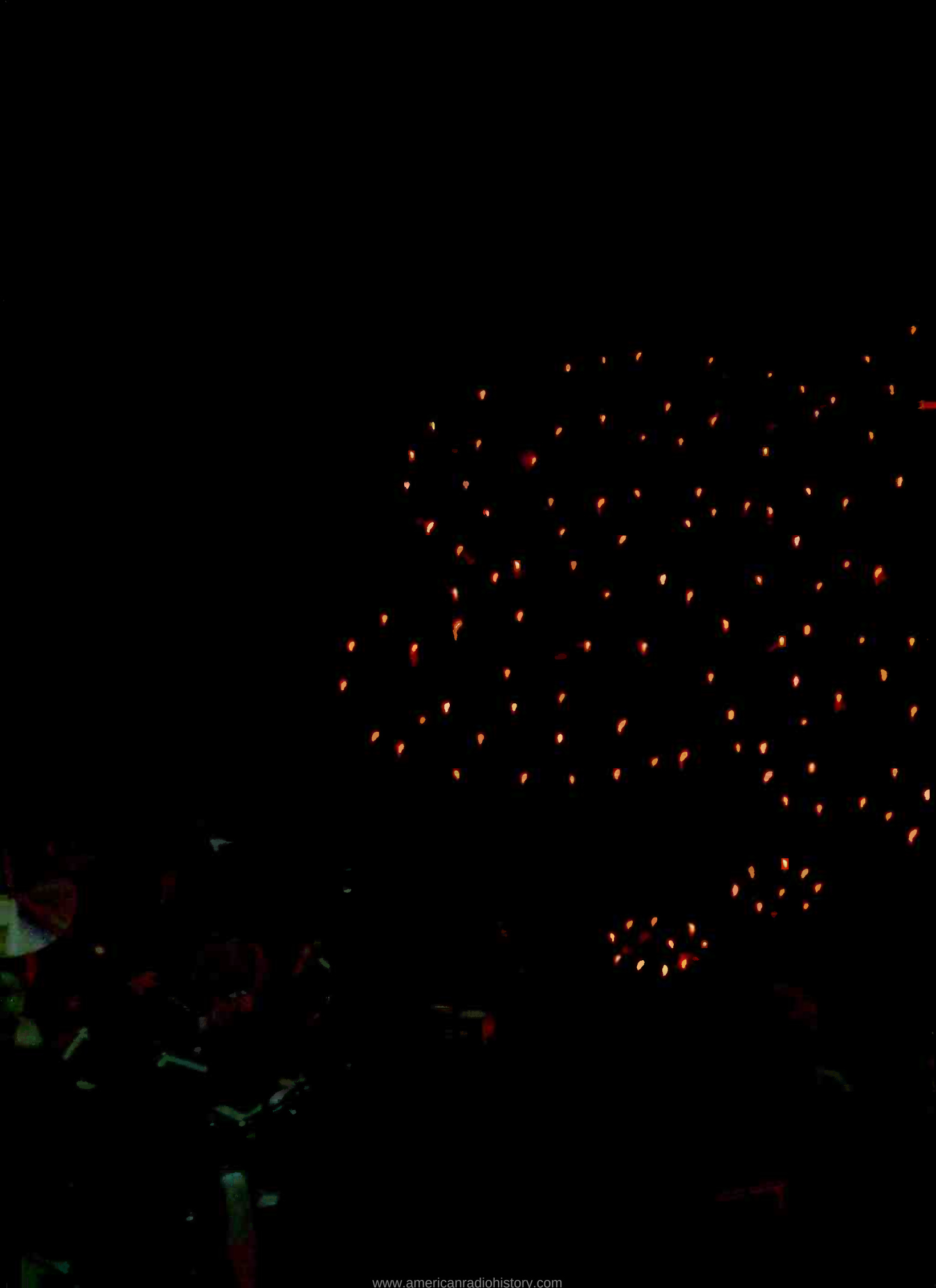

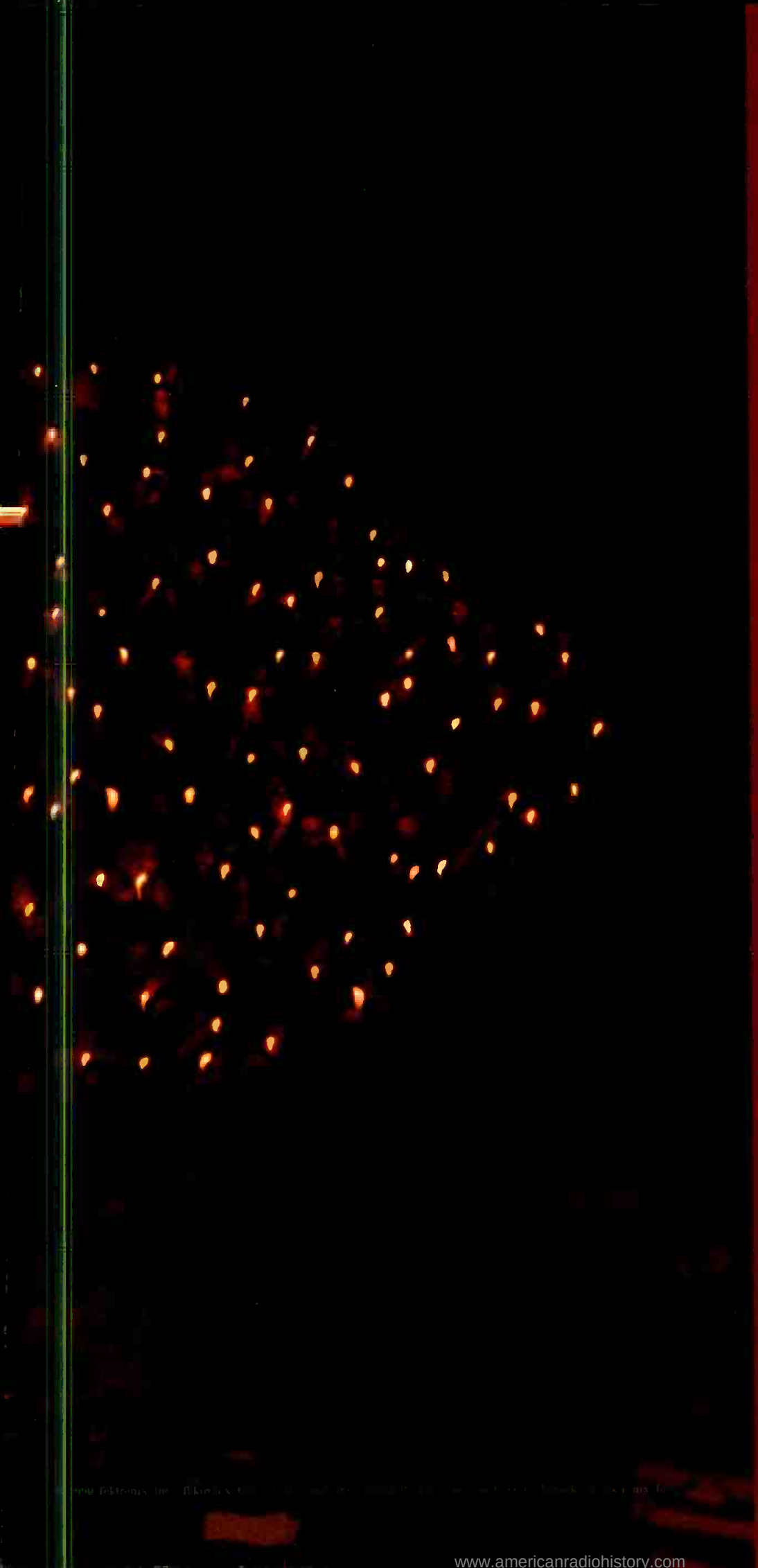

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eas where outdoor antennae would most likely be used. In such situations it is likely that these antennae would be directional, high gain units inherently resistant to multipath conditions. Therefore, there is no advantage in the City and Grade A coverage area. In fact, the 8-VSB standard is at a great disadvantage in precisely those areas which provide for the greatest value to broadcasters.

We believe that the primary emphasis that has been placed by the ATSC on reception at the fringes is misguided and has led to a selection that is a poor choice for DTV. When the entirety of the Australian tests are read, and the published results are interpreted within the context of relevant requirements for broadcasters, it is clear why the Australians chose COFDM.

Let us be clear, we do not discount the value of good reception in any coverage area. It has been stated that to achieve equivalent coverage with COFDM in the fringe area, significantly greater transmitted powers will be required. However, in the context of the Australian reporting of real world conditions and performance, there is no relevant difference in the transmitted power requirements for 8-VSB or COFDM providing equivalent coverage.

Sinclair is not promoting any standard. We are promoting the concept that any successful standard must fulfill the promise made to us. That promise is the complete replication of today's coverage. We do not underestimate the magnitude of the tasks at hand in re-characterizing the transmission system. We are, however, concerned with the performance of the present system. Do we risk proceeding down the road of 8-VSB with the promise of future implementation gains, a promise that we are asked to take on blind faith? A failure of 8-VSB will, without question, relegate the over-the-air broadcaster to becoming just another cable program provider.

Sinclair has called for a real consumer-based comparative test. We will proceed and may the best standard win.

Look for a complete discussion of DTV reception results in one station's tests, which will be carried in the July issue of *Broadcast Engineering* magazine. ■

## New digital consumer format

Don't ever tell a broadcaster that this or that is for home use only, especially if they are a small market station trying to save a few bucks. Many stations across the country still use S-VHS machines in on-the-air service, and you can bet that when the consumer version of a digital videotape machine is available, many broadcasters will take a very close look.

That time is not too far away. JVC and Sony have joined forces for a D-VHS/1394 VCR. Sony, who is promoting its i-Link (IEEE-1394 related technologies), will combine forces with JVC's D-VHS format in a strategy aimed at positioning the D-VHS recorder as the most practical digital video recorder for home networks that use the 1394 serial interface.

To help avoid any copy-protection problems, the D-VHS format features bitstream recording, in which the input signal and output are stored as scrambled data. In addition, Hitachi, Intel, Panasonic, Sony and Toshiba have proposed a digital transmission content protection scheme for 1394 to prohibit illegal duplication. They believe a 1394-equipped D-VHS deck will have ample copy protection. Other copyright protection measures will be employed as well.


**JVC's D-VHS with IEEE 1394 interface is aimed at becoming a new prosumer standard. Thirteen major VCR manufacturers have lined up in support.**

With the ability to bring in signals via the i-Link 1394 technology, there is no reason this machine can not be used for most any application. The limiting factor in the older S-VHS was the quality due to a number for analog factors including signal-to-noise. In digital, signal-to-noise is not as big of an issue as it is in analog, so don't be surprised to see these units in commercial applications. That may not be limited to smaller markets either.

IEEE-1394 has already been adopted in the consumer realm for output of DV camcorders. But JVC and Sony plan to devise technology to send MPEG-2 data through the 1394 link, making it possible to connect D-VHS decks to set-top boxes for recording digital broadcasts.

Although JVC licenses the D-VHS and Sony the 1394 i-Link, a total of 13 major VCR manufacturers have lined up behind D-VHS, with three companies — Hitachi, Panasonic and Philips Electronics — serving as technical advisors. That kind of support should remove any question as to what will show up in the marketplace.

Several consumer manufacturers, including Sony and JVC, are working on the next generation disc system, which is reported to have a capacity of around 15GB. This is expected to be suitable for a home videodisc recording.

Despite the advances in disc systems, it is expected that tape will be around for a while. Cost will be the major contributing factor in this area, as D-VHS will utilize the huge supply of VHS tape that has already accumulated. ■

# Panasonic builds DTV center

Panasonic, recently announced that it will strengthen its digital television development efforts around the world by substantially expanding its U.S. digital TV R&D center, Panasonic AVC American Laboratories Inc. (PAVCAL). In addition to plans to expand in the U.S., it has also opened a new European digital TV lab in Langen, Germany.

PAVCAL, will expand by nearly 30 percent, bring its engineering staff up to 100 engineers. The Burlington, NJ, location has been the center of the company's development of digital and high-definition TV products since 1982. To accommodate the new talent pool, the lab will break ground shortly on a new, substantially larger facility also located in the Burlington area. This expansion is expected to reduce the time required for development of digital television products for both consumers and broadcasters here in the U.S. and other parts of the world.

"Panasonic is playing a key role in creating a whole new entertainment and information industry made possible by the switch to digital and high definition television," said Jukka Hamalainen, president of PAVCAL. "We will continue to be leaders in making this happen."

The new advanced television laboratory in Europe, Panasonic AVC European Laboratory, was established last month and will add 80 engineers to the ranks of Panasonic's quarter of a million plus employees. Both the U.S. and the new European lab will work in close coordination with Panasonic's laboratories and industrial resources in Japan.

Jukka Hanalainen, president of PAVCAL, and Sai Naimpally, vice president, shown with the digital set-top tuner/decoder developed by their laboratories in Burlington, NJ.

For more information on Panasonic, visit www.panasonic.com. ■

Send questions and comments to: larry_bloomfield@intertec.com

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# Avoiding buyer's remorse

JERRY WHITAKER, BE CONFERENCE CONSULTANT

As you are reading this issue of *Broadcast Engineering*, you most likely have recovered from the gigantic NAB99 show and have probably managed to clear your desk of the most immediate fires. Now comes the challenge of putting the equipment displays, sales pitches, product brochures and general convention hype into some type of perspective. After all, you went to NAB99 for two reasons: to learn what's new in the industry and to gather information for necessary equipment purchases.

The selection process for hardware and/or software is not a trivial task, of course. Competing and conflicting claims, laundry lists of features and benefits; and — always — really good sales pitches often are difficult to sort out. So, where do you go from here? This month, we offer two perspectives on equipment selection, one from Tom Weber of WISH-TV in Indianapolis and the other from Richard Farquhar of RAF Associates. Tom approaches the question from the end-user standpoint, and Richard offers a perspective from both sides of the fence. ■


Send questions and comments to:
jerry_whitaker@intertec.com

EXPERT

**Thomas P. Weber, WISH-TV**

One of the most useful processes I've used in my broadcast engineering career has been that of checking references. Certainly this is true of personnel, but I've had some real fun doing this for equipment. The results have always been worthwhile. Like anything worthwhile, it took a little time and effort but greatly improved my odds in buying the right product.

When preparing to purchase a major piece of software a few years ago, we asked the competing vendors for some references. Manufacturer Y's references said that the software was quite good. It did almost everything it was expected to do, except for one function that the purchasers had wanted. One other function was noted as existing, but didn't really work.

Manufacturer Z's references uniformly replied that the software did everything it was supposed to do, and offered some additional functions that the purchasers really liked.

We had entered the process with an assumption because Y was considered a leading firm and Z was not known as well. However, after we did the legwork, making the right decision was simple and we've been happy.

Let's look at some of the questions you should be asking, adding whatever is most important to you into the process:

- How long have you been using the product and has it performed as promised or expected?
- Has your opinion changed?
- What research did you do before making your purchase?
- Why did you eventually choose this product and would you choose it again?
- How has it changed the way your station operates, good or bad?
- Were there any major surprises, good or bad?
- Did it work out of the box or were there startup problems?
- What is its maintenance history?
- How would you rate service/parts support? Do they offer loaners or fast turnaround on repairs?

Don't forget that you ought to be asking all of these questions of more than just one person. A chief engineer may give you one opinion and a bench engineer may have a different outlook. When we bought a new transmitter, I talked to the chief and the transmitter supervisor.

A lot of the answers will surprise you. I've had one person tell me that he bought product Y because product Z's salesperson was a jerk. Maybe it shouldn't have surprised me; I've wanted to do that a couple of times myself.

Get aggressive about finding your own references. Besides the stations in your group, or your market, go borrow a Yearbook or Factbook from the GM's office and call some other stations out of the blue. I've made good contacts this way, and have been able to trade information on gear that my counterpart was considering, so the help was mutual. If your new friend isn't using any of your alternatives, ask why; you may get a really good suggestion. A side benefit is that you'll build up an enviable network of industry contacts, which will pay off in other ways.

We were recently choosing between three different vendors for a piece of hardware. None of the first vendor's references could speak of their experiences without using the word "flames." Users of the other two vendors were happy with their products.

Between those remaining, one vendor appeared to have a more robust design, and that's the unit we purchased. Unfortunately, we seem to have a lemon — three different significant problems in about a year. That gear is now out of service. It's important to note that checking references and doing your homework is not a guarantee of happiness; it just vastly improves the odds.

With equipment increasingly doing the work that people used to do, wise equipment choices are more crucial than ever. Do the research on what it can and can't do well, and tap the experiences — good and bad — of your colleagues. You and your facility will reap the benefits.

*Thomas P. Weber is engineering maintenance supervisor at WISH-TV, Indianapolis, IN.*

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Purchasing broadcast equipment or services is not an easy task for anyone today. With all the hype about functions and features, the process can be confusing. The goal of any engineering department is to build systems in which products will perform to the manufacturers specifications and work seamlessly with the equipment of other manufacturers. What follows is the procedure I have employed in the purchasing process:

VENDOR

Richard A. Farquhar, RAF Associates

- Determine what you want to do. What is your application? I do a conceptual drawing of the proposed system or equipment installation. (Like they say, a picture is worth a thousand words.)
- Determine what parts and pieces will go into the system. This would include, equipment, mounting hardware, redundancy components, cabling, connectors, converters and other necessary elements.
- Identify the preferred vendor(s) of the required equipment.
- Determine the equipment and services budget. This can be most difficult. You want to obtain the best equipment at the lowest price and the vendor wants to deliver the best equipment at a price that allows the company to stay in business and service the account.
- Realize that there will always be someone with a lower price, but realize also that a lower price may translate to a lower quality of product or support.

As a chief engineer in three large markets, it was my responsibility to go through the basic steps outlined above. What I found worked best for me was to look for an outside resource or an independent representative — someone who took a personal interest in my project and my company. Because this person represented various products and service, and had developed a considerable body of knowledge on most broadcast/production equipment and its application, I viewed these independent representatives as a valuable resource. An analogy would be that of a real estate agent who represents several different properties and can assist you in finding the home that best suits your needs.

Many engineers today believe they can get a better deal by working directly with a manufacturer or signing a long-term contract with the manufacturer guaranteeing a predetermined pricing structure. This might look good to the accounting department, but it also could deter other vendors from calling on you and passing along the latest industry developments and news. If you bought a new home and signed a long-term contract with the one manufacturer to supply all of the electrical outlets, why would other outlet manufacturers want to call on you? They would focus their efforts where they have a greater chance of success. This affects you as the customer, because you have eliminated a business resource. I personally do not believe the current trend of contractual obligations by big and small broadcast groups, networks and, in some cases, system integrators is usually in the buyer's long-term best interests.

**Your rep can spot new trends, tomorrow's transistor technology, and share them with you.**

For example, an independent representative, one that represents many manufacturers, will reside in the territory in which he or she sells and usually will remain there throughout their professional career. Like any other professional — doctor, lawyer or accountant — they understand all of your requirements, constraints and budgeting process, and will be in a good position to offer you additional services or products that will make your job much easier. They have industry knowledge that goes beyond what many engineers see on a day-to-day basis. The independent rep is actively involved in professional conventions and organizations on a local and national level. Here, he or she associates with other professionals where broadcast solutions are openly discussed. The rep brings these solutions to you, the customer. The rep's loyalty is to you, rather than a specific manufacturer.

I am sure you have heard the following true story, but for those that have not, it is worth repeating. In 1947, the transistor was invented at Bell Labs. Almost immediately, it could be seen that the transistor would replace the bulkier, more expensive and less reliable vacuum tubes that were the key components in every radio and TV. Howeve, nobody did anything about it, at least in the U.S. American manufacturers were proud of their super-heterodyne radio sets, which were the ultimate in craftsmanship and quality.

Sony was practically unknown outside Japan at that time and was not involved in consumer electronics. Sony saw the potential of the transistor and quietly bought a license from Bell Laboratories. Within two years, Sony produced the first portable transistor radio. With prices that were only one third that of vacuum tube radios, Sony captured the entire U.S. market for inexpensive radios by the early 1950s.

Your representative, because of his or her professional industry involvement, can spot new trends, tomorrow's transistor technology, and share them with you. The independent rep will know most of the up-and-coming small companies that are making great cost-effective products. As you know from your own experience, manufacturers will tell you about the bright side of their products and how they work, but the professional independent representative will always be representing you and your company foremost. Their job depends on it.

Remember that if you always do what you have always done, you will always get what you have always gotten. ■

*Richard A. Farquhar is RAF Associates, Canal Winchester, OH*

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FCC Update

# Satellite home viewing creates hot issues

BY HARRY MARTIN

Four of the major television networks and their affiliates recently entered into an agreement with satellite TV operator DirecTV that would slowly phase out the delivery of distant network signals to subscribers who are able to receive signals over the air from their local affiliates. This agreement should relieve some of the political pressure in Washington to liberalize the rules that limit satellite TV operators. Legislation is still pending that would allow the satellite operators to continue distributing distant network signals, at least until the FCC reviews the impact on local stations. This legislation would give at least some stations must-carry rights on the satellite systems.

## What is Grade B?

It has been the practice of satellite TV operators such as DirecTV, EchoStar (Dish Network) and Primetime 24 to deliver distant network television feeds to subscribers who are able to receive a Grade B signal from their local network affiliates. Delivery of such satellite signals is a violation of the Satellite Home Viewer Act (SHVA). The satellite operators attempted to avoid the SHVA requirements by asking the FCC to change the definition of Grade B for SHVA purposes, but the FCC did not do so. While the operators did not get the relief they sought from the FCC, the battle is far from over.

## Petition filed with FCC

EchoStar filed a petition asking the FCC to reconsider its recent decision. Among other things, EchoStar requested that the Commission rule that ghosting in a signal is evidence that a home is unserved and therefore a satellite operator may deliver network signals to that home. In addition, EchoStar asked the Commission to simplify the methodology recently created for measurement of signal strength at a subscriber's home, and to reconsider its decision to adopt a 50 percent confidence factor as part of its model for predicting the presence of a Grade B signal in an individual household. Previously, EchoStar suggested a 99 percent confidence factor that was rejected by the Commission. Now, EchoStar suggests a 90 percent confidence factor.

## Partial settlement

When recent court actions were about to force DirecTV and Primetime 24 to stop delivering distant network signals in a manner that violated SHVA, DirecTV attempted to do an end-run around the court by using a different

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$$\text{Min. bandwidth for HDTV} = \frac{D_R}{2} (\times 3) = \frac{1.485}{2} = 742.5 \text{ MHz } (\times 3) = 2.228 \text{ GHz}$$

3rd Harmonic = 2.228 GHz

$D_R$ = data rate

Do the math: the equation for figuring out the bandwidth you'll need to broadcast HDTV. No matter how you figure it, it adds up to ADC Superjacks.

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feed for its imported distant signals. Four networks sued DirecTV again, and the parties recently settled that litigation. DirecTV agreed to use the predicted signal model recommend by the FCC for determining which subscribers may receive network signals. In addition, on June 30, DirecTV subscribers predicted to receive Grade A intensity signals from network affiliates will lose receipt of satellite-delivered CBS, Fox, NBC and ABC signals. On Dec. 31, subscribers who can receive a predicted Grade B signal will lose access to those same satellite-delivered network signals. Subscribers who will lose DirecTV network signal service are to be notified in advance and will receive discounts on over-the-air antennas.

### New towers subject to new painting/lighting rules

The FCC modified its rules regarding tower painting and lighting. All new and altered towers registered with the FCC are now required to conform to painting and lighting specifications listed in the most recent FAA Advisory Circulars: AC 70/7460-1J, Obstruction Marking and Lighting (January 1, 1996), and AC 150/5345-43E, Specification for Obstruction Lighting Equipment (October 19, 1995). The circulars are available on the FCC's website at www.fcc.gov/wtb/antenna/faainfo.html or from the FAA. This updates the FCC's rules, which previously referenced outdated FAA Advisory Circulars.

Important changes in the new circulars include the requirements that all coaxial, conduits, and cables attached to the face of a tower be painted and all flashing red obstruction lights on a tower flash concurrently.

It was not intended that antenna structure owners previously assigned painting/lighting specifications by the FCC be required to update their structures to comply with the new circulars.

If a tower you own has circular AC 70/7460-1J specified on its registration authorization and you do not wish to comply with the new cable painting and concurrent flashing requirements, you may request that the tower registration be modified to specify the circular in effect at the time the FAA approved the tower. To do so, you must submit FCC Form 854, Application for Antenna Structure Registration, indicating on item 12B that you wish to change the existing obstruction marking and lighting requirements. Be sure to attach a copy of the tower's current FAA Determination Of No Hazard specifying the prior circular. There is no FCC filing fee required with Form 854. ■

*Harry C. Martin is an attorney with Fletcher, Heald & Hildreth, P.L.C., Rosslyn, VA.*

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

## Dateline

Television stations (commercial and noncommercial) in the following states (or district) must file their biannual ownership reports by June 1, 1999: Arizona, District of Columbia, Idaho, Maryland, Michigan, Nevada, New Mexico, Ohio, Utah, Virginia, West Virginia and Wyoming.

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Jerry Agresti. Director of Engineering
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Transition to Digital

# Ancillary data multiplexing

BY MICHAEL ROBIN

Figure 1 is a simplified view of the 4:2:2 525/60 scan line. It includes the location of video words during the active line interval as well as the horizontal blanking interval. The combined (multiplexed) number of luminance (Y) and chrominance ($C_B$ and $C_R$) samples per total line (words per total line) is 1716 (numbered 0-1715). The digital active line accommodates 720 Y samples, 360 $C_B$ samples and 360 $C_R$ samples for a total number of 1440 words per active line (numbered 0-1439). The result is 276 words in the digital-blanking interval (numbered 1440-1715).

The component digital standards do not provide for the sampling of the analog sync pulses. Two timing reference signals (TRS) are multiplexed into the data stream on every line immediately preceding the start of the active line data and following the end of the active line. Of the 276 data words in the horizontal blanking interval, eight are reserved for the transmission of the TRS. Words 1440-1443 are used to transmit the end of active line (EAV) TRS message and words 1712-1715 are used to transmit the start of active line (SAV) TRS message.

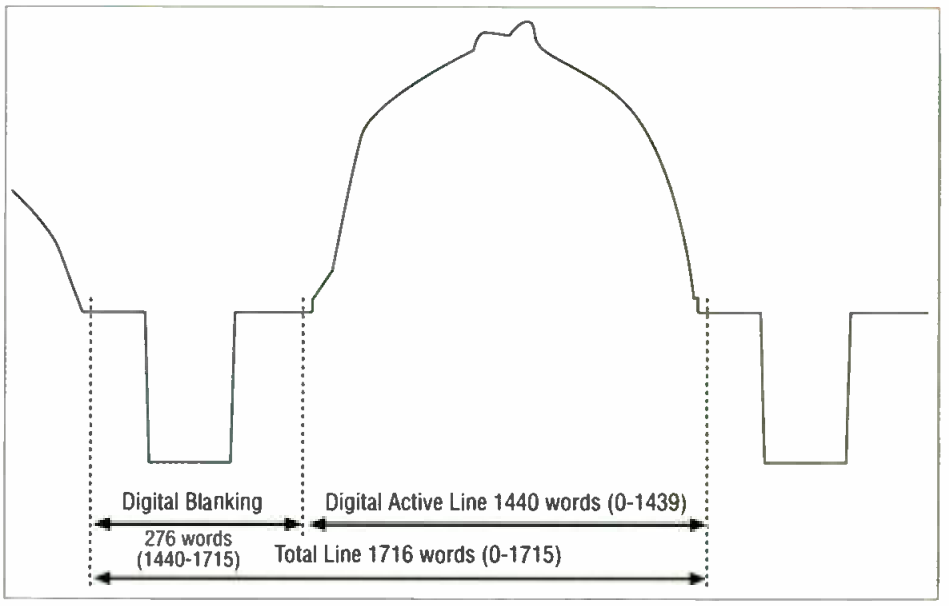


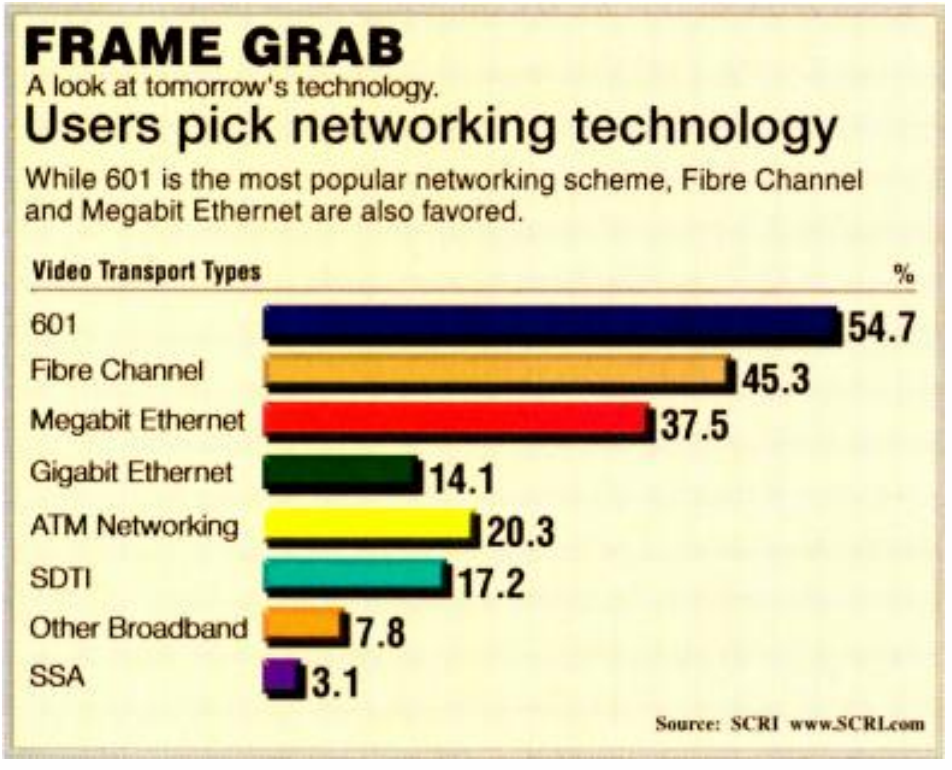

**Figure 1: There are 1716 digital words per active line in the 525/60 standard, of these, 276 are used for digital blanking and 1440 are used for the digital active line.**

Each TRS consists of a four-word sequence. Using a 10-bit hexadecimal notation these words are represented as follows:

3FF 000 000 XYZ

The first three words are a fixed preamble and unambiguously identify the SAV and EAV information. XYZ represents a variable word and defines the field identification, the state of vertical blanking and the state of horizontal blanking.

The remaining 268 words (1444-1711) can be used to transmit ancillary data. During the vertical blanking duration, large blocks of data, up to 1440 words, can be transmitted within the interval starting with the end of SAV and the start of EAV. Only eight-bit words can be used in the vertical-blanking interval. Restrictions only allow the use of lines 1-19 and 265-282. Line 10 (vertical interval switching instant) and the following line 11 are not used



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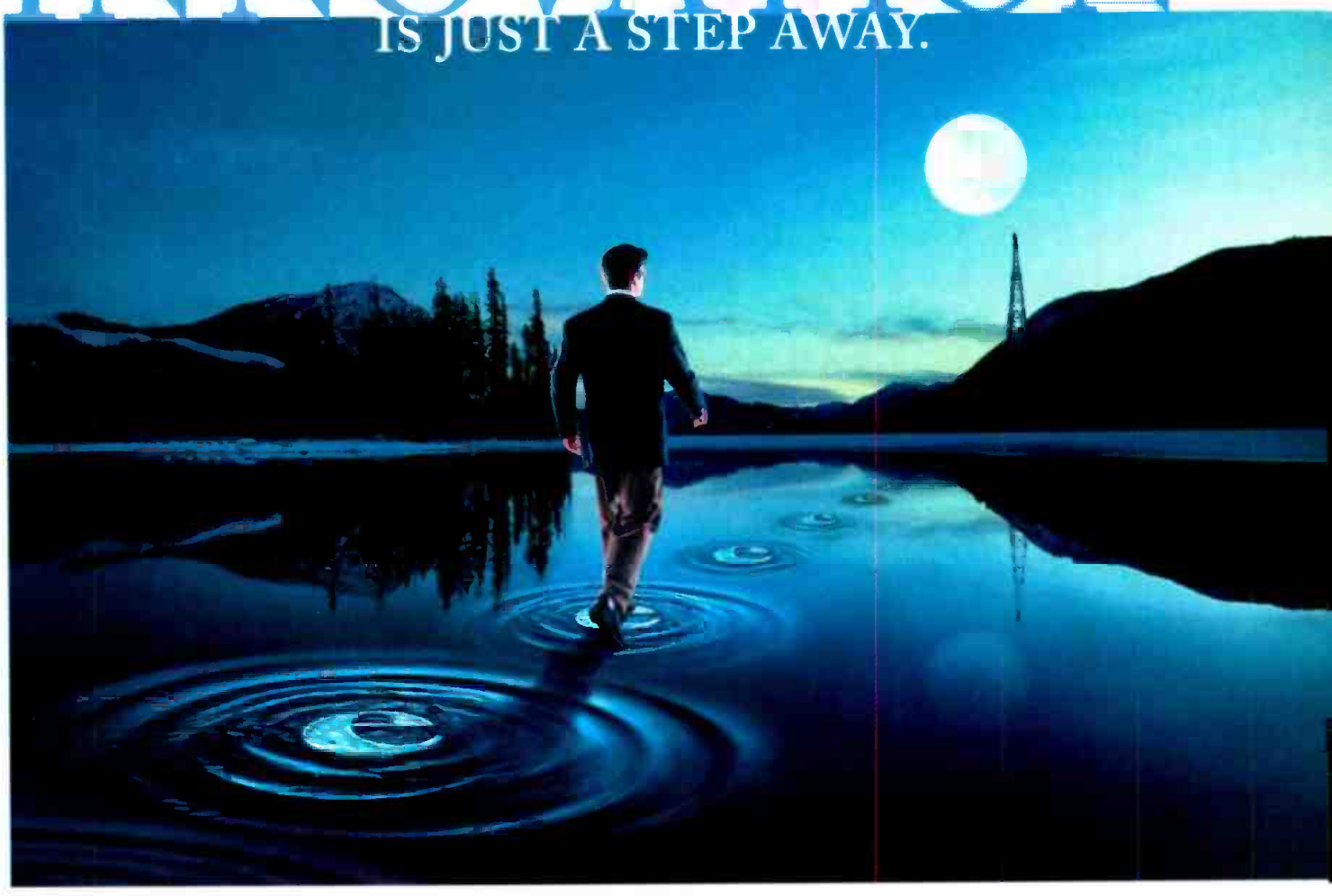

Ever tried to walk on water? Producing and distributing multichannel audio for DTV can be just as difficult. But now up to eight audio channels can be carried through the existing two-channel broadcast infrastructure with the latest innovation from Dolby Laboratories...Dolby E. With the Dolby E Encoder and Decoder, programs created for DTV broadcast can be decoded, processed, re-encoded, and edited many times without sacrificing sound quality. And Dolby E allows metadata to be carried throughout the entire production and broadcast distribution stages, which means programs sound just the way they were originally intended all the way down the line. Take the first step...visit our website for more information.

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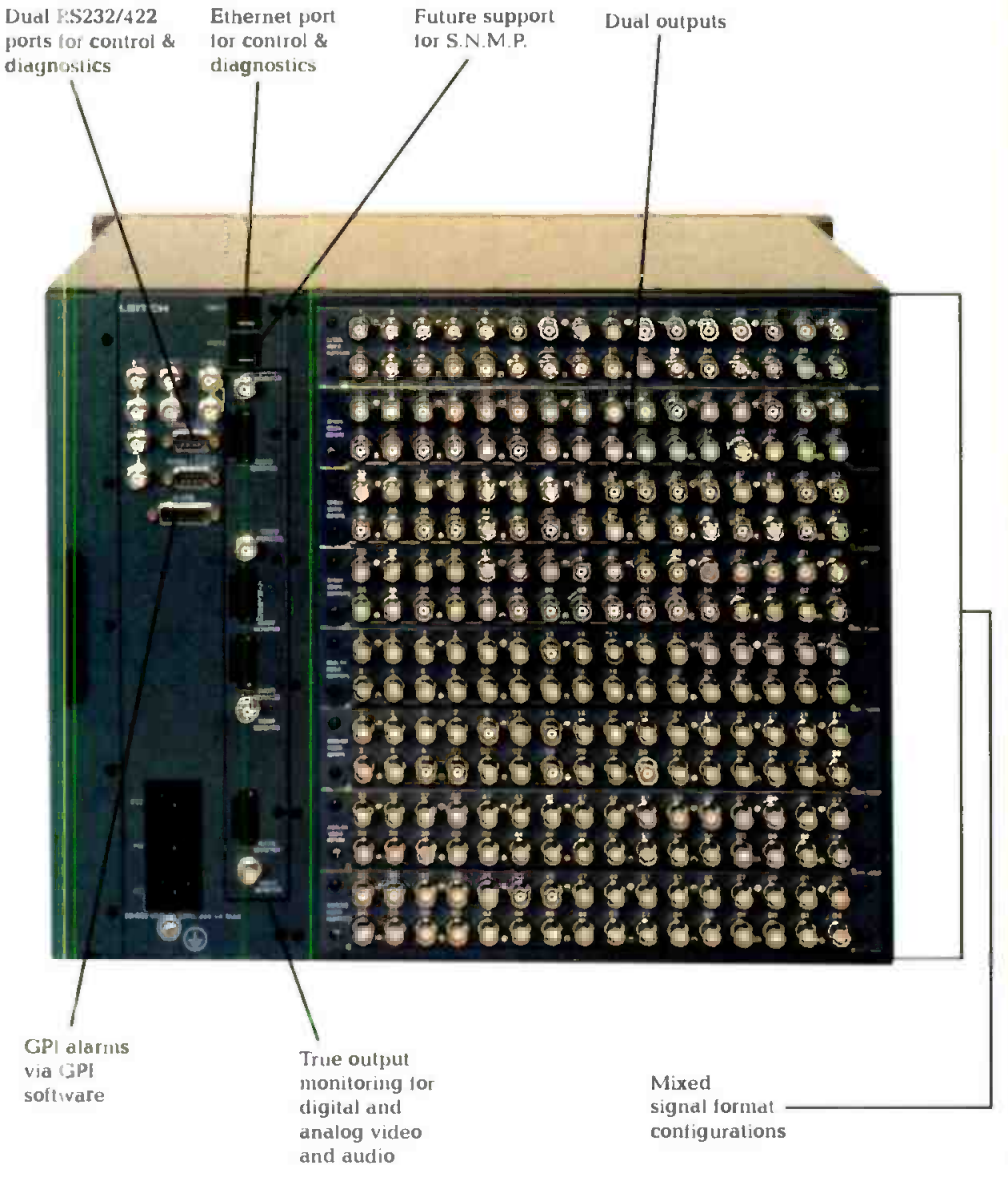


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| | |
|---|---|
| **Horizontal ancillary data space (HANC)** | 268 Words/line x 525 lines/frame = 140,700 Words/frame<br>140,700 Words/frame x 29.97 frames/s = 4.216779 MWords/s<br>4.216779 MWords/s x 10 bits/Word = 42.16779 Mb/s |
| **Vertical ancillary data space (VANC)** | 1440 Words/line x 38 vertical interval lines = 54,720 Words/frame<br>54,720 Words/frame x 29.97 frames/s = 1.6399584 MWords/s<br>1.6399584 MWords/s x 8 bits/Word = 13.1196672 Mb/s |
| **Total ancillary data space** | 42.16779 Mb/s (HANC) + 13.1196672 Mb/s (VANC) = 55.3 Mb/s<br>Data formatting and exclusions may reduce this value by 10% to 20% |
| **Total bit-rate** | 1716 Words/total line x 525 lines/frame x 29.97 frames/s x 10 bits/Word = 270 Mb/s |
| **Essential bit-rate** | 270 Mb/s - 55.3 Mb/s = 214.7 Mb/s |

**Table 1: Of the 270Mb/s in the SMPTE 259M signal, approximately 42.17Mb/s are available for ancillary data within the 4:2:2 525/60 format.**

to prevent switching clicks. Lines 9 (fields I and III) and 272 (fields II and IV) are reserved for error detection and handling (EDH) signals.

Table 1 summarizes the ancillary data space available within the ITU-R601 4:2:2 format. The horizontal ancillary (HANC) capability, listed in the upper row of the table, indicates the bit-rate available for insertion of ancillary data in the horizontal-blanking interval. The vertical ancillary (VANC) capability is listed in row 2. It indicates the bit rate available for insertion of ancillary data in the vertical-blanking interval. The total ancillary data space, listed in row 3, represents the sum of the HANC and VANC capability of the system. This value may be reduced by 10 percent to 20 percent by the data formatting used.

**Ancillary data may include digital audio, time code and EDH, as well as user and control data.**

The essential bit rate required by the standard is shown in row 4 of the table. It results from the elimination of non-essential samples in the horizontal and vertical blanking intervals. Ancillary data may include digital audio, time code and EDH, as well as user and control data.

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ancillary data space is for the insertion of audio signals accompanying the video signal. The 4:2:2 component digital standards have a considerable amount of overhead. They can easily accommodate eight AES/EBU signals (eight stereo pairs or sixteen individual audio channels) and still leave quite a bit of space for other uses.

The ANSI/SMPTE 272M document defines the manner in which AES/EBU digital audio data, AES/EBU auxiliary data and associated control information is embedded into the ancillary data space. The 4:2:2 525/60 component digital signal can accommodate 268 ancillary data words in the unused data space between the end of active video (EAV) timing reference and start of active video (SAV) timing reference. Figure 2 shows the ancillary data packet structure for the 4:2:2 component digital interface. Each packet can carry a maximum of 262 10-bit parallel words. A six-word header precedes the ancillary data and contains:

- A three-word ancillary data flag (ADF) marking the beginning of the ancillary data packet. The values of these three words are 000, 3FF and 3FF respectively.
- An optional data identification (DID) word identifying the user data.
- An optional data block number (DBN) word
- A data count (DC) word

The header is followed by not more than 255 data words and the packet is closed by a checksum (CS) word, which allows the receiver to determine the

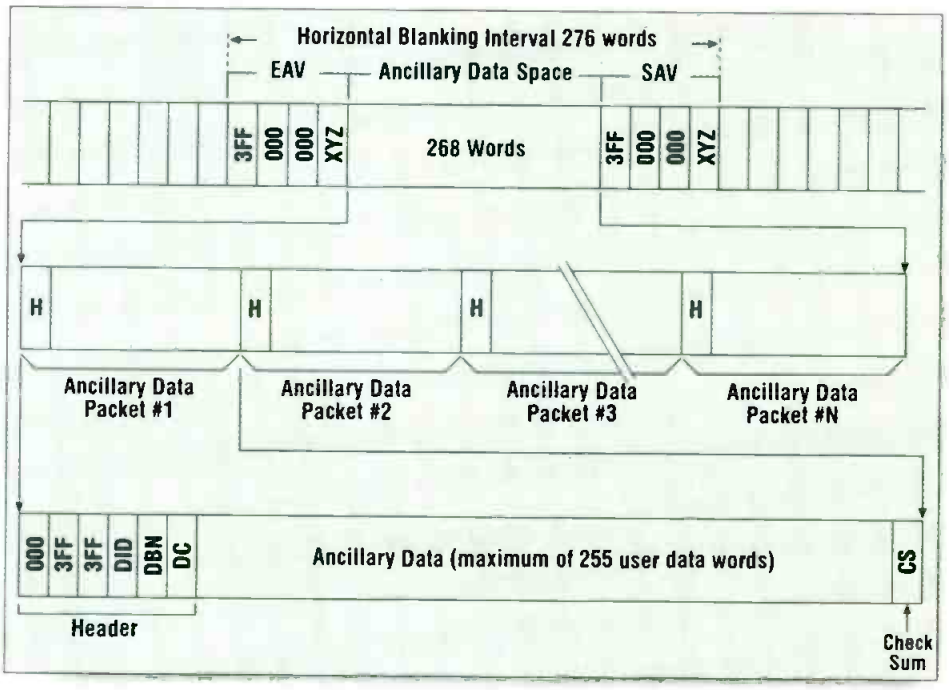
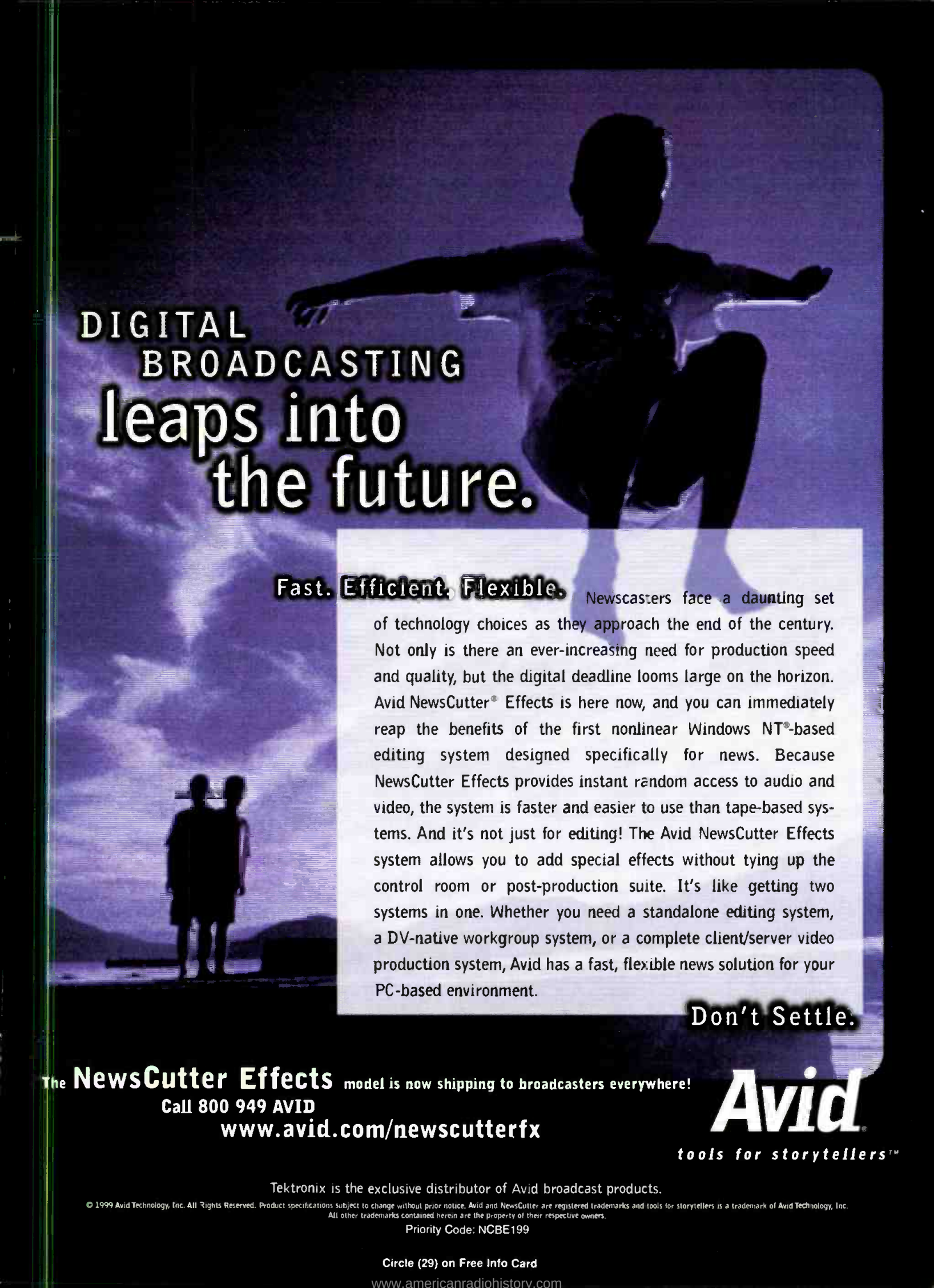



**Figure 2: Ancillary data packets within the horizontal blanking interval consist of a 6 byte header, up to 255 user data words and a checksum word.**



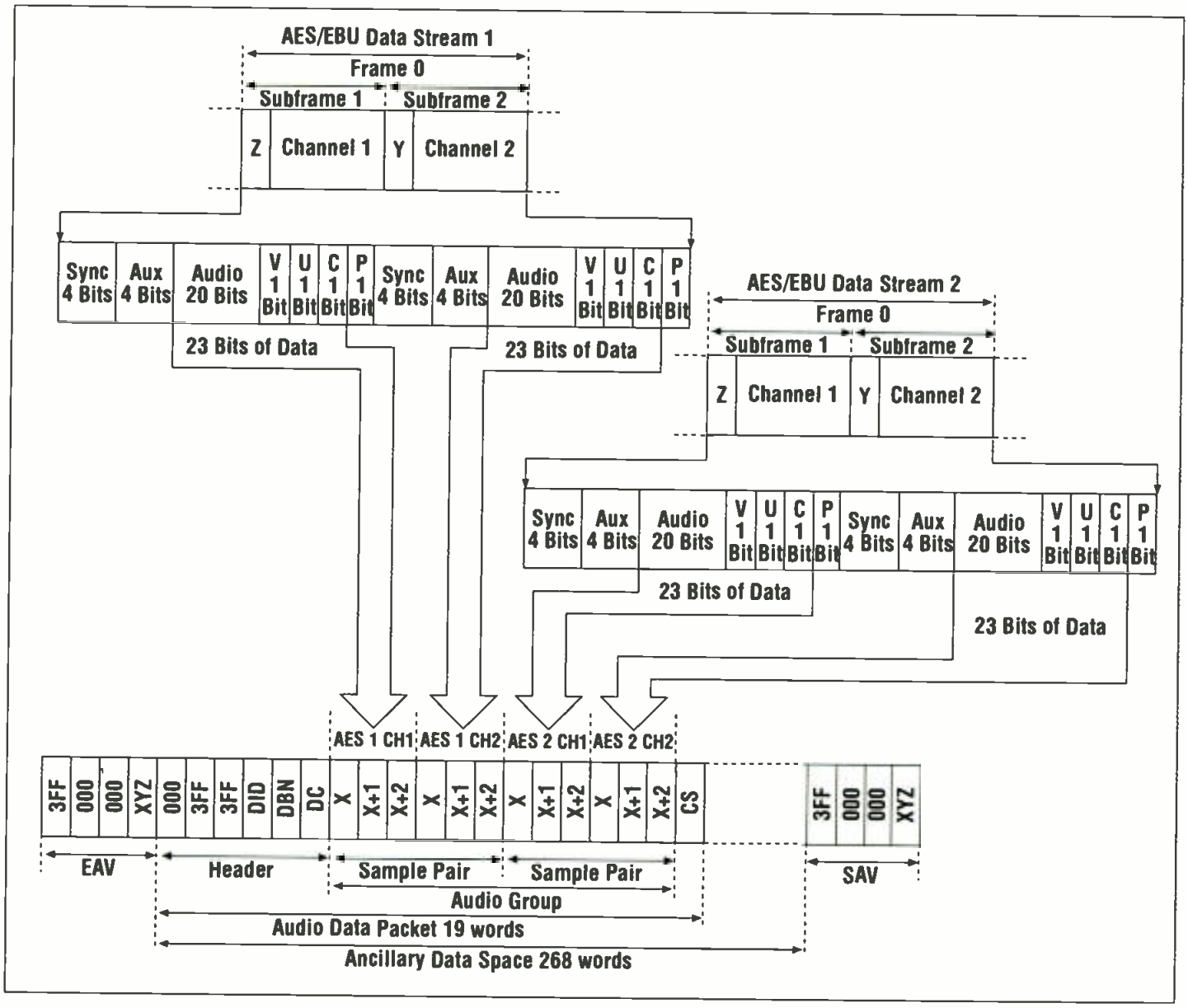



**Figure 3: Several AES/EBU datastreams can be embedded within a video signal. To do this properly, 23 bits are used from each subframe and mapped into three consecutive 10 bit words. Bits from subframe 1 and 2 of a datastream form a sample pair. Sample pairs from all of the datastreams form an audio group.**

packet's validity. Multiple, contiguous ancillary data packets may be inserted in any ancillary data space. They must follow immediately after the EAV, for the HANC, or the SAV, for the VANC, to indicate the presence of the auxiliary data and the start of a packet. If there is no ADF in the first three words of an ancillary data space it is assumed that no ancillary data packets are present.

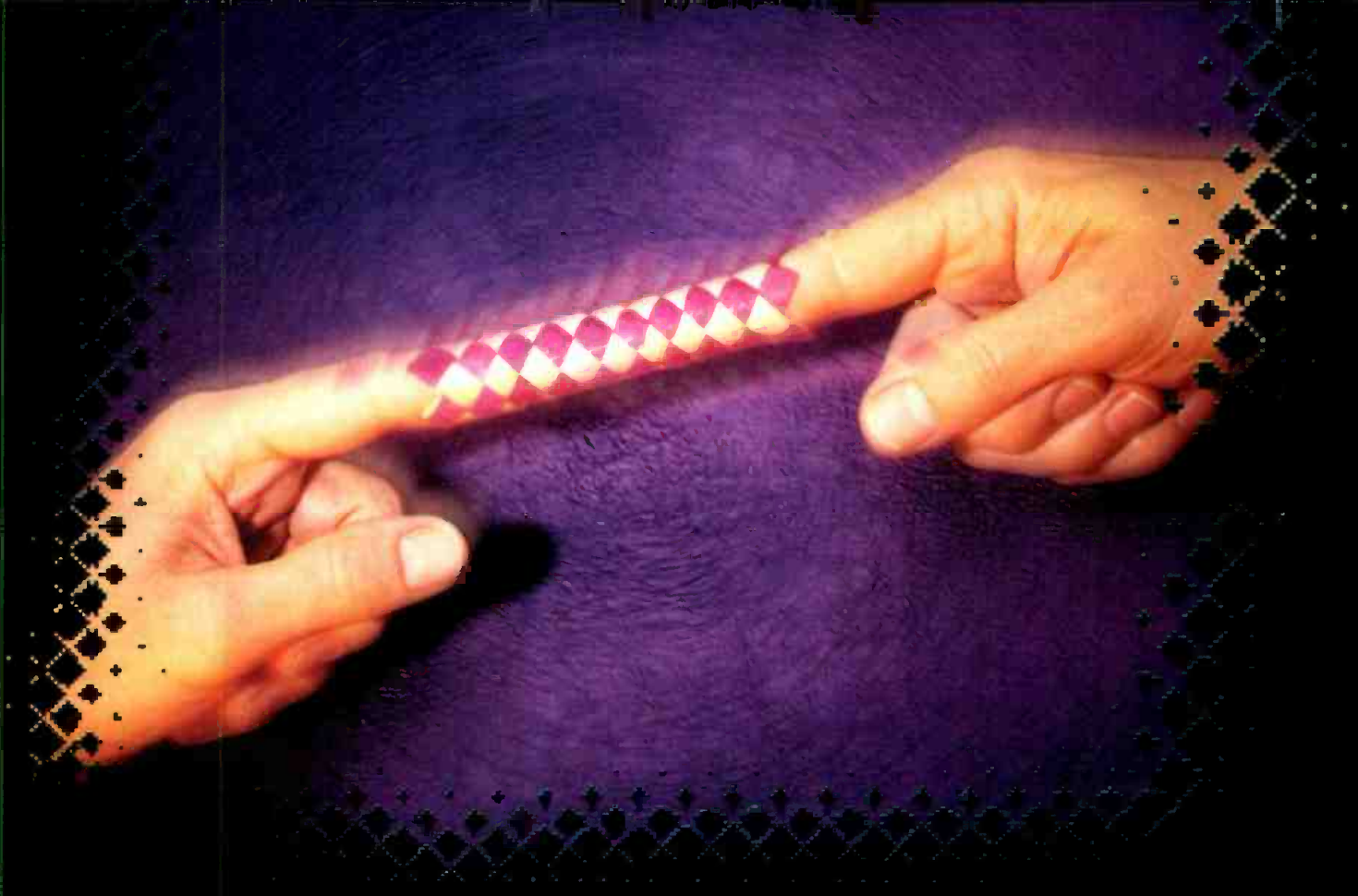
SMPTE standard 272M proposes two modes of operation for embedding digital audio into a video digital data stream. The minimum implementation is characterized by 20-bit resolution, 48kHz sampling, audio synchronous with video, only one group of four audio channels and a receiver buffer size of 48 audio samples. The full implementation is characterized by 24-bit resolution, sampling frequencies of 32kHz, 44.1kHz or 48kHz, audio synchronous or asynchronous with video, up to four groups of four audio channels, a receiver buffer size of 64 audio samples and the indication of relative time delay between any audio channel and the video data signal.

Figure 3 shows an example of the minimum implementation in which two data streams (AES/EBU data stream 1 and 2) are formatted for embedding into a 4:2:2 525/60 component digital signal. The packets are inserted in the following manner:

- A six-word header starts the audio data packet.
- The embedding sequence begins with subframe 1 and 2 of frame 0 of AES/EBU data stream 1 being stripped of the four sync bits, the four auxiliary bits and the P bit. The remaining 20

| BIT ADDRESS | WORD X | WORD X+1 | WORD X+2 |
|---|---|---|---|
| b9 | not b8 | not b8 | not b8 |
| b8 | audio 5 | audio 14 | P |
| b7 | audio 4 | audio 13 | C |
| b6 | audio 3 | audio 12 | U |
| b5 | audio 2 | audio 11 | V |
| b4 | audio 1 | audio 10 | audio 19 (MSB) |
| b3 | audio 0 (LSB) | audio 9 | audio 18 |
| b2 | channel 1 | audio 8 | audio 17 |
| b1 | channel 0 | audio 7 | audio 16 |
| b0 | Z | audio 6 | audio 15 |

**Table 2: The mapping sequence used to place bits from each audio subframe into three consecutive 10 bit words.**



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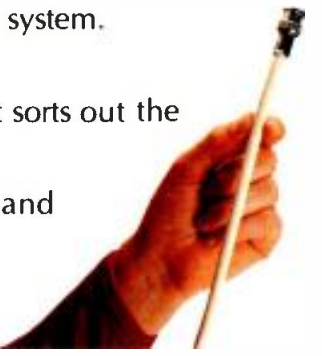

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bits of audio and the V, U and C bits, a total of 23 bits of subframe 1 are mapped into three consecutive 10-bit words identified as X, X+1 and X+2 of AES1/CH1.

•The 23 bits of subframe 2 are similarly mapped into three consecutive 10-bit words identified as X, X+1 and X+2 of AES1/CH2.

•AES1/CH1 and AES1/CH2 form a sample pair.

• Continuing the embedding sequence, subframes 1 and 2 of frame 0 of AES/EBU data stream 2 are similarly reduced to 23 bits and result in sample pair AES2/CH1 and AES2/CH2.

•The two consecutive sample pairs form an audio group.

•The 19-word audio data packet closes with a CS word.

•Subsequent horizontal blanking intervals will accommodate frame 1 of AES/EBU data streams 1 and 2, frame 2 of AES/EBU data streams 1 and 2 and so on until the 192 frames (each constituting one AES/EBU block) of each of the two AES/EBU data streams are embedded.

•From then on, a new block of 192 frames from the two AES/EBU data streams are embedded and the process continues.

•At the receiving end, the packets are extracted and fill a 64 sample buffer from which the original data are extracted at a constant bit-rate and reformatted.

Table 2 shows the audio data structure represented by the three 10-bit data words. The channel number is indicated by two bits and parity is calculated on the 26 bits, excluding all b9 address bits.

Distributing digital audio and video signals in a single coaxial cable is very advantageous if the multiplexed signal does not have to be processed separately. Or, in other words, if the product is ready for distribution or transmission. However, if the video signal has to feed a production switcher for further processing, the audio has to be demultiplexed and processed separately which may prove to be awkward and costly. To embed or not to embed is a decision that requires a clear understanding of the predictable and unpredictable operational requirements. ■

**Distributing digital audio and video signals in a single coaxial cable is advantageous if the multiplexed signal does not have to be processed separately.**

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

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

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# The EBU/SMPTE Task Force – Part V, Networks and Protocols

BY BRAD GILMER

In the fall of 1998 at the International Broadcasting Convention in Amsterdam, the EBU/SMPTE Task Force published a report on the future of television technology. This article is the fifth in a series that explores the report and its impact on the industry at large. The Task Force report is divided into four sections – Systems, Compression, Wrappers and Metadata, and Networks and Transfer Protocols. This month's article will focus on Networks and Protocols.

## Networking video – a whole new world

For many years, files have been shared across computer networks. Because they can be moved back and forth with ease, we rarely think about the work that makes it possible. Almost everyone agrees that it would be great to transfer and share program content (video, audio, data and metadata) in the same way. Yet, with some notable exceptions, this goal has remained elusive. Much of the reason is the difference between the attributes of program content and attributes of a typical data file. Program content files have three critical attributes.

Program content is:

- very large compared to files generated by typical computer applications.
- isochronous – they must be delivered continuously. Viewers easily perceive any interruptions.
- usually comprised of multiple entities: video, audio and metadata, all of which may have to be delivered at the same time.

These attributes have made it difficult to apply typical network solutions to program content. For example, file transfer protocol (FTP) is a tool used to move files from one computer to another with the restriction of point-to-point transfers only. But universal FTP will not allow the transfer of files larger than 2GB and does not support partial file transfers. These problems are among the hurdles designers face as they seek to employ existing networking technology for our industry.

## What does it take?

Interoperability, or seamlessly transferring and sharing files between program content users, is a complex task. Interoperability can be addressed on many different levels. Is a system interoperable if program content files can be exchanged between two systems, but the files cannot be opened by the applications involved? Or, is interoperability achieved only when a user on one system can open and manipulate files created on another system using different software?

Figure 1 illustrates some of what must take place behind the scenes before such interoperability is possible as well as the level of interoperability the Task Force sought to address. Shown are a number of interoperability domains that follow the famous ISO seven-layer model. To achieve the highest level of interoperability, the industry would have to agree to:

- adopt a limited set of physical interfaces. This makes the physical media compatible (not shown ).
- adopt a limited set of electrical interfaces. This makes the electrical

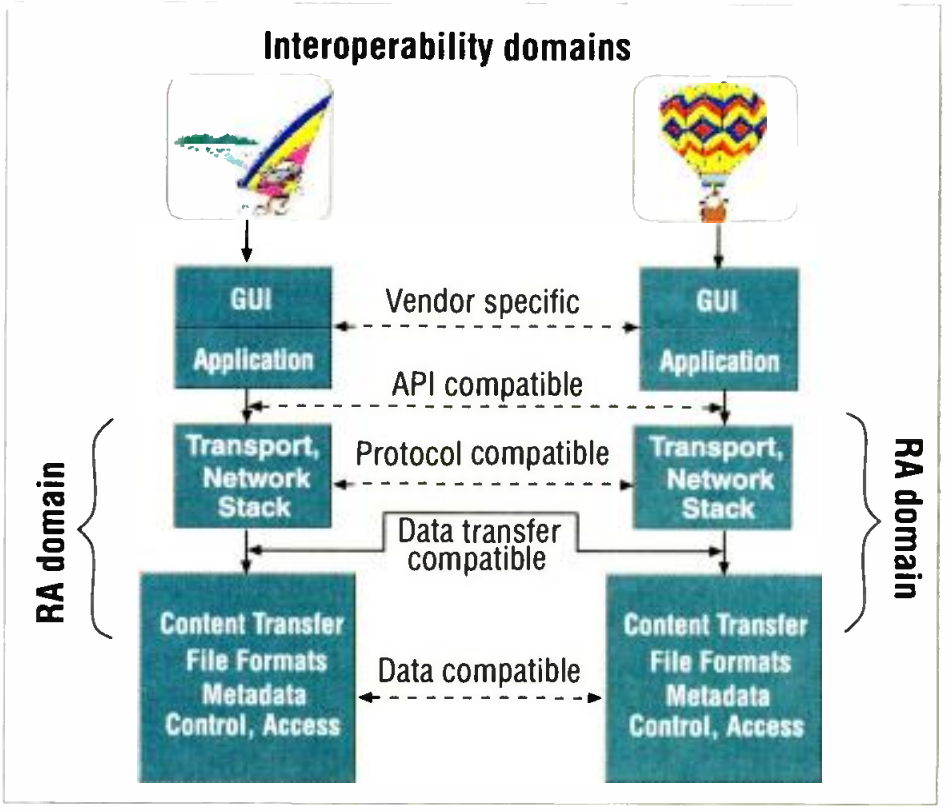
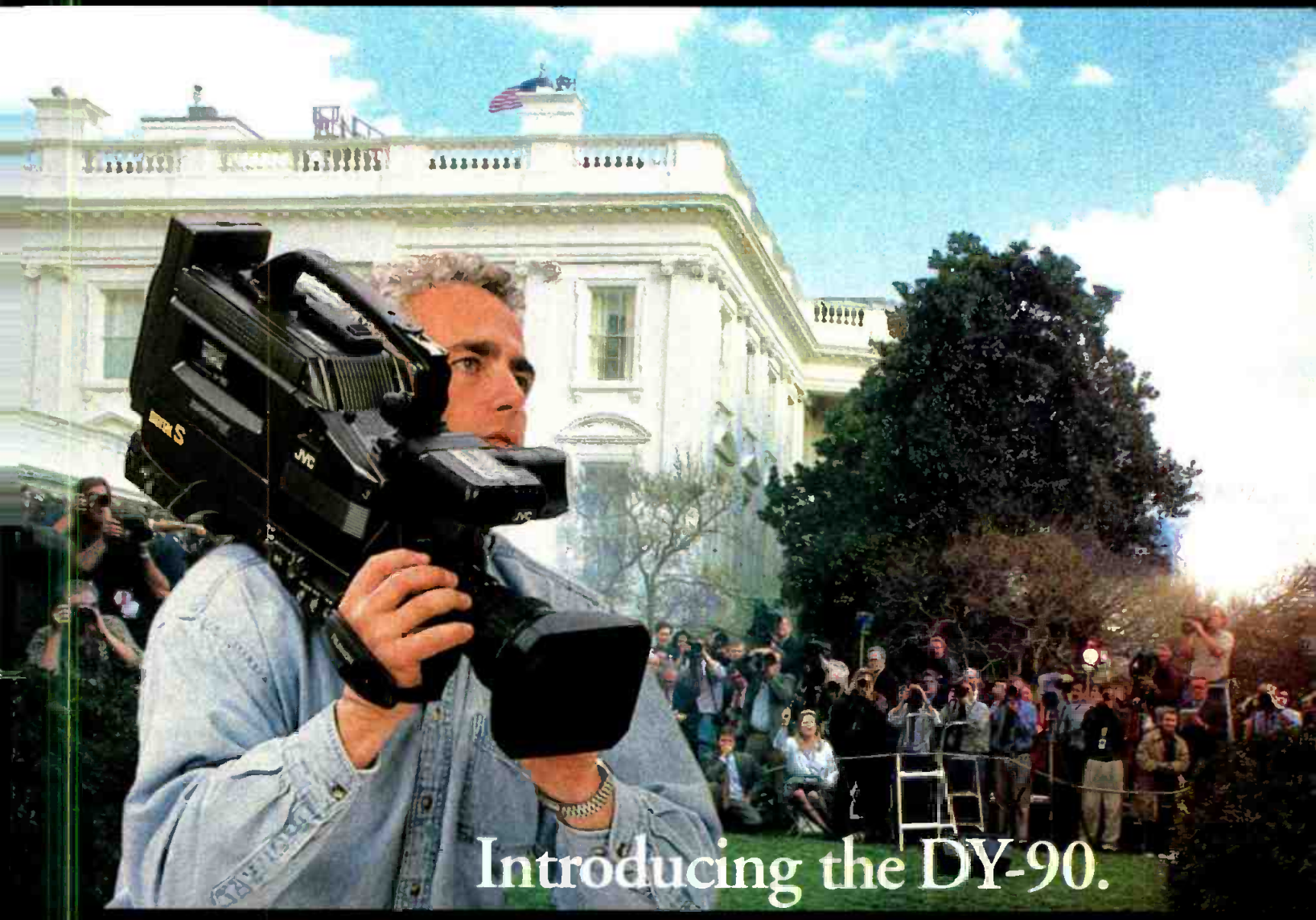



**Figure 1. Interoperability can be defined several ways. For program content, the Task Force has recommended a reference architecture(RA). The RA recommends interfaces as well as protocols for access.**

# Newsworthy.



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components on either end of the wire (or fiber) compatible (also not shown).

- adopt a common set of content transfer file formats. This makes the data compatible.
- adopt a common set of transport protocols. This makes the exchange dialog compatible.
- adopt a common set of API interfaces to the transport stack. This makes the connection to the applications compatible.

For the ultimate in compatibility, the end-user environment should have the same look and feel. The Graphical User Interfaces (GUIs) should be compatible as well.

Providing standards all the way up to the GUI level would be impractical. In fact, achieving such a high level of compatibility might stifle creativity and cause more harm than good. In the end, the report recommends focusing on achieving data and protocol compatibility. (This is the area indicated by the RA Domain) This work, coupled with the work of the Wrappers and Metadata area of the Task Force, will allow users to transfer files using a known set of protocols and file formats across networks with known characteristics.

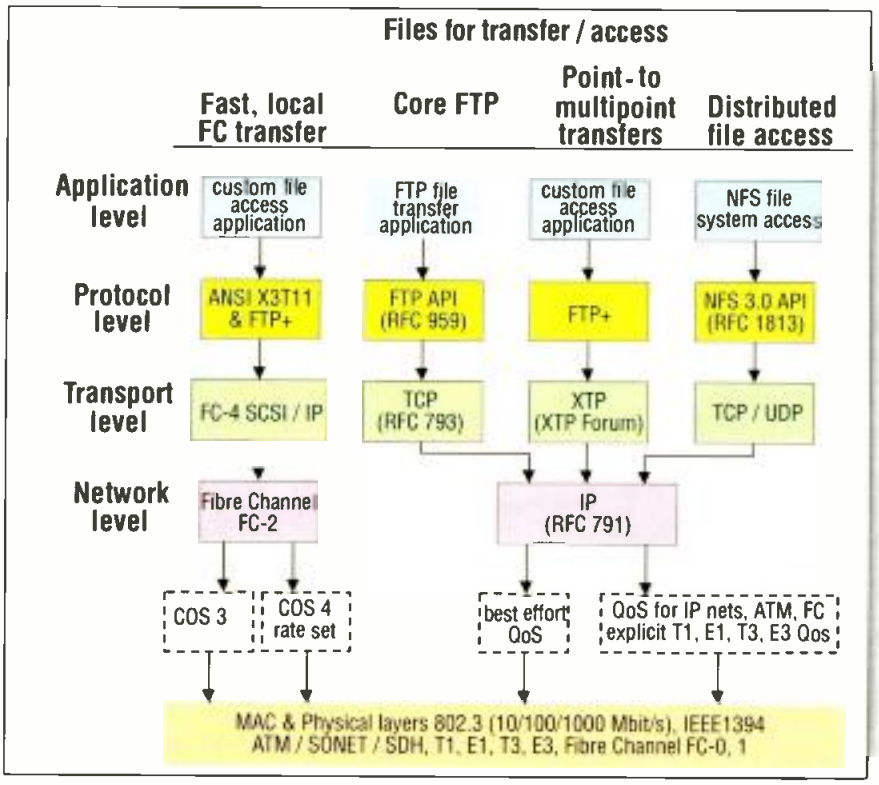


**Figure 2. There are several protocols to choose from when transferring files. Shown are some of these protocols as well as appropriate applications.**

### Two ways to transfer material

There are two common ways to transfer program content – streaming and file transfer. These methods have very different characteristics and require very different protocols and, perhaps, networks.

Streaming follows the typical broadcast model. A piece of program content is fed down a pipe (push transfer), and the end user can receive this content at will. The frame rate for display at the receiver(s) is set by the transmitting source. Users can join the stream at any time and multiple users can view the stream at the same time. For streaming applications, the path is usually unidirectional.

File transfer is a point-to-point (push or pull, in some cases point-to-multipoint) method of transferring program content. It involves establishing a connection between two systems, and then sending a piece of content from one system to the other. One of the biggest advantages of file transfer is *guaranteed* delivery. If something disturbs the transfer, the corrupted bits are resent until they are received correctly. Furthermore, the file can be sent at any speed – faster than real-time, real-time, or slower than real-time. Table 1 provides a quick comparison between streaming and file transfer.

One item in the table that bears some discussion is Quality of Service (QoS). QoS is a telecom term that refers to the quality of the link between two points. It is essentially a contract or guarantee of the performance the customer will receive using a particular link. The following elements are typically specified by QoS

- bandwidth (which may be expressed as peak and average bitrates).
- bit error rate.
- jitter and delay (latency).
- access set-up time.

In streaming applications, the QoS directly determines what the pro-

**With file transfer, the QoS may or may not be related to what you see at the other end of the pipe.**

## Obtaining a copy of the Task Force report

The Final Report is published jointly by the EBU and SMPTE. Contact the EBU or SMPTE and ask to be sent a paper copy (the EBU can supply a Special Supplement, SMPTE can supply a Journal) or download the .pdf document from the EBU website (www.ebu.ch/pmc_es_tf.html) or from the SMPTE website (www.smpte.org/engr/ebumeet1.html)

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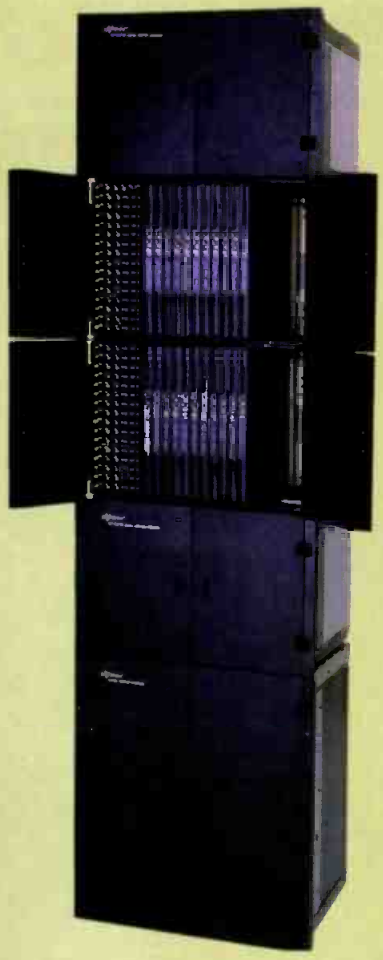

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# A perspective on networks and transfer protocols

BY HANS HOFFMANN

The Networks and Transfer Protocols subgroup of the Task Force had the responsibility of finding the best technologies to enable different data types to be moved around a networked production environment. It also had the task of identifying the best methods for audio/video streaming in real-time (and faster than real-time), file transfer (also at different speeds) and file access.

**If every manufacturer and system designer follows just one or two parts of this RA, interoperability is guaranteed**

The chosen methods should guarantee the interoperable transfer of program content between devices, and these transfers should meet the high-end requirements of the broadcast world. An additional part of the subgroups' work was to identify and define the further work that needs to be carried out by standardization organizations.

We have defined a Reference Architecture (RA) which allows the movement of digital content between the devices of different manufacturers. We have made some choices for general-purpose streaming and for file transfer. We have identified special technologies to meet high-end television broadcast requirements. We have also identified the follow-up work that is necessary to standardize all these new technologies and to expand on the ideas we have already generated. And finally, if every manufacturer and system designer follows just one or two parts of this RA, *interoperability*, (at least in the physical area, the data-link area and the network area) is guaranteed. ■

*Hans Hoffmann is Chairman of the Networks and Transfer Protocols subgroup.*

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gram content looks like at the far end of the pipe. If you take a hit during a video feed, you will see it. With file transfer, the QoS may or may not be related to what you see at the other end of the pipe. Since a file transfer usually involves a bidirectional link, any disruption of the signal at the receive end causes the receiver to request a re-send of the affected material.

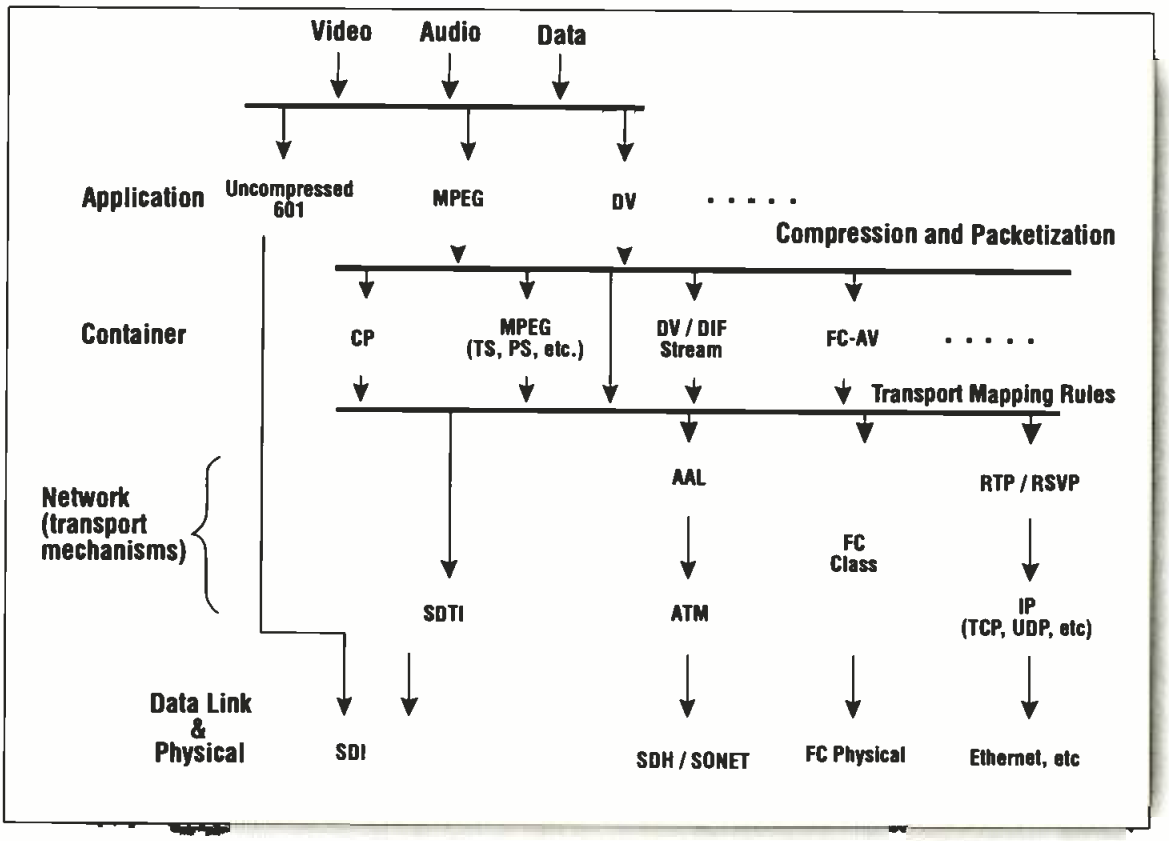


**Figure 4. Mapping video audio and data into various types of transports streams is done using specific rules depending upon the application and the network transport mechanisms.**

## File transfer methods

For each of the transfer methods there are appropriate protocols to be used. To achieve the goal of interoperability, these protocols must be standardized. Fortunately, or unfortunately, there are a large number of technologies to choose from. For interoperability, the number of possible choices has to be constrained. Specific recommendations can be found in Table 2, but some of the leading technologies for file transfer are:

- Universal FTP (based on TCP/IP).
- Point-to-multipoint transfers using the eXtended Transfer Protocol (XTP).
- Fast File Transfer (methods which use hardware or lightweight software protocols over Fibre Channel, ATM (and other IP based transports).
- An enhanced version of FTP called FTP+.

To complete the picture, let's look at how the networks and protocols discussed are stacked together to make a complete transport system. Figure 2 shows various protocol stacks that can be used in different applications. (A protocol stack is usually a series of software applications and hardware that are combined to enable communications across networks.)

Figure 2 shows that, for fast local Fibre Channel transfer, FTP+ might be used over Fibre Channel. Universal FTP would be carried across an IP network using the standard FTP client and TCP. FTP and TCP/IP have some limitations that may make it unsuitable for program content transfer. It is also important to note that point-to-multipoint is also not supported in Universal FTP and TCP/IP. To get around these restrictions, FTP+ is used on top of XTP. FTP+ enables point-to-multipoint communications along with a number of other features including partial file transfers which may be especially useful for broadcast applications.

Streaming over a network is different from streaming using traditional broadcast methods. In the broadcast world, delay through a given system, whether it is terrestrial or satellite based, is relatively fixed. Jitter, or change in the system delay, is small. The same cannot be said for computer networks. When program content is streamed, it is isochronous – that is, it is a continuous flow of data. If the network induces significant delay, the effects on the program content can be disastrous.

Traditional computer networks were built without much regard for latency. For example, Ethernet has indeterminate delay due to the way it

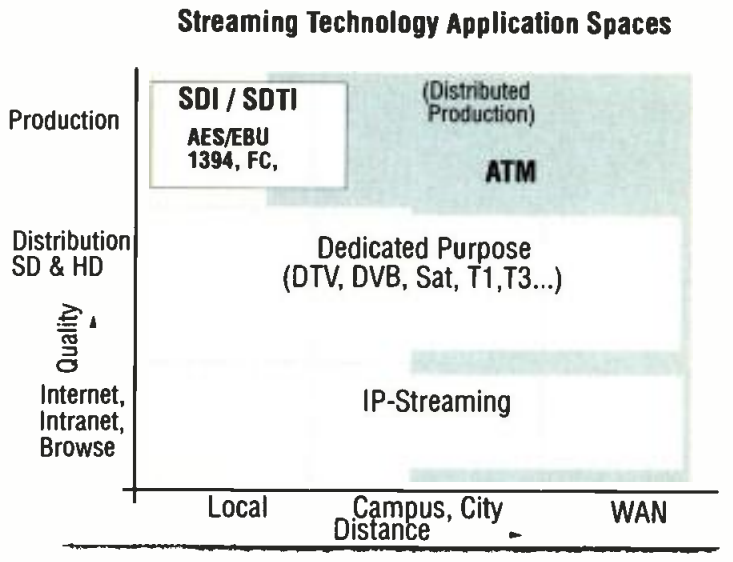


**Figure 3. Different streaming technologies need to be employed based on quality and distance parameters.**

handles collisions. If a streaming application does not anticipate this, a disruption of the program content will result. Jitter and timing issues such as these can be handled with proper buffering techniques as long as the jitter or change in network delay is known. Other parameters are also critical.

To specify a network connection so that it may be used for streaming, it is important to establish the appropriate QoS. The following parameters are used to define network performance for streaming applications.

- Peak bit-rate (bit/s) – the bit-rate which the source may never exceed.
- Minimum bit-rate (bit/s) – the bit-rate which the source is always allowed to send.
- Sustained bit-rate (bit/s) – the mean bit-rate at which the source transmits.
- Jitter (or Delay Variation).
- End-to-end delay (seconds) – i.e. propagation delay.
- Bit Error Rate (errors/bit) – the average number of errors per bit.
- Set-up delay (seconds) – the maximum delay between requesting a connection and receiving it.

Once the appropriate network has been defined, the next step is to decide how content will be sent across the network.

There are a number of methods that can be employed to stream program content, including:

- Serial Digital Interface (SDI).
- Serial Data Transport Interface (SDTI).
- Dedicated purpose transports such as DVB and DTV.
- IP.
- ATM.
- Fibre Channel.
- IEEE 1394 (Firewire).

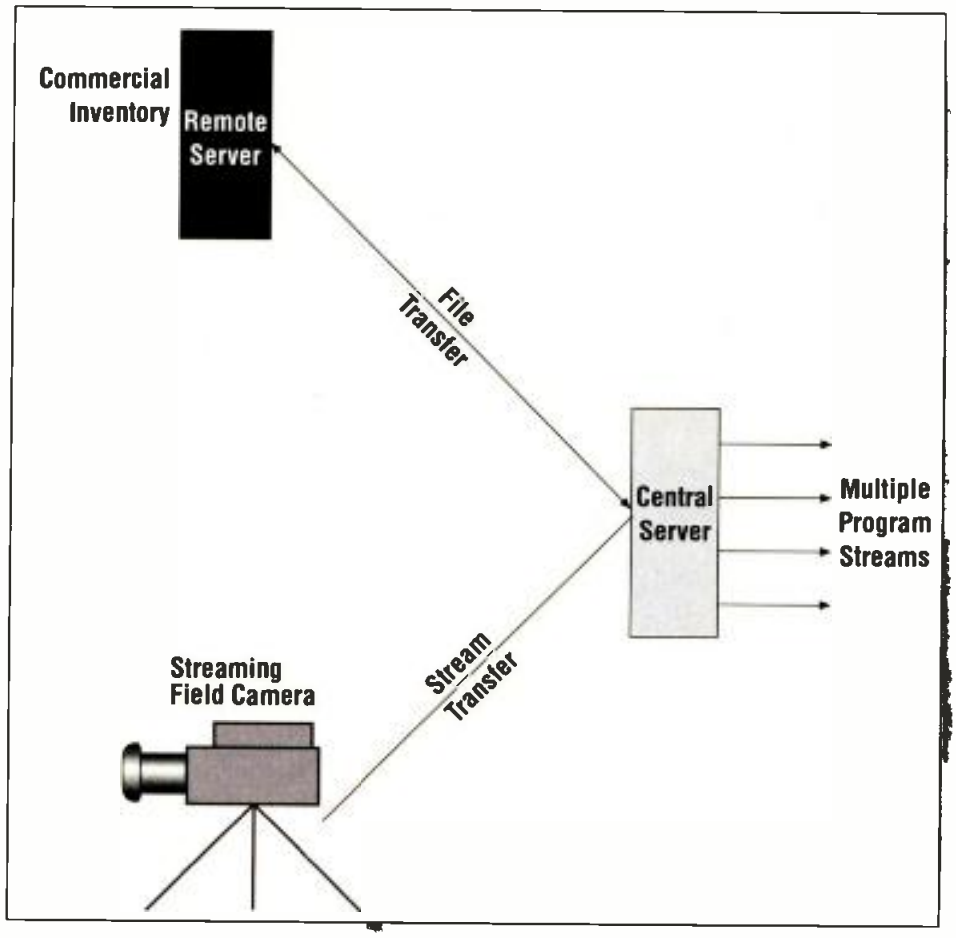


**Figure 5. With interoperable systems, commercials and feeds from a streaming camera could be sent to a central server and played out as needed.**

Figure 3 shows how these transports may be affected by quality and distance. As you might expect, SDI, and SDTI work well in the local environment, and ATM is well suited for use over longer distances. IP streaming can be employed across a wide range of distances, but it is an unlikely candidate for high-quality streams. From this information, it can be seen that there is no clear single network or protocol to use for all applications. In fact, it is more likely that a range of tools will be used depending on the application.

## Task Force Recommendations

**Streaming File Transfer**

**SDTI** is currently the choice for internal studio interconnects. This means that to transmit compressed signals without re-encoding within the studio, SDTI is the right choice – if you have to do it in real-time and at faster-than-real-time. **Fibre Channel** for high-performance local area networks. The development of disk drives with Fibre Channel interfaces was part of the decision.

**Fibre Channel** is a high-performance file transfer mechanism. The FC A/V project is working on a streaming implementation, but it is only on paper. The Task Force felt that if a Fibre Channel streaming implementation can be realized, it would be a suitable network candidate. **ATM** is the choice for wide-area networks.

**ATM** is the choice for WAN streaming. However, wander and jitter issues remain to be resolved. **IP**-based interfaces can be used, because IP provides a standardized interface on which our file transfer protocols can sit.

**XTP** is the current choice to meet the requirement for point-to-multipoint transfer

**Table 2. After much deliberation, the Task Force offered these recommendations for streaming and file transfer.**

### Mapping – putting program content into the stream

In a number of applications, file servers and


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other storage devices in particular, it is vital to know how the various components of the program content (video, audio, and metadata) are mapped into the stream. This is because many storage devices sort program content into its component parts and then store these elements separately. Figure 4 shows how program content is mapped onto various streams.

The various components of program content are usually first compressed (video) and packetized. They are then inserted into various unique and standardized containers/wrappers (MPEG, DV, etc.) and then put onto the network (Fibre Channel, ATM, etc.). Some of these containers or wrappers are universally able to transport different types of content such as FC A/V which can transport DV, MPEG and 601, while others are designed to for one content type only (DIF for DV, CP for MPEG-ES). The video, audio, data and metadata can be thought of as boxes being continuously loaded into a semi-truck trailer – the container. When one container is full, it gets on the highway, the network, and the next one pulls up to be loaded. The point is that each container must be loaded in a standardized way. Otherwise, at the receiving point, each individual box must be opened and inspected before being processed (decompressed). This costs both time and money.

## A networks and protocols glossary

| | |
|---|---|
| ANSI | American National Standards Institute |
| ASF | (Microsoft) Advanced Streaming Format |
| ATM | Asynchronous transfer mode |
| A/V | Audio/video |
| EBU | European Broadcast Union |
| FTP | File transfer protocol |
| FTP+ | File transfer protocol plus |
| IEEE | (US) Institute of Electrical and Electronics Engineers |
| IP | Internet protocol |
| ISO | International Organization for Standardization |
| FC | Fibre Channel |
| LAN | Local area network |
| MPEG | (ISO/IEC) Moving Picture Experts Group |
| NFS | Network File System |
| QoS | Quality of service |
| RA | Reference architecture |
| RFT | Request for technology |
| SDI | Serial digital interface |
| SDTI | Serial data transport interface |
| SMPTE | (US) Society of Motion Picture and Television Engineers |
| TCP/IP | Transmission control protocol/Internet protocol |
| WAN | Wide-area network |
| XTP | eXtended Transfer Protocol |

**The video, audio, data and metadata can be thought of as boxes being continuously loaded into a semi-truck trailer – the container.**

### Practical application

The Task Force was faced with some difficult decisions, their recommendations for streaming and file transfer are listed in Table 2. So what is the practical application of these technologies? What are the consequences of adopting the report? If the recommendations are adopted, it will be possible to exchange files and send streams from one system to another—a big step down the path to interoperability.

Figure 5 shows a simplified diagram of how such technology might be employed. Commercials could be sent via file transfer (guaranteed delivery) to a central server. A streaming camera connected to a public network could deliver images and sound for immediate broadcast or later playback. The central server allows the interspersing of streaming material and stored files, all of which can be combined to make up a complete program stream. Because the server can generate multiple streams from the same piece of stored content, multi-channel applications are possible without dramatic increases in storage size.

As the work on networks and file transfers progresses, you will be hearing more and more announcements about centralized facility operations. USA Network just announced that they will be operating all of their facilities from a central master control operation. Other networks are sure to follow.


### Acknowledgement

I would like to acknowledge two persons for their contributions in the area of Networks and Protocols. Many of the ideas in the report came from Al Kovalick of Hewlett Packard. Al developed the Reference Architecture (RA) that describes a basic implementation of networks and protocols. The RA is serving as the blueprint for development of standards in this area. Hans Hoffmann was the chairman of the Networks and Protocols sub-group. He did an outstanding job in leading the group to reach the conclusions that are published in the Final Report.



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

Send questions and comments to: brad_gilmer@intertec.com

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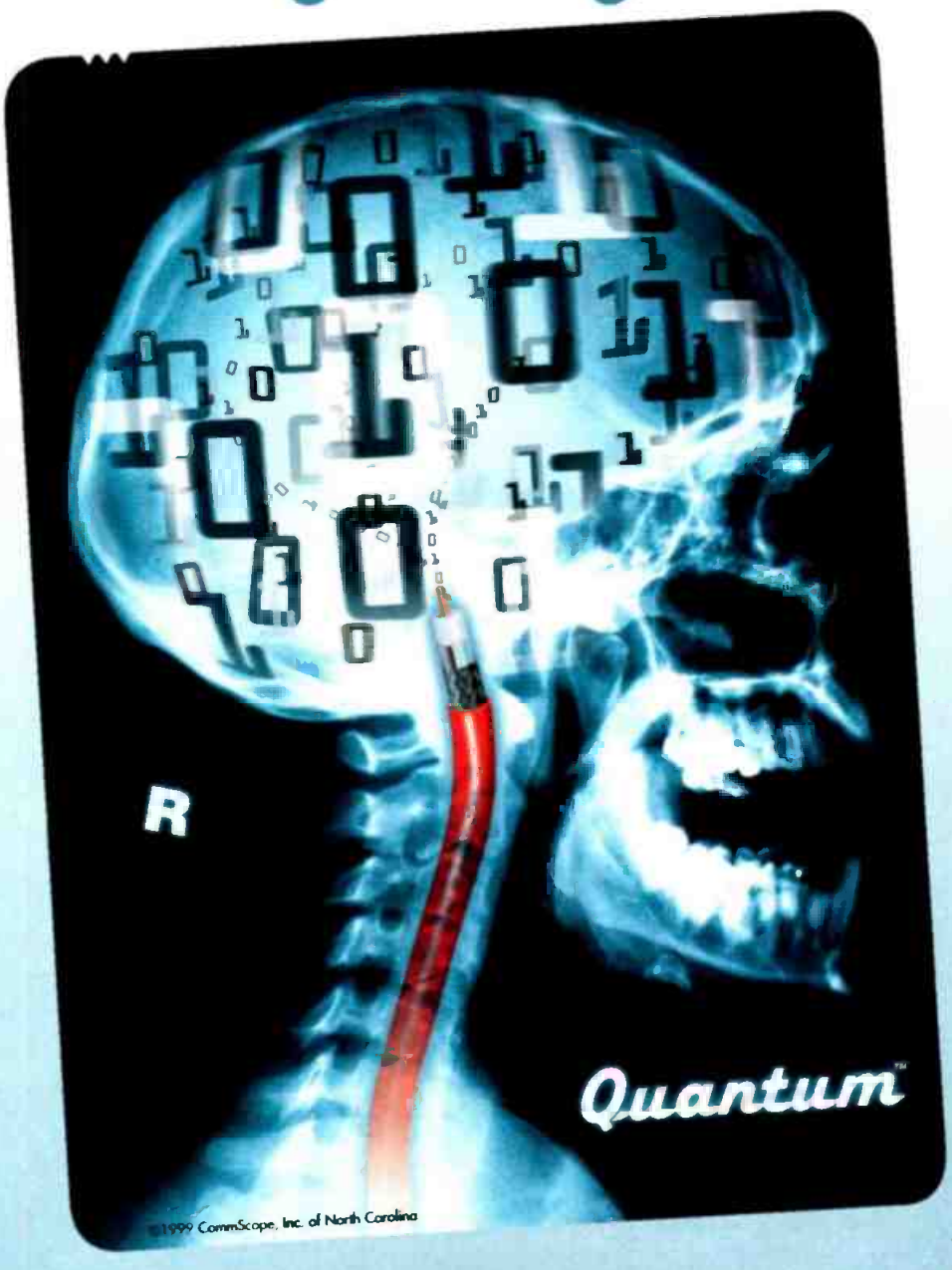


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# CAV standards

**BY STEVE EPSTEIN, TECHNICAL EDITOR**

Regarding component analog video, how does MII component video differ from Betacam component video?

*Greg Hertfelder*
*Audio-Visual Project Manager*
*Cerner Corporation*

*Dr. Digital responds:* Yes they are different, the signals used are the same (Y, R-Y, B-Y) but the amplitudes are different. This issue is a real political football. Despite numerous efforts, SMPTE has never been able to adopt a component analog video standard. The specifications of the various standards are shown in Figure 1. Basically, Betacam 100 percent luminance is 714mV, while MII luminance is 700mV. For 100 percent chrominance, Betacam is +/- 467mV (934mV p-p), MII is +/-324mV (648mVp-p). Changing the signal amplitude affects the signal-to-noise ratio, which can make one product appear better than another from a specifications point of view.

In addition to problems between Betacams and MIIs, integrating these decks into digital component environments can be problematic. These applications require deserializers feeding EBU N-10 signals to the deck's CAV inputs. The CAV outputs feed a serializer. The result is signal level transparent in the analog domain. Problems occur when the tapes are played back using the composite outputs. The resulting signals do not have setup and reduced chrominance (-25%). The opposite situation occurs when the composite inputs and component outputs are used, Signals then have setup and excessive chrominance (+33%).

In *BE*'s May 98 "Transition to Digital" column, Michael Robin suggests that facilities standardize on the EBU format. However, without the equipment in front of you, it can be difficult to determine the factory settings. Within facilities, the simplest method is to standardize on a single format and use DAs to adjust levels accordingly. If you only have one or two MII decks and numerous Betacams, run everything Betacam and vice versa.

For a more complete discussion of the issue, see May 1998's "Transition to Digital."

| WAVEFORM | | NTSC | EBU N10 | BETACAM | M II |
|---|---|---|---|---|---|
| Y SIGNAL | PEAK WHITE | 714.3mV | 700mV | 714.3mV | 700mV |
| | SETUP | 53.57mV | 0mV | 53.57mV | 0mV |
| | BLKG | 0mV | 0mV | 0mV | 0mV |
| | SYNC | -285.7mV | -300mV | -285.7mV | -300mV |
| B-Y SIGNAL | SCALING FACTOR | .493 | .564 | .75 | .522 |
| | POSITIVE PEAK | +313.54mV | +350mV | +466.65mV | +324mV |
| | | 0mV | 0mV | 0mV | 0mV |
| | NEGATIVE PEAK | -313.54mV | -350mV | -466.65mV | -324mV |
| R-Y SIGNAL | SCALING FACTOR | .877 | .713 | .95 | .66 |
| | POSITIVE PEAK | +438.5mV | +350mV | +466.65mV | +324mV |
| | | 0mV | 0mV | 0mV | 0mV |
| | NEGATIVE PEAK | -438.5mV | -350mV | -466.65mV | -324mV |

**Figure 1. Component analog signal characteristics for 100 percent color bars in the various CAV standards.**

## Keeping those miniature lamps lit

I'm changing, or trying to change, the two scale illumination lights on a Tektronix 1720 vectorscope. It's horrible! I have found several ways of doing this, but none of them are easy. Is there some trick or modification that I am missing? These bulbs need to be replaced fairly often and an easier method would be welcome. Is there a trick, a solution or a modification for this problem?

*Dany Marquis*
*Engineering technician*
*Le Réseau Des Sports*
*Montréal, Canada*

*Dr. Digital responds:* Been there, done that. Maybe you know a surgeon friend interested in that task. Keeping those little

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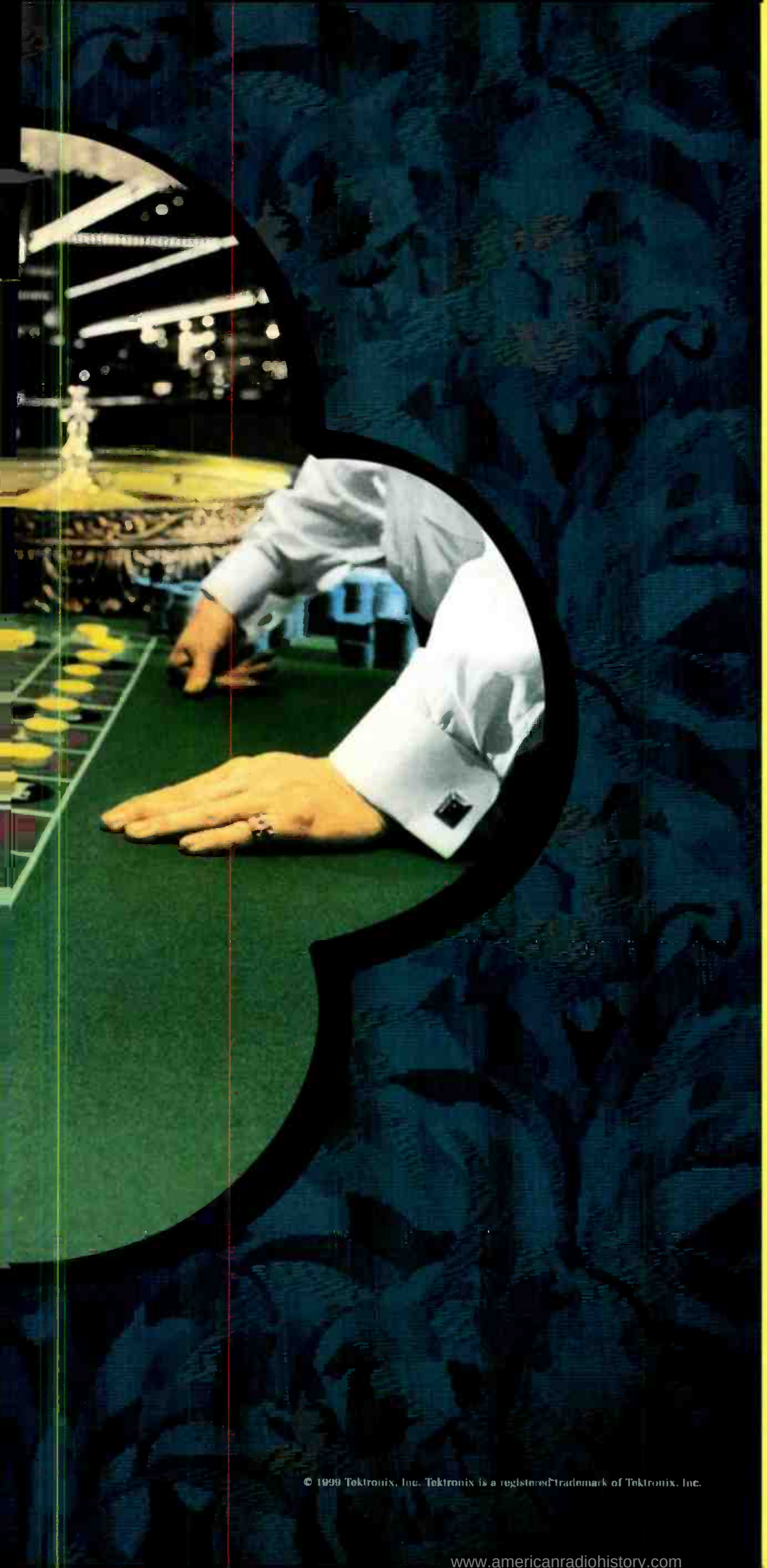

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incandescent bulbs lit is a constant chore. Unfortunately it is also expensive, in terms of both time and money. Luckily, today most situations where incandescent bulbs were employed have become the stomping ground of long lasting LEDs. There are some incandescent lamp replacements on the market that are actually LEDs, but they may not be appropriate for this application. In any event, I contacted Tektronix to see what they suggested. Here is their reply:

To replace the scale illumination lamps in a Tektronix 1720 Vectorscope, first take the bezel off the instrument by removing the two bezel screws on the front panel below the display, grasp the bottom of the bezel and pull straight out and upward. Use a tweezers with curved, serated tips to remove the bulb by positioning the tweezer tips on the thin, flat portion of the bulb (close to the plastic socket) and pulling the bulb straight out. Install the new bulb holding it in the same way with the tweezers, positioning it in front of the socket and pushing the bulb with your finger until it snaps into place. Finally, replace the bezel. There are a few safety tips to keep in mind when changing the light. First, of course, unplug the power cord before removing the bezel. Also, don't re-insert the screws in the rear panel when the instrument is removed from the cabinet.

*Tom Winroth*
*Technical support specialist*
*Tektronix Measurement*
*Business Division*

## Paying for software bug fixes

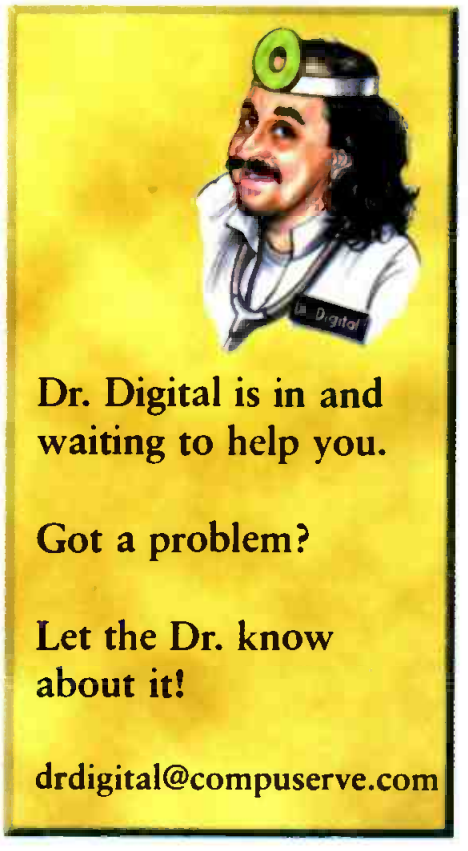
According to TechWeb News, (www.techweb.com) Microsoft has announced its plans to charge $89 for the Windows 98 service pack. Let me see if I have this straight — I (we) paid approximately $180 for the original version of Windows 98 complete with bugs (I'm sorry, *features*). Now, for an additional $89 Microsoft will fix those features?

If I had purchased a new car that did not run right I don't think I'd be willing to pay an additional 50 percent — a year later — to get it running correctly. I don't think I'll pay for this upgrade either. If Microsoft wanted to sell this they should have changed the opening graphic to read "Windows 99" and called it an upgrade. People would likely line up to buy it.

Computers are a fact of life, and trying to get things done without them can be very difficult. It is unfortunate that much of today's consumer level software is poorly implemented (read: *bloated*) and full of bugs. Many users simply accept computer crashes as SOP. For those in broadcast and professional video applications this is unacceptable. The truth is, downtime is expensive in any industry. Having to live with the bugs and then pay for the fixes is a double whammy. I would much rather pay $270 for a bug-free version than have to live with the bugs for a year and then pay for the fix.

Software, by its very nature, is a work in progress. A fix in one area can cause problems in another. With the myriad of hardware available, it is amazing it works at all. However, the computer industry has not done a good job of preventing/correcting integration problems. They have been so busy reinventing their market that quality and robustness have been forgotten. Thankfully today there are two robust alternatives. The new Mac operating system is polished and ready to go. If you are not a Mac fan, Linux is available free. Getting it up and running might be frustrating, but then again Win 98 and NT have not been without problems. The choice is yours. ■

*If you need help or have any comments or questions, drop me a note at drdigital@compuserve.com.*

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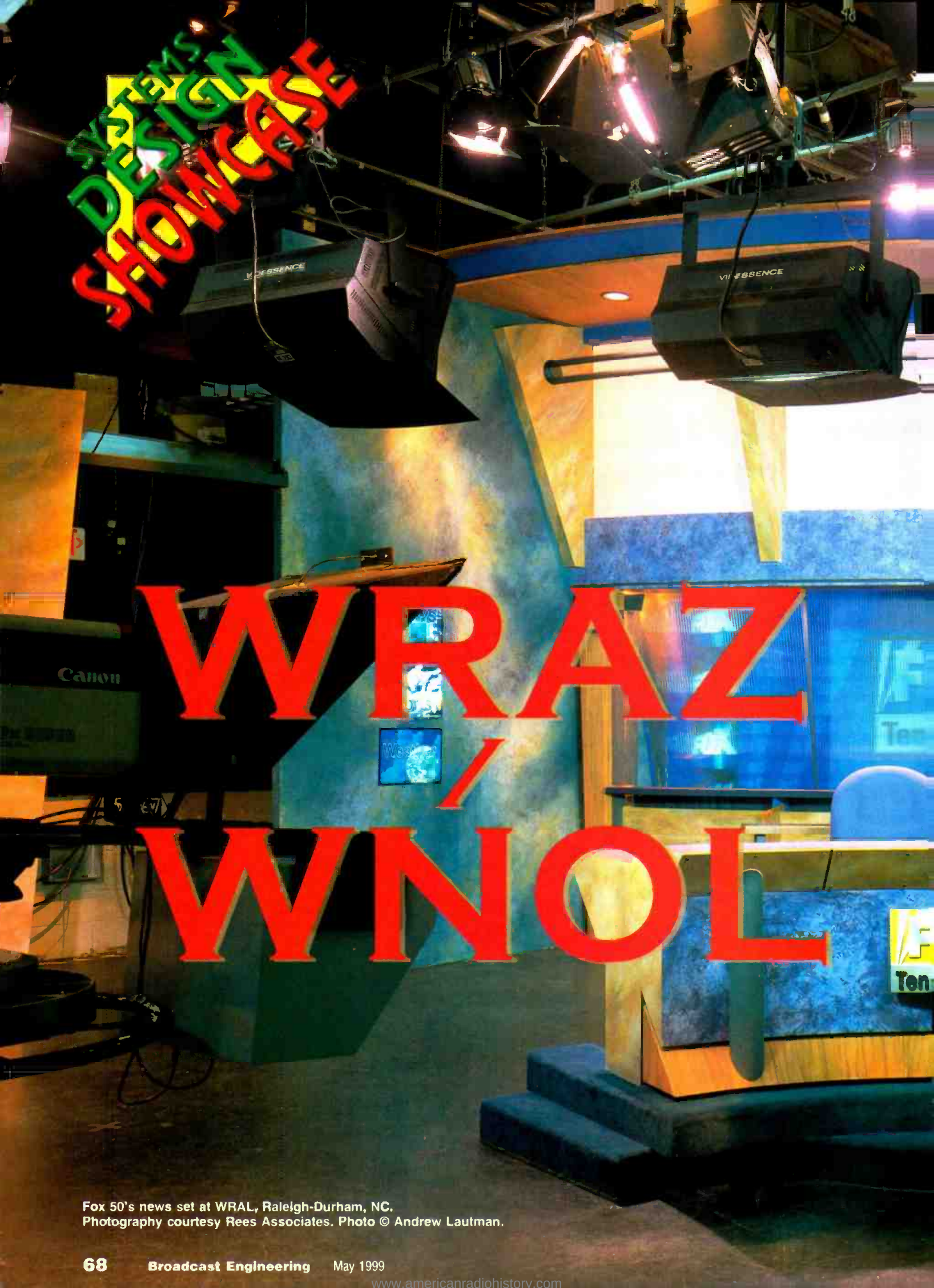


Fox 50's news set at WRAL, Raleigh-Durham, NC.
Photography courtesy Rees Associates. Photo © Andrew Lautman.


## By Lee Ann DeForest

Larger studio space, stable power systems, fly balls and stray shoppers – the average station manager's list of relocation concerns, right? It can be. Amid the current flurry of digital equipment upgrades, the quest for more space means many stations are moving. The crucial question: where? Centrally located stations often want to remain in their city but face high property values and even higher construction costs. Existing buildings are often the only option, but the

# WRAZ / WNOL

challenge is to find a place with enough space.

Two stations, WRAZ in Durham, NC, and WNOL in New Orleans selected existing, but unusual, new homes with the help of Rees Associates Inc., a leading architectural, interiors and facilities planning firm that specializes in broadcast building design. WRAZ moved into an office building overlooking right field at the Durham Bulls Athletic Park, while WNOL's new facility is under construction inside the upscale New Orleans Centre mall. Moving into pre-existing buildings not meant for television stations has required extensive planning and design creativity. The WRAZ and WNOL teams have used both to implement the latest in digital technology into these nontraditional new locations.

**Rack room showing distribution amps, patch panels and a Leibert computer room air conditioning unit in the background.**

A relative newcomer to the broadcasting world, WRAZ began life as a WB affiliate inside the studios of its sister station WRAL in Raleigh, NC. Founded in 1995 as part of a local marketing agreement owned by Capitol Broadcasting, WRAZ aired WB programming, its own local public service programming, and news from WRAL. The two stations shared equipment, studios and staff. When the FOX network granted Capitol Broadcasting's petition for affiliation in 1996, Capitol decided it was time for WRAZ to establish its own public presence.

Space in the current building was tight. Several spots in and around Raleigh were recommended, but the station had other ideas.

Construction was already underway on the $9.6 million Diamond View building overlooking the Durham Bulls Athletic Park. Owned by Capitol Broadcasting, Diamond View kept the deal within the company, while allowing continued support of Durham revitalization efforts. The 18,000 square foot first floor of Diamond View offered WRAZ both an exciting scenic view and the chance to bring business and visitors to downtown Durham.

## Technical hurdles

The Diamond View space created a variety of technical challenges. The shell of the building was already complete. WRAZ now faced the daunting task of adapting its original ideas for the new station to the physical constraints of the long, narrow space available. Station engineers planned the facility design with Rees Associates. System integrator The Whitlock Group was then brought in to finish the equipment planning. Due to the time constraints of the fast-track project and WRAZ's small staff size, Whitlock was also chosen to complete the wiring and installation.

The lack of open space around the park hindered placement of five satellite dishes, a key initial decision. The four steerable 4.5 meter Andrews KU/C-Band dishes, one Fox dish and their accompanying racks were positioned 700 feet away from WRAZ's technical center in the corner of the left field parking lot. The receivers for the five satellite antennae are connected back to the facility by single-mode multifiber link because of the extensive distance.

WRAZ elected to continue using the news program from WRAL, taking advantage of WRAL's established credibility and number one position in the market. This required WRAZ to position a strong microwave relay antenna to receive the signal from Raleigh. The station was able to place the eight-foot-diameter Andrew High Performance antenna amid the right field light bridges, which are attached to the Diamond View building. WRAZ also added a four-wire intercom circuit between the two facilities to allow live coordination for the news show. The system is installed over the STL and intercity microwave subcarriers.

Diamond View was designed as corporate office space, which made wiring of the facility a challenge. The floor was already set, forcing station engineers to choose overhead wiring. Space above the ceiling was minimal and not easily accessible. Although full size racks were used, routing was difficult. The Whitlock Group staff ran numerous spare wires — in some cases, up to an extra 25 percent more – to each location in the station to limit future


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# WRAZ / WNOL

trips back into the ceiling.

The separation from WRAL meant that WRAZ had to purchase new equipment for all areas of station operation. The decision to use WRAL's news facility meant that WRAZ was not required to have a news room or studio, news editing facilities, or multiple sets of field gear, saving the station time, space, and money. Although the new facility does have a small studio for limited local production, it is not currently outfitted for broadcasting.

Purchasing new equipment allowed station engineers to take advantage of the latest in digital technology. Obtaining this technology, however, posed its own problem. WRAZ engineers began ordering equipment at the end of April and early May of 1998, with building occupancy tentatively scheduled for July. WRAZ had to pressure vendors and manufacturers to meet tight delivery times. Much of the equipment was delivered at the last minute, yet all of it arrived in time for installation.

Station engineers creatively handled the short time allotted to upfit the Diamond View building. Because all of the equipment was new, every piece and wire had to be tested for possible bugs. While walls were placed in the space, the entire technical facility was prewired and powered up in a warehouse. Due to the sensitivity of the digital equipment, a professional moving company was hired to transfer the filled racks to the station for installation and system tests as space became available.

The new WRAZ has been designed with a strong eye to the future of the digital industry. Every piece of equipment was chosen to create a fully digital WRAZ, ready for adaptability to DTV. Anchored by a GVG 7000 series 128 X 128 routing switcher (currently populated to 64 X 64), a serial digital 601 routing infrastructure was selected to ensure an easy transition to a variety of formats. Another example is the Leitch DES-6801, which now converts all analog video sent to the satellite receivers to serial digital format.

Everything produced by WRAZ is digital, with only the actual transmission remaining analog. The plant will handle multiple master controls and has a digital-ready microwave. A new digital transmitter and tower are currently under construction. WRAZ-TV FOX 50 will be ready to meet its FCC-mandated deadline of Nov. 1, 1999, for DTV. The WRAZ team was successful in adapting the unusual Diamond View building space to accommodate all of their current and future digital broadcast needs.

**Rack room showing a news ASC server, a Grass Valley Group routing switcher, and the station's ASC server.**

## WNOL

The architects at Rees Associates faced a similar spatial challenge with the design of the new facility for WNOL-TV, WB 38 in New Orleans owned by Quincy Jones Broadcasting, LLC. WNOL is accustomed to inhabiting unusual spaces: the station's current home previously housed an auto dealership. Facing limited space and the impending expiration of their lease, WNOL's leadership began the search for a new home over two years ago.

Station management set a list of goals for the new location. WNOL needed expanded studio and office space to accommodate a growing operation, both on-air as one of the top-rated Warner Bros. affiliates in the U.S. and as a production house. Studio 38, WNOL's production arm, handles a constant flow of commercials and music videos, is the home of a local syndicated cooking show, and rents the studios and suites for editing and production. Additional production space was greatly needed.

The price of real estate in New Orleans also influenced the search of nontraditional sites. While costs have always been high, revitalization projects throughout the city, particularly in the Central Business District, have driven land and construction costs even higher.

After months of searching, they settled on The New Orleans Centre, an upscale business, hotel and shopping complex located adjacent to the Louisiana Superdome, Hyatt Hotel, and the new 18,000-seat New Orleans Sports Arena. This area is the hub for special events in the city, including the

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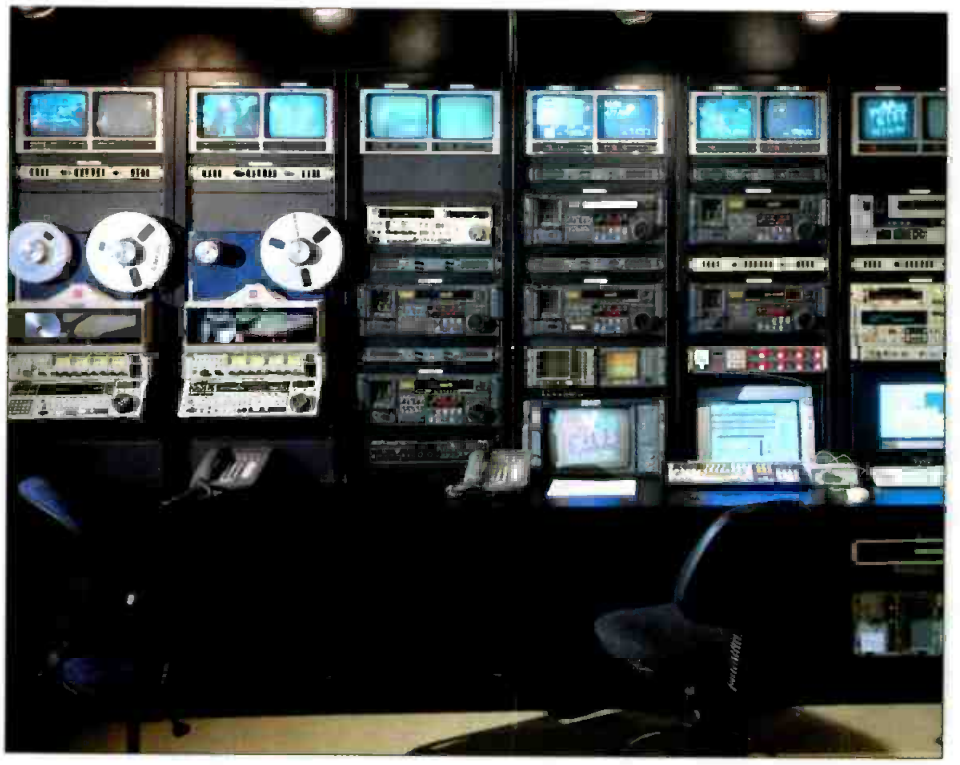
# WRAZ / WNOL

NFL Saints, Tulane University football, professional hockey, and future Super Bowls. The Centre itself hosts approximately 30-40,000 visitors each week, offering excellent access to the community. However, like WRAZ, the space itself was long, narrow, and not as large as originally planned. Rees Associates and WNOL's planners worked together to devise several creative solutions to meet all of the station's needs.



Tape room showing two Sony one-inch machines, JVC Digital S tape machines and a Panasonic M-2 tape machine.

## Taking shape

The shape of the space is unique, wrapping around the mall's glass and steel atrium. To take advantage of WNOL's new storefront location, station executives elected to make the on-air operation visible to the public. Operation and control areas were placed around the semi-circular atrium, bringing major studio functions front and center.

The narrowest part of the space was the center, a semicircular area only 35 feet deep. The designers placed master control in this focal point, which led to a traffic flow problem in the operational area. The master control room would become the only corridor between the edit suites and tape room, creating a busy distraction in an ordinarily calm space.

Rees Associates' solution was to create a hallway behind the master control racks, taking advantage of a typically "dead" space used to access equipment. By mounting the seven custom-built racks through the wall, the space behind the racks became the major passageway connecting the production area with operations, leaving master control isolated and quiet.

Carving a large, open studio out of property originally designed as retail space was a major concern. Station management wanted the new studio to be a minimum of 60 feet by 60 feet. The unusual shape of the space dictated that the studio be placed at one end of the facility. With the building's support columns approximately 30 feet apart, one column supporting the roof must be removed to open up a clear 60-foot studio space. A large steel truss installed on the roof will support the ceiling and studio lighting grid and will also serve as the mount for the studio's four 4.5-meter satellite dishes.

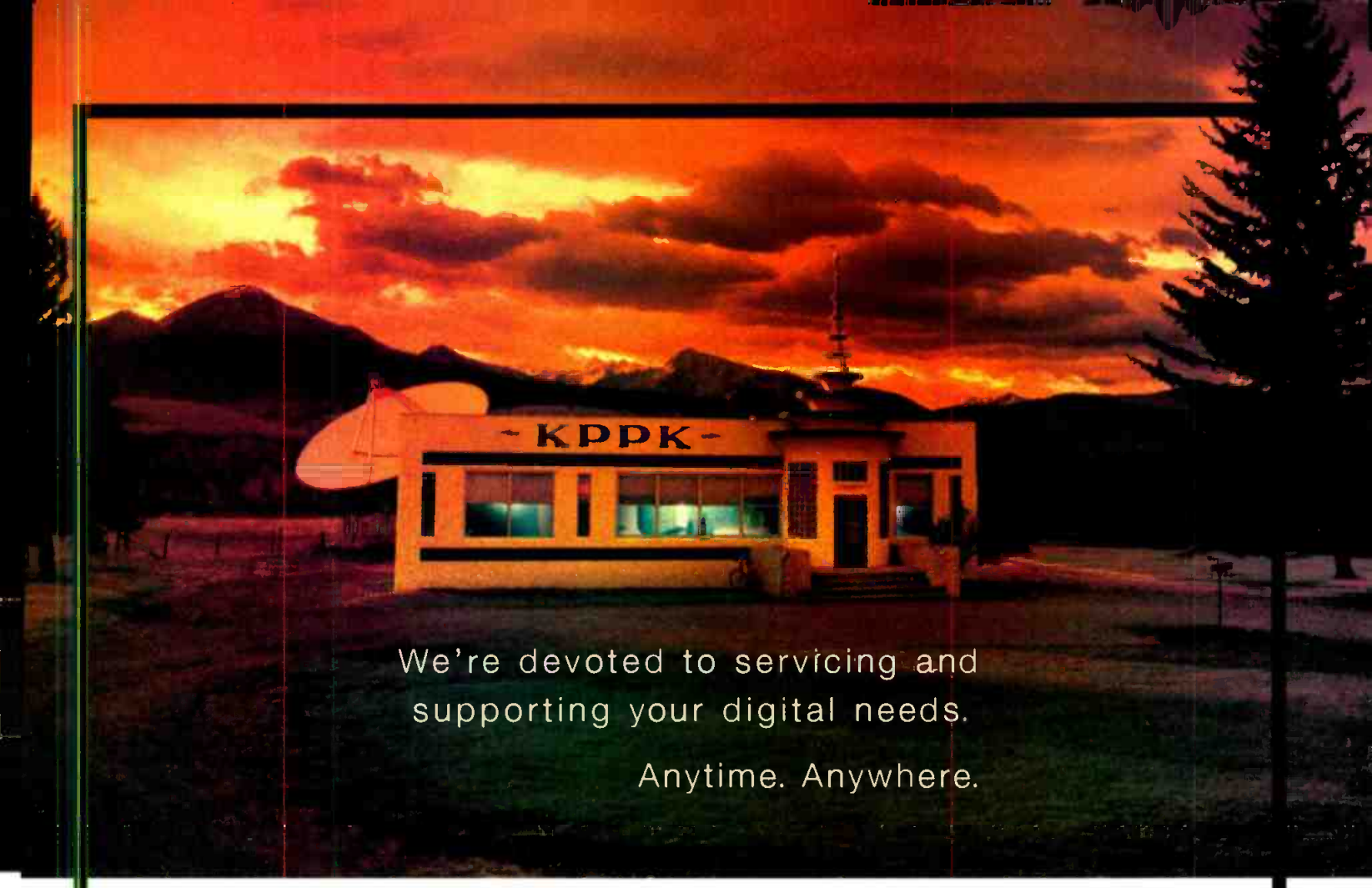
With several basic design problems solved, focus shifted to the creation of

## WRAZ equipment list

JVC Digital S videotape format
GVG 7000 series 128 X 128 routing switcher (currently populated to 64 X 64)
GVG M-2100 master control system
GVG model 2200 production switcher
Chyron Liberty Paint System
Chyron Aprisa Still Store System
Chyron Max! Character Generator (Production Control)
Chyron Maxine Character Generator (Master Control)
Two Avid Media Composer 1000 edit suites
ASC/Leitch VR-300 system for commercial playback
Four Andrew 4.5M steerable antennas feeding 12 CKU receivers (three per dish).
Leitch DES-6801 A/D converters
Leitch equipment for audio and digital video distribution
Ikegami HL-45 W digital camera with switchable aspect ratio (studio camera)
Microwave Radio Corporation microwave equipment

## WNOL Equipment list:

Sony DVS-7250 digital production switcher, with two channels of DME 7000
Wheatstone audio board
Philips Jupiter / Venus video routing
Nvision AES digital audio routing
Sony 9100 production editor
Graham-Patten audio board
Sony Digital Betacam and SX VTRs
RTS Adam intercom / IFB system
Avid 1000 with 3-D
Philips LDK-9 studio cameras with digital output upgrade
Sony DVW-700WS field cameras
Odetics system automation with Hewlett-Packard MediaStream servers
Philips Saturn master control switcher
DigiCart and Short/cut audio systems (360 Systems)
Tektronix test scopes
Ikegami & Sony monitors
Tektronix, Sony & Leitch A-D converters
Nu/Comm digital STL/TSL microwave system
Patriot 4.5 mm. KU / C-band downlinks

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# WRAZ / WNOL

a digital production center containing multiple-format edit suites and a large two-tiered control room. Over the past two years WB38 has been slowly retiring its analog equipment and upgrading its digital capability. WNOL's engineers are using the move as the deadline to complete the transformation.

WNOL's engineers worked with system integrator Beck Associates of Austin, TX, to evaluate the station's equipment. The process began with the selection of an Odetics/Hewlett-Packard disk-based commercial playback system. One HP MediaStream drive was put on the air in March, 1998, replacing a variety of 11 Betacam BVW-40, 10, and PVW-2800 tape machines that had been running for over ten years.

When the facility is ready this spring, a second MediaStream will be installed and interfaced with the new Phillips Saturn Master Control switcher. This will allow the new system to be completely tested and the staff trained prior to putting the new studio on the air. Once the switch is made, the Odetics system from the old location will be moved and mated with the new system.

Additional analog tape machines and the station's extensive program library, containing thousands of BetaSP-formatted movies and programs, were also concerns. Digital BetaCam was initially considered for the station-wide digital format and then rejected due to prohibitive costs. Instead, WNOL became one of the first station to employ the new Sony digital SX format, which plays all older Betacam formats and is more cost-effective.

Although all audio and video routing will be digital, WNOL will accommodate its lingering analog needs by keeping two BetaSP machines in operation. The station will also place several frames of analog-to-digital and digital-to-analog converters, both audio and video, at key points in the station. These will be dedicated to specific analog machines to seamlessly meld these islands into the routing for any operator.

Like WRAZ, WNOL anticipated the transitional future of digital broadcasting. The output of both the Master Control and backup switchers will be multiplexed into one data stream with various control data for the studio-transmitter link (STL), main, and backup transmitters. This signal will then travel over a pair of fiber optic links to the top of an adjacent 26-story office tower and into a 7GHz digital microwave transmitter. The digital microwave system being installed can transmit multiple signals of various combination, both standard TV and HDTV.

On the edge of a salt marsh nine miles away, the digital signal will be converted to analog again and fed to the Channel 38 main transmitter. Control and other transmitter data will then be multiplexed and sent to a transmitter-studio link (TSL), returning to the New Orleans Centre studio up the same pathway. The STL/TSL is also ready for future multicasting and digital broadcasts, allowing WNOL to grow with the evolution of the digital television industry. While New Orleans is not slated to offer DTV until 2003, WNOL currently plans to begin DTV transmission in late 2001.

The placement of a television station in an unconventional and unprepared space can be done, and it is often a viable and economic option available to station management. Drawing on the experience of Rees Associates' and systems integrators The Whitlock Group and Beck Associates, WRAZ and WNOL have made the most of their space, whether it's next to a ballpark or inside a mall. They have shown that with creativity and careful planning a non-traditional space can provide great aesthetic and operational opportunities. Both stations are ready to make a smooth transition to the ever-changing future of digital broadcasting. ■

*Lee Ann DeForest is a freelance writer for Ballas & Partners, Richmond, VA.*

## WNOL Design Team

Client: Quincy Jones Broadcasting, LLC
Gary Furlow, Director of Production & Operations

Architect: Rees Associates (Oklahoma City, OK)
Bill Howell, Project Designer
Kyle Lombardo, Project Manager
Karen Bishop, Project Architect
Angela Mayer, Interiors

Contractor: Broadcast Building Company (Jacksonville, FL)

Broadcast Systems Consultant: Beck Associates (Austin, TX)

Mechanical Engineer: Davenport & Associates (Oklahoma City, OK)

Electrical Engineer: EE Systems Engineering (Oklahoma City, OK)

Interior Design Consultants: Crestia & Staub (New Orleans, LA)

## WRAZ design team:

Client: Capitol Broadcasting (Raleigh, NC)
Jim Goodmon, President
Paul Pope, Station Manager of WRAZ
Tommy Schenck, General Manager of WRAZ
Tom Beauchamp, Corporate Chief Engineer for Capitol
Jim Gamble, Chief Engineering Manager of WRAL

Architect: Rees Associates (Oklahoma City, OK)
Bill Howell, Project Designer
Kyle Lombardo, Project Manager
Steve Stovall, Project Architect

Contractor: Bovis Construction

Broadcast Systems Consultant: The Whitlock Group (Virginia Beach, VA)

Mechanical Engineer: Davenport Associates (Oklahoma City, OK)
Steve Davenport

Electrical Engineer: EE Systems Engineering (Oklahoma City, OK)
Roger Edwards

Interior Design Consultant: Van Stavern Design Group (Oklahoma City, OK)

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# Building a tower

BY DON MARKLEY

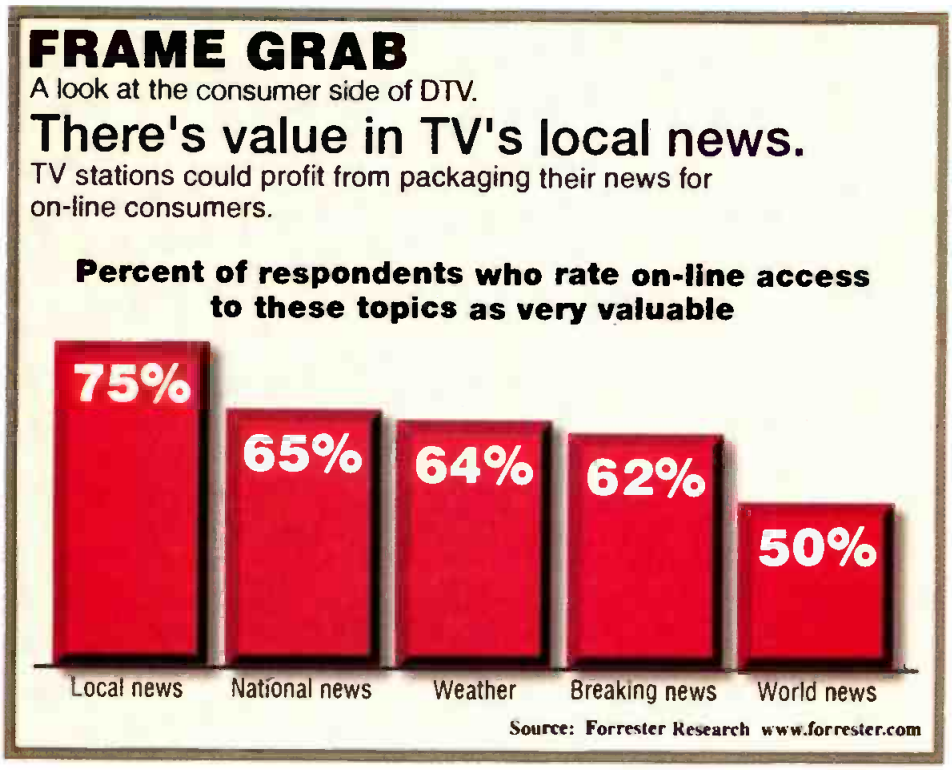
Congratulations! You are going to be involved in building a tower. This can be one of the more enjoyable times for a station engineer, especially if we are talking about a major structure, not one of those little STL towers. You will get to watch big machines at work, massive pieces of steel fly through the air and, if you are lucky, giant helicopters dangling hardware worth a small fortune high over your site. This will be fun — maybe.

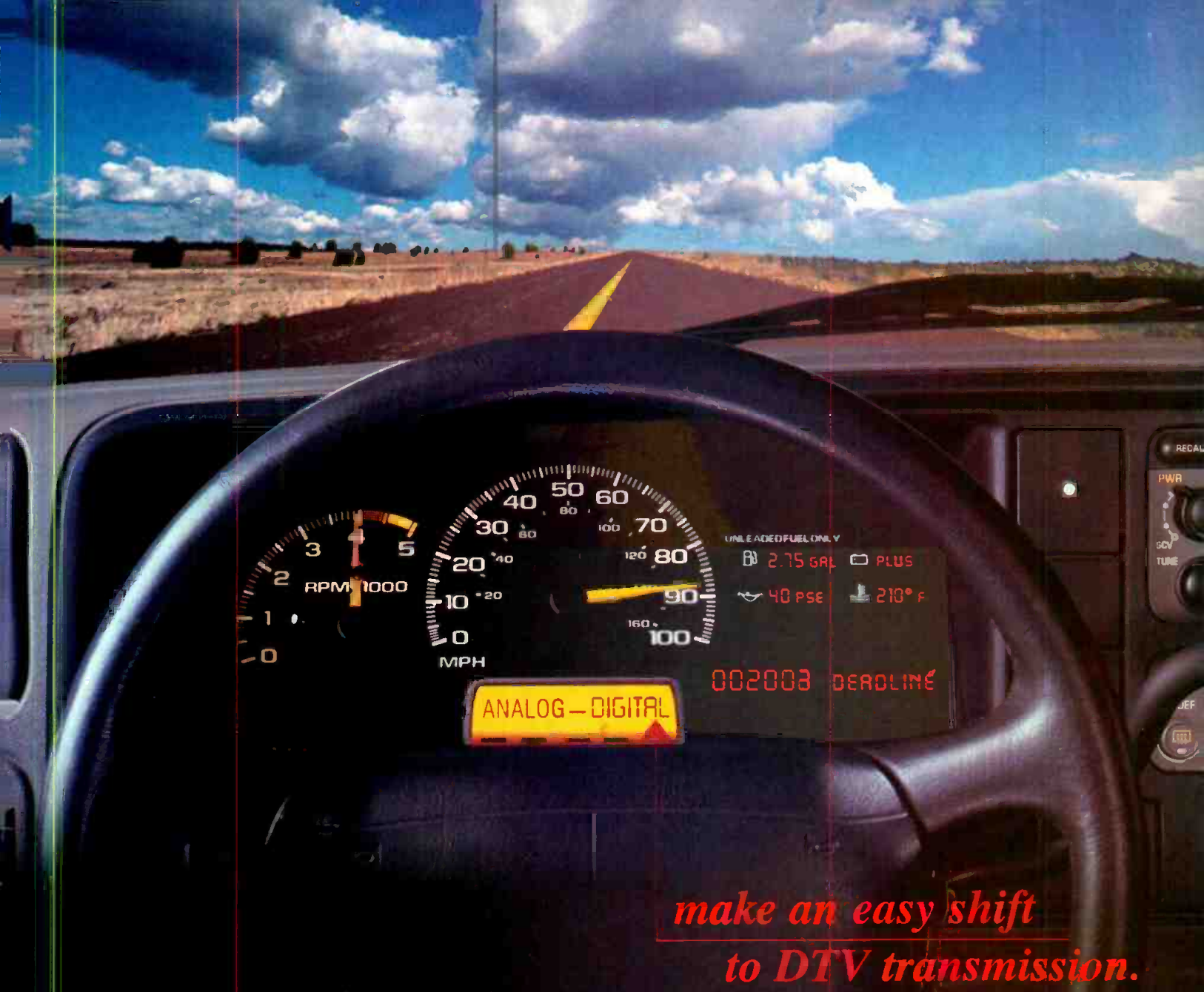
When building a tower, broadcasters should consider potential demand for tower space and plan equipment purchases accordingly.

## Horizontal vs. vertical space

For the purposes of this article, let it be assumed that all of the necessary permits are in place and you think that you are ready to place the order for the tower. That would mean that the site has been obtained and surveyed to determine that you have adequate guy space. The default value for guy distance is usually 80% of the tower height. Remember that the tower height isn't to the top of a top-mounted antenna and beacon for anything other than filing purposes. The tower height is usually to the bottom of a top mounted antenna for guying purposes. The 80% number is nice, but not necessary. Depending on the available site, it may be necessary to reduce the distance to the outer set of guy points. Many towers have been built with 50% guying; most range between 50% and 80%. Shorter guyed towers are just as safe as those with longer radii but may be more expensive.

As the distance to the guy points is reduced, the angle for the guy wires obviously becomes steeper. Remember, the horizontal forces required to hold the tower remain nearly the same, varying only if a heavier tower is needed due to the shorter guying. Applying simple trigonometry to the horizontal loads indicates that the downward force for a fixed horizontal force increases as the distance to the guy point is shortened. That increases the loading on the tower and the stress on the guy cables. This is all included in the tower design and may cause some increase in the cost of the project. The increased loads on the cables also means increased loads on the guy points which may result in larger anchors than for a longer guyed tower. If a choice is available, the tower will probably cost less if 70% to 80% space is available. The facts of life are that you may not have that luxury. In any case, the tower design will still provide you with adequate



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### How many antennas?

Once you have determined the guy distance to go with the desired height, you need to decide just how much capacity should be designed into the structure. In other words, how many antennas and transmission lines will be on the tower? You should assume future demands for tower space providing a good source of income. History indicates your tower will eventually be loaded up to its capacity with antennas for two-way systems, cellular equipment, microwave dishes and even cameras. Make a list of your current needs and add a couple more broadcast antennas, some microwave dishes at various levels and 20 or so two-way antennas along with anticipated transmission lines. Remember that the transmission lines will often add more windload than the antennas themselves. This has to be done with some element of reasonableness. Obviously, don't plan on a large television antenna when you are simply trying to build a tower for a six-bay FM antenna. Be aware that rental space can eventually pay for the tower, especially in urban areas.

### Sample the soil

Now a new problem comes up. Unless you specify otherwise, the tower design will be for standard soil conditions. If other than standard soil is encountered when the guy points are dug, the price and design of the anchors will have to be altered significantly. For large towers, at least one soil boring should be made at the base of the tower. Other than for the outermost guy points, you don't know exactly where the other points will be until the tower is designed. Therefore, test borings at those locations should probably be delayed until a manufacturer is selected and the initial design is completed. Soil borings are rather straightforward, check the phone book for Drilling and Boring Contractors or Laboratories,Testing.

Soil boring services will usually have a good idea of the conditions in your area and will be able to make recommendations on just what is needed. Your main concerns are the load bearing characteristics of the soil, the level at which you may hit rock and any problems that might be anticipated with water. Water can be a problem. The author has experienced one site that presented good soil when first used, but the second time a tower was erected it followed a wet season and the guy points filled with water. In fact, a Cat D-6 became stuck at the high-ground site. In any case, obtain an analysis of the soil conditions and furnish it to the tower companies along with your request for bids. If the tower is relatively short and you are confident that the soil conditions are good, the tower can simply be designed for normal soil avoiding the cost of the borings. The choice is up to you, but it is a bit like not practicing safe sex. It may seem fine initially, but the payback is terrible if you are wrong.

All tower designs will be to the current standard; ANSI/EIA/TIA 222F. The only variable you may wish to include is a bit of extra ice loading. For Northern areas, adding an extra 1/2" ice load is advisable. The tower companies are all aware of special requirements that some states may have and will include that in their design calculations. Be sure to

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advise the companies prior to bidding as to exactly where the tower will be located as opposed to just the location of your office.

### Hiring a crew

The project can now proceed down one of two paths. First, you can request a quote on a full turnkey solution from the tower manufacturer. That is, they include the foundations and the erection. The other option is to simply buy the materials from the manufacturer and arrange for the foundations and erection separately. Some money may be saved by such separate negotiations, but you now are in the position of general contractor with all of the responsibilities attendant thereto. If this is your first tower project, it is probably advisable to let the manufacturer worry about the coordination. Otherwise, if anything goes wrong, everyone will be pointing their fingers at each other and you will have nowhere to turn. One possible alternative is to use your consulting engineers to coordinate the project. That normally brings the experience of constructing several such structures to the project and can result in significant savings.

As to the erectors, many tower erectors now belong to the National Association of Tower Erectors (NATE). This group has been working with OSHA to develop accepted standards for the manner in which towers should be built and the equipment and methods for use on the site. The operative term here is "working with OSHA." Everyone is in favor of a safe workplace, and OSHA is definitely the controlling agency on projects of this type. It only makes sense to deal with someone familiar with the OSHA requirements and is attempting to meet them. Any erector that you choose for your project must be familiar with the OSHA requirements. Furthermore, you should insist that the crew be experienced with towers of the type and height proposed. A 2000' tower is *not* simply four 500' towers stacked. It is a totally different type of animal.

As the station engineer, insist on two things. First, in the contract documents, the tower erector must clearly be identified as responsible for OSHA compliance and hazard assessment. This should include providing you with a list of all employees and the dates when their safety training for your project was completed. Second, require that the tower manufacturer provide you with a complete set of all tower loading and design calculations sealed by a Registered Structural Engineer licensed in the state where the tower is to be located. A set of those calculations should be furnished to your insurance carrier for their approval to assure that your station's interests will be protected. The original set should be locked in a safe place in your files for future reference.

You now are ready for the backhoes, hulldozers, winch trucks and cranes to roll. Enjoy the project and make sure that the temporary lights are on at night.

One more thing: While all of those fascinating big machines are at work — stay the hell out of the way. ■

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

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

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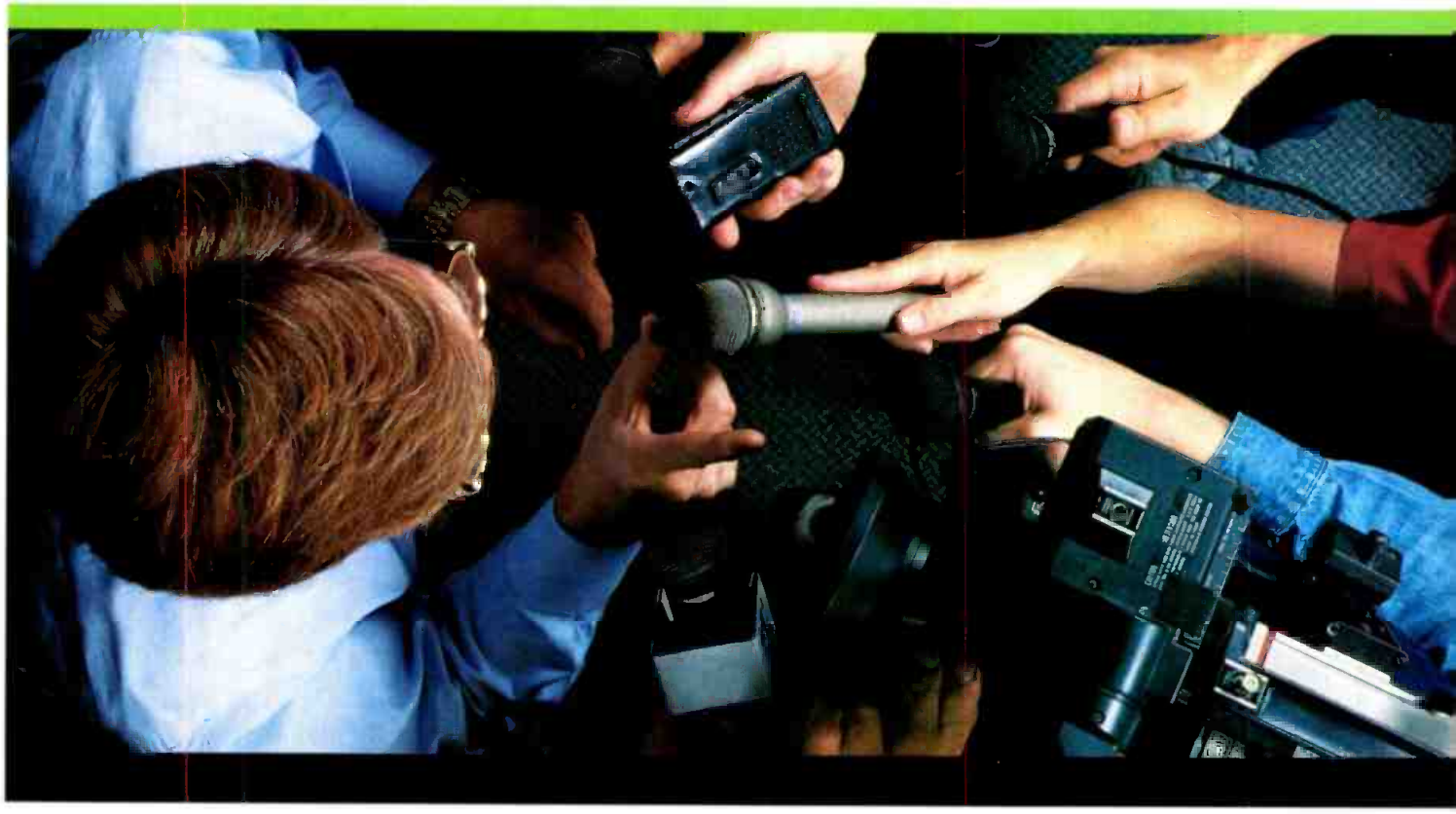

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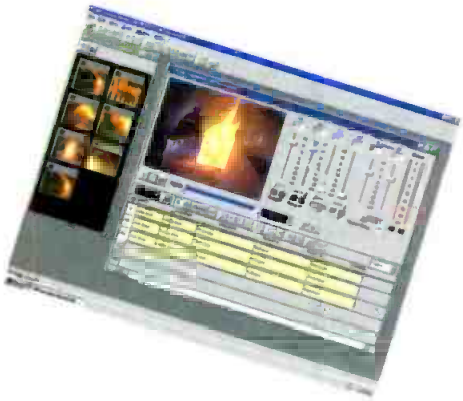

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# Video production software

BY MARC BOEDDEKER

Video production software and the computer hardware that supports it have been evolving at an incredible pace. Prices are headed down and feature sets are expanding. Multipurpose workstations and applications are becoming the norm, and even dedicated boxes are offering enhanced capabilities. Some are actually learning to play well with others. Software solutions for editing, paint, animation and compositing have begun to blur the distinction of where one application leaves off and another begins or where one program becomes a plug-in of the other.

The basics of editing and the features that facilitate it are pretty well established, as are the "expected" feature sets for paint programs. After that the ability of a system comes down to the person running it. The human element is even more important when it come to creating animation, composites, etc. where the requisite paint and graphics skills must be integrated with basic editing ability and production aptitude.

Editor Marc Boeddeker in a Producers Post edit suite. The facility uses a variety of hardware platforms to support the many video software programs that clients and staff depend upon to produce content.

For the most part, any program that has survived the marketplace is good to go in the hands of a competent artist or editor. For the rest of us, ease of use, plug-ins and support for advanced systems are the key factors.

When considering which of the competing applications is right for you and your operation, one of the first questions should be "What am I going to do with it? How is this combination of software and hardware going to pay for itself and hopefully make me some money? Quite often a new client or the need for some specific new capability drives a purchase. This is often a chance to upgrade existing systems and to think of what else the same gear might be used for. For example, most edit software includes a minimal CG application. This is sufficient for offline and some industrial uses, but with an upgraded CG option or the addition of a paint or DVE/effects plug-in you suddenly have a much more capable box, lending itself to the pursuit of new business.

It is always nice to get more than you need, but you should not pay for stuff you know you will never use. Unless an option or enhancement has a potential use or commercial payoff, the extra expense should be diverted to bigger, faster storage or dual processors instead of dual monitors. Aesthetics are important but so is speed when deadlines are involved. If you're trying to crank out product, choose applications that support multiple processors and get hardware to match. For example, I would choose dual 450s over a single faster, probably more expensive processor. On the other hand, if you are committed to using a product that does not yet support multiprocessing, or perhaps never will, spend your computer budget on the aspect that will most impact your workflow (more RAM, better I/O, etc.).

It's gotten a little bit cheaper to make mistakes these days, but the wrong call still hurts. Deal with a reputable integrator who can tell you what kind of motherboard, processors, SCSI, etc. you are buying and why.

Another consideration is which operating system will you choose to be the heart of your environment? Many of the installed editing and graphics workstations are Mac based, so operator familiarity can be a factor, although many of the "old favorite" graphics, compositing and even editing products have been ported over to familiar GUIs (graphical user interface) on NT-based platforms. Unix-based products tend to offer high capability with a higher price, usually with a steeper learning curve for the uninitiated. However, for top echelon work these products continue to be well accepted.

The question to ask when considering specific software and hardware combinations is whether or not the application was written for the operating system you plan to run it on. You should not assume an application will behave exactly the same running on unique hardware or on a different operating system than you are used to.

The video board you choose for your system in some ways influences all subsequent decisions. The level of product that you produce will be dependent on the quality of your I/O. First, get the best board you can afford. A video board may be capable of higher resolution capture than you can initially af-


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ford to support in terms of drive capacity and bandwidth, but as you add storage capacity, multiple drives can be striped for higher bandwidth and better resolution. Analog I/O is fine for many applications, as is Firewire for a DV production environment. On the more expensive side, serial digital I/O provides the bridge between the various "lossless" compression schemes available and delivery in the real world of digital betacam post and broadcast. Speaking of that "real world," looking at your graphics, composite, etc. on some form of NTSC monitor (perhaps even a waveform monitor) is very useful in avoiding some of the problems that can be involved when delivering computer output to an NTSC post or broadcast operation.

Board manufacturers and software developers generally have a list of preferred or "authorized" partners that are supposed to be compatible with each other. This is a good list to check. Most boards are bundled with some kind of basic editing application. On a basic level each is as good as the next, and usually offer an upgrade path based on plug-ins or alternative software.

Networking and shared assets are an important part of today's production environment. Even the smallest shop will want to choose applications that are compatible, running on platforms that can communicate with each other.

Ethernet comes for free with most new computers and other network solutions are becoming more "user friendly" all the time, so it's no longer mandatory to stay within one operating system. Bear in mind, however, that some applications have mutually exclusive requirements when it comes to networking, so deal with specifics when discussing implementation with your VAR or product representative.

In closing, let me mention a preference for using "external devices." CDRs, MOs, and hard drives all generate heat and require additional power supply, either of which can stress out your computer. The extra expense of an external device is an investment in reliability, and, if you must work on a piece or reconfigure, it's much easier to repair or replace a unit that is outside the box. ■

*Marc Boeddeker is Director/DVD Author with Producers Post, Burbank, CA*


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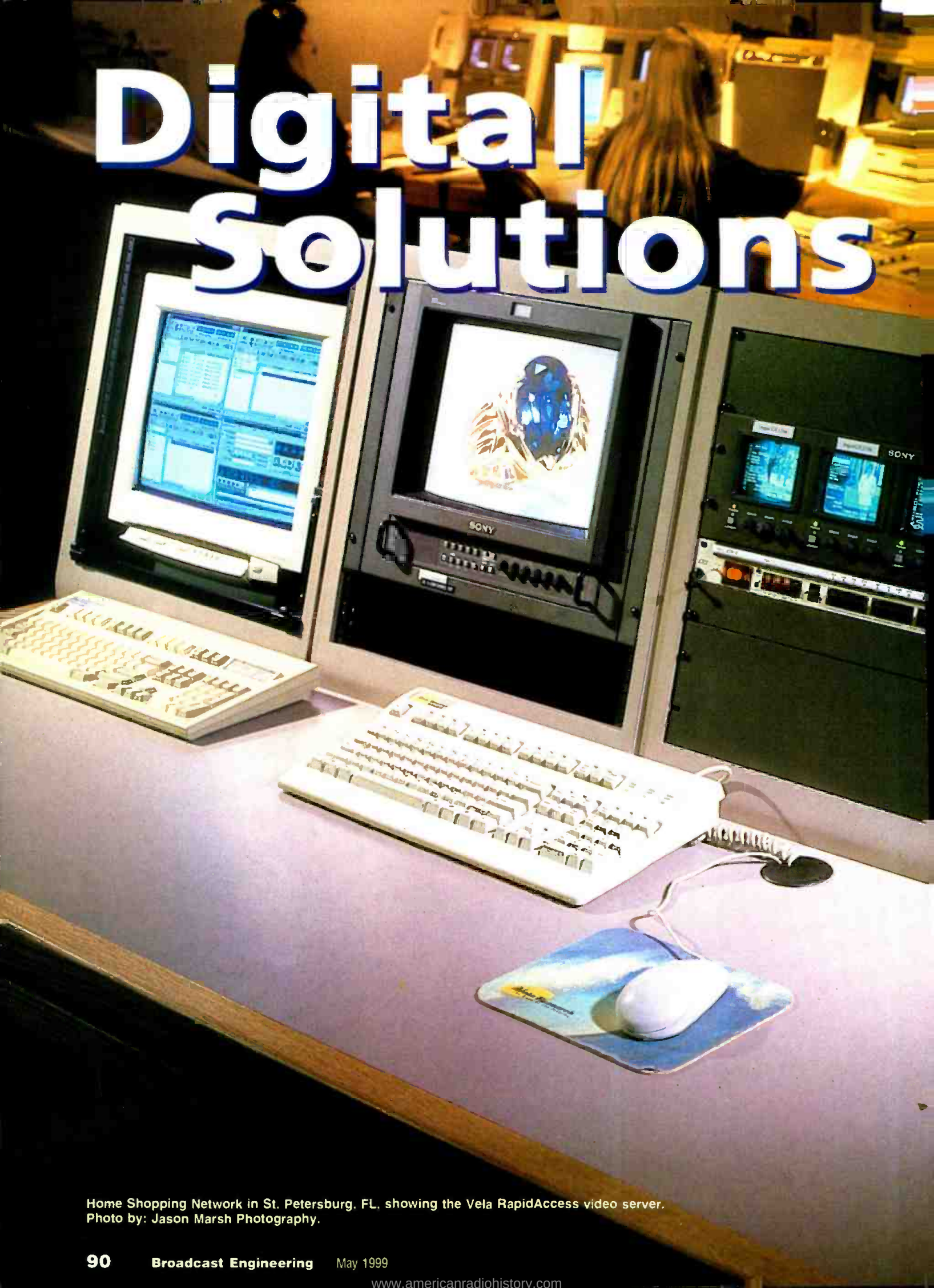
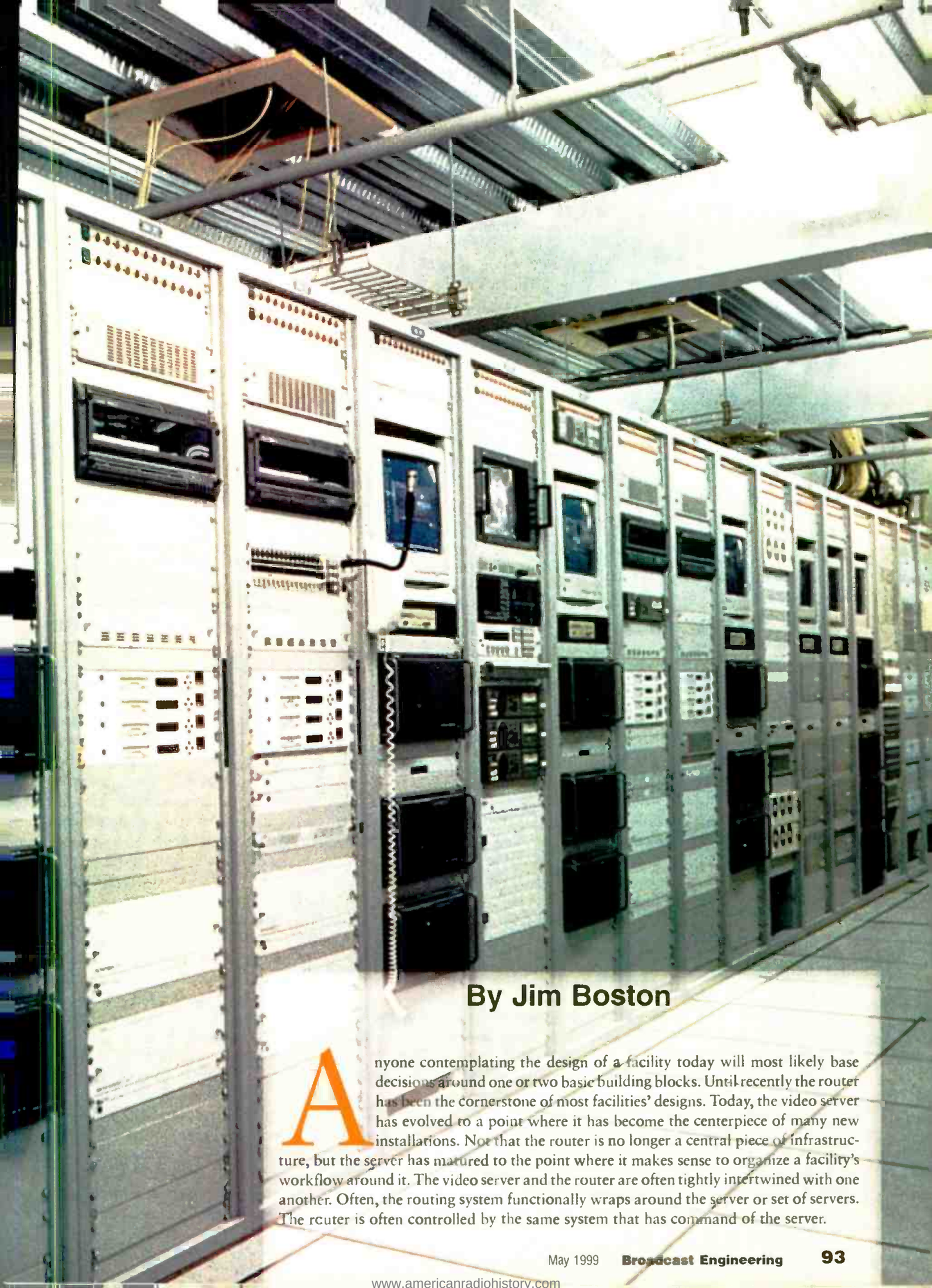
# Digital Solutions




Home Shopping Network in St. Petersburg. FL. showing the Vela RapidAccess video server.
Photo by: Jason Marsh Photography.

# VIDEO SERVERS

Britain's BSKYB is currently using two different Tektronix Profile systems. The first part utilizes, per Profile, one SDI record and three SDI outputs, encompassing 48 channels with 100% redundancy. The second, NVOD system, uses Fibre Channel and currently utilizes four channels of output per Profile. It has 48 channels working with Fibre Channel, 12 each main and reserve channels with 100% redundancy.



## By Jim Boston

Anyone contemplating the design of a facility today will most likely base decisions around one or two basic building blocks. Until recently the router has been the cornerstone of most facilities' designs. Today, the video server has evolved to a point where it has become the centerpiece of many new installations. Not that the router is no longer a central piece of infrastructure, but the server has matured to the point where it makes sense to organize a facility's workflow around it. The video server and the router are often tightly intertwined with one another. Often, the routing system functionally wraps around the server or set of servers. The router is often controlled by the same system that has command of the server.

# Posting digital audio

Audio mixer Rob Fritts puts an AMS Neve Logic 2 console with 24-track AudioFile through its paces in Henninger Video's Mix One suite.

# By Rob Fritts

Revolutionary advancements often turn out to have little long-term impact on the way business is conducted in the audio field. Quad sound, for one, seemed liked an interesting concept, but it failed to attract the attention of a buying public that was satisfied with stereo.

## CD quality

Coined in the early days of the compact disc, it was a nice phrase. If the poor standard of these early recordings had not been surpassed, the long-term viability of this medium may have been jeopardized as well. Nonetheless, digital technology has continued to develop, and it is fair to say that the proliferation of tools now available to the audio engineer and his or her clients constitutes a revolutionary departure from previous work methods. These changes apply equally to the recording and audio post industries.

As an audio mixer with Henninger Digital Audio, I have had the opportunity to witness the changes in professional audio. Most post facility clients have a fairly sophisticated knowledge of the tools that are now available, and yet there are times when a clear understanding of exactly what they are, and how they might best be used would help producers in their preproduction planning. In this article we will lay out, in simple and easy-to-understand terms, the areas where digital technology has changed the rules of the game. Armed with this information, you should be able to get the best audio possible and stay within your budget.

There are three essential areas: digital audio workstations (DAWs), digital consoles and surround sound mixing. Strictly speaking, surround sound is not functionally dependent on digital technology. In the real world, however, multispeaker mixing nearly always incorporates digital technology, and therefore, it makes sense to discuss the topic within the context of this article.

In many ways digital audio posting is identical to working in the analog realm. Rule #1 is simple: Get the cleanest field sound possible. Although digital processes can be applied to scrub unwanted noise from source material, nothing matches source audio recorded with care. Most field work still comes to us on analog tape, but if you're working in the field with digital equipment, make sure to stay below 0dB. Analog media are forgiving as far as levels go, but once you top the 0dB level in a digital recording your sound will clip, and the result isn't pretty.

## Digital audio workstations

What is a DAW? At its most basic level, a DAW combines a multitrack recorder and an editor. There are two distinct markets for DAWs. One is musicians who need access to software that lets them record performance data on a piano-like keyboard and send

it out to synthesizer and sampler modules that are part of the system. Those of us working in the audio post field may like working on a keyboard as well, but you'll find less need for sequencing software in our area of the business.

The other market, audio posting, relies more on software that relates the placement of audio events to picture using SMPTE location markings. The good news for clients is that the price barrier on DAWs has dropped. Initially, this technology relied exclusively on proprietary hard-drive recorders. These days many DAWs piggyback onto off-the-shelf PCs and Macs, reducing the prices of the systems drastically. Personal computers are getting faster all the time, and greater speed translates into more tracks and digital signal processing power (DSP) as well.

**Henninger Digital Audio's Capitol Facility is equipped with AMS Neve' Logic 3 post-production systems and Audiofile DAWs.**

Some studios continue to rely on standalone editing systems; Henninger uses AMS Audiofile DAWs. The decisions you make regarding where to work, and how much to spend on the audio post process should be made with an understanding of how complex your audio needs are. Do you anticipate eight tracks or so of sound effects, another eight for dialog, plus multiple music tracks? If so, be sure you're posting at a facility that can handle multiple sources on the input and output sides of the DAW. On the other hand, if you expect only one or two tracks of dialog and effects, plus a stereo music bed that requires limited massaging, you might be best served by posting at a facility that can capably handle limited requirements only and which charges less.

Let's take a look at a real-world situation, one that leans heavily on the speed and power of a DAW. Henninger posts "Ravens Report," which is broadcast weekly on the Fox affiliate in the Baltimore area. A producer for the NFL Baltimore Ravens shoots footage of a game on Sunday, and then heads into an offline suite on Monday, where he compiles highlights on an Avid system. On Thursday the producer onlines the project while a narrator is in our studio recording the script. This recording goes straight into our Audiofile. Having lots of recording time available on hard disk is critical. Recording to tape, and transferring preferred takes to a DAW later would be possible, but slow.

On Friday we get four online audio tracks, sync sound from the camera, a single feed of the stadium announcers calling the game, plus a couple of tracks of in-studio voiceover material. While loading this material into the system and preparing to add sound effects, music and the narration we've recorded, the producer is creating a virtual set in his online mix. We hand off the final audio tracks to him on Friday evening, and the show airs on Saturday. Without an extremely flexible and powerful DAW and automated mixer this kind of audio post work could not be done.

## Digital consoles

Recent advancements in digital mixing boards have been exciting. Yamaha started the ball rolling when they introduced the O2R several years ago. This console brought automation and onboard DSP to a much broader base of users, and the unit's success has brought heated competition to the field. Panasonic, Mackie, Tascam and others now offer new digital consoles that carry lower list prices. Should you post your project in studios that rely on boards like these, or do you need to pop for the higher-priced spread? Let's take a look at the issues involved.

As I mentioned, one of the nice things about the affordable boards is the fact that they're making automation available to more engineers and their clients. Once a dream, automation — of levels, EQ changes, effects inserts and dynamics — is now an indispensable part of the audio post process. Suppose, for example, that you have a natural soundtrack that is unobtrusive. In the middle of it, an explosion occurs, and you want to highlight that with EQ and effects. In the old days you'd try to find an open track and bounce the explosion to it. Assuming you had the track (don't take it for granted), you'd then have to dedicate an effects device to the explosion.

Using most any of the digital consoles on the market today, you'd be able to create a snapshot setting for the explosion and have it kick in at a point — down to the subframe level, that you want. Once the moment has passed, your settings could go right back to where they had been, saving you the hassle of dedicating a track and an effects device permanently to the explosion.

What do you get when you work on a higher-end digital console? Generally speaking, much better A/D, D/A convertors. Real-world sounds come into our systems as analog sources. They need to be translated into digital streams. The real shell game behind the CD quality catchphrase was the sale of the notion that all digital audio is the same. Not only are the sampling rate (the number of audio pictures taken per

second) and the bit depth (levels of volume distinctions captured) critically important, but there is also a quality distinction among the convertors that are on the market. Some of the newer, lower-priced digital consoles will argue that their convertors are equal to those in the more expensive ones. You be the judge. Keep a 30- or 60-second piece of your favorite audio — preferably one that contains soft and loud passages and complex waveforms — with you when you go into different studios. Have this piece recorded to various systems and begin to make your own judgements.

One clear advantage of the larger boards is their busing and routing schemes, which are much larger than anything found on their smaller siblings. Again, knowing your needs is critical. You will not be able to take in as many sources and route them to as many destinations with the smaller consoles. Maybe you don't need the kind of power that the larger boards offer, in which case why pay for it?

Now is a good time to talk about data storage. There is a distinction between the way smaller consoles handle back-up and the methods used by the larger boards. Some of the smaller boards back up to 3.5-inch floppy disks, but only the automation moves are being stored, and so you'll need to separately store the audio. This can be OK, but if you need to make changes to a show three months down the road, you might not want the hassle of having to scrounge around for your audio tracks. Our systems back up an entire project- including the audio itself, to an 8mm Exobyte drive. Knowing that they can grab a single tape, load it into our system and be back where they were the last time they worked on a project is a source of comfort to many Henninger clients.

## Surround sound mixing

5.1 audio refers to mixes that have a pair of front stereo images, another pair in the rear, and a sub-woofer, the .1 to carry all that sexy low-end stuff. Very often there's another speaker dedicated to dialog as well. More and more material is being mixed in surround sound mode, which differs from the Dolby Pro Logic concept in one significant area: Dolby carries the same information to the rears that's going to the front speakers, whereas true Surround yields a quad-like, four-way imaging (plus the sub-woofer).

**The price benefits offered by PC and Mac-based piggyback DAWs make them attractive alternatives to some facilities. Henninger has chosen the AMS Audiofile, a stand-alone system, for its post needs.**

Be careful when you use a mixer that claims to be a surround sound board. In one carefully delimited sense, any board that has six or more speaker buses can claim to be a Surround board, but unless the console lets the mixer monitor each output against source, its usefulness in Surround mixing sessions is limited. Again, the more expensive consoles will allow you to study your surround sound mixes in a more detailed fashion.

As HDTV and DVD become reality, the opportunities for audio mixers to do better work will expand, because we will be shucking off the current bandwidth limitations that we operate within. Let's say you have a scene where a mouse is walking across the room. We won't have to compress the sound, and so we'll be able to get that sonic image in much more accurate detail. You'll need to know just how that sounds, and what the imaging is like, so choose your post facility accordingly. Expect viewers to become more demanding in the quality of audio they expect as the quality of visual imagery they experience at home gets better and better.

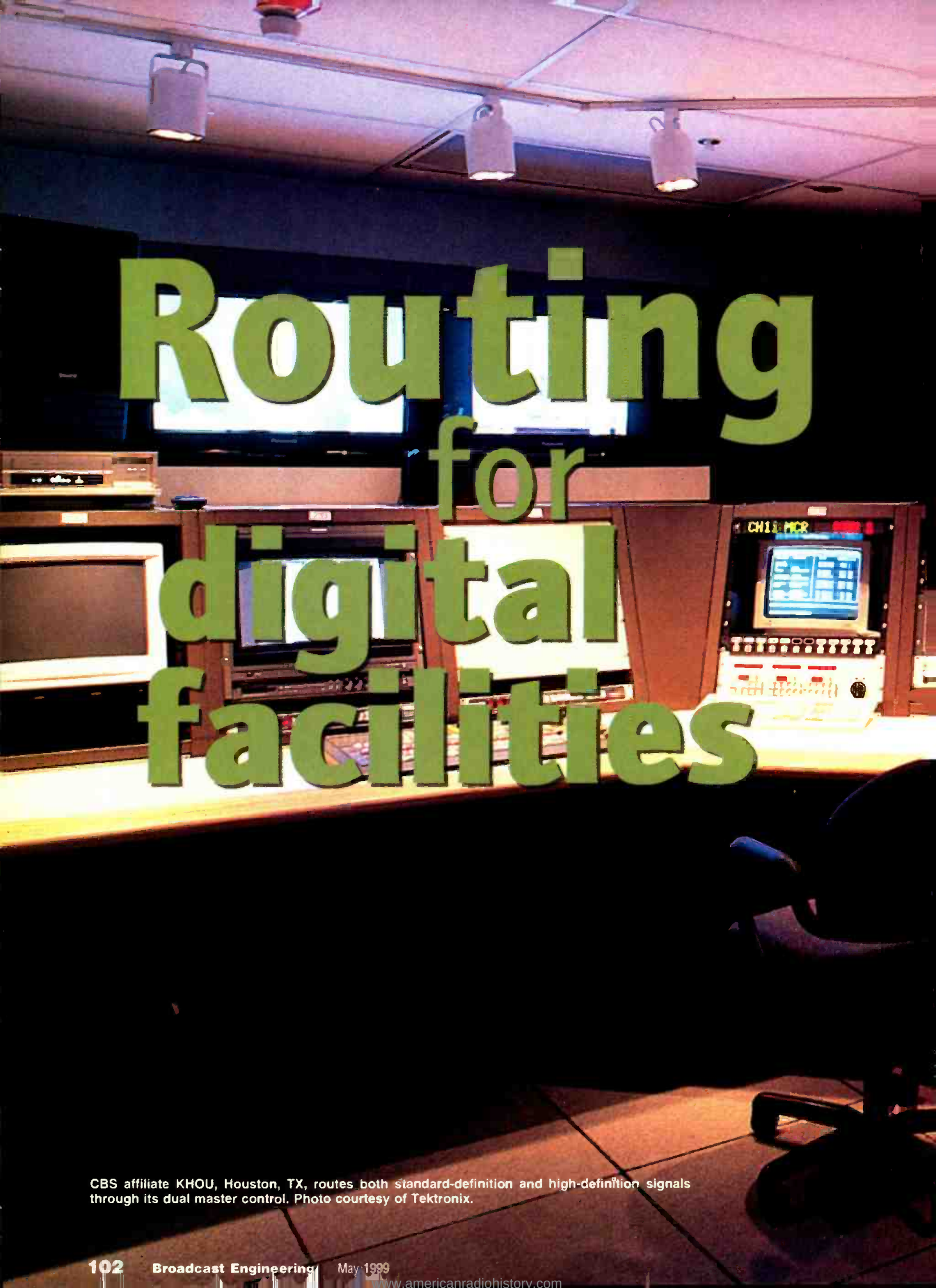
Be sure that your facility knows how to handle DVD mastering. We master to Tascam DA-88 tape at Henninger, using six tracks for our DVD projects. A DVD authorer will want tracks that have been properly laid out, with maximal signal on each one. Your mixer must know how to create a sphere of audio within these tracks, so that the imaging flows naturally from one speaker to another.

One final topic needs to be addressed before we close. The cost of offline edit systems, primarily Avids, has dropped drastically. That means that more producers are able to work at home on picture and sound. However, we're seeing some problems that come when producers who are not experienced audio engineers prep audio tracks. The Avid OMF (open media file) protocol has really caught on, and that's a very positive development. OMF lets different systems work on the same files, but be aware of the sample rates of digital sources in relationship to the Avid sync reference. For example, if you're loading music from a CD with a sample rate of 44.1kHz and your Avid is sync referenced to 48kHz, you will hear clicks in the music. Also, note your pan pot settings on the console and if the Avid is set for stereo or mono when loading in sources. If you create any fades in the audio, make sure each one is rendered. Making the right adjustments and proper sample rate conversion is key to a successful OMF conversion.

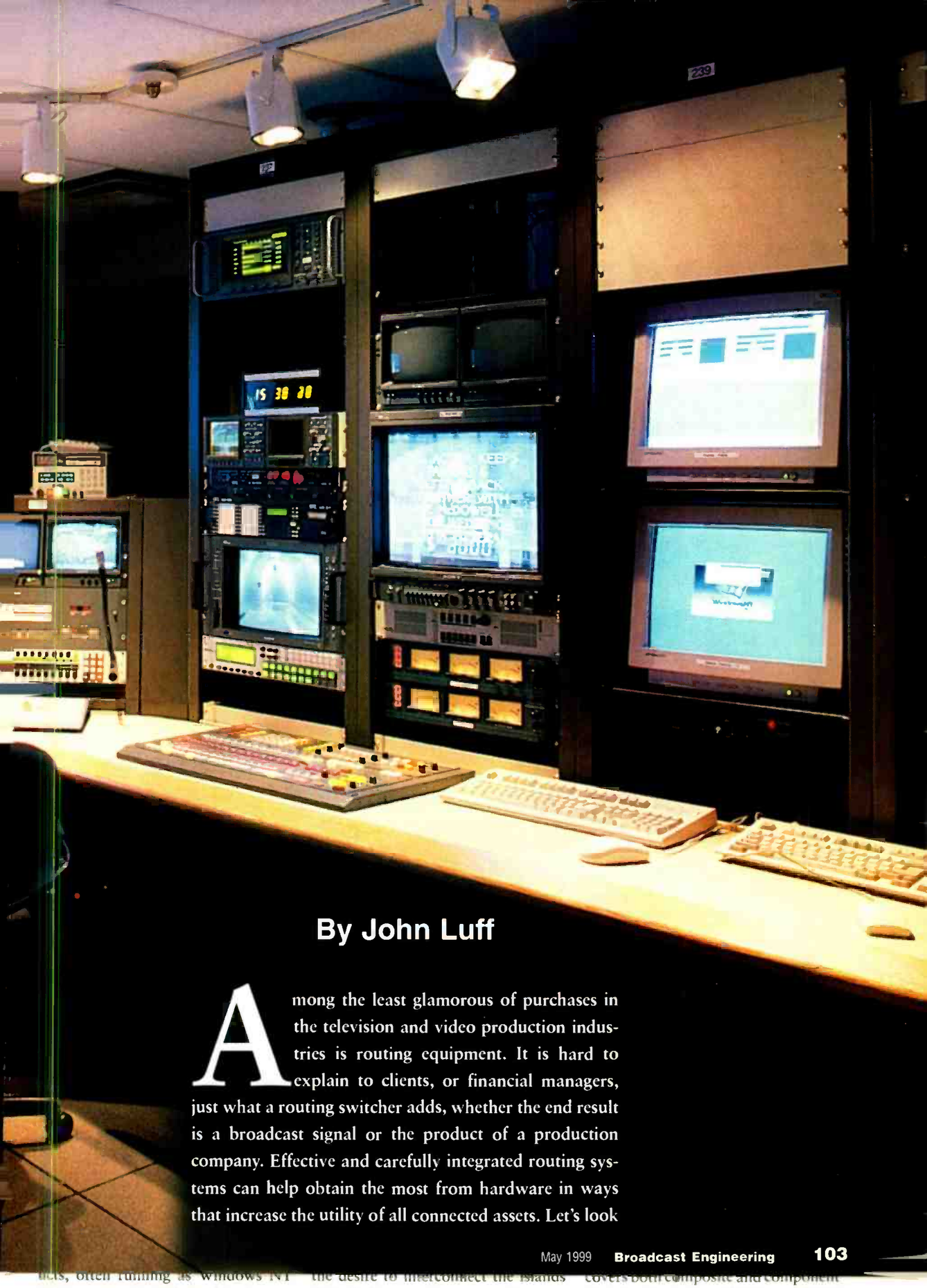
Notwithstanding these problem areas, the proliferation of affordable offline editing systems is another indication of how exciting digital technology has made the post field. In the audio world there have been many changes in the last several years, and more are on the way. Stay abreast of them and you're sure to make the wisest decisions when it comes time to choose an audio post facility. ■

*Rob Fritts is an audio mixer for Henninger Digital Audio, Arlington, VA.*

# Routing for digital facilities



CBS affiliate KHOU, Houston, TX, routes both standard-definition and high-definition signals through its dual master control. Photo courtesy of Tektronix.



## By John Luff

Among the least glamorous of purchases in the television and video production industries is routing equipment. It is hard to explain to clients, or financial managers, just what a routing switcher adds, whether the end result is a broadcast signal or the product of a production company. Effective and carefully integrated routing systems can help obtain the most from hardware in ways that increase the utility of all connected assets. Let's look



NCSs, often running as Windows NT 4.0 processes. As with anything in your facility, be conscious of Y2K issues when choosing routing. For the most

the desire to interconnect the islands digitally becomes important, the question of how to manage the signals rises to the top of the "to do" list for the

covers both composite and component digital video). But HDTV and DTV have added new flavors that must be interconnected inside and between is-

# Routing

The technology has moved to a mix of analog and digital switchers. As digital applica-

## New Products & Reviews

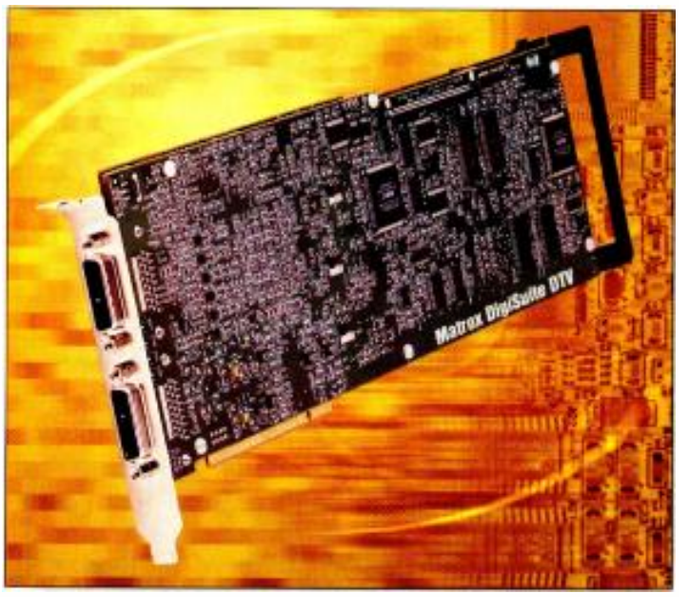
Applied Technology

# Matrox DigiSuite and DigiServer DTV products

BY ALAIN LEGAULT AND MARCO LOPEZ

One of the goals of EBU/SMPTE Task Force for Harmonized Standards for the Exchange of Program Material as Bitstreams (for more information see Computers and Networks, January through June 1999) is to guide development of new TV production technology. Two products that incorporate technology choices in line with the Task Force recommendations are the Matrox DigiSuite DTV digital video editing platform, and the Matrox DigiServer DTV dual-channel multistandard audio/video codec card.

Matrox Video Products Group designs and manufactures a complete line of open-architecture, PC-based, broadcast-quality digital video hardware and Windows NT development tools for OEMs, systems integrators and end users in the broadcast, cable and post-production industries. DigiSuite products are currently being used in nonlinear editing systems, video servers, DDRs, character generators, commercial insertion systems, instant replay systems, time delays and multilayer effects compositing workstations.




**Matrox DigiSuite DTV digital video editing platform incorporates technology choices in line with recommendations from the EBU/SMPTE Task Force as they apply to editing and server systems.**

To meet the needs of these customers and help them take advantage of cost-effective PC-based tools as they move toward DTV, Matrox analyzed the available technologies and made new product implementation choices in the following areas:

- Audio and video I/O;
- Compression formats;
- Connectivity interfaces;
- Software APIs;
- Interchange file formats.

### Audio and video I/O

In the foreseeable future there will continue to be a huge installed base of analog equipment in TV stations, so Matrox DTV products support all the legacy analog and digital video and audio I/O formats. Composite, Y/C, and analog component I/O channels are standard. SDI is the clear choice for digital I/O. Because most new professional gear supports SDI, it is becoming less expensive to implement. The infrastructure exists in facilities and SDI coexists with SDTI.

Line-level, balanced and AES/EBU audio continue to be supported. In keeping with the EBU/SMPTE recommendations, Matrox DTV products provide eight audio I/O channels. DTV surround-sound (also known as the 5.1 format) requires six audio I/O channels. Conventional stereo requires two I/O channels. To support both simultaneously requires eight I/O channels.

### Compression formats

The EBU/SMPTE report recommends the use of DV and MPEG-2 compression formats. The Matrox DTV products support DV, DV50, and MPEG-2 4:2:2 I-frame compression formats for editing. Analog video can be digitized in any one of these compression formats. In addition, MPEG-2 4:2:2P@ML and MPEG-2 MP@ML output are provided for distribution purposes.

Editing Formats: Currently, the interface between camcorders/VTRs and nonlinear editing systems is via uncompressed video (analog or SDI) regardless of the compression technology used in each individual device. The exchange of compressed video between devices using a common compression scheme offers significant benefits. Quality is preserved by avoiding multiple decompression/compression passes and faster-than-real-time transfers of video material are possible. DV native editing systems are required to fully realize these benefits. The DV formats include Digital-S, DVCPRO and DVCPRO 50, DVCAM, and the DV "Blue Book" specification used by several vendors. EBU/SMPTE tests have shown that DV and Betacam SP are comparable in terms of video quality. DV50, with its 4:2:2 pixel structure, can be used for more intense post-production work such as multilayer compositing and chroma keying. EBU/SMPTE tests have shown DV50 and Digital Betacam to be similar in terms of video quality.

DV25 and DV50 have bit rates fixed at 25Mbs and 50Mbs respectively. To achieve a greater range of video quality vs. storage space flexibility in the editing station, DigiSuite DTV supports the MPEG-2 4:2:2 I-frame format between 10- and 50Mbs

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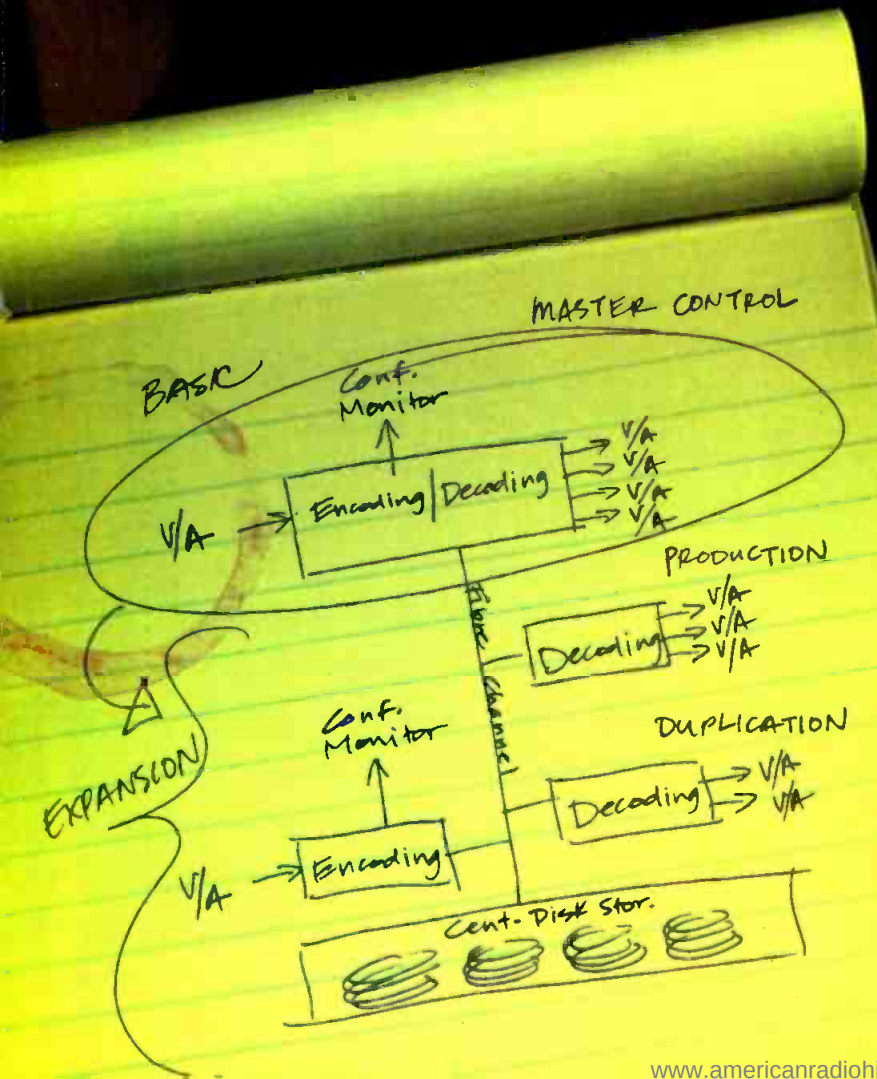


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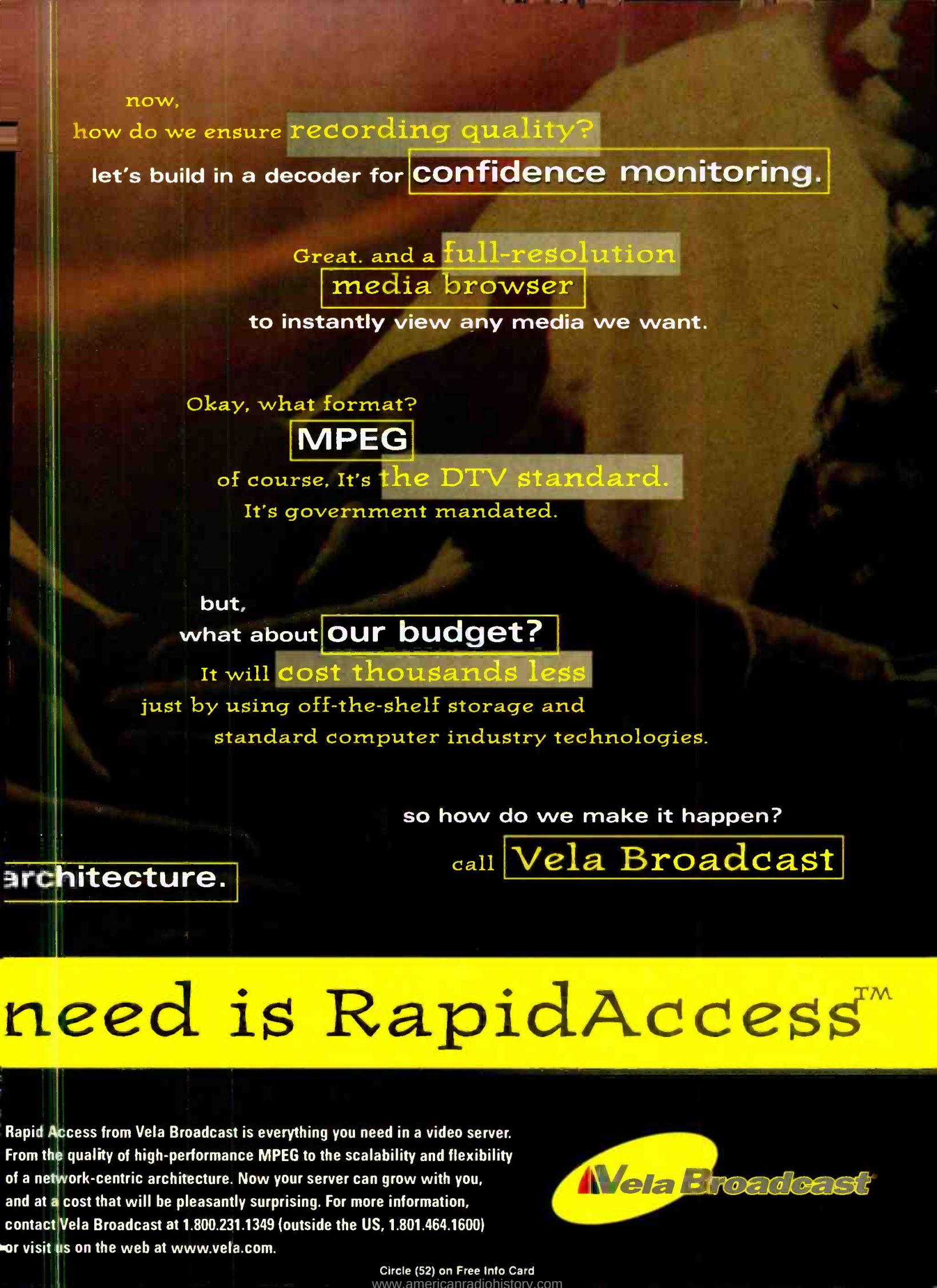


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for offline work. Batch digitizing of final clips and auto conforming can be done using DV or DV50 formats for finishing.

Distribution Formats: DigiSuite DTV provides transcoding from the DV formats to MPEG-2 4:2:2P@ML and MPEG-2 MP@ML for applications such as broadcast transmission, video server storage, archiving, DVD authoring and web video streaming.

### Connectivity interfaces

The EBU/SMPTE report recognizes that multiple connectivity technologies must be used in a facility depending on the distance between devices, the nature of the material to be transferred, and the bandwidth required. Various interconnect technologies are needed for storage access, file transfers and media streaming. The Matrox DTV products implement on-board SCSI or Fibre Channel for high-speed access to storage devices. In addition to its use as a storage interconnect, Fibre Channel can also be used as the basis for a LAN to support fast file transfers. For media streaming, the Matrox DTV products implement IEEE-1394 and SDTI interfaces to provide real-time or faster-than-real-time streaming of digital media. Matrox's use of open file systems and networking architectures allows third-party hardware such as ATM and Ethernet adapters to be used.

### Software API

The DigiSuite DTV products are based on the Windows NT operating system and DirectShow multimedia architecture. They use standard Windows NT I/O services such as the NTFS file system and NT network sockets to provide an open environment for a wide variety of third-party hardware and software. Abstraction of the DigiSuite DTV hardware through the DirectShow API significantly eases the process of porting applications from one hardware platform to the next.

### Interchange file formats

DigiSuite DTV products employ the enhanced AVI video and WAV audio file formats. DV, DV50, and MPEG-2 I-frame data types are supported by Microsoft in the AVI file format. The Matrox enhancements support a 12TB AVI file size limit. Interoperability among various applications using AVI, such as NLE, CG, compositing, paint, and 3D animation, provides an attractive total solution for the user. Applications based on the Matrox DigiSuite SDK can interchange video files among applications without cumbersome file format conversions.

The use of standard file formats enables the interchange of media. However, users desire a higher level of interoperability that includes not only media interchange but also the platform-independent interchange of all types of project information. Advanced Authoring Format (AAF) is an industry-driven, cross-platform, multimedia file format that will allow interchange of media and compositional information between AAF-compliant applications. Matrox is one of seven AAF promoter companies.

The EBU/SMPTE report is an important effort that will help to determine the direction of our industry for years to come. It is the groundwork for the emergence of standards, but it also contains recommendations that can be implemented in products now. Matrox's DTV products incorporate many of these recommendations as they apply to editing and server systems. ■

*For more information about Matrox's Digisuite DTV products, circle (250) on the Free Info Card.*

*Alain Legault is vice president of product development and Marco Lopez is product manager of Matrox Video Product Group, Dorval, Quebec, Canada.*

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Applied Technology

# Pro-Bel automated master control

BY KATHY BIENZ

Automated master control operations have traditionally been the domain of the larger broadcast facilities or of multichannel providers. Mainstream broadcasters have managed very well with the tried-and-true master control operator. However, with the advent of video servers and their popularity in providing spot playout, automated master control has become a requirement for virtually all TV stations. But more than just automating server playout, TV stations also need to plan for future moves into multichannel, multiformat operations, and determine how to best provide for seamless integration between the master control switcher and automation system.

This is maximally achieved by systems designed to work together by virtue of having been developed and manufactured by a single company.

**Pro-Bel automated master control goes beyond a serial link with rudimentary controls by offering built-in automation buttons in the master control, video HUD of schedule and under-monitor displays in the master control monitor walls, among other features.**

## Beyond serial interfaces

The integration of Pro-Bel's TX Series of master control switchers and automation systems, including the new Meridian automation system, goes far beyond a serial link with rudimentary controls. Built-in automation control buttons in the master control panel, a video heads-up display (HUD) of the schedule, and special use of under-monitor displays in the master control monitor wall, give the operator the capability to monitor, augment and intervene in the automation schedule. The built-in automation buttons in the TX master control panel provide immediate and direct control of the schedule and, in conjunction with the HUD, allow easy and seamless interaction with the automation, including allowing the user to scroll the cursor up and down through the automation events, take or skip the next event, preview an event and hold automation.

The HUD output, provided by the automation controller frame, displays seven lines of the automation schedule. It is best connected to a video monitor centered over the master control panel, such as between the PST and PGM monitors, thereby displaying the schedule directly in front of the operator. Thus, the operator's attention is not forced away from the master control panel and video monitors just to perform a simple automation change on the schedule editing workstation. This workstation can be set to the side and, while still readily available for major schedule editing, the operator can focus on the transmission operation in front of him/her, interacting with automation directly from the master control panel to accommodate late-breaking news items or schedule timing adjustments. This arrangement greatly minimizes the risk of error during high-pressure situations.

The HUD seven-line schedule is displayed in full-color, double-height teletext type characters and includes the time of day, date, schedule name and file name, total number of events in the schedule, operational error messages and warnings, and messages and warnings from the automation controller, device interface units and attached devices.

To complete a streamlined master control/automation work area, the master control monitor wall can be fully integrated into the operation. Up to seven under-monitor displays can be connected to the automation controller to provide large, easy-to-read automation status and labeling of the appropriate video monitor. Each under-monitor display is configured by a switch setting to display time-of-day and countdown duration of on-air event, title of on-air event, title of preset event, start time of preset event, video and audio source of on-air event and video and audio source of preset event.

The use of the built-in automation buttons in the master control panel combined with the automation system's HUD and under-monitor display interfaces provide important advantages. This tight coupling between the master control switcher and automation system yields a powerful and effective operating environment that is an excellent foundation from which to expand.

## Multiformat, multichannel

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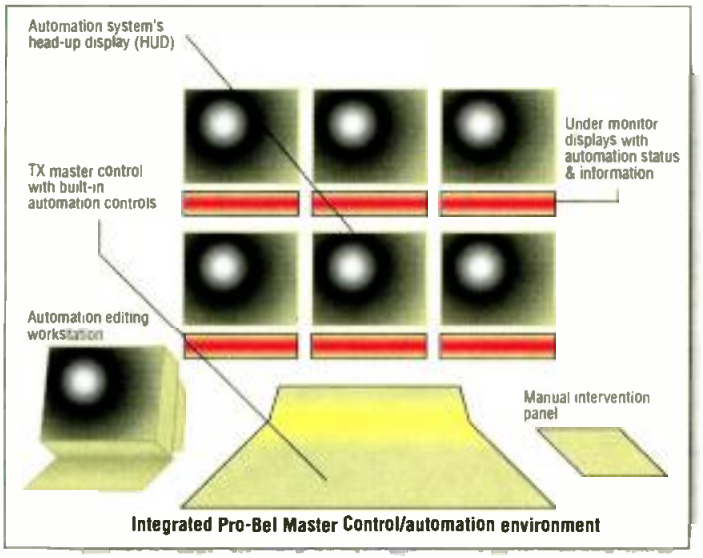
both the master control and automation functions. The key is to ensure that master control and automation channels can gracefully expand once, twice and more without doubling or tripling the workload. Exploring multiformat, multichannel issues goes beyond the space available here, but the mechanisms described above for a well-integrated master control/automation system carry over into multiformat, multichannel operations.

There are several ways in which Pro-Bel solutions accomplish this:

a) Two choices of master control switcher panels to provide the appropriate functionality and physical size for the operation.

b) One-button selection of the channel(s) to be controlled, with any mix of standard-definition or high-definition electronics.

c) Automation controllers comprised of real-time, frame-accurate electronics units with main and back-up processor




Integrated Pro-Bel Master Control/automation environment

**Figure 1. An integrated Pro-Bel master control environment provides the major components of the complex infrastructure necessary for full operations support.**

boards and PSUs that eliminate single points of failure which could affect all channels.

d) Schedules held in battery-backed-up memory in the automation controllers which are not impacted by fickle PC workstations, operating systems or operator learning curves.

e) External hardware-based manual intervention panels that can be integrated into the system, providing for automation control/interaction should any (or every) user PC workstation fail.

Multichannel systems must be streamlined and self-reliant, and selecting systems that best support this architecturally and operationally paves the way for effective transmission operations. Pro-Bel's integrated master control and automation systems provide major components of the complex infrastructure necessary for supporting operations in a rapidly changing and increasingly demanding broadcast environment. ■

*For more information about Pro-Bel's integrated master control and automation systems, circle (251) on the Free Info Card.*

*Kathy Bienz is product manager for Pro-Bel, Melville, NY.*

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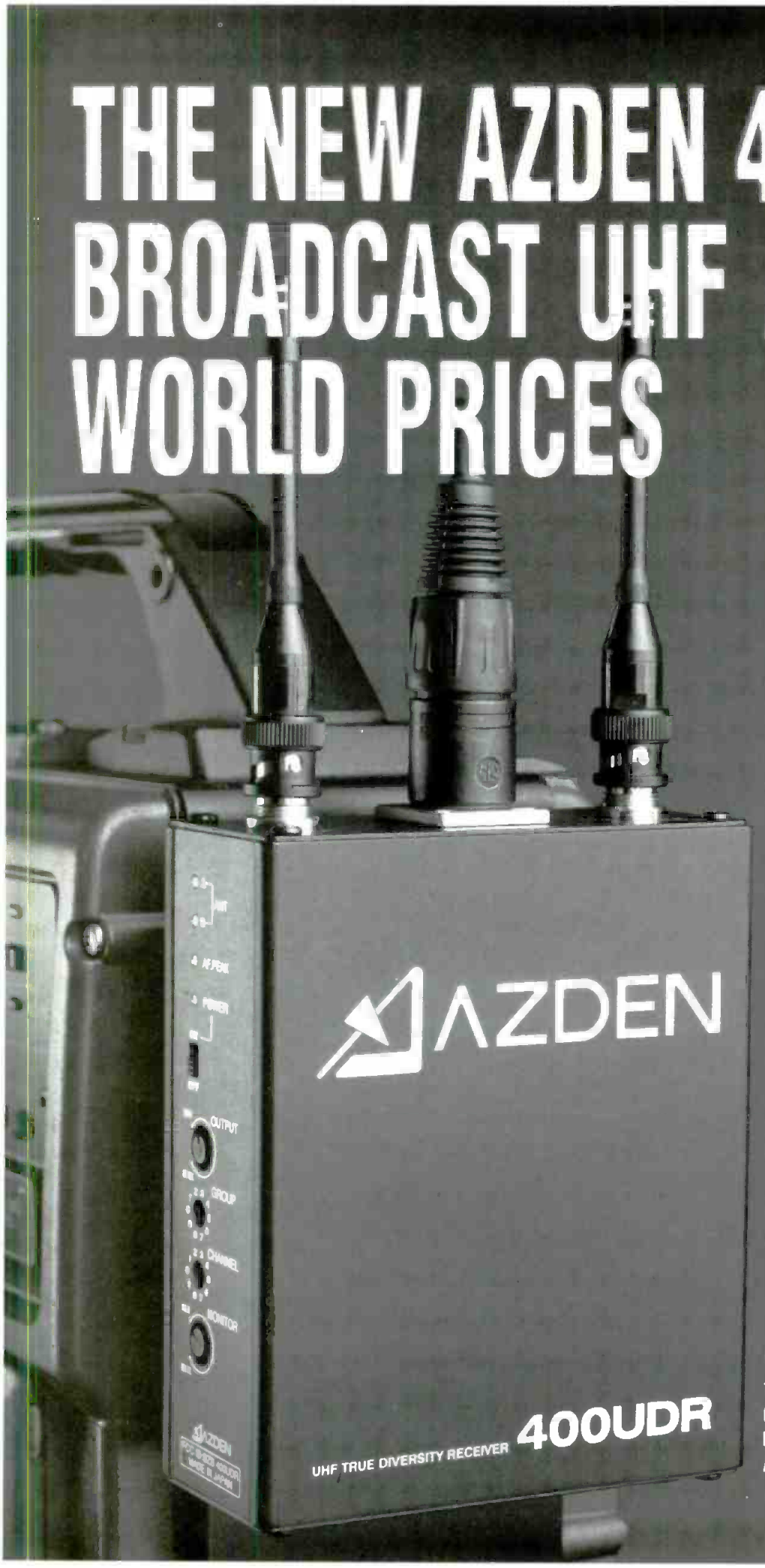


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# HD conversion equipment

BY KENNETH HUNOLD

If your station will be starting from scratch – creating a brand-new digital facility dedicated solely to digital high-definition (HD) broadcasting – then you may not need any DTV conversion equipment. But for everyone else, simultaneous DTV and NTSC transmission will be a reality for the next decade, or so. Many broadcasters have stated that much of the programming on their DTV stations will consist of signals digitized and converted from their current 525-line programming schedule. For the purpose of this discussion, and perhaps at the expense of accuracy, current broadcasting formats will be referred to by their total number of scanning lines (e.g., 525- and 625-line systems) while new DTV formats will be referred to by the number of active lines (e.g., 480, 720, 1035, or 1080) with a notation for scanning mode where appropriate (480p, 1080i, etc.)

## The need to change

Broadcasters and program producers will need to convert their signals between, or even among, the various production formats that will be available. Decisions must be made at the network, group, or station level as to which format(s) your station will need to support. Hopefully your viewers will be insulated from this confusion, as most receivers and accessories will receive any of the formats in the original ATSC Table 3 and display them all (although perhaps not in their original format.)

All analog standard-definition (SD) TV programs will need to be converted to DTV formats for transmission. This is commonly referred to as up-conversion, where 525-line signals are converted to 480p, 1080i, or 720p signals. This is not a trivial process. Anytime you are trying to make more out of less the challenge is to make the resulting high line rate signal look as if it has more information than it had with fewer lines. 525 to 480i conversions are a relatively straightforward case of A/D conversion, often including composite (NTSC) to component decoding, if the conversion has not already been performed elsewhere in the system.

Can these images be enhanced, or be made to look better than they actually are? Within reason, yes. Processes similar to SD image enhancement can be performed, but there are often more choices of parameters. You must remember that any SD enhancement will be magnified on a larger display, along with the magnified image. This might also explain why overly enhanced SD images do not convert well to HD. What was thought to be subtle enhancement on a SD image might become objectionable in an HD image.

## Motion and frame rate

Many of the standards converter/upconverter manufacturers have proprietary processes for motion compensation. These processes attempt to mimic the eye's response and reduce the visibility of *judder* in the converted image. Film originated material is usually shot at 24fps. The process of converting from 24- to 30fps is usually done in the telecine. The process involves repeating film frames over consecutive TV fields in a prescribed sequence. This results in each film frame being scanned at least twice. In our interlaced TV system, this results in a complete TV frame for each film frame (and then some). (Editor's note. For a detailed description of how this is accomplished, see Ken's article, "Understanding HD/SD conversion," July 1998.)

The relationship between 24Hz and 60Hz frame rates is such that odd-numbered film frames result in two 60Hz fields and even-numbered film frames result in three 60 Hz fields. An upconverter that can recognize this distinctive "3:2 pulldown" process can reconstruct the original film frame and upconvert the complete frame without introducing any temporal artifacts. These frames can be re-interlaced for display, if necessary. This process is also useful in video compression systems, where repeated frames can be identified and recognized as redundant, saving bits.

## Down and cross-conversion issues

Downconversion has its own set of problems. Whereas upconversion has the unique problem of trying to create more than what was originally there, downconversion attempts to display an HD image using fewer lines. Downconversion takes advantage of a HD image being essentially an oversampled SD image.

In theory it is possible to create a better SD image from a HD master than you could obtain by using a SD camera originally. There are studios that are first transferring film to HD videotape, then downconverting the HD version to 525- and 625-line SD formats for distribution. In addition to creating a better SD product, this reduces the number of times a film has to be put up on a telecine to be transferred.

One special HD conversion tool that will find use in HD plants in the near future is one that converts between (or among) the various HD standards. This device could be called either a cross converter, or simply a converter. The primary function of a 1080i to 720p converter is to de-interlace the image and filter the line structure to 720 lines. The 720p to 1080i converter must interpolate between lines and output the displayed frame as interlaced fields. In light of the legacy material available, conversion between 59.94- and 60.00Hz frame rates could also be supported.

HD and SD sources will be coexisting for quite some time. Therefore, HD and SD conversion devices will be an operational necessity. Just as 525- and 625-line programs must be accommodated on a worldwide basis, HD and SD conversions will be a necessary part of television operations into the next century. ■

*Ken Hunold is project engineer with of audio/video systems at the ABC Engineering Laboratory, New York.*

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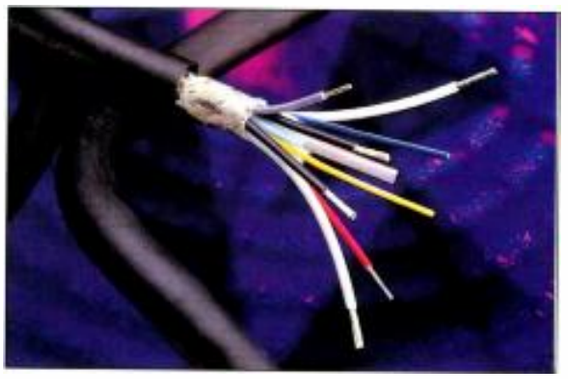

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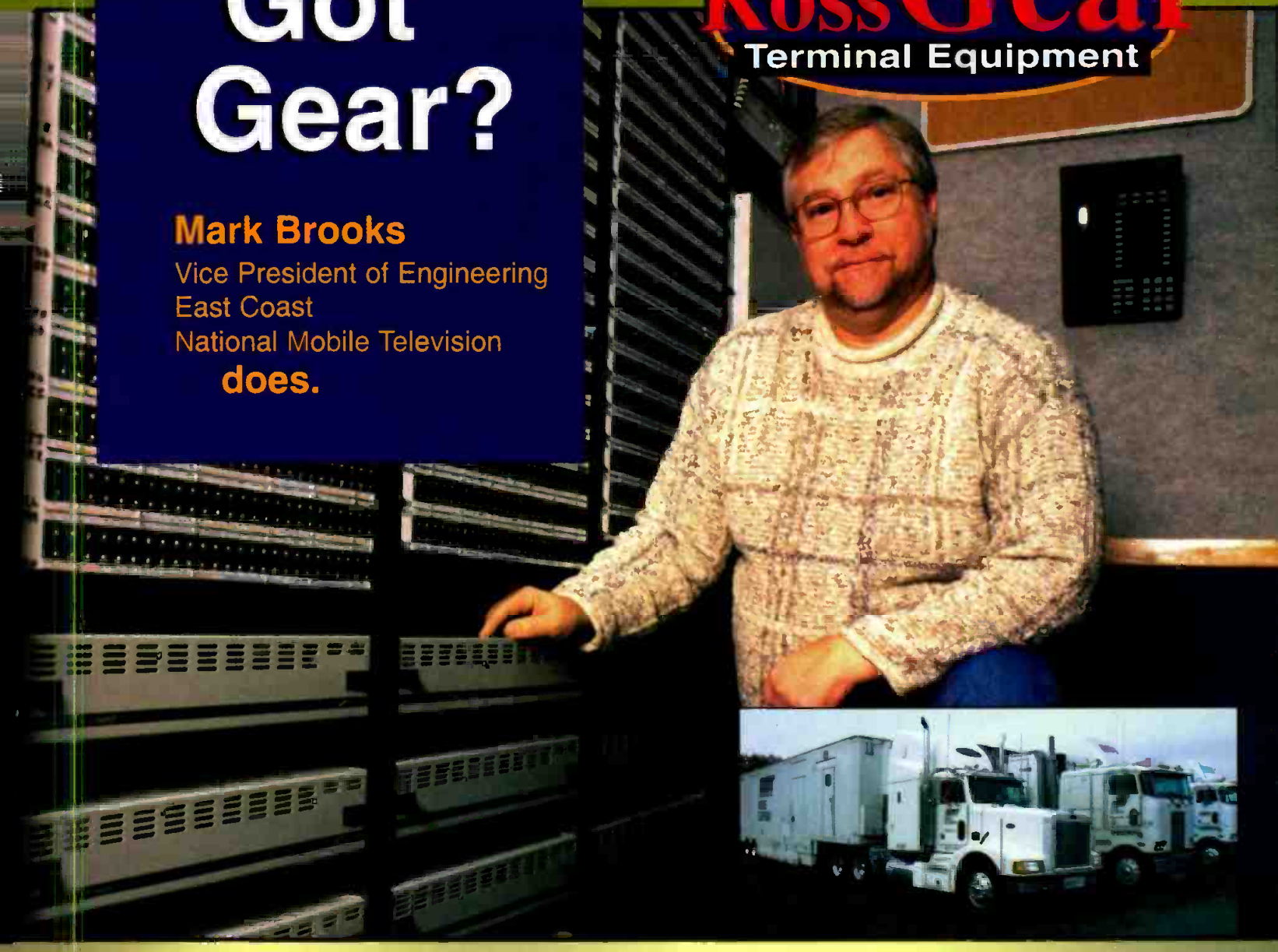



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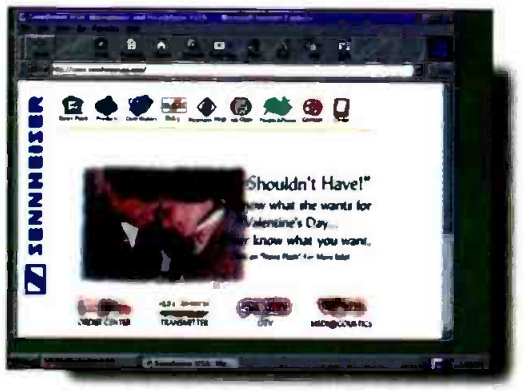


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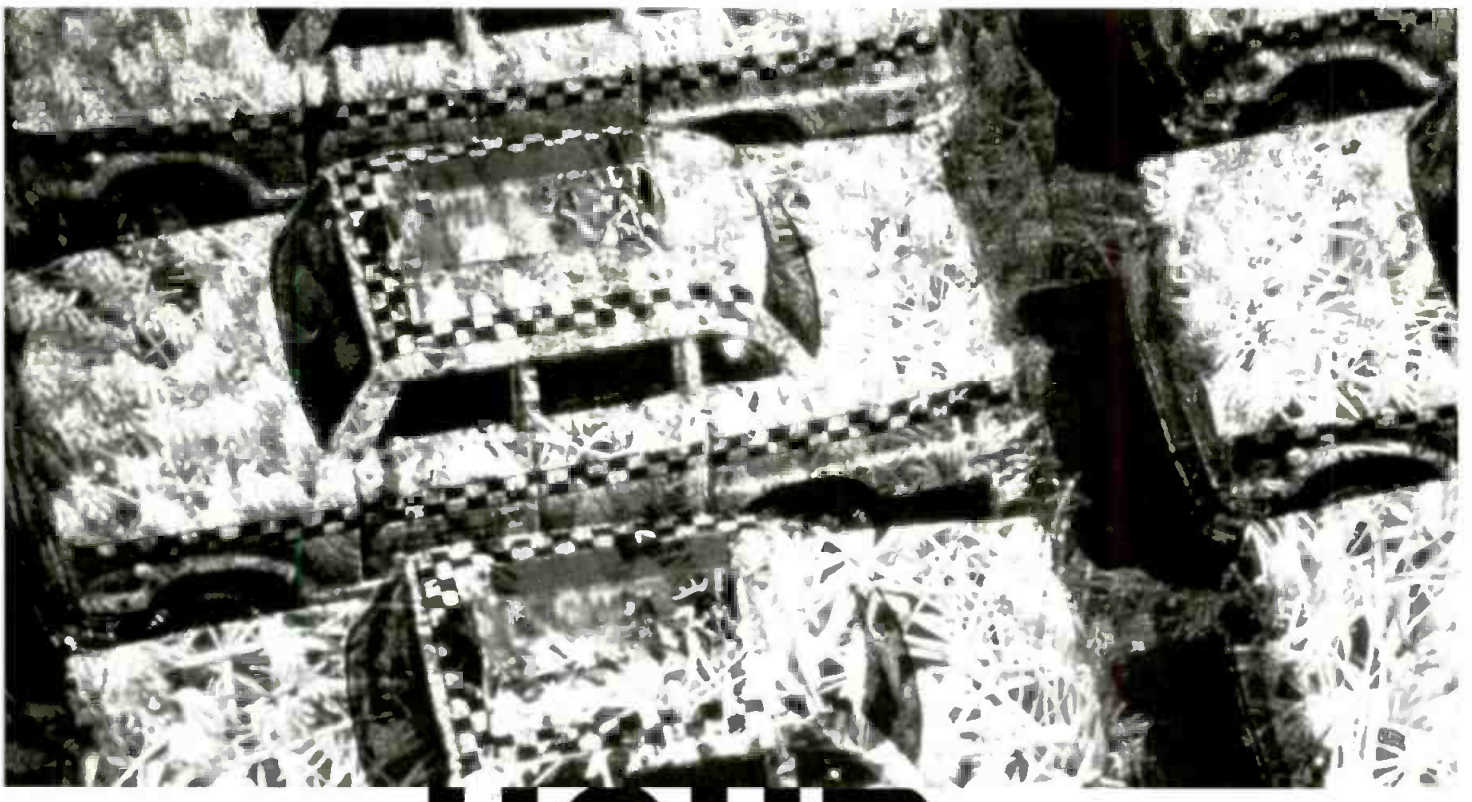

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- VCT-U14 Tripod Adapter • LC-2000CP System Case

## DSR-20 DVCAM Player/Recorder

The DSR-20 is a versatile DVCAM VCR with a very compact chassis and a variety of convenient functions for recording, playback and simple editing. It features auto repeat playback, power-on recording/playback, multiple machine control interfaces, AC/DC capability and i.Link (IEEE1394) input and output. And of course, it offers the stunning image and sound quality inherent to the DVCAM format.

**DVCAM Quality**
- Utilizing the DVCAM format, the DSR-V10 provides the recording/playback quality and reliability required for professional use. It can also play back consumer DV format tapes without any special adapter.
- Provides two selectable audio modes: a two channel mode with 48 kHz/ 16-bit recording and a four channel mode with 32 kHz/12-bit recording.
- Dual-size cassette mechanism accepts both mini size (up to 40 minutes) and standard size DVCAM tapes (up to 184 minutes) without an adapter.

**Editing Capability**
- 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 like the DSR-30, DSR-200A or DSR-PD1. When using the FXE-120 or ES-3 EditStation System, the DSR-20 can serve as a feeder player.
- Has DV (IEEE1394) input and output. When connected to other DV equipped machines, the DSR-20 offers digital dubbing of video, audio and data, without any deterioration of image and sound quality. 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.

**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 automatically rewinds the tape then starts playing back the segment again.
- Power-on recording/playback capability for unattended automatic VCR operation. When connected to an external timer and the VCR's TIMER switch is set to REC, the DSR-20 starts recording as soon as power is turned on. Likewise, when the TIMER is set to REPEAT, the VCR goes into Auto Repeat mode and starts playing back the moment power is turned on.
- In addition to Control L, the DSR-20 also incorporates a Control S and RS-232 interface for remote control operation. Basic VCR functions can be controlled from a PC via RS-232, while Control S allows control via the optional DSRM-10 Remote Control. In addition, with the Control S input/output connector, two or more (up to 50) DSR-20's can be daisy-chained and controlled from one DSRM-10 Remote Control.
- External sync input enables synchronized playback with other VCRs. Especially important in A/B roll configurations.

**Conveniences**
- The DSR-20 be powered by AC or DC. Ideal for mobile applications, the DSR-20 can be connected to a 12V power supply like a car battery or battery belt & powered via the 4-pin XLR DC input.
- Can perform searches for Index Points, which are recorded on the tape as "in-point" marks everytime a recording starts. The DSR-20 can also search for photo data recorded on a DVCAM cassette by the DSR-PD100/200A/300, or where the recording date has been changed.
- Supplied with the RMT-DS20 Wireless Remote for control of basic VCR functions. And again, when two or more VCRs are connected via Control S, they can be simultaneously controlled from one wireless remote by simply sending one command to the master deck.

## PVM-14N5U/14N6U & 20N5U/20N6U
### 13-inch and 19-inch Presentation Monitors

With high quality performance and flexibility, Sony's presentation monitors are ideal for any environment. They use Sony's legendary Trinitron CRT and Beam Current Feedback Circuit for high resolution of 500 lines as well as stable color reproduction. They also accept worldwide video signals, have a built-in speaker and are rack mountable. The PVM-14N5U/20N5U are designed for simple picture viewing, the PVM-14N6U and 20N6U add RGB input and switchable aspect ratio.

**They Feature:**
- 500 lines of horizontal resolution
- They handle NTSC, NTSC 4.43, PAL, and SECAM.
- Picture (chrome, phase, contrast, brightness) and setup adjustments (volume, aspect ratio) are displayed as easy-to-read on screen menus.
- Closed captioning is available with the optional BKM-104 Caption Vision Board.

**PVM-14N6U/20N6U Only:**
- (Last Input Switch) - Contact closure remote control allows you to wire a remote to an existing system so that the monitor's input can be remotely controlled to switch between the last previously selected input and the current input.
- 4:3/ 16:9 switchable aspect ratio

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

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

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

## SONY
## UVW-100B 3-CCD Betacam SP Camcorder

More affordable than ever, the UVW-100B offers 700 lines of horizontal resolution, 60dB S/N ratio, 26-pin VTR interface, compact design and ease of operation- making it ideal for field shooting applications.

- 1/2-inch Power HAD CCDs attain sensitivity of F11 at 2000 lux (4 lux low light). 700 lines of resolution & 60dB S/N ratio.
- Gain-up can be preset in 1dB steps from 1dB to 18dB.
- Auto Iris detects the lighting conditions and adjusts for the proper exposure.
- Clear Scan records computer monitors without horizontal bands across the screen. Shutter speed can be set from 60.4 to 200.3 Hz in 183 steps. Also has a variable high speed shutter from 1/100 to 1/2000 of a second.
- SMPTE LTC time code and UB generator/reader. Rec Run/ Free Run, Preset/Regen are easily set. For multi-camera operation, genlock to an external time code is provided.
- Genlock input and built-in color bar generator.
- 26-pin VTR interface for feeding component, composite and S-Video signals to another VTR for simultaneous recording. Sart/stop are controlled and external VTR status such as Rec and Tally are shown in the viewfinder.
- 8-digit LCD display indicates time data, warning indications and video status. Battery status audio level are also shown in a bar graph meter.
- Diecast aluminum, 1.5-inch DXF-601 viewfinder is rugged yet comfortable while providing 600 lines of resolution.
- Large diameter eye cup reduces eye strain and simplifies focusing. Diopter adjustments (-3 to 0) compensates for differences in eye sight.
- Zebra level indicators, safety zone and center marker generator. Shows tape remaining and audio levels.
- With Anton/Bauer Digital Batteries remaining battery power is displayed on the LCD panel and through the viewfinder.
- Weighs 15lb. with viewfinder, battery, tape and lens. Shoulder pad is adjustable, so you maintain optimum balance when using different lenses and batteries.

## DXC-637 3-Chip Color Video Camera

- PVW-637 - Perfect camcorder operation with the PVV-3
- Compact size, lightweight and low power consumption
- High density three 2/3-inch IT Hyper HAD sensors
- 800 TV lines of horizontal resolution
- HAD sensor structure
- 2 dimensional optic low pass filter
- Clear scan function for shooting computer displays • Hyper Gain mode
- EZ mode and EZ Focus functions enable cameramen to get ready for shooting swiftly
- Dual Pixel Readout technology
- Can be coupled directly with the DSR-1/PVV-3 for high quality component acquisition or with the EVV-9000 for handy operation
- Can be combined with the recorders from Panasonic or JVC
- Can be connected with computer equipment via CA-325A/325B camera adapter.

**DXC-637** with Fujinon 16:1 zoom lens, tripod plate and hard case ..... **$7495**
Also available in Betacam or DV-CAM packages, call for prices.

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

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

**All the features of the UVW-1200/1400A *PLUS*—**
- Optional BVR-50 allows remote TBC adjustment.
- RS-422 interface for editing system expansion.
- Two types of component output: via three BNC connectors or a Betacam 12-pin dub connector.
- Frame accurate editing is assured, thanks to sophisticated servo control and built-in time code operation. In the insert mode of the UVW-1800, video, audio Ch-1/2 and time code can be inserted independently or in any combination.

## PVW-2600/PVW-2650/PVW-2800
### BETACAM SP PRO SERIES

Whenever versatility and no compromise performance is needed, there is only one choice. Legendary reliability and comprehensive support for its many users has established the PVW series as the standard in broadcast and post production. The PVW Series includes the PVW-2600 Player, PVW-2650 Player with Dynamic Tracking and the PVW-2800 Editing Recorder. They feature built-in TBCs, LTC/VITC time code operation and RS-422 serial interface. They also offer composite, S-Video and component video inputs and outputs. Most important they are built for heavy, every day duty.

- Built-in TBC's and digital dropout compensation assure consistent picture performance. Remote TBC adjustment can be done using the optional BVR-50 TBC Remote Control.
- The PVW-2600, PVW-2650 and PVW-2800 (generates as well) read VITC/ LTC time code as well as User Bits. Ext/Int time code, Regen/Preset, or Rec-Run/ Free-Run selections.
- Built-in character generator displays time code or CTL data.
- Set-up menu for presetting many functional parameters.
- Two longitudinal audio channels with Dolby C- type NR.
- Recognizable monochrome pictures at up to 24X normal speed in forward and reverse. Color at speeds up to 10X.
- Two types of component connection; three BNC connectors or a Betacam 12-pin dub connector. They have composite and S-Video signals as well.

**PVW-2650 Only**
- Dynamic Tracking (DT) playback from -1 to +3 times normal speed.

**PVW-2800 Only**
- Built-in comprehensive editing facilities.
- Dynamic Motion Control with memory provides slow motion editing capability.

## 800 SERIES UHF WIRELESS MICROPHONE SYSTEMS

Consisting of 5 handheld and bodypack transmitters and 6 different receivers, Sony's UHF is recognized as the outstanding wireless mic system for professional applications. Operating in the 800 MHz band range, they are barely affected by external noise and interference. They incorporate a PLL (Phase Locked Loop) synthesized control system that makes it easy to choose from up to 282 operating frequencies, and with the use of Sony's pre-programmed channel plan, it is simple to choose the correct operating frequencies for simultaneous multi-channel operation. Additional features, like space diversity reception, LCD indicators, reliable and sophisticated circuit technology ensure low noise, wide dynamic range, and extremely stable signal transmission and reception. Ideal for broadcasting stations, film production facilities, and ENG work.

**SEVEN DAY CUSTOMER SATISFACTION GUARANTEE**

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PHOTO - VIDEO - PRO AUDIO

## NewTek

### Calibar 3-Oz. Pocket-Sized Test Generator

The size of a ball point pen and running on a single battery, Calibar is an NTSC test signal generator that packs a rack mount's worth of test equipment into a battery operated instrument. Calibar is the fastest, easiest and most portable way ever to calibrate video equipment. No patch bay racks. Just one cable. So besides giving you fast, accurate readings in the studio, it's perfect for off-site events or trouble-shooting in the field.

**$349**

- Designed for studio and field operation, it produces 24 test pattern functions at the touch of a button. 10-bit precision digital-to-analog conversion assures highly accurate signals.
- Calibar's combination of low cost, portability and full-featured operation makes it ideal for broadcast engineers, television production facilities and video post houses.
- Tuck Calibar in your pocket and you're ready to go. Touch the button to generate SMPTE color bars, touch it again to calibrate convergence and so on.
- With the supplied AC adapter, it also functions as a black burst generator.

## 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 OLE objects, iNiNiTi 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

### TARGA 1000/MCXpress NT

### 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 II- 300 MHz Processor
- Matrox Millenium II AGP 4MB WRAM Display Card
- 64MB 10ns 168-Pin (DIMM) S-DRAM
- Quantum Fireball 6.4GB IDE System Drive
- Seagate Barracuda External 9.1GB SCSI-3 Ultra Wide Capture Drive
- Adaptec AHA-2940UW 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-inch (1280 x 1024) Monitor (0.27mm dot pitch)
- Focus 2001A Keyboard • Microsoft MS Mouse
- Windows NT 4.0 Operating System Software
- Avid MCXpress for Windows NT
- 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 rack-mount 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

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Business Wire

# Business highlights from broadcast and production

BY SANDRA FERGUSON, EDITORIAL ASSISTANT

Panasonic announced the following: The company recently delivered its one-unit DVD Authoring System, which runs Windows NT. Two 1080i HD cameras, the AK-HC880 full-size studio camera and its portable companion, the AK-HC830, are now available for delivery. Panasonic also announced the availability of the AJ-UFC1800 universal video format converter.

Pluto began shipping SPACEShift HD, its high-definition digital time delay system. Also, AirSPACE HD, its HD version of AirSPACE play-to-air server, is now available.

Avid is now shipping version 5.1 of Avid Media Illusion software, a digital effects and compositing system for film and television.

Discreet is now shipping flint* version 6.0, its visual effects and broadcast graphics system.

Chyron recently made the following announcements: The company sold five Pro-Bel automation/media management packages and a master control system to Turner Entertainment Networks. Chyron now has a joint marketing agreement with Peak Systems Inc. Peak is Chyron's first partner developer to create 3D graphics software for its DUET open video platform. Business Technology Inc. announced that it is developing a transmission interface between its multi-application Attendant Solutions platform and Chyron's DUET real-time video platform with the CAL API. Chyron also announced a joint marketing relationship with the Nexus ASA Group and its subsidiaries, Nexus-Informatics GmbH and NewsMaker Systems Inc. Under the agreement, both companies will market the integrated Nexus OpenMedia/StarDrive and Chyron DUET solution.

Canon's full line of HDTV Prime lenses ranges from 6mm to 35mm and features an iris T stop, gear rings for film-style accessories and focus scale calibrated so that it is measured 48mm to the rear of the lens/camera interface.

Gerling made the following announcements: Southwest Television (SWTV) of Phoenix gave the go-ahead for Gerling to construct SWTV's newest 53-foot Expandable Production Trailer. The Canadian Broadcasting Corporation awarded the first of a multi-SNG contract to Gerling. The first two SNGs will be delivered to the Canadian network this spring.

Interra's MProbe family of MPEG bitstream analysis software, a set of test, measurement and quality analysis tools for digital television and other MPEG applications, received official certification by Dolby Laboratories. The Dolby certification applies to Dolby Digital audio format support in the newly released version 3.2 of the MProbe 200 and the MProbe 110.

Broadcast Video Inc. recently purchased Abekas 8150 Digital Switchers for the company's film-to-tape transfer suites in Miami Beach, North Miami and Coconut Grove, FL.


Avica announced the sale of 10 Vecta DTV still stores to post production facility FotoKem, located in Burbank, CA.

WB affiliate KKYK-TV of Little Rock, AR, will use Orad's CyberSet O virtual set system for its live newscasts. KKYK will be one of the first local stations in the U.S. to put a virtual set into daily operation for a live newscast.

## People

CEI, a broadcast engineering firm, recently announced the addition of four engineers to its staff. They include: Lachlan Murdoch MacNeil, senior design engineer; Bob Bieberdorf, senior design engineer; Jefferey Steele, senior design engineer; and Phillip Reiners, assistant design engineer.

Bob Metzler, chairman of Audio Precision Inc., received the 1999 John Fluke Sr. Memorial Award for Management Excellence and Leadership at the recent NEPCON convention.

Telex/EVI Audio announced the appointment of Alan B. Shirley as vice president of marketing for its Speakers and Microphone Group.

Telex appointed Lisa Hankins as sales administration manager.

Vibrint Technologies recently hired two new regional sales managers. They are Ken Sargent, who will manage central U.S. sales activities and Tom Cragin, who will manage the company's East Coast sales.

Radamec named Bret Lukezic as general manager, effective April 1. ■

The GALLERY



# Professional Services

# Professional Services



# Classifieds Services



# Classifieds Station for Sale

**Miami TV Station - For Sale**

Channel 21 LPTV Licensed to City of Miami. 3rd Largest Hispanic Market. Excellent Opportunity $2,750,000 Serious inquires only. Contact: Eddie Sixto 305-261-0212 or email edsixto@yahoo.com

# Classifieds For Sale



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Circle (153) on Free Info Card

# Classifieds Help Wanted

**WETA**

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Come to WETA in Arlington, VA... here's why: We are leading the way into the digital broadcasting future, already operating a full power digital transmitter and constructing a state of the art multi-channel all-digital master control facility. WETA is recruiting for a **Maintenance Technician** who has *vision*, a *passion* for new technology, and the *skills* to work in a highly intensive production operation with people who have fun working on incredibly challenging assignments. Send cover letter, resume, and salary requirements to WETA, 2775 S. Quincy St., Arlington VA 22206, or fax to 703/998-2034. EOE/D/M/F/V. Visit our website: http://www.weta.org, for more information.

**MAINTENANCE/REMOTE ENGINEER:** Live and work in a wonderful climate with entertainment, sports, and cultural activities for all ages. Repair and adjust TV/Radio equipment in a leading Florida joint community station. Assist in construction of new equipment or modification of existing facilities. Assist remote production team. FCC general radiotelephone operator license, background in analog and digital troubleshooting required. Resume to: Human Resources, WMFE, 11510 East Colonial Drive, Orlando, FL 32817. Don't miss this great opportunity!

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**ASSISTANT CHIEF ENGINEER:** WFFT FOX fort Wayne, a Quorum Broadcasting Co. station, is seeking a hands on assistant chief engineer. 5 years experience in repair and maintenance of broadcast equipment. Computer skills a plus. FCC or SBA certification desired. Send resume and salary requirements to Personnel Dept., WFFT TV, PO Box 8656, Fort Wayne, IN 468998-8655. EOE.

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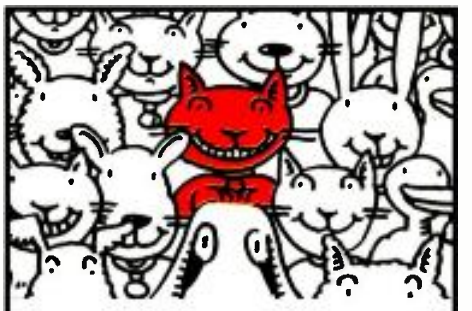

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# Ad Index

| | Page Number | Reader Service Number | Advertiser Hotline |
|---|---|---|---|
| Adaptive Broadband | 87 | 48 | 800-490-5700 |
| ADC Telecommunications | 31 | 8 | 612-403-8886 |
| ADC Telecommunications | 32 | 10 | 612-403-8886 |
| Adherent Ltd. | 135 | 68 | |
| Allied Tower | 82 | 41 | 281-535-0501 |
| Audio Precision | 15 | 5 | 800-231-7350 |
| Audio-Technica U.S. | 57 | 34 | 330-686-2600 |
| Avid Technology | 41 | 29 | 800-949-2843 |
| Axon Digital Design | 40 | 28 | 314-241-4500 |
| Azden Corporation | 119 | 63 | 516-328-7500 |
| Beck Associates | 146 | 152 | 888-422-8600 |
| Benchmark Media Systems | 143 | 73 | 800-262-4675 |
| B&H Photo-Video | 138-141 | 69,70 | 800-947-9928 |
| The Broadcast Store | 146 | 153 | 818-551-5858 |
| Broadcast Video Systems | 114 | 54 | 905-764-1584 |
| Canon USA | 27 | 16 | 800-321-4388 |
| Clear-Com Intercom Sys. | 77 | 47 | 510-496-6666 |
| Columbine Systems | 66 | 26 | 303-237-4000 |
| Comm/Scope | 61 | 36 | 800-982-1708 |
| Continental Electronics | 115 | 55 | 214-381-7161 |
| Datatek, Inc. | 111 | 51 | 800-882-9100 |
| DiviCom | 43 | 30 | 877-DIVICOM |
| DNF Industries | 114 | 53 | 818-252-0198 |
| Dolby Labs Inc. | 35 | 18 | 415-558-0200 |
| DPS | 51 | 22 | 606-371-5533 |
| Drastic Technologies | 123 | 65 | 416-255-5636 |
| DTV '99 | 30 | | 800-288-8606 |
| Extron Electronics | 59 | 35 | 714-491-1500 |
| For A Video | 144 | 74 | 352-372-0270 |
| General Instrument Corp | 127 | 59 | 215-956-6505 |
| Gentner Communications | 54 | 24 | 800-945-7730 |
| Harris Corp./Broadcast Div. | 3 | 4 | 606-282-4800 |
| Henry Engineering | 143 | 71 | 626-355-3656 |
| Hewlett Packard | 47 | 20 | 800-452-4844 |
| Itelco | 79 | 38 | 303-464-8000 |
| ITS '99 | 137 | | 703-319-0800 |
| Jones Earth Segment, Inc. | 145 | 151 | 303-784-8809 |
| JVC Professional Products | 49 | 21 | 800-JVC-5825 |
| KTech Telecommunications | 143 | 72 | 818-361-2248 |
| Leitch Incorporated | 36-37 | 19 | 800-231-9673 |
| Leitch Incorporated | 152 | 3 | 800-231-9673 |
| Louth Automation | 73 | 46 | 415-843-3665 |
| Miranda Technologies Inc. | 9 | 12 | 514-333-1772 |
| NDS America | 39 | 27 | 714-725-2500 |
| Network Electronics | 46 | 32 | 800-877-TAPE |
| NVision Inc. | 52-53 | 23 | 530-265-1000 |
| Odetics, Inc. | 19 | 7 | 800-243-2001 |
| Orban | 125 | 67 | 510-297-2774 |
| Panasonic Broadcast | 5 | | 800-528-8601 |
| Pesa Switching | 29 | 17 | 800-328-1008 |
| Philips Digital Video | 7 | 11 | 800-962-4287 |
| Pinnacle Systems Inc. | 109 | 62 | 650-526-1600 |
| Pirod, Inc. | 118 | 58 | 219-936-4221 |
| Prof. Communication Sys. | 71 | 45 | 813-888-5353 |
| Prof. Audio Supply | 82 | 42 | 903-737-8478 |
| Quantegy Inc. | 67 | 37 | 770-486-2800 |
| Quantel Ltd. | 11 | 13 | 446-354-8222 |
| Ross Video | 129 | 60 | 613-652-4886 |
| Sachtler Corp | 25 | 15 | 516-867-4900 |
| SeaChange | 55 | 33 | 508-897-0100 |
| Sierra Video Systems | 118 | 57 | 530-478-1000 |
| Silicon Graphics | 117 | 56 | 800-636-8184 |
| Snell & Wilcox | 44-45 | 31 | 408-260-1000 |
| Snell & Wilcox | 84-85 | 44 | 408-260-1000 |
| Snell & Wilcox | 120-121 | 64 | 408-260-1000 |
| Solid State Logic | 33 | 9 | 800-343-0101 |
| Sony Electronics | 12-13 | | 800-635-SONY |
| Sony Electronics | 75 | | 800-635-SONY |
| STB Systems | 130 | 61 | 972-234-8750 |
| Switchcraft Inc. | 81 | 40 | 773-792-2700 |
| Technical Operations | 145 | 150 | 212-465-1318 |
| Tektronix Inc. | 20-22 | | 800-998-3588 |
| Tektronix Inc. | 64-65 | | 800-998-3588 |
| Telecast Fiber Systems | 124 | 66 | 508-754-4858 |
| Telex Communications | 88 | 49 | 800-392-3497 |
| Tieman Communications | 17 | 6 | 619-587-0252 |
| Trompeter Electronics | 80 | 39 | 818-707-2020 |
| Tron-Tek | 144 | 75 | 918-663-4877 |
| TVOne | 24 | 14 | 606-282-7303 |
| Vela Broadcast | 112-113 | 52 | 801-464-1600 |
| Vibrint Technologies | 83 | 43 | 781-275-4088 |
| Videotek, Inc. | 151 | 2 | 800-800-5719 |
| Wheatstone Corporation | 2 | 1 | 252-638-7000 |
| Windows to the Web | 136 | | |
| Yamaha Corporation | 89 | 50 | 800-937-7171 |
| 360 Systems | 63 | 25 | 818-991-0360 |

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EOM

# Good maintenance is not an accident

BY PAUL MCGOLDRICK

When I was a lot younger I wrote a monthly column answering pleas for help about TV receiver repair. Because of this, I knew the ins and outs of just about every TV chassis made. The same faults were recorded in letters again and again. About 90 percent of the problems could be diagnosed without even pulling out the circuit diagram. Because I got paid for every letter answered, including the more interesting ones that were published, the more the merrier. When a really unusual fault symptom was offered, most turned out to be situations where the reader had done things wrong or overlooked something more obvious. You could nearly always pinpoint the problem to within a couple of possible parts — which just added more to my own information database.

It was completely different working with broadcast transmitters: AM, HF, FM, as well as television transmitters across the spectrum. An efficiency expert visited a transmitter station where I worked, complete with his stopwatch, clipboard and pencil. He was horrified that when a transmitter went down we read meters, observed status monitors and then pulled out plywood-mounted circuit diagrams to start isolating the fault. He completely failed to understand that we were not smart (or psychic?) enough to walk directly to the faulty part, yank it, replace it and get the thing back on the air.

Around the same time I remember a supervisor deciding that a telecine channel was producing too much noise, and he concluded that it needed to be completely retubed. This innocent (or lunatic, I've never been too sure) was kind enough to do the hard work of pulling every tube out of this Cintel channel and tossing all of them. I was left with the job of retubing the whole thing. It did not, of course, turn out the way that my supervisor expected. It took nearly a week to get the channel operational and up to spec.

## Times have changed

Today, maintenance is even more difficult, especially if performed down to the component level. Indeed, in a lot of equipment, manufacturers do not really expect that level of expertise. With the interaction of the various modules of just about any camera, VTR or transmitter, there is still a lot of pulling and replacing of modules and feeling around before many maintenance efforts are successful. It is interesting that when you compare electronic servicing and the servicing of automobiles, they seem to be astonishingly alike. Then you realize that the complications in auto repair are mostly due to the electronic content. I have known a number of extremely well-paid auto technicians who admit that repairing vehicles is no longer the fun it used to be.

Fault diagnosis using the data made available by testers can also be confusing. Fault codes are often caused by a fault in another location, a cascade effect that confuses and delays repairs. Simply replacing pieces until something relative to the problem changes is an expensive, and unfortunate, fact of life.

For us in the electronics world, this situation should be different. Unlike most auto technicians, we are supposed to understand the nuts and bolts of the operation of the products; we should be able to identify the faulty module the first time and then replace it. But, of course, that is not life as we know it. The module we believe we need is the only one we don't have a replacement for or it's well outside the time that the manufacturer has its help line open. If it's not, "We've never seen that problem before," it's "Are you sure you've checked the XX?"

When I worked for a company that provided emergency help lines for 24 hours — a regimen that a number of us cycled through — it was astonishing how many calls we received for problems that had nothing to do with our equipment. We were a phone number — a hope in the middle of the night for the desperate. Like a good suicide hotline, we always tried to help.

Many service manuals are not the complete tools they once were. Often, they seem to have been put together at the lowest price possible rather than with the customer's maintenance needs in mind. Products are getting to the market much quicker than ever before, leaving less time for service material to be produced. There really is no substitute for attending a manufacturer's training course for the essential pieces of equipment in your operation. If such a course is not offered, maybe you should think twice about whether you want to buy that particular piece of equipment. If management doesn't want to cover the costs of getting you to a training course, then maybe you need to think again about accepting responsibility for the equipment. Besides, training costs are usually negotiable with the vendor.

An understanding of maintenance doesn't come automatically; it requires training and reinforcement in every situation. With the incredibly tight connections between microprocessor and signal circuitry in modern equipment it is almost impossible to understand how a complex piece operates without a detailed, hand-held explanation. Unfortunately, in many situations today, getting that explanation seems harder than ever. ■

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

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

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