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JUNE 1998

Broadcast ENGINEERING

THE JOURNAL OF DIGITAL TELEVISION

NAB '98: DTV GOLD RUSH

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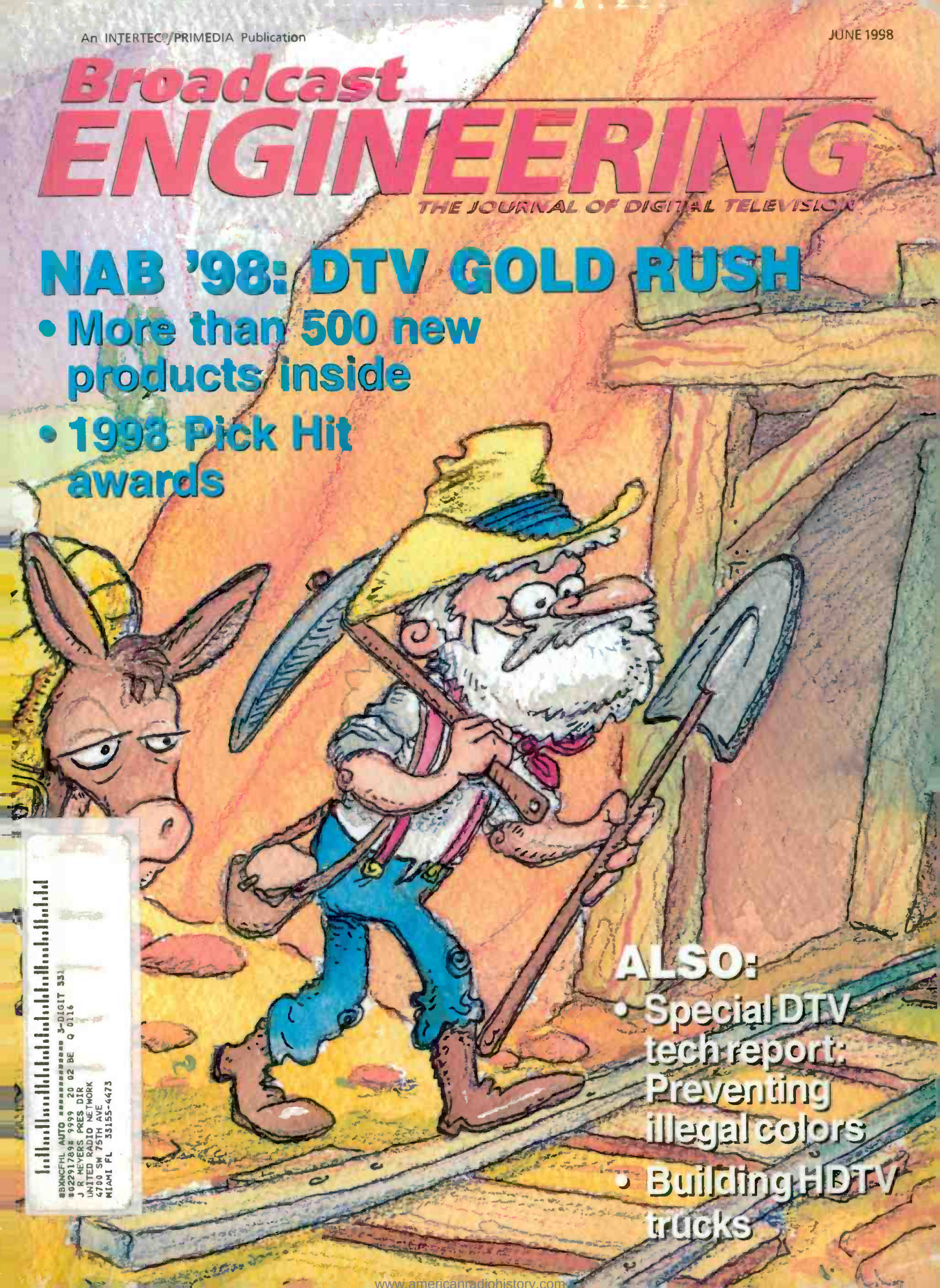
- 1998 Pick Hit awards



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ON THE COVER: *It was a gold mine of products as attendees and exhibitors exchanged views at this year's NAB. This month's cover illustrates our convention review theme of "DTV gold rush." This year's coverage begins on page 98. Cover illustration by John Hayes.*

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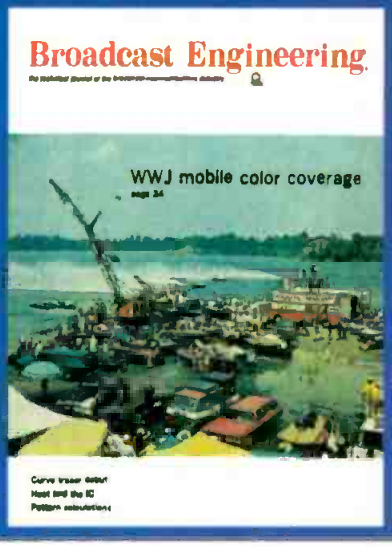
FREEZE FRAME

A look at the technology that shaped this industry.

Do you remember?

Station WWJ-TV first added mobile color coverage for its viewers in 1971. Originally scheduled to cost $750,000, it ended up costing only $150,000. For an idea of how far we've come, see "Building HD trucks," page 78.



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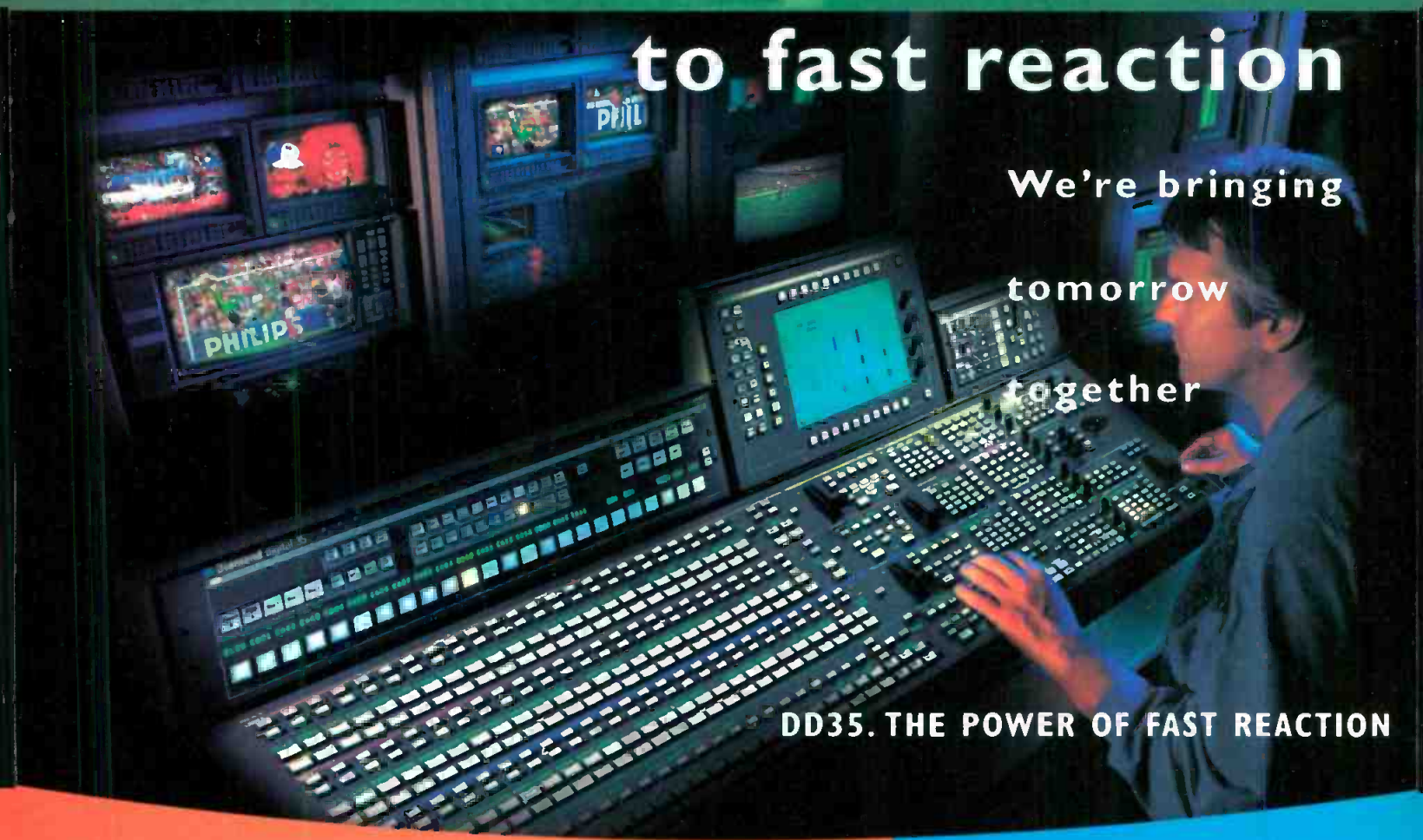

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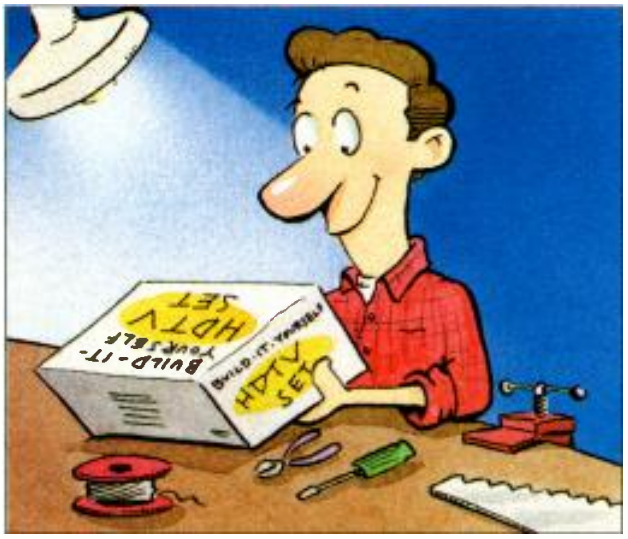
Editorial

It's a Heathkit world

Many of you will be old enough to remember the days when engineers built stuff. You know, the "good old days" when transmitters meant tubes and engineers were men. Okay, things have changed; we now have solid-state transmitters and women engineers. That's all well and good, but there are things I miss about the old days.

When I was in the eighth grade, my parents gave me a Heathkit stereo amplifier. Now for those of you under the age of 40, let me explain what a Heathkit was. A Healthkit (not Healthkick as some thought) was not an aerobic bicycle or home gym. No, it was famous for offering electronics in kit form. If you wanted a great stereo, some test equipment, a ham radio or a TV set, you could build it from a kit. So, my Heathkit stereo amplifier was a bunch of parts, that when completed, formed the central piece of my stereo system — an awesome 14W-per-channel of stereo tube-based power!



My, how things have changed. Today, TV stations come in boxes of electronics. Hook up output A to input B, and you're on the air or that's what it seems like. But things are changing. A reader commented to me this week about the change he sees with the way stations are going to build their DTV facilities: "There aren't any answers with HDTV, every station is going to have to build their own." Yippee! TV engineers can trade in their box knives for soldering irons.

Seriously now, building an HDTV station is never going to be a kit project. The complexity is just too great. However, engineers are going to have to do a lot more work in understanding each of the basic HD building blocks than with NTSC. Vendors too have to work harder, because no one company has all the solutions. Boxes have to be designed to work with a multitude of vendors and different types of signals. Simply being able to pass a single signal like NTSC won't work anymore.

At first, stations are going to have to work with HD network feeds, either 1,080i or 720p intermixed with their local 480i/p SDI sources. Then, there will be the additional 16:9 sources that have to work with older 4:3 feeds — add to this, monaural, stereo, SAP, and eventually, 5.1 audio signals. All this complexity will require some innovative solutions to be developed by every station. Over time, more generic solutions will be developed. But for now, early adopters will be forced into building TV stations again. That should be fun. If any of you need help in building these new HD facilities, I know a former broadcast engineer who can read a print, follow instructions, solder with abandon and even use a tube checker. Contact him at 1-555-USE TUBES. I miss the good old days, when tubes were tubes and things worked and engineers *built* stuff.

Oh, I need to finish my story. Recently, my $500 solid-state, famous-brand stereo receiver, with Dolby surround sound and more features than I can count, crapped out only 18 months after I bought it. When I discovered that the replacement output transistors would cost $75.00 apiece, I just retired the darn thing. In its place, I proudly mounted my 35-year-old Heathkit stereo amplifier. Now I listen to my digital CDs and stereo videotapes on an amplifier that is older than many of you readers. It doesn't have a remote control or Dolby surround sound, but you know what? With the lights dimmed, the warm glow of the tubes can even be romantic. At least, that's what I tell my dates.

Brad Dick

Brad Dick, editor

direct: brad_dick@compuserve.com
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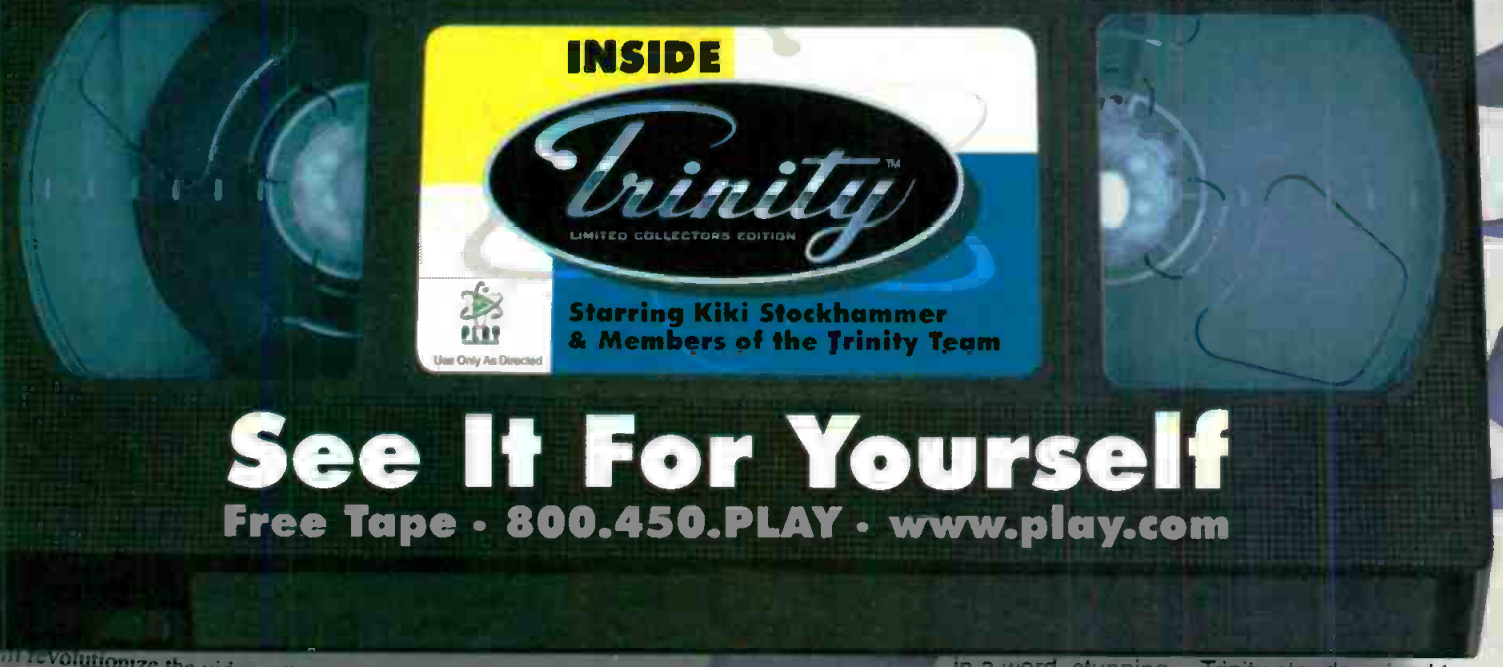

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Reader Feedback

Analog resolution

I wish to add a comment with regards to the Kell factor. (see "Transition to Digital," March 1998, p. 46.) It should be noted that L.C. Jesty published in the "Proceedings of the IEE" in 1958 details of his research and concluded that for equivalent resolution, progressive scan at 60 frames/s against interlaced scan at 60 frames/s requires only a little more bandwidth for the same subjective resolution. Hence the Kell factor is reduced by about 30% for progressive scan. Also, I understand the current HDTV 1,125 standard is 1,080 active lines; 1,035 lines being the former standard established by Japan for their Hi-Vision system.

TERRY HARVEY
BARANANG, MALAYSIA

Author Michael Robin replies:

The Kell factor for interlaced TV pictures is generally taken as 0.7, even though some authorities go as low as 0.5. The 0.7 figure is, nevertheless, at the root of the standard-definition TV standards. As far as the progressive TV pictures are concerned, I am using the generally accepted value of 0.9.

Concerning the HDTV resolution, as the title ("Analog resolution") suggests, the article refers to an analog HDTV format. The ATSC formats are digital, and the trend, rightly or wrongly, is to define digital TVA resolution capabilities in terms of the number of active lines per picture (vertical resolution) and the number of horizontal pixels per active line (horizontal resolution).

Power quality and grounding

Thanks to Warren H. Lewis for his excellent and thorough article in the February 1998 issue of *Broadcast Engineering* ("Power quality and grounding"). However, somewhere along the production chain, some errors crept into a couple of the figures. In Figures 11 and 13, the ground pin of the NEMA receptacle should not connect to the metal box. This is the whole point of insulated grounding of the branch circuit.

In Figures 12 and 13, the circuit breakers must disconnect both line wires, and the receptacles must be GFCI-protected, as indicated in the footnote, not "any style" as indicated in the text. Furthermore, they cannot be standard NEMA receptacles unless located in a *restricted access* area.

Keep up the good work with *Broadcast Engineering*.

LEWIS D. COLLINS
WAYLAND, MA

Author Warren Lewis replies:

Murphy's Law was hard at work and indeed, the three drawings contained some minor (not the author's) errors.

In Figure 11, the receptacle must not have any connection between its equipment ground pin and the receptacle's metal device mounting box. Note that for IG use, the ESGC pin is not connected to the metal device mounting box.

The circuit breakers in Figures 12 and 13 should be double-pole, not single-pole as shown.

In Figure 13, the receptacle's equipment grounding pin must not be connected to the receptacle's metal device mounting box. On the drawing, the solid line between the box and ESGC on the receptacle should be a dotted line. Note that for IG use, the ESGC pin is not connected to the metal device mounting box.

Finally, unless these receptacle types shown in Figures 12 and 13 are located in machine rooms, control rooms, equipment rooms and other locations that are restricted to use by qualified personnel, they must be uniquely configured and identified for use on the 60/120-vote technical class of system.

Thank you for running Warren Lewis' article "Power Quality and Grounding." Mr. Lewis is one of very few people I have seen who actively rejects the dogmatic power and grounding principles that broadcast engineers have been using for eons.

As some readers my have noticed, Mr. Lewis' concepts are essentially generic to all manner of technical electronic installations. They are not unique to video and audio and did not arise from broadcasting specifically. However, they are based on the laws of physics, which everyone must follow. Many of the conventional broadcast practices have never worked well anyway and I, for one, am happy to see one more layer of the Emperor's New Clothes being removed from this subject!

ERIC WENOCUR
LAB TECH SYSTEMS
SILVER SPRING, MD

And the winners are...

During NAB '98, webmaster, Deanna Rood posted the following question on the *Broadcast Engineering* web site: "What was the most interesting thing you saw at NAB this year?"

The following five winners were picked at random from the responses received. Each of these readers will receive a deck of *Broadcast Engineering* playing cards:

- **Larry Laing** — KCTS, Seattle, *"ASC's video server"*
- **Jaime Allyn Ananko** — WEZX/WEJL/WBAX/WQFM Radio, Scranton, PA , *"Orban Optimod 9200, Sennheiser MKH 2-80 Mic, Clear-Com Tel-14"*
- **Randle G. Mason** — Digital Postproduction Services of New York, NY, *"HDTV flat screens from NEC and Toshiba"*
- **Brian McCaffrey**, RF Video Productions, Watertown, MA, *"Harris exhibit"*
- **Mark Russell** — New London, CT, *"Kiki's outfit"*

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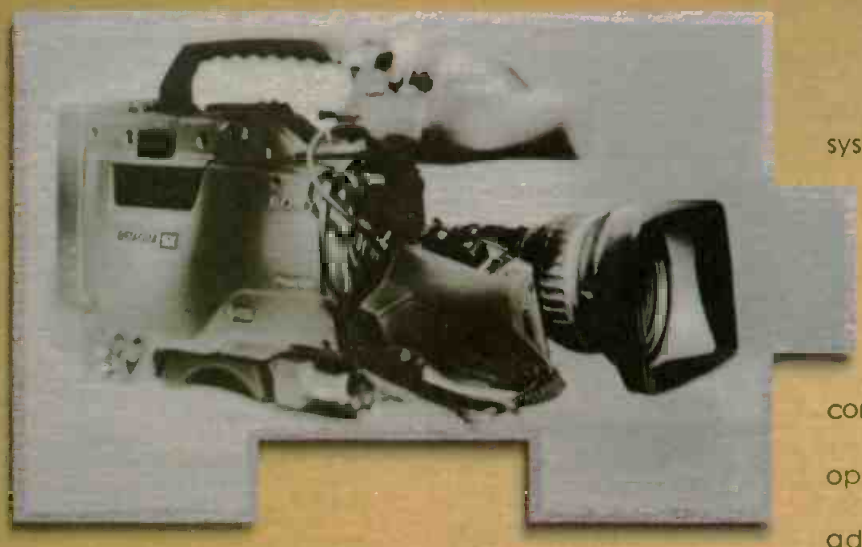

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News

It's my cable and I'll do what I want

BY LARRY BLOOMFIELD

TCI's chairman, John Malone has a propensity to talk himself into trouble and he did so again at this year's National Cable Television Association show. While speaking to reporters at the convention in Atlanta, Malone accused the CBS and NBC selected 1,080i HD format of taking up too much space on his cable systems. Unless CBS and NBC change, Malone said TCI would not voluntarily carry their stations on local cable systems. Readers may recall that this is the same network that claims that the 480-scan rate is high definition television. (See Feb. 1998, "TCI has different HDTV," p. 14.)

Gary Shapiro

When called about their chairman's comment, company officials back-peddled with a press release quoting earlier statements. "With respect to broadcasters which are desirous of adopting more demanding and inefficient formats, such as 1,080i, TCI will continue to work with vendors to accommodate such demands."

In an earlier statement, Malone said that TCI would carry CBS's and NBC's high-definition signals only if required. "I'll do whatever the government orders me to do," he said. His words didn't find favor with certain members of Congress.

In reference to Malone's statement, Ken Johnson, spokesman for Congressman Billy Tauzin, R-LA, chairman of the House Telecommunications Subcommittee, said, "In a nutshell, it looks like the cable industry just fired on Fort Sumter. After cajoling, prodding and then finally mandating that American broadcasters convert to digital, Congress is not going to allow cable to become a roadblock to progress. If John Malone wants a war, he'll get one."

CEMA president Gary Shapiro wasn't happy about Malone's comments either: "It's the height of rudeness to tell Congress one thing, make a personal promise, and then change the position two weeks later."

The cable industry apparently can't get its collective act together on this issue either. Time Warner Cable's spokesman, Mike Luftman said, "The fact is that whatever Mr. Malone said, he does not speak for the cable industry and he does not speak for Time Warner Cable. Time Warner and the rest of the cable industry is committed to passing through, as received, the HDTV signals of all the major networks and major independents; no ifs, ands or buts!"

"If John Malone wants a war, he'll get one."

Jeff DeMarrais, spokesman for NBC, said, "We (NBC) were not there when he (Malone) made the comment and the comment was not made directly to us. What I would say is that if those comments were true, we are disappointed in that instance, in light of the comments that TCI made in front of Congress on April 23, 1998 in the Q & A session regarding digital television. We are committed to 1,080. We're committed to putting the best picture in front of our viewers." A similar statement was all that was available from CBS.

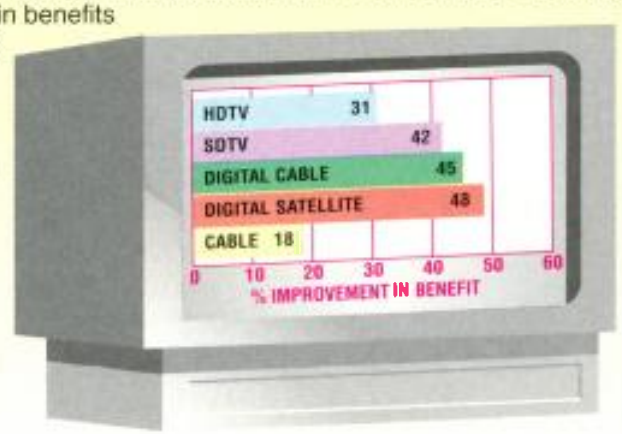
I guess when you shoot yourself in the foot, the next best thing to do is put that foot in your mouth to ease the pain. ■

FRAME GRAB

A look at the issues driving today's technology.

Having more channels is better than having more resolution

When calculating the benefits of digital services: having more channels is better and having higher-quality pictures is better, but the percentage of improvement in benefits is not linear. The benefit that consumers perceive in a service is given by the log of picture quality multiplied by the number of channels. This graph shows the percentage of improvement provided by digital signals over NTSC.



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WXYZ goes digital

Detroit's WXYZ-TV announced a major move into the digital arena. Supported by the systems design and integration division of Tektronix, WXYZ-TV will replace its existing analog-based master-control and switching equipment with an all-digital infrastructure. The station is scheduled to go on-air with the new equipment late this year. The conversion is timed to coincide with ABC's plan to launch 720p programming late this fall.

According to director of engineering, Mike Doback, the station decided to install HDTV capability in order to help get HD programming into the market as soon as possible. The three-stage conversion process will first replace tape-based storage and cart systems with two Profile servers and an Omnibus communications playback module. This phase will provide the station with 35.5 hours of RAID storage at 12Mb/s. Stage two will integrate this on-air playback system with a new serial digital master-control room. Stage three will add full HD capability relying on the new Tektronix Grass Valley Series 7000 HD router running at 1.5Gb/s. Other routing and on-air functions will be handled by a Grass Valley M2100 and M2100-D master-control systems. ■

Y2K bug

The year 2000 conjures up many images, not the least of which is all the hoopla regarding computers failing at midnight, Dec. 31, 1999. Even Washington, DC, has climbed onto this bandwagon and is studying the problem known in computer jargon as the Y2K problem. The president has even established a committee to study the problem — The Council on the Year 2000 Conversion.

Federal Communications Commision
FCC Y2K
YEAR 2000

At the turn of the century, when the date changes from 1999 to 2000, there are concerns that many computers will fail to recognize the millennial change, thereby erroneously assuming "00" to be "1900," not "2000." Systems may crash, or at least misfile data. According to some, if not properly fixed, the year 2000 problem could have serious consequences for those in the telecommunications industry, and that includes TV stations.

The FCC has announced a series of initiatives to raise awareness within the various communications industries about this issue. Among some of the actions the commission has taken is the establishment of a special Internet site to provide information for consumers and the industry. (www.fcc.gov/year2000) Through this site and other programs, the FCC is working to ensure that companies and consumers are prepared for the year 2000. The FCC plans to update the web site as more information becomes available on how the communications industries are responding to the issue. ■

No shootout at the NAB corral

To sweep something under the rug doesn't make it go away, and in most cases, it only makes things worse. Traditionally engineers have been matter-of-fact about technology and do not put up with a bunch of unprofessional nonsense. That does not seem to be the case when it comes to the progressive-vs.-interlace-scan issue.

A demonstration of the two scan formats was scheduled at this year's NAB. Unfortunately, a hastily erected sign in the Microsoft booth told otherwise. The wording lead this writer (and others) to believe there might be some skullduggery afoot. However, trying to get answers from the players in this truly stupid novella was like pulling teeth without pliers. As I spoke to the various alleged participants in this poorly orchestrated event, I was hit with a barrage of "don't quote me" comments reminiscent of a government cover-up.

The story goes like this: The pro-progressive tribe, Microsoft and Compaq, wanted to show off their comparison demonstration, which they call "The Gang of 4 Demo." The demo had previously been shown to a group of VIPs in Washington, DC, in an effort to properly illustrate the differences between several video formats. However, at the show, a sign appeared in the Microsoft booth saying that the tapes for the demo were withdrawn "due to political pressure from NHK and the Advanced Television Systems Committee (ATSC)."

While the sign was removed later that same day, the incident certainly raises questions about who's behind such political ramblings. Sources at NAB said Panasonic, which had supplied the original tapes for the Washington demo, was under "undue political pressure" from the United States and a Japanese broadcaster (presumably NHK) who wanted to stop Microsoft from conducting the side-by-side format comparisons.

In an exclusive interview with Steven Guggenheimer, group product manager for digital television at Microsoft, I asked what happened. Guggenheimer said, "There was no sabotage. There's

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480	704	X	X	X	X	X	X
480	640	X		X	X	X	X

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nothing relative to this particular story that there's to comment on, nor is there any story here." Guggenheimer went on to say, "The truth of the matter is that we were able to show a Gang of 4 Demo that had side-by-side videotapes, some that were created in native formats and some that were of the same footage that were up- and downconverted to different formats."

When pressed about NHK and whether they played any role in all this, Guggenheimer responded, "NHK played no roll in our Gang of 4 Demo at this NAB." The Gang of 4 Demonstration was supposed to show the relative difference in quality between native video formats — 1,080i, 720p, 480p and 480i. The operative word here is native. One has to ask why anyone would interfere with this open demonstration that was trying to put to rest the wrangling that continues to go on in various sectors of our industry over the issue of interlace vs. progressive scan.

When asked about the issues of up- and downconversion not retaining the images' original quality, Guggenheimer said, "We also had the native tape formats as well. Those tapes may have been different than the tapes we used in the past, but then that's business."

When asked how he'd characterize the reactions of those who saw their demonstration, he replied, "Most of the (Microsoft) people who worked in there said we got a lot of positive reaction. It was just that people are surprised at the quality of 480p. The truth is that when you put images side by side, the jump from 480i to 480p is the most significant. The consequent jump from 480p to 720p and then 720p to 1080i is that they (image improvements) get smaller at each increment, and in fact, a lot of people will argue about 720p and 1,080i, and which one is better."

In a different conversation with a Microsoft staff member, who asked to remain anonymous, I was told that the tapes finally used were from Matsushita (Panasonic's parent corporation) and were shot using a 720p camera, but were unconverted to 1,080i and downconverted to 480p. If so, this could not fairly represent the native video formats as was intended. As a result, three separate tapes were used, each with different footage. An independent producer who had been commissioned by Microsoft shot the 1080i tape; the 720p tape was obtained from ABC; and Microsoft used its own 480i/480p materials.

So, rather than unification, the battle between the interlace Hatfields and the progressive McCoys continued. ■

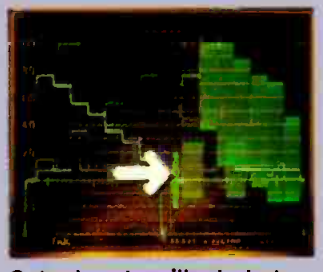
It's good enough for NTSC

When talking about the different frame rates that are part of the new ATSC standards, where do you find 29.97 frames per second (fps)? That is the frame rate we currently use in NTSC. In a recent seminar on DTV, the question came up as to why we started out with 30fps and ended up with 29.97fps. A comment was also made about NTSC meaning "never twice the same color."

Let's take the last comment first. NTSC first established the standards for television back in the early 1940s. There wasn't any color television then, and the present color system didn't come about until 1952.

The change in synchronizing frequencies occurred for two reasons. As the result of testing carried out by the NTSC committee while developing our new color standards, it was decided to interleave the color sub-carrier and any beat product of the color sub-carrier with that of the aural or sound carrier. The reason behind this was to reduce any visible beat in the receiver's picture. For compatibility reasons, the committee decided that it was impractical to change the pre-existing 4.5MHz sound-to-picture carrier offset, so that was left alone. Therefore the color subcarrier frequency had to be set to a frequency to accommodate interleaving the aural carrier color subcarrier with the line, field and frame rates, which were already frequency interleaved.

The sub-carrier frequency of 3.579545MHz was specifically chosen to be 227.5 times the line rate 15,734Hz to accommodate the interleave. Interleave cancels out the picture interference that would otherwise result because the chroma subcarrier frequency resides within the video frequency range.



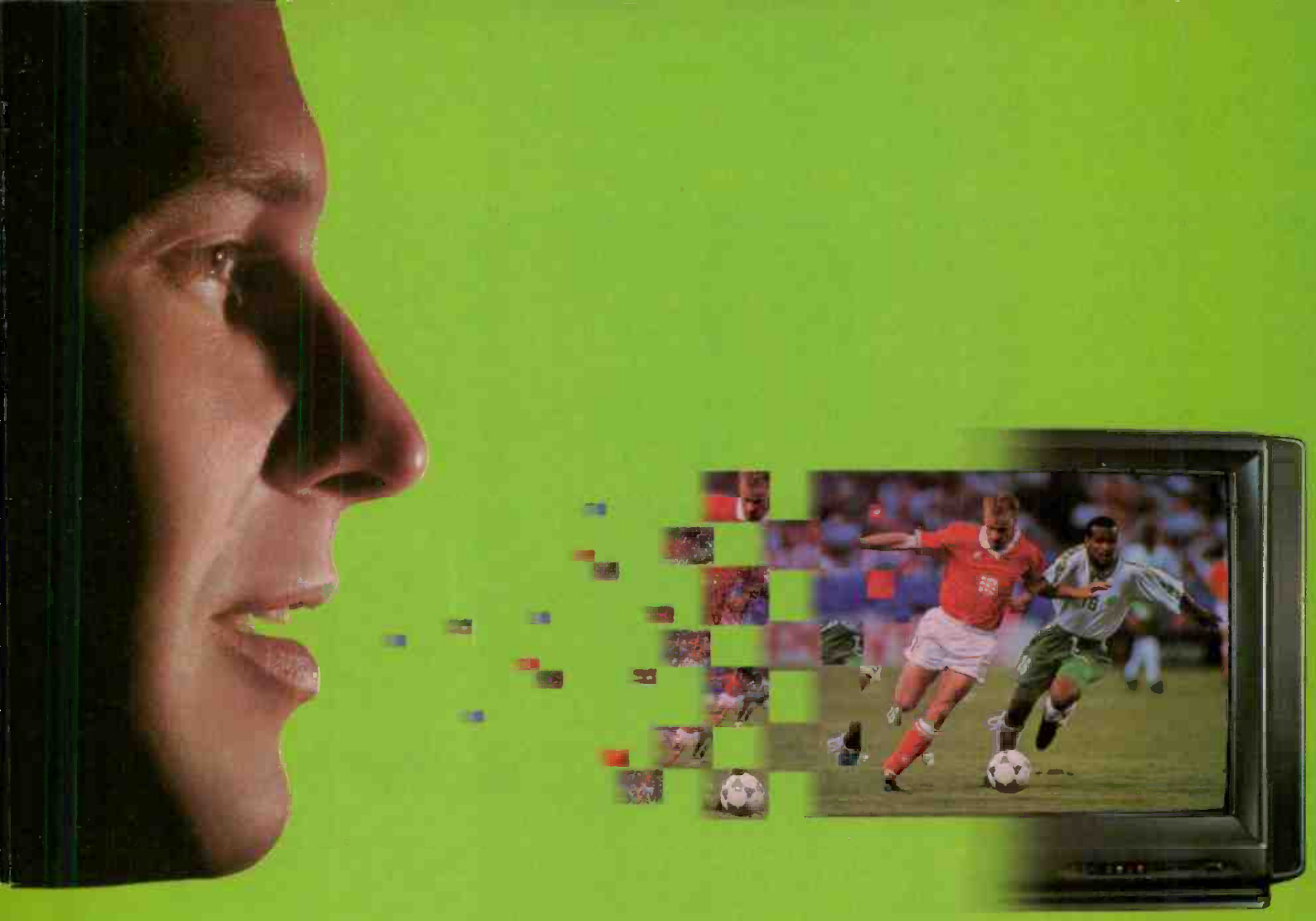
Color burst as illustrated on the Tektronix 1730.

This is not the end of the story, though. In your VHS recorder, the VCR records the color under the video by heterodyning the subcarrier down to a lower frequency. When the tape is played back, an oscillator in the VCR heterodynes the color subcarrier back up to the original 3.58MHz.

This works for home use. However, these machines do not have the stability of their big brothers in broadcast use and therefore display a significant amount of jitter in the tape playback of the color signal. This jitter causes the chroma to not be locked to the horizontal, resulting in poor interleave. The redeeming factor is that the signal is still within the range of most color detector circuits.

This problem can not be tolerated in professional machines and they must have a reference, be it internal or external, to play back in the interleaved mode. You can verify this by putting an oscilloscope on the VHS machine's output (with no video source and no antenna) and note that the picture on playback is locked to the line, while the burst is free running around 3,579545Hz. The result is a system that works for home use, and consumers seem satisfied with the resulting color quality. That might lead you to believe that image quality doesn't matter; witness the dismal failure of laser disks and the s-l-o-w adoption of DVD technology.

But then consumers haven't seen studio quality NTSC, let alone digital images. ■



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Views from NAB

It's hard to imagine that anyone was left at home minding the store with all the folks that showed up at NAB this year. Nearly every sector of interest in broadcasting was represented in droves. Most everyone I've talked to said the same thing, "There's lots I wanted to see, but there wasn't enough time."

To help those attendees who didn't see all they wanted, and those who did not attend, here's a brief snapshot of key individuals and their thoughts on this year's show.


Tom Wimberly

Tom Wimberly, director of engineering, Ramar Communications, Lubbock, TX: "I had a very good NAB. The all-day seminar with Fox on DTV was extremely informative." Wimberly said that the ITS paper by R.W. "Sam" Zborowski on converting a Klystron transmitter to DTV interested him the most. "There just doesn't seem to be enough time to see everything. I hope the expansion at the convention center can put everyone back in the same spot. Sony at Bally's, the Sands, plus the convention center makes for a lot of travel time. I felt like it was Washington, DC, all over again."


Ed Grebow

Chyron president and CEO Ed Grebow said Chyron had a great NAB. The company unveiled its digital TV product strategy, which included HDTV-capable graphics systems and a full-bandwidth 1.5-gigabit router from its U.K.-based subsidiary Pro-Bel. "Our focus is making DTV products that are flexible, resolution independent and that handle all 18 ATSC formats," Grebow said.

Chyron was pleased with several agreements that the company was able to announce, such as Pro-Bel finalizing a $1.8 million agreement with PrimeStar, and work Chyron is doing with Snell & Wilcox to develop a 32x32 HDTV router.

CBS's vice president of engineering Robert Seidel said, "I think the attendance figures alone speak for themselves — 109,000 attendees; that's a record. The manufacturers finally have understood that the DTV and HDTV revolution is taking place, and we saw products from almost every manufacturer for HDTV."

The question that remains, according to Seidel, is transition cost. "I think one of the things that's become evident is that the exorbitant prices that people had been quoting for prototype HDTV laboratory equipment have disappeared. We saw a lot of the missing pieces of the HDTV puzzle finally coming into place, where you can build a station and transport an HDTV network signal via satellite. I think this NAB has served to solidify the posi-

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tions of all the major networks. It helped to solidify the program planning process. It helped to establish, once and for all, within the manufacturing community, that the DTV transition and HDTV transition was indeed occurring and would be occurring pretty much to the FCC schedule," Seidel concluded.

Comark's director of engineering, Mark Aitken, expressed the same general feeling about NAB's size. "Recovery from NAB gets harder and harder," he said. Comark's seminar, *The Road to DTV* had was standing-room only with 600 attendees. The session focused on the implementation activities required to move to DTV. (Editors note: For more information see "First opening day baseball game in HDTV," May 1998, p. 26 and "Add Brazil to the ATSC list," April 1998, p. 16.)

Pleased with NAB '98, Aitken said, "Comark booked several orders at this NAB, as well a receiving a 'handshake deal' from a prestigious group for all of their UHF DTV transmission systems."

With a vested interest in getting you "wired," Greg Hansen, vice president of sales and marketing at Gepco International Inc., was also pleased with NAB '98. Hansen, a veteran exhibitor, said, "The 1998 NAB was the best yet. There are numerous contributing factors for me to make that statement ranging all the way from location of the booth to a strong economy. One observation I did make was that the attendees had a heightened interest in knowing specifics about products and how the features would affect them over the long term."

The Panasonic Broadcast & Digital Systems Company had a lot to be happy about at NAB '98. Vice president marketing, Alec Shapiro said, "The Panasonic NAB exhibit was a 100% digital environment. On display was Next Generation Television! Be it in non-linear editing, HD switchers and cameras, or our industry standard DVCPRO and D-5 HD products. We hope NAB attendees came away from the show with the understanding that Panasonic is open-minded in working with them to develop the advanced television facilities and equipment that they require."


Alec Shapiro

Robert Mueller, president of Panasonic's Broadcast & Digital Systems Company, was even more pleased: "The tremendous enthusiasm that broadcasters showed for our DVCPRO and DVCPRO50 product lines at NAB was terrific. We announced major DVCPRO sales to broadcasters.

"One of our main goals at NAB was to showcase products that represent the basic production tools among all the primary ATSC television formats. NAB marked an unprecedented rollout of a range of end-to-end digital TV broadcast production products that provide interoperable solutions for


Robert Mueller

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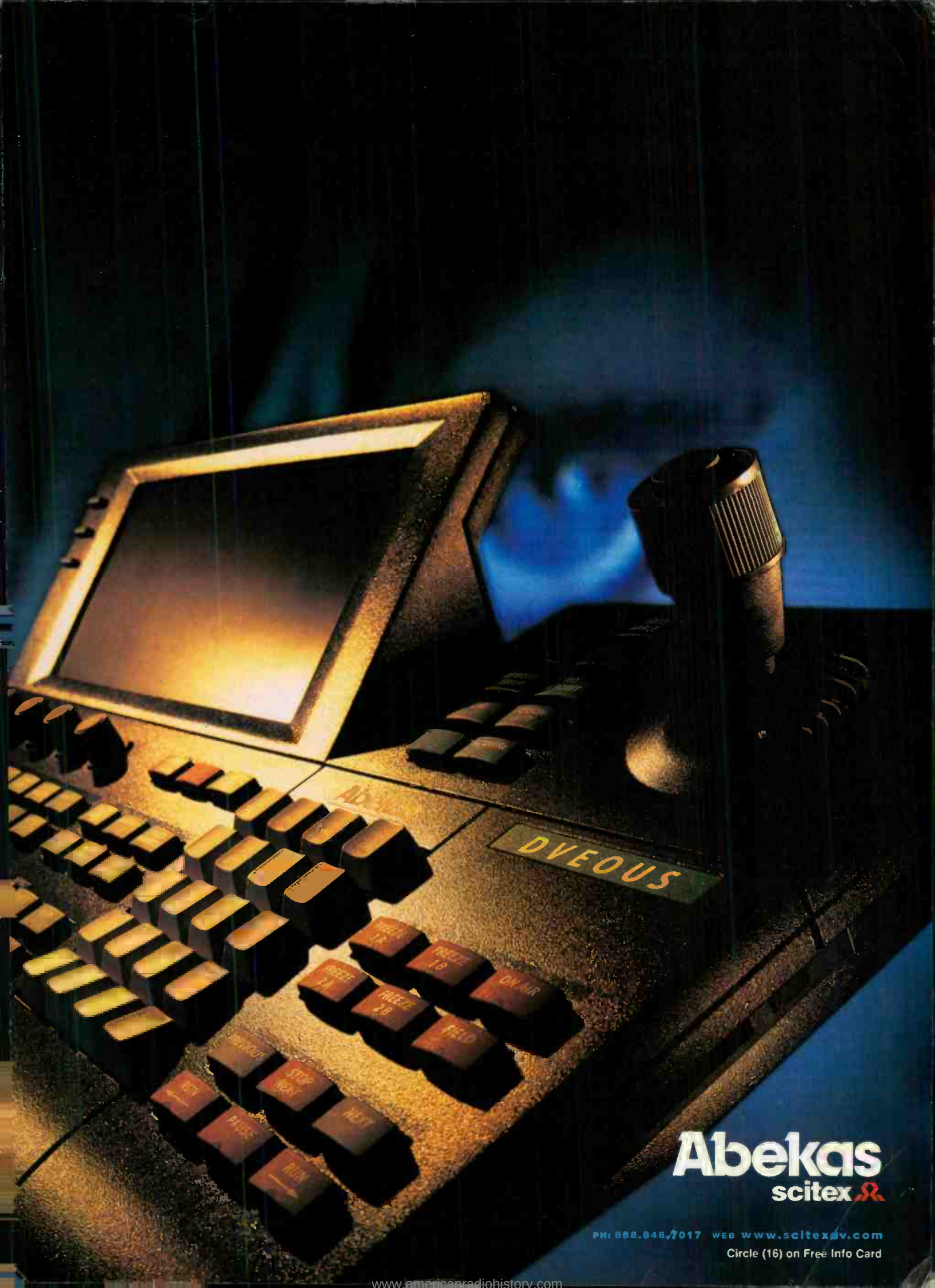

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today and beyond. Among our ADTV offerings, I was glad to see the great interest from broadcasters in the universal video format converter, which enables broadcasters to convert television signals between all ATSC-DTV formats. In the DTV era, multiple image formats will be commonplace, so the universal format converter is a key component to our capability to fully support the ATSC standard for DTV video formats. See "Technology in Transition," p. 188 for a complete list of HD/DTV conversion products.

Jim Adamson, LeBlanc/Larcan president, said: "NAB '98 was our best ever. Customers asked informed questions about transmitters, towers and antenna systems. Last year the mood was what's new and what's available? This year they came prepared to make purchasing decisions."

It's always interesting to speak with someone who's never been to NAB before, and that was the case with Kathy Engholm, a Tektronix transmission test engineer. Engholm said, "This was my first NAB. I was impressed by the number of TV station employees that were there, not just managers. They were very focused on learning more about the new digital standard and how to prepare for broadcasting an 8-VSB signal."

Alan Hodel, Compaq Computer Corporation's senior manager for worldwide public relations said, "NAB went great. From our prospective, we've been advocates of progressive scan technology. It seemed very clear at NAB this year, that broadcasters, for the first time, had the opportunity to see quite a range of different progressive scan equipment both, 720p and 480p, and they can now make decisions to go progressive and know the equipment is going to be there. I think it was very positive."

"I thought NAB '98 went very well," said Preston Davis, president of broadcast operations and engineering for ABC television. "The question I heard asked the most is 'why are we (ABC-TV) backing 720p?' I think you know the answer to that." In a general observation, Davis said: "The one thing that occurred at this NAB is I think we finally put the format debate to bed. Those people who were going the 1,080i direction, that's fine. We're going the 720p direction; I think that's fine. I left this NAB feeling as if we all respectfully agreed to disagree and I think that's the right place for broadcasters to be. Now we just have to get it done!"

When asked about the focus of the other attendees this year, Davis replied: "My sense was that there were a lot of people who came to this NAB finally realizing that they really have to do this, and I had the impression they were there with loaded wallets planning to buy transmission equipment to get them started."

Lisa Hobbs, NDS Americas marketing manager, said: "Compression seemed to be the focus at NAB. The NDS booth was overwhelmed with visitors seeking to take a peek at our new HDTV encoding solutions for both 4:2:0 and 4:2:2. What impressed most visitors was that we were one of the few, if not the only company, demonstrating real product with live transmission feeds outputting into a 1080i ATSC format. Using a six-SDTV encoder design with switchable ATSC Table 3 formats, the HDTV encoder solutions were exceptionally well received." Hobbs recounted that, "Broadcast engineers appreciated the flexibility offered to use the same equipment for both SD and HD transmissions in a two-tiered multicast environment."

Probably one of the most politically influential attendees, in addition to being one of the events featured speakers, was Republican Senator John McCain of Arizona. "NAB '98 showed the vibrancy and versatility of DTV. But, it also showed that a number of tough technical problems still have to be solved before Americans will be able to enjoy it. The FCC's job is to make sure these technical issues are resolved so that consumers can receive digital TV service quickly and efficiently," he said. ■

Senator John McCain

Larry Bloomfield, a former chief engineer, is an industry consultant and author, located in San Jose, CA.

Can you spare a yottabyte?

Just when a gigabyte or so is becoming the bare-minimum survival size for hard disk, along comes talk of storage devices that make a gigabyte, or even a terabyte, seem like chump change. David Weiss, CEO at Storage Technology (StorageTek), expects to announce partnerships with several Internet service providers this year to offer large storage solutions called I:Drives. The I is for Internet. Subscribers would pay $20 to $30 per month to rent Internet space in 50MB to 100MB increments.

StorageTek, based in Louiseville, CO, is also thinking in petabytes, exabytes and zettabytes. In case you've forgotten: a terabyte is 1,000 gigabytes and a petabyte is 1,000 terabytes. An exabyte is 1,000 petabytes and a zettabyte is 1,000 exabytes. If that's not big enough for you, how about a yottabyte, which is 1,000 zettabytes.

Such massive storage has been the domain of mainframes for medical imaging and for large storage applications such as banks, which digitize and store images or millions of checks.

Weiss, however, foresees some practical home uses of massive storage. With rental space on the Internet, you could for instance, store digitized home video that would otherwise be impossible to save. You could then access the video in a snap and show it on your television or PC.

To prepare for the exploding demand for large-scale on-line storage that Weiss predicts, StorageTek has partnered with Imation (a spin-off of 3M). The two companies plan to develop a next-generation tapedrive/cartridge format that, according to Weiss, will reduce storage cost by one-third, while at the same time increasing capacity by that same amount. To grasp how large a yottabyte is, consider that it's a "1" followed by 24 zeros: 1,000,000,000,000,000,000,000,000. ■

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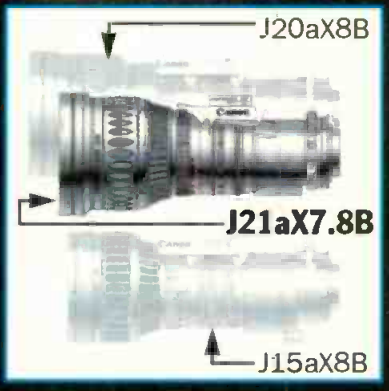

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FCC Update

FCC EEO rules declared unconstitutional

BY HARRY C. MARTIN

In April the U.S. Court of Appeals in Washington ruled that the FCC's equal employment opportunity rules are unconstitutional. In the same decision, the court reversed a $25,000 EEO-related fine imposed on the Lutheran Church, which operates two radio stations in Missouri.

The EEO rules require broadcasters to recruit and promote minority job applicants and to maintain meticulous records of all such efforts. EEO performance has been a principal factor in the license renewal process. The FCC has strictly enforced the EEO rules, often levying fines upon licensees who do not comply. In fact, five days prior to the court's decision, the FCC upheld a $12,000 fine against a Philadelphia radio station for violating the EEO rules.

Although it appears the FCC's EEO regulations will be severely cut back or abolished, licensees must continue to follow the current rules until the appeal process is completed at the Court of Appeals and/or the Supreme Court. This process could take a year or more.

Hours after the court released its decision, FCC Chairman Bill Kennard issued a statement reiterating that he was confident that the EEO rules are constitutional and accusing the court of "diminishing" the nation. In his statement, Kennard claimed that the FCC's EEO policies have opened doors for minorities and women and provided them with opportunities over the past several decades.

At the NAB Convention, seven days prior to the court's decision, Kennard had expressed concern that the media was becoming less pluralistic and challenged broadcasters to develop plans to increase ownership by minorities and women. (For more information on the FCC's action, see *Broadcast Engineering*, April 1998, "Reader Feedback," p. 12 and "Beyond the Headlines," p. 14.)

Petitioners seek DTV changes

On April 20, dozens of stations filed petitions for reconsideration in response to the FCC's reconsideration orders in its DTV proceeding. The petitioners requested that the commission make changes in their own DTV allotments or to those of other stations which they believed would interfere with them. Many petitions asked the FCC to reconsider specific DTV allotments, while others were filed by applicants for new NTSC stations affected by the DTV table.

DTV may be subject to significant reception problems in cities with tall buildings.

Fox claimed that its affiliates would be "uniquely disadvantaged" by the 200kW power limit for UHF DTV facilities. Fox also argued that the lower power levels assigned to current UHF stations would slow the transition to DTV. The Fox affiliates in the top 30 markets, where the build-out timetable is accelerated, would be forced to initially construct facilities limited to the 200kW output level. Later, they would have to rebuild the facilities in order to take advantage of the higher power levels expected after the transition.

Other petitioners challenged basic elements of the reconsideration order. For instance, the National Religious Broadcasters asked the FCC to reconsider allowing some DTV operations on Channel 6. They claimed that it would result in increased interference to NCE-FM stations, many of which are operated by religious broadcasters.

Washington tests show DTV reception problems

According to interim results presented at NAB, DTV reception tests in the Washington, DC, area have shown that fewer than 80% of the sites tested received DTV signals using an outdoor antenna, and fewer than 67% using an indoor antenna. Victor Tawil, a senior vice president at MSTV, claims that these results are probably higher than the percentages that are able to receive a watchable NTSC signal at the same sites.

Tawil also claimed that the DTV reception will improve over time as stations implement full-power operations and the quality of receivers and antennas improves. The DTV test results in the Washington area, which has relatively low buildings, suggest that DTV may be subject to significant reception problems in cities with tall buildings, such as Chicago and New York. ■

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

Dateline

TV, TV translators and LPTV stations in California and TV translators and LPTVs in Kansas and Nebraska must file their 1998 renewal applications on or before Aug. 3. Pre-filing renewal announcements for TV stations and program originating LPTVs in those states began on June 1 and June 16, and should continue on July 1 and July 16.

Commercial TV stations in the following states must file their annual ownership reports by Aug. 3: North Carolina, South Carolina, Illinois, Wisconsin and California. ■

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DTV Update

Back to school

BY LOUIS LIBIN

The technical level of expertise required for broadcasters will continue to rise as stations become more entrenched in digital technologies. As a result of the conversion to digital, broadcasters will be faced with new challenges. Station engineers may even be forced to stand in front of the proverbial blackboard and prove their worth.

The new system

The new DTV system is a significant advance over the current NTSC TV standard. It is also more complicated than the analog NTSC standard. The DTV standard uses digital compression, packetization, and brand-new modulation techniques, as well as audio and unrelated data transmissions. Multiple video formats are also used. This means that full flexibility will be available to broadcasters on video formats, all the way from high-definition pictures to low-resolution images. The stakes are quite high and stations will need to replace all of their existing analog broadcast system with a new digital system.

Digital television has not been precisely defined by the FCC — for example, there are now 18 different formats that broadcasters can use. Broadcast engineers will need to develop experience dealing with the new system under real-world conditions. Until then, there will still be some confusion and the new TV service will not be fully optimized.

Training: The key to success

Start training your engineers now. The new test instruments are not at all like those of the past; the vector scope and waveform analyzer are gone. Now engineers will need to know how to use the vector signal analyzer (VSA). It is a "real-time" spectrum analyzer that samples the entire data block, thus allowing the time and frequency spectrum to be studied simultaneously. Traces can also be superimposed on one another in different colors for clarification, and measurements are fairly automated.

Some of the new test equipment does allow you to make NTSC measurements along with the 8VSB measurements. However, engineers should not be confused by the "old" analog TV standard. The DTV system uses a motion-compensated discrete cosine transform (DCT) algorithm for compression of video signals. DCT exploits spatial redundancy, and motion compensation exploits temporal redundancy. DCT was selected for its good energy-compaction properties, and the many fast algorithms that are available afford low-cost implementation.

In addition, the system employs source-adaptive coding and other techniques for greater coding efficiency. The field and frame motion vectors and the adaptive field/frame DCT coding greatly improve the compression efficiency. The forward analysis with localized quantization-level control further decreases the visibility of the compression artifacts by exploiting the characteristics of the human visual system. This is all different from NTSC power measurements, which are simply characterized by peak power.

Broadcasters must also become familiar with the new receivers. Manufacturers will be working with the broadcast organizations to produce literature for individual broadcasters. The plan is that all receivers currently being built will be able to recreate high-quality picture, sound and data, no matter what format is used.

The transition

As the transition to DTV moves forward, consumers will begin noticing the changes. The first and most obvious quality improvement that DTV will have over NTSC is that it will deliver HDTV programming with double the resolution of NTSC. DTV will also provide many other advantages, whether it is used for one HDTV program or multiple standard-definition programs. It eliminates the chroma crawl interference, inherent to NTSC. Noise in the picture due to poor off-air reception or noisy cable systems is also eliminated, and there will be no ghosting.

It is vital that engineers continue to learn about this new, exciting technology as implementation approaches. Only after station engineers take the necessary time and effort to carefully learn the new system, plan and test their new facilities, will DTV reach living rooms with the high quality that is expected from this hot, new technology. ■

Louis Libin is a broadcast/FCC consultant in New York and Washington.

What station engineers will need to know

- The composition of the 8VSB signal.
- How and where to monitor the 8VSB signal.
- How to test the 8VSB signal.
- The acceptable levels of DTV interference into NTSC home receivers.

Potential problems

- Some digital receivers may display unacceptable pictures.
- A number of NTSC viewers will have to install new antennas to receive good NTSC.
- Different receivers might behave differently.
- Solutions to certain types of interference may cause other interference problems.
- Directional receive antennas for DTV could exacerbate some receive situations.
- In some cases, reducing directional coverage could improve overall performance.

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Compression for storage

This month in *Expert's Corner*, we cover an issue that is sometimes overlooked with disk storage — compression. Digital storage on video disks is now taken for granted. What's sometimes missed in any discussion is that of the compression used with the storage systems.

With several different types of compression technologies available for disk storage, users need to consider carefully how the storage will be used, not just how much needs to be stored. Users need to ask, "Will the disk system compress the signal prior to storage? If so, what format will be used? Also, how will the need to manipulate the video through multiple I/O operations and editing affect the final image quality?"

Compression formats

The major compression technologies currently used by disk systems include M-JPEG, MPEG 4:2:0, MPEG 4:2:2 and DV.

At this year's NAB, we saw disk systems moving away from M-JPEG compression to MPEG or DV. As broadcasters demand the ability to move video directly from their acquisition format to storage without an intermediate step to analog or 601, the compression format used becomes critical to preserving quality.

Also, the ability to move video around a facility at faster than real time is increasingly desirable. This cannot be done with analog or 601. Because there are no field acquisition products with M-JPEG outputs, this places the format in the legacy category. However, at least we can now predict its useful life.

To get an idea of where disk manufacturers are going with compression for storage technology, *Broadcast Engineering*'s writer and industry consultant, Brad Gilmer, conducted a survey among some makers of these products.

Here's an overview of how three of the companies who responded to his survey view today's disk-recording technology.

Editor's note: *For a complete list of disk recording technology and available products, see* "Technology in Transition" in *next month's issue of* BE.

Given that the industry seems to be unable to standardize on a common compression format, are the user's only choices analog or 601?

DVS Digital Video Inc. — Tore B. Nordahl, vice president sales and marketing

No, with HDTV and DTV now being implemented, 601 will have no practical relationship to HDTV in the future. The only relationship will be to possibly use the 270MB/s switching plant for compressed HD if the plant can handle a slightly higher bit rate, 360MB/s (D5).

Drastic Technologies — Patrick Rea, manager, hardware development, and Karen Taul, director of sales and marketing

Currently the most time-efficient manner of translating between formats is to use translation to 601 digital video and then into the desired format. As processor speeds move steadily upwards, conversions between formats will stop going through a translation that includes 601 digital video and recompression. Instead, format-to-format translation will be handled by software routines that are faster than real time and use no recompression.

Pluto — Mark Gray, president

Certainly, the way to get the highest quality image is to keep the media as uncompressed 601 and compress only when absolutely necessary, usually just before transmission. Given that acquisition is now migrating to compressed formats, minimizing the number of compression/decompression cycles and minimizing the number of compression technologies (JPEG, MPEG, DV, etc.) throughout the production process is the only way to optimize picture quality.

Which compression format is better?

DVS Digital Video Inc. — Tore B. Nordahl, vice president sales and marketing

For production, uncompressed HDTV is required. For post-production, intraframe compression not exceeding 7:1 is possible. For on-air play-out, MPEG-2 ATSC is possible. M-JPEG is on its way out.

Drastic Technologies — Patrick Rea, manager, hardware development, and Karen Taul, director of sales and marketing

All of the compression formats have a place in today's production and broadcast environments. DV and Mo-

Continued

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tion-JPEG are similar in the way that the video is compressed, however, there are some differences. In DV, you are dealing with a fixed compression (video quality) level while the video compression of most M-JPEG systems can be varied allowing the user to select the video quality at which they need to work. The other advantages of using M-JPEG or DV is in the editing capabilities that a frame-by-frame compression scheme allows.

Apart from the issue of standardization, MPEG-2 offers reasonable high video quality, while using lower bandwidth than DV or M-JPEG. The difficulties with MPEG-2 arise when you need to edit the material, or when several frames become corrupted as the playback system loses the motion base that the segment is depending on. MPEG-2 main profile is again not much different than M-JPEG or DV, as these are all DCT-based with no motion-based compression.

Pluto — Mark Gray, president

Each compression format has positives and negatives. It is now clear that 70% or more of the world's news will be recorded with DV compression. DV, DV50 and DV100 for high definition will be the standard for producing (editing) broadcast material. If DV is the compression format for acquisition, then it clearly will be advantageous for the broadcaster to keep the DV native format for all editing, switching and processing applications. MPEG-2 has the advantage of much higher compression ratios with the downside that editing is more difficult and limited. Also with MPEG-2 great care must be taken to avoid objectionable compression artifacts. It is our opinion that the station should keep the signal in DV native all the way up to the ATSC encoder. This will result in the best quality, flexibility and performance with a low cost of ownership.

Will vendors provide products that can edit MPEG?

DVS Digital Video Inc. — Tore B. Nordahl, vice president sales and marketing

Yes, but not real-time on-the-fly without modifying the way clips are encoded in MPEG-2.

Drastic Technologies — Patrick Rea, manager, hardware development, and Karen Taul, director of sales and marketing

Currently, available systems for editing in the MPEG-2 format are based on profiles that use no motion-based compression. At these data rates, the storage requirements are the same as DV or M-JPEG formats. The question that the user needs to ask is whether or not the capability of editing in the MPEG format is worth the high system costs for the video quality presented at the output.

Pluto — Mark Gray, president

Some vendors are touting such capabilities, but these systems are unlikely to be effective at anything except cuts only and even then will impose limitations preventing many popular edits, such as back-to-back frame cuts. Keys over, DVE moves, or other frequently used effects will be difficult to achieve in the MPEG domain.

Will vendors provide products that translate between DV and MPEG?

DVS Digital Video Inc. — Tore B. Nordahl, vice president sales and marketing

DVS has no opinion on this. It is not our business area.

Drastic Technologies — Patrick Rea, manager, hardware development, and Karen Taul, director of sales and marketing

Currently, the most time-efficient manner of translating between formats is to use straight translation to 601 digital video and then into the desired format. As processor speeds move steadily upward, straight translations between formats will stop going through a translation that includes going to 601 and being recompressed. Instead, format-to-format translations will be handled by software routines that are faster than real time and will not introduce the need for recompression.

Pluto — Mark Gray, president

We do not anticipate that it will be feasible to edit between the two compression formats (DV and MPEG) without resorting to a full decompression/recompression cycle for at least one of the two formats. Going to 601 will probably be the most straightforward means of dealing with such a situation. The difficulty in editing MPEG 4:2:0 is that it will always require reprocessing and special equipment. It's our opinion that the editing process should be done within the DV format and then converted to MPEG (only if necessary).

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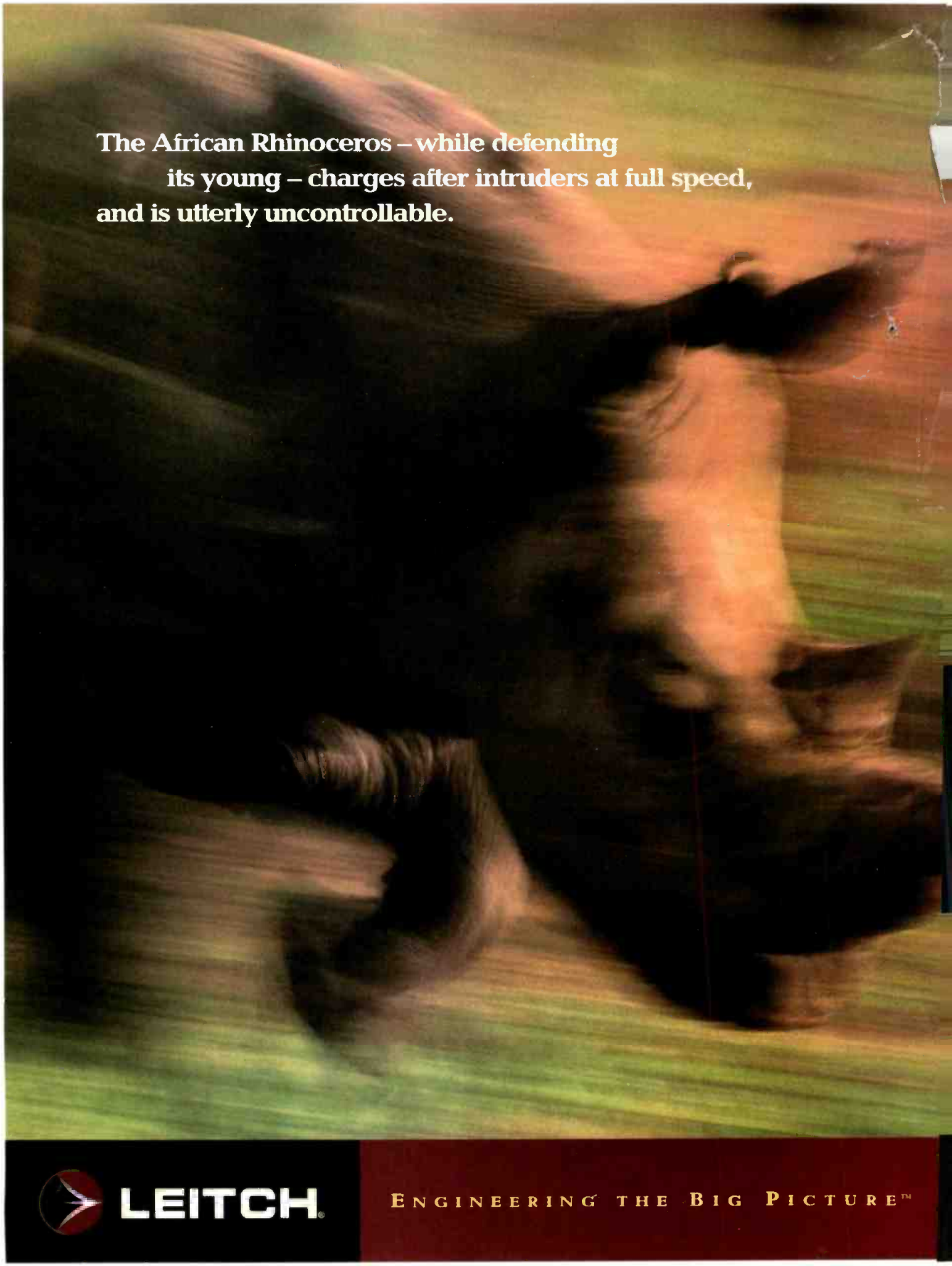

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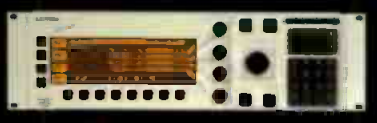

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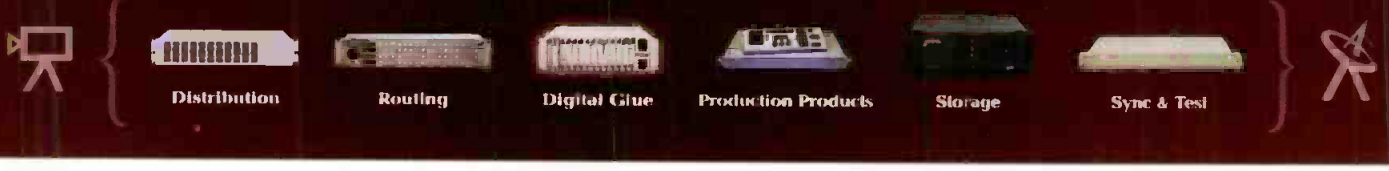


Transition to Digital

Audio levels and metering — the analog environment

BY MICHAEL ROBIN

Audio signal amplitudes are continuously variable. Given the extremely wide range of audio voltages, it is customary to express audio signal levels in decibels with reference to a specific power or voltage level. Currently, there are three commonly used units for the measurement of audio levels: dBm, dBu and dBV.

The dBm

The dBm abbreviation is used to express the root-mean-square (RMS) power of a sine-wave signal with respect to a 1milliwatt (mW) reference. A power of 1mW dissipated into a 600Ω load results in a 0.77459V RMS voltage (rounded up to 0.775V RMS). When dissipated into other load values, other voltages result. The power of 1mW is defined as 0dBm. Other audio power levels are expressed in dBm with respect to the reference 0dBm power level according to the formula:

$$N(dB) = 10 \log_{10} (P/P_{ref})$$

where N(dB) = The number of decibels

P = The measured power level

P_{ref} = The reference level of 1mW

The formula can be extended to the measurement of voltages or currents as follows:

$$N(dB) = 20 \log_{10} (V/V_{ref})$$

$$N(dB) = 20 \log_{10} (I/I_{ref})$$

The above formulas assume that the voltages and currents are measured across identical impedances (e.g., 600Ω).

The dBu

An alternate method of expressing audio signal levels is the dBu. The dBu concept assumes a near-zero signal source impedance and a near-infinite load impedance. Under these idealized open-load conditions, the source does not dissipate any measurable power into the load, and the open-load source voltage is unaffected by the load. The reference signal is 0.775V RMS. For practical purposes, the dBu concept requires signal source impedances of the order of 50Ω or less and load impedances equal to or in excess of 10kΩ.

The dBV

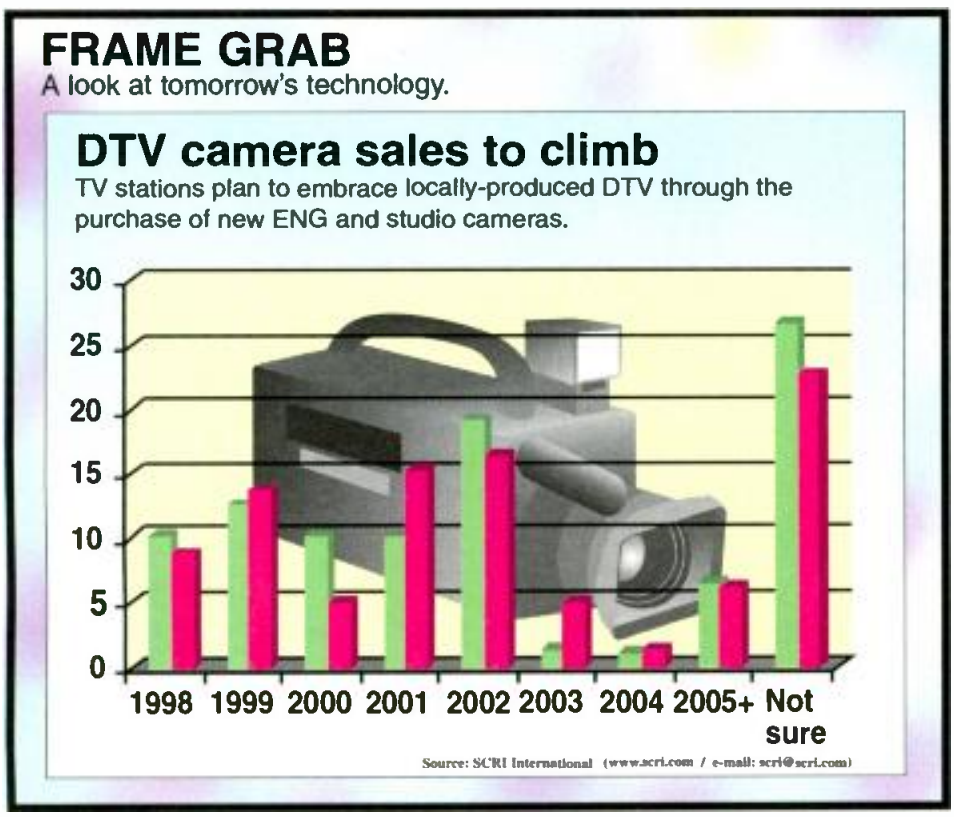
An alternate method of expressing audio signal levels is the dBV. This is an open-load voltage concept, and the reference voltage is 1V. The dBV is used by microphone manufacturers.

Typical signal levels and impedances

There is a wide variety of studio-quality equipment available to the user. Normally, in terms of signal level, there are two main categories, namely, low-level devices (typically microphones) and high-level devices (everything else).

Microphone sensitivity ratings, measured at 74dB sound pressure level (SPL), are commonly expressed in open-load microvolts or dBV. Impedances for professional-quality microphones are standardized at 150Ω, but other values are also encountered in practice. A typical moving-coil microphone, with a source impedance of 150Ω, generates an open-load voltage of 100mV (-80 dBV) at 74dB SPL. The input impedance of the microphone pre-amplifier bridges the microphone output, that is, it has a value of 1,500Ω or higher (10 times the source impedance), to avoid microphone damping and input signal-to-noise degradation due to excessive signal loss.

Audio signal levels generated by microphones are suitably amplified to line signal levels and distributed within broadcast facilities or to common carri-



ers for land or satellite transmission.

The power-matching concept

In North America in the 1930s, the audio distribution line impedance inside broadcast facilities, as well as that of the common carriers and audio transmitters, was standardized at 600Ω. The interconnection of various types of equipment followed the power matching concept. This concept assumes that:

- The audio signal source (i.e., common-carrier line, audio tape recorder, audio distribution amplifier, or audio mixing console) output impedance is 600Ω, balanced and floating.
- The loading input impedance of the receiver (i.e., common-carrier line, audio tape recorder, audio distribution amplifier, or audio mixing console) is 600Ω, balanced and floating.

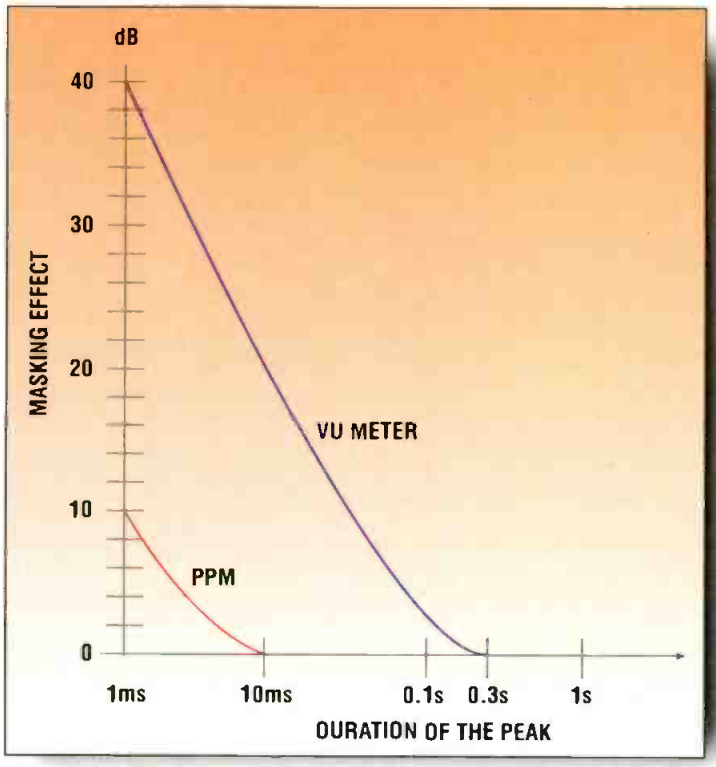


Figure 1. The masking effect of typical VU meter and PPM for a given tone duration.

The audio signal level is expressed in dBm. A standard operating level (SOL) of +8dBm into 600Ω, or 1.95V RMS, was chosen in North America. Some authorities, including sound recording studios, opted for a +4dBm SOL within their facilities. The SOL represents the steady-state maximum level or peak program level as measured with a standardized audio signal level meter (volume unit or VU meter). Many older facilities operate in this manner.

The voltage-matching concept

Modern studios operate in a voltage matching configuration. The signal level is expressed in dBu and the SOL in North America is +4dBu or +8dBu. This reduces the

power requirements of the signal source considerably because it is only required to dissipate a minute amount of power across the bridging load. An added advantage is the improved frequency response and transient response of the system because the capacitive loading of the shielded balanced audio cable has a lesser effect across a source impedance of 50Ω than it has across a source impedance of 600Ω. The interface with common carriers retains the power matching philosophy to avoid return-loss problems with long cables resulting in echoes.

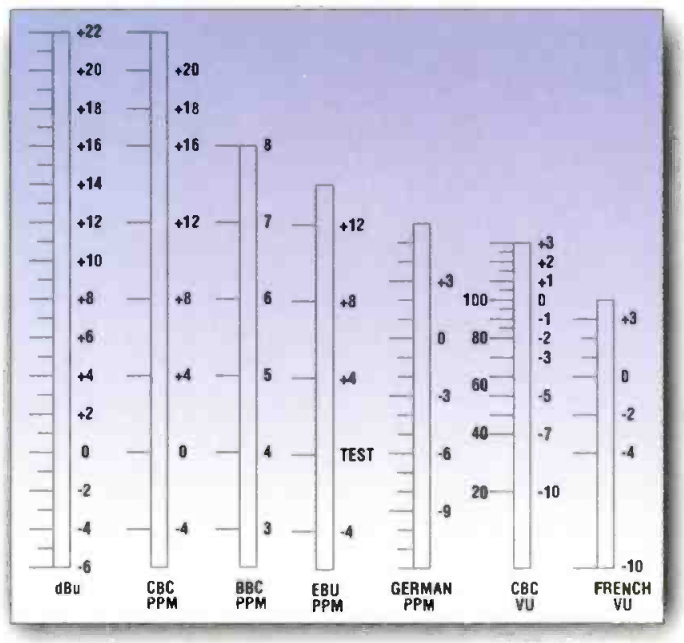


Figure 2. Upper-scale details of some audio level meters used throughout the world and the corresponding steady-state signal level in dBu.

Signal-level monitoring

Audio-signal levels are closely monitored in a studio environment to ensure that sudden or sustained peaks do not cause overloading and distortion in various elements of a system. There are two generic types of audio monitoring meters found in applications for studio environments. These are the volume unit (VU) meter and the peak program meter (PPM).

The VU meter was developed in North America primarily for the control and monitoring of audio program. The specifications of the VU meter reflect the philosophy of the 1930s. Essentially, the VU meter is a moving-coil RMS-type audio-signal level measuring instrument. It is fitted with two scales, a VU scale marked 0 (reference deflection) at about 71% maximum scale reading extending to +3 (maximum) and -20 (minimum), and a percentage scale with 100% corresponding to 0 VU reading

The VU meter has an input impedance of 7,500Ω and as such has a minimal loading effect on the 600Ω source impedance. Its sensitivity is adjustable so that the VU reference level (0VU) can be made to correspond to the SOL (+4 or +8dBm) under steady-state sinusoidal voltage conditions. Its dynamic characteristics are such that if a sinusoidal voltage of a frequency between 35Hz and 10kHz, and of such amplitude as to give refer-

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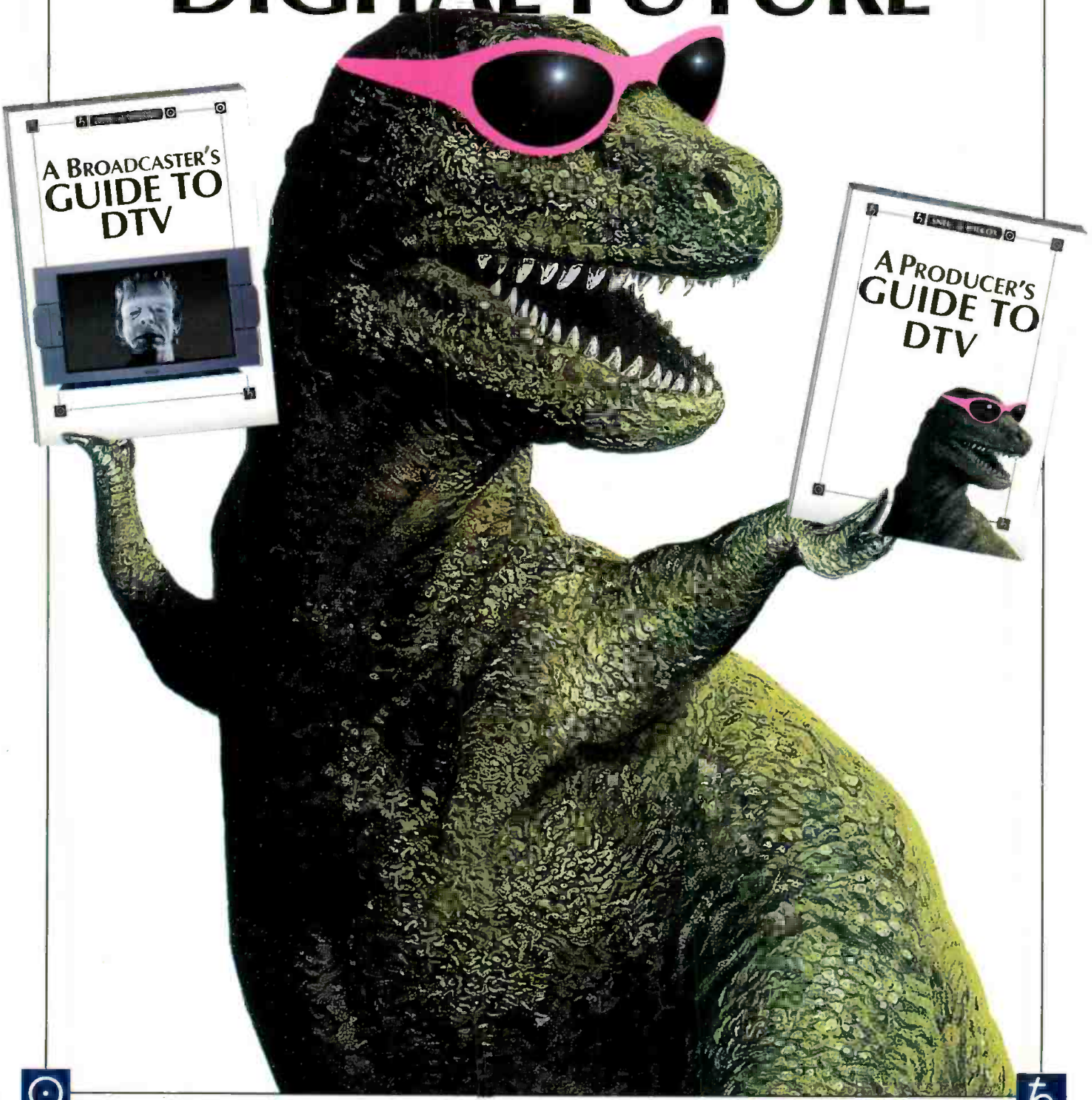

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ence pointer deflection (0 VU) under steady-state conditions, is suddenly applied, the pointer will take 0.3 seconds to reach reference deflection. This characteristic was chosen to approximate the assumed response of the human ear. The 0.3-second rise-time characteristic of the VU meter introduces a masking effect. Essentially, the instrument is unable to give accurate audio signal level indications under complex-wave, fast rise-time, input signal conditions. The instantaneous speech or music signal level may, in reality, be 10VU or more above the readings of the VU meter.

The use of the VU meter has resulted in the need for a relatively large headroom in recording and distribution system elements to avoid the clipping of sudden bursts in audio signal levels. Typically, audio equipment designed to handle an SOL of +8dBm is capable of handling output signal levels in excess of +18dBm at a total harmonic distortion (THD) not exceeding 1%. Such undistorted audio peaks, unnoticed by the operator, are likely to reach the audio transmitter and overload it. The situation is further complicated by FM audio transmitters that use a high frequency pre-emphasis with a time constant of 75μs resulting in a 14dB boost at 10kHz. A complementary de-emphasis at the receiver results in an improvement of the SNR and a linear frequency response. The high frequency preemphasis concept was developed in 1940 when the presence of high-level high-audio frequency signal was unlikely to occur. It can potentially lead to overmodulation of the FM transmitter in the presence of high-level high-frequency spectral component in the audio signal. Various types of limiter/compressor combinations are used in an effort to avoid transmitter overmodulation and to achieve an acceptable SNR.

The PPM is a peak-reading instrument of European origin capable of adequately displaying audio signal transients. Some current designs feature a 10ms attack time (risetime) and a 2.85-second fallback time. This characteristic amounts to a "sample-and-hold" approach to audio-signal-level monitoring. It allows the user to accurately monitor audio signal levels under steady-state and program conditions, reducing the need for large amounts of headroom in studio equipment. Neither the scale nor the display is universally standardized. Its input impedance is usually in excess of 10k. The use of the PPM is gradually gaining favor in North America and is in common usage in most European countries. When properly used, it reduces the need for signal compression as audio transmitter overload is less likely to occur.

Present-day meters

Figure 1 shows that the PPM is capable of more accurate peak audio signal level measurements than the VU meter. There are two entrenched camps steadfastly preferring the PPM or the VU meter. In an effort to satisfy all the users of contemporary audio equipment, manufacturers offer equipment with selectable VU or PPM rise/fall times.

Figure 2 shows details of the upper part of the display scale of some audio level meters used in various countries. This drawing shows clearly that, in addition to transient response differences, various organizations have different reference levels (SOL) and meter display scales. This situation creates problems in international TV program exchanges and is not likely to change in the near future. ■

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

Computers & Networks

High-speed networking topologies

BY BRAD GILMER

There are four basic topologies employed in computer networks today. These are point-to-point, star, Thinnet and switched fabric.

Point-to-point

Figure 1 illustrates point-to-point topology, in which each node is directly connected to the next without any intervening hardware. The most common systems using this topology are Fibre Channel arbitrated loop (FC/AL) and token-ring.

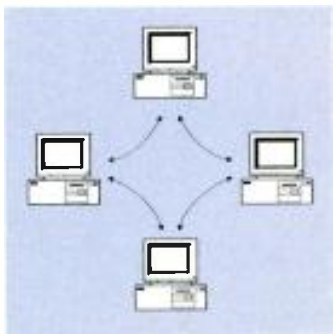

Figure 1. Point-to-point topology.

Point-to-point topology is low-cost, but it has a big drawback. It is subject to many single points of failure. Since each computer is connected to the loop, the failure of any cable, any computer, or any network interface card can cause a complete loss of communication amongst all the computers. A common way to deal with this problem is to employ two loops. Another method is to move to the star topology (see Figure 2).

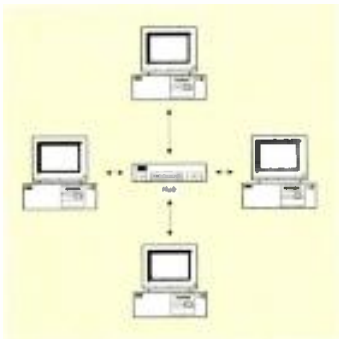

Figure 2. Star topology.

Star

In the star topology, each node is connected to a hub or concentrator. This is the basic building block of 10BaseT Ethernet, the most popular networking system in use today. It is also used

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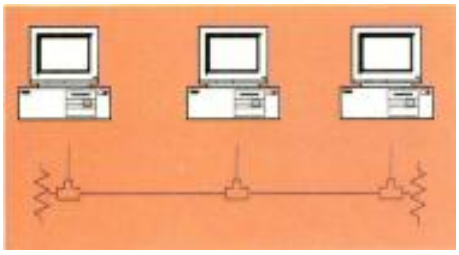

Figure 3. Thinnet topology.

in Fibre Channel networks when designers want to protect users from the problems associated with point-to-point systems.

A disadvantage of star topology is it's somewhat higher cost. However, a big advantage is that almost all hubs can isolate a faulty node, preventing a bad connection from affecting other computers attached to the network. Of course, the hub is a single point of failure, and steps should be taken to minimize risk in this area.

Thinnet

Figure 3 illustrates Thinnet topology in which all computers connect to a common cable. This topology is employed in Thinnet Ethernet systems.

The strengths and weaknesses of this system are identical to that of point-to-point wiring schemes. The system is inexpensive but if a connection fails, it will affect all computers on the network.

Switched Fabric

The fourth topology is switched fabric. Switched fabric topologies are commonly used in switched networks such as Ethernet or Fibre Channel.

Switched networks can provide the highest aggregate bandwidth of any topology currently available short of dedicated point-to-point networks. Switched fabric networks will be the basis of most high-speed networks of the future.

With the exception of switched fabric topology, in all of the diagrams above,

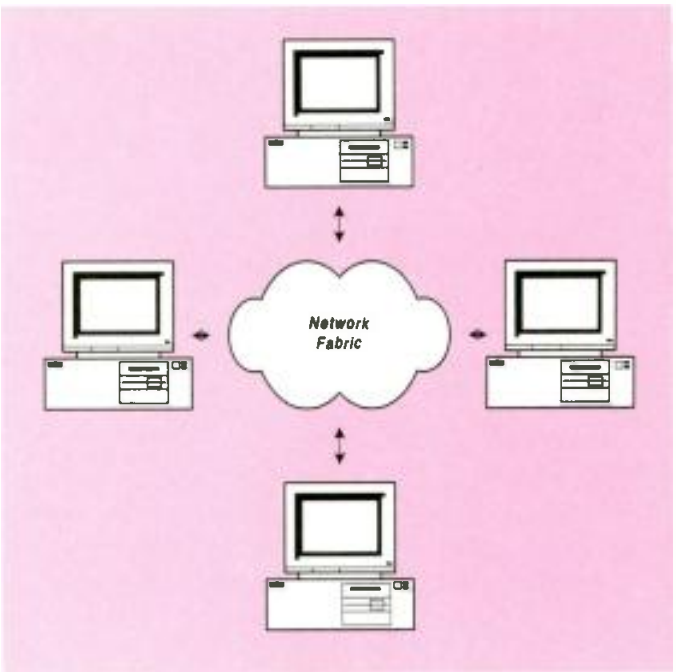

Figure 4. Switched-fabric topology.

as the number of nodes on the network increases, performance decreases. This is because these networks connect everyone together on one big party line. As with an old-style telephone party line, if more than one person talks, it can be very confusing to determine what is being said. For this reason, most modern networking systems include a method to ensure that only one node talks at a time. Clearly, if your system is large, and many people are talking, performance for any given node will suffer.

In the past, network designers resorted to keeping individual network segments small. They connected a number of segments together with bridges to build larger networks. Bridges isolate the chatter on one network segment from another and only send messages across segments when required. This resolved the party line problem to some extent, but it did not fix it entirely. Users unfortunate enough to share a segment with a fileserver,

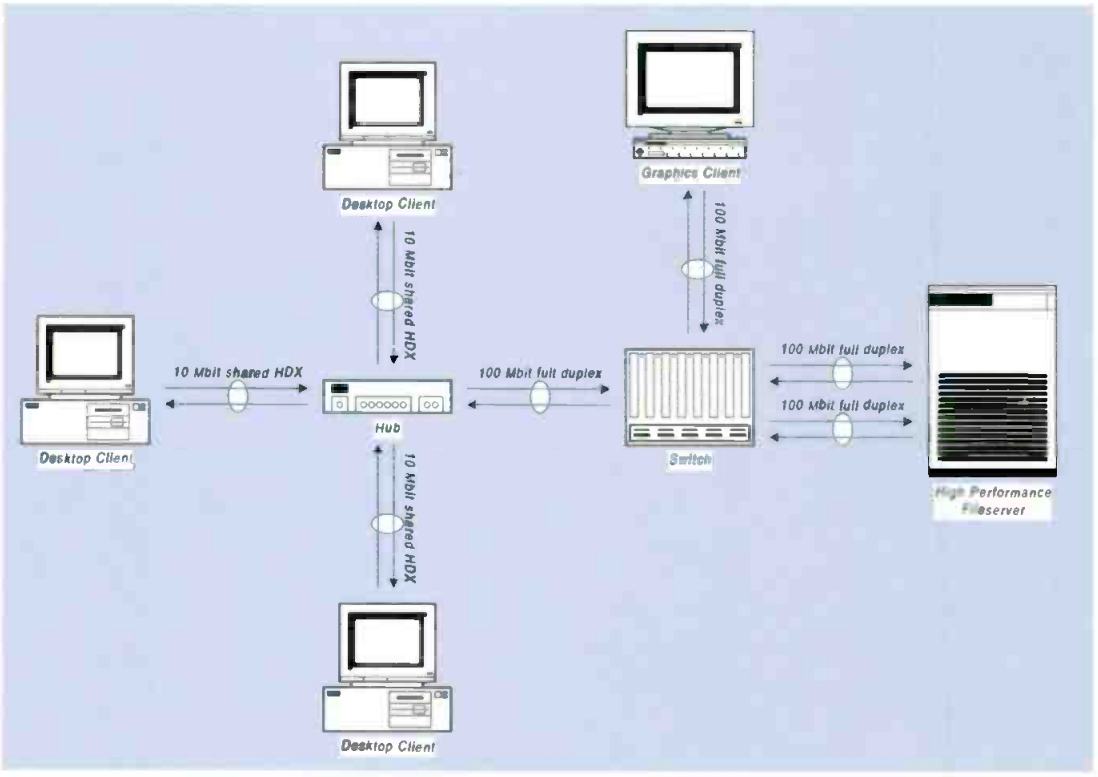

Figure 5. An example of a high-performance switched topology network.

graphics workstation, or other high-bandwidth device, typically noticed a significant decrease in performance whenever those devices were active.

So what is the difference between a switched fabric and other topologies? The biggest difference is that a switch can give you a dedicated full-bandwidth segment all to yourself. This means that if you are running a 10, 100 or 1,000Mb network, you will have access to all that bandwidth (less overhead, of course). Another big difference is that, once you go to a dedicated segment, you are able to use full duplex communications – that is, you can send and receive data at the same time. In other systems, one person talks while everyone else listens. Furthermore, in particularly heavy usage situations, you can install more than one network connection to a device to provide simultaneous dedicated full bandwidth connections.

Figure 5 illustrates how a switched network might be constructed to provide very high bandwidth connectivity to a server and a graphics client while providing conventional connectivity to typical desktop users.

Here are some things to note in the drawing. First, the server is given two 100Mb/s full duplex connections to the switch. Since it is the only computer on these nodes, it has the full 100 megabits available on each link. It is possible to add more than two cards to a server, increasing the available network bandwidth even further. (There is no point in increasing the network bandwidth if the server has I/O or other limitations.) Second, note that the graphics workstation has a dedicated 100Mb/s full duplex link to allow it to exchange very large files with the server. Third, note that the Ethernet hub provides desktop clients access to the same high performance server, but over much slower 10Mb/s shared links. Finally, note that the graphics workstation can consume all its available network bandwidth to the server without affecting any of the desktop connections.

The example shown in figure 5 illustrates only one topology for a high speed network. There are many other possibilities, including network designs that allow for shared common storage for multiple servers (called Storage Area Networking, or SAN) based on Fiber Channel. One can easily imagine a high speed network with shared area networking providing common access for non-linear editors to a common pool of broadcast-quality video. Designs such as these were not possible as recent as a few years ago.

New networking equipment and techniques are being developed all the time. One thing is for sure — broadcasters will be at the forefront of this technology employing high speed networking in video applications.

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

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Malloc failure

As you might guess, not all of the letters I receive make it into the column due to space limitations. Well, recently I helped Walter Kuhne with a flash-frame problem. It seemed that editors had placed 100 IRE white frames in a video to mask a jump cut and it was causing a monitor to apparently lose sync:

This is the second time I am sending an e-mail to Dr. Digital, and I would like to thank you for your attention regarding the first one. The main reason for this e-mail is to find an answer regarding a message that sometimes comes out from our ACR-225 machine. We have two and are using version 4.1a software. Sometimes, when we are including or cutting some events in the playlist, we try to save the most current playlist after modifying it, and a message appears in the display that says "Malloc failure." Could you help me regarding this message? Where can I find its meaning?

Walter Kühne Jr.
On-air supervisor
MTV Brasil

An ACR-225? There aren't many of those beasts around. The term "Malloc failure" is a computer term. Malloc, or memory allocation, is an operation whereby the system sets aside, or allocates, a section of memory for a specific task. In this case, the task is probably to set aside a copy of the original file. It could be failing because of the size of the log file or because of several other reasons. That should answer the "what" part of the question.

I checked with Ampex to determine how to eliminate the problem. It turns out the problem is in the ACR-225, rather than the PC attached to it. Adding memory to the PC will not help. The ACR was designed to handle a playlist of 1,500 events with no problem. However, a larger active playlist can easily overflow the ACR's internal memory — which is what is happening is this case. The cure is to keep the size of your playlist under 1,500, thereby preventing the errors.

Need help? Drop me a note at drdigital@compuserve.com. ■

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What's Real ***What's Next***

Transmission & Distribution

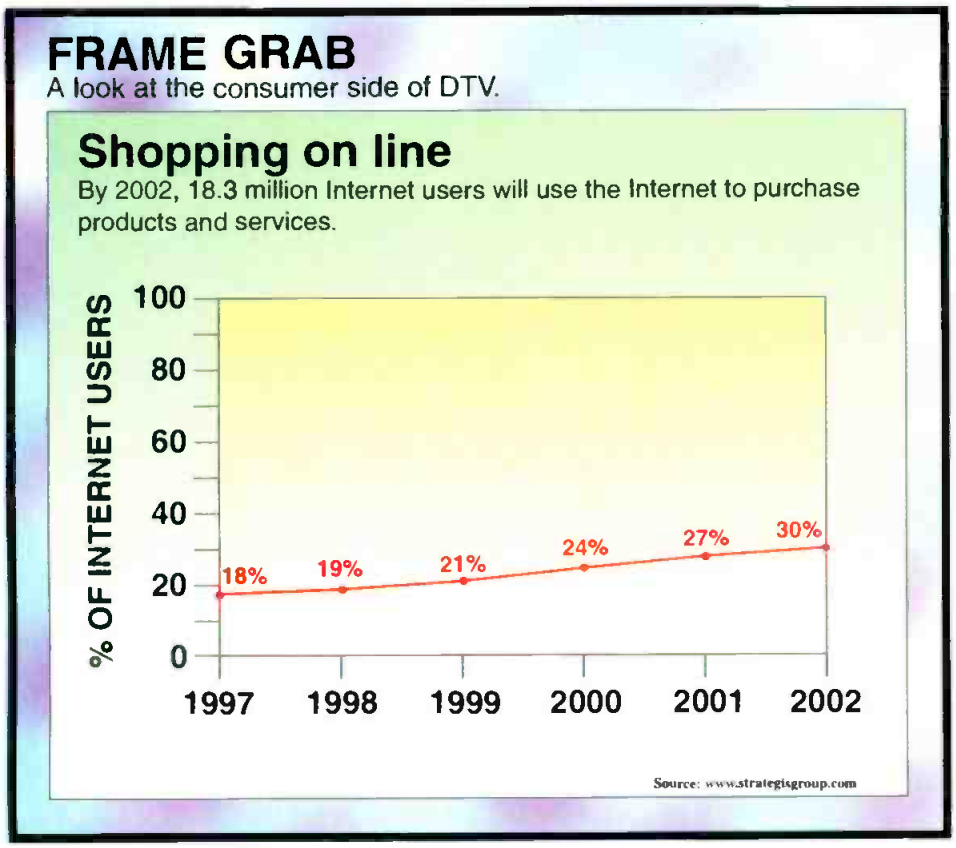
Tower lighting systems and problems

BY DON MARKLEY

First and foremost, the rules of the game have changed slowly over the past few years. Perhaps the most significant point to remember is that the FCC places primary responsibility for maintaining proper tower marking and lighting with the registered tower owner. If you rent tower space, you are not totally relieved of responsibility for such systems; you will be called on if the owner fails or is unable to maintain the tower properly.

The other big item concerning tower lighting actually occurred a few years ago; however some operators do not seem to be aware of the change. If a tower is less than 200 feet above ground level, it may be possible to eliminate existing lighting and to also stop painting the structure. The operative word here is "may." It is not acceptable to simply pull the plug. Existing towers under 200 feet that are marked and lighted have usually been so equipped as a result of conditions on construction permits and/or licenses. That means that a notification was filed with the FAA, a no-hazard opinion was issued and the commission directed the way the lighting and marking was to take place. In some cases, even for towers below 150 feet, the marking and lighting is still necessary due to nearby aeronautical facilities.

Intermediate tower lights can no longer be installed on the tower. Existing towers are "grandfathered," but new towers must have two fixtures installed so that at least one light is clearly visible without any obstruction from the tower members.



For towers under 200 feet, it still is necessary to obtain FCC approval before eliminating the lights. The FAA must agree that the lighting and marking is no longer required before the commission will grant approval, which actually involves a modification of the station license.

This can be sought by filing FAA Form 7460-1 with the FAA regional office. The address of the office for your area can be obtained from the FAA web page at www.faa.gov/

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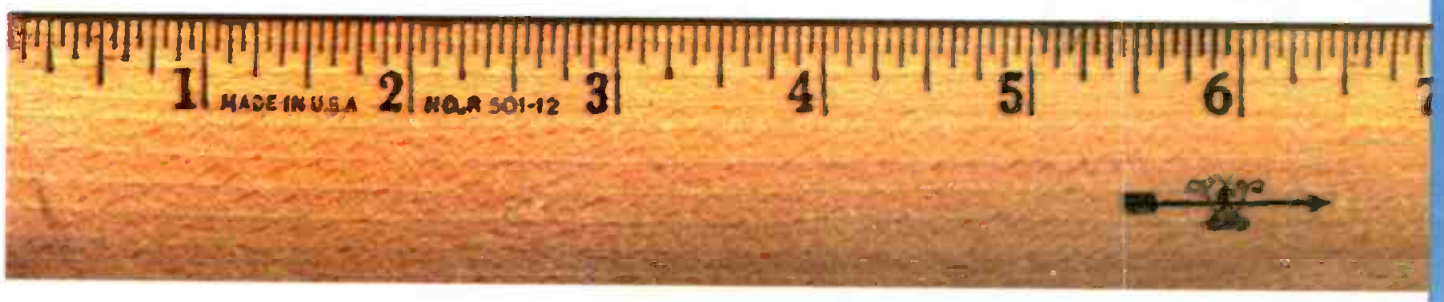

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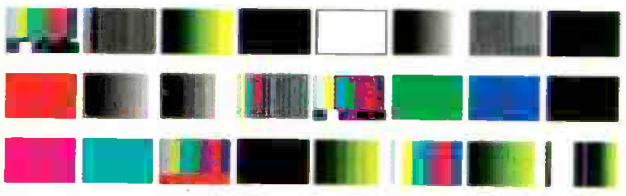

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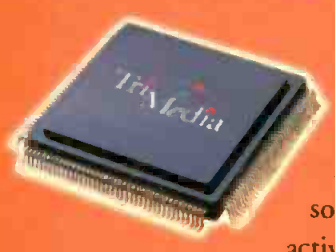

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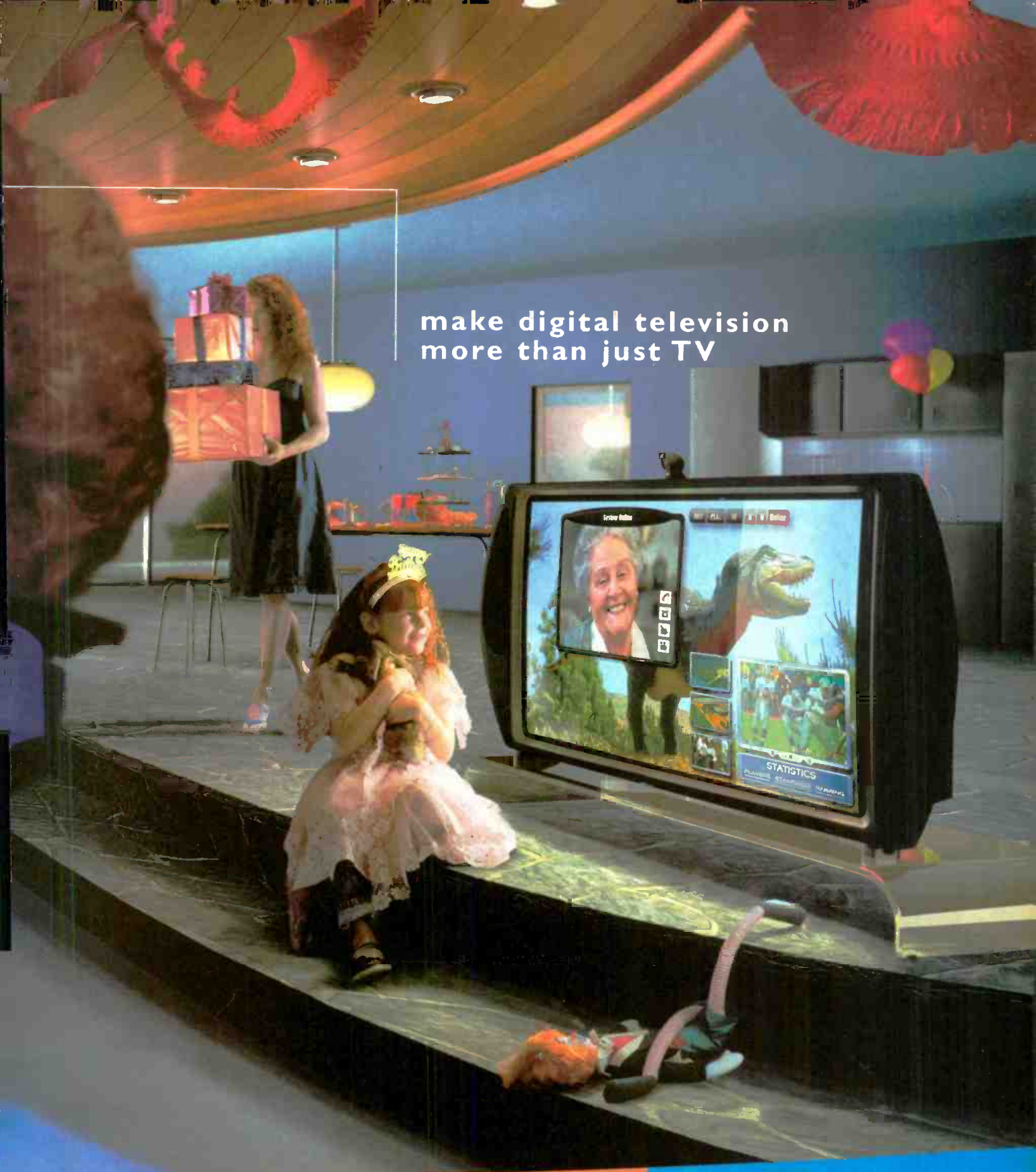

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If it is found that the tower does not present a hazard to the navigable airspace based on the current regulations, the FAA will issue a "No Hazard Determination" that clearly states the requirements for marking and lighting. Assuming that such a determination is in hand, a letter to the FCC identifying the structure, along with the registration number and a copy of the FAA determination will result in the commission's approval to turn off the lights. Now comes the fun part.

Removing the lights

Removing the lights from towers used for AM will cause a change in the tower's base impedance. This requires measuring the impedance and filing FCC Form 302 for direct measurement of power using the new parameters. Of course, the FCC should be advised that the station is measuring power by the indirect method prior to removing the lighting. Form 302 can also be used to advise the commission of the new total structure height.

If the tower is in a directional array, it may be necessary to touch up the tuning of the array slightly after the lights are removed. Again, removing the lights changes the electrical height of the towers slightly. This then changes the base self-impedance, which in turn changes the power division slightly. As a result, these changes will mess up the array.

The FAA has changed the requirements for obstruction lights.

When the removal of the lighting system includes removing the wiring from the isolation coils to the tower for the lights, the base impedance will be further changed. The existing base impedance values and operating impedance in directional arrays include the shunt effects of the isolation coil or coils. This can be significant for tall towers. Again, the prospect of measuring the impedances and retuning becomes a reality.

In brief, it is probably best to content oneself with simply turning off the breaker and leaving everything on the tower as it is. That way, no height changes occur, no notifications are necessary and no retuning of the antenna systems is needed. At some point down the road, other maintenance requirements will doubtlessly require touching up the array or remeasuring the base impedance. At that time, it may make sense to eliminate the lights including all conduit and wiring, especially if deterioration of those components is the cause of the maintenance.

Change in requirements

One other change in the regulations needs to be addressed. The FAA has changed the requirements for obstruction lights. For towers tall enough to

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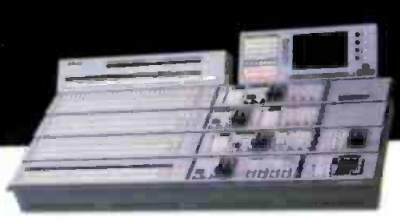

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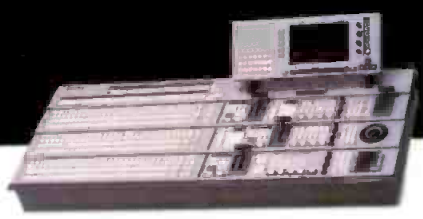

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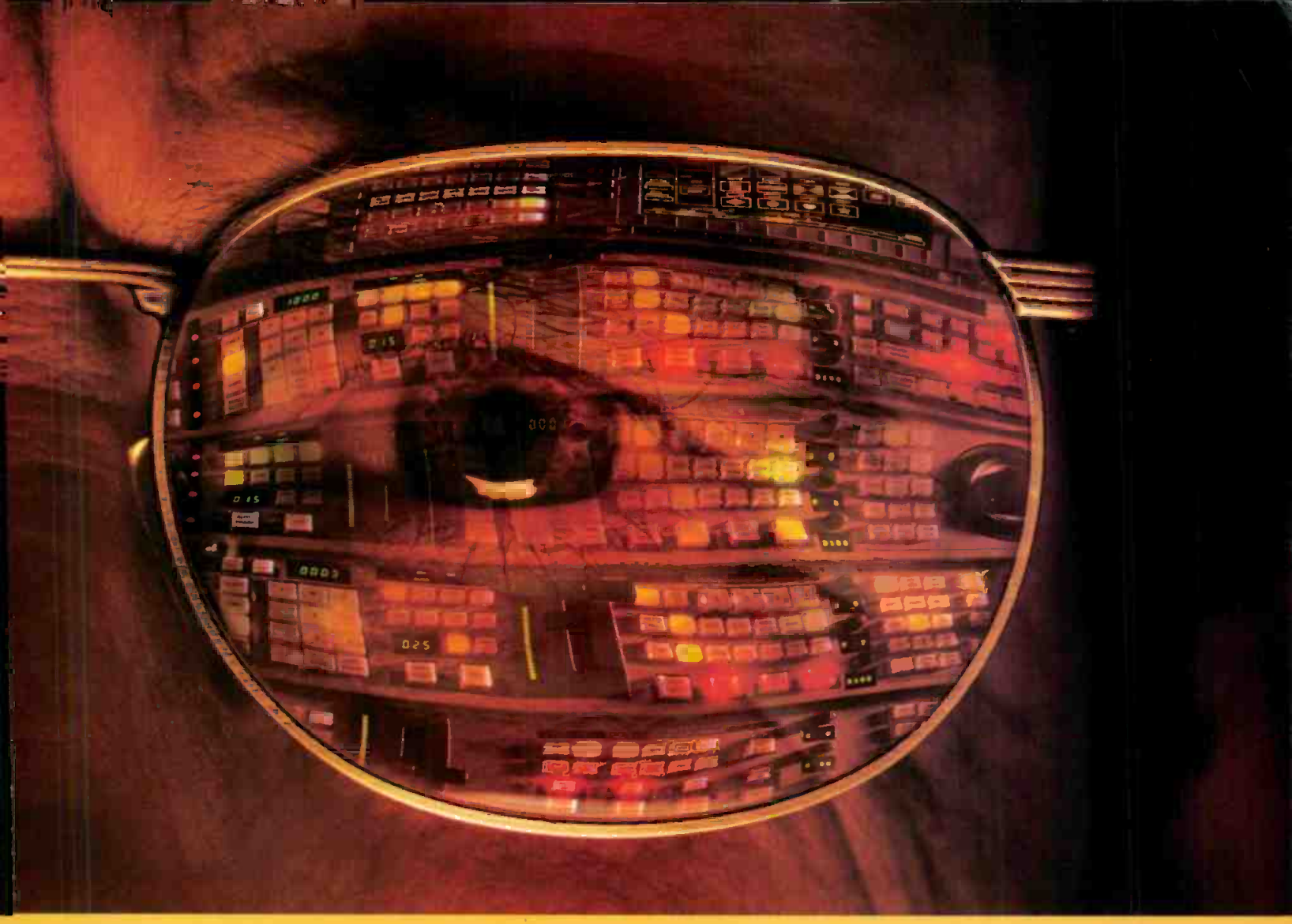

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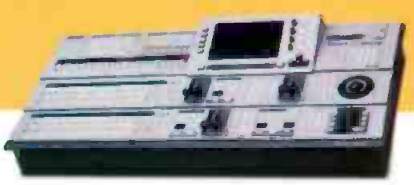

DVS-7200 System

DVS-7300 System

Features and specifications are subject to change without notice.

require one or more sets of intermediate obstruction lights, the FAA now requires that two light fixtures be installed so that at least one light is clearly visible without any obstruction from the tower members. Such was not the case on older towers where the intermediate lights were often inside the towers themselves. Some riggers have been selling new lights based on the change in regulations; that is not necessary. The old lights are "grandfathered" and do not have to be replaced until some other change is required. Usually, that change is involved with changing the height of the tower such as changing out a top-mounted antenna system.

Even when changing the height of the tower, it may be possible to leave the existing lights alone. For example, if a pole-mounted FM antenna or a top-mounted TV antenna is being replaced, there will often be a change in several feet in the overall structure height. Such a change causes all of the lights to be in the wrong place as they would no longer be uniformly spaced along the tower. However, it is possible to obtain permission from the regional office of the FAA to leave the lights alone if the change in height is not major. A few feet of change in the light spacing won't normally create a hazard to aircraft. However, get the approval from the FAA in writing for the files in case anyone does hit the tower.

Normal maintenance is usually taken care of by the tower crew during relamping. The only time that the station staff becomes involved is when flasher components are replaced or when catastrophic failures of the system occur, such as burnouts from lightning. The most common problem for AM towers will be a need to replace the isolation coils. While this doesn't constitute a significant problem, it will be necessary to go through the whole impedance bit as described earlier to maintain normal operation. ■

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

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From here to there

BY BARRY THOMAS

The technology of sending and acquiring remote audio has changed dramatically over recent years. Old methods for transmitting sound for remote applications were fairly straightforward — dedicated program lines, dedicated-channel broadcast RPU, telco dial-up or subcarrier on the video feed. Telco deregulation, frequency congestion and high demand for remote feeds have forced the development of alternative audio backhaul methods. While some of the old ways can still be used, new technology is available that can help improve the quality and flexibility of remote audio feeds.

IFB

In many markets, fixed short-distance feeds can often use the classic methods. The wireless RPU-band IFB system is the most convenient of the options, but a growing number of applications will benefit from alternative methods. The typical fallback plan is to use some sort of dial-up circuit and a coupler to feed the headphone mix back to the talent and crew.

There are a wide variety of products to serve both ends of the circuit. The simplest method relies on an auto-answer coupler at the studio with the talent literally listening to a phone-line feed of on-air audio. At the other end of the quality (and price) spectrum is a high-quality automatic-answer telephone hybrid at the studio end and similar equipment at the remote site.

This technology is particularly useful where only cell-phone service is available at the remote site. While the speaker output of a cell-phone "hands-free" kit will provide an easy connection, products are available to interface a bag-style phone with standard broadcast connectors, thereby providing a simple hook-up to the talent's headphones. Although this approach has the advantages of being extremely compatible, compact and easy to interface, quality and intelligibility suffer because the best quality you can achieve is limited to the cell-phone line response. Audio frequency-extension systems can improve the quality, but compatibility may be reduced and cell-phone performance is often unreliable. Multiline frequency-extension systems will not work with cell phones, so forget that idea.

Digital compression techniques developed recently offer a much greater field of choices. Dial-up digital codecs that can send voice-quality audio over a simple dial-up line are available. These systems are basically 28.8kb/s or faster modems with digital audio encoder/decoders included. Like frequency-shift systems, these devices require a coder/decoder at each end but their performance can be impressive.

Cell phones cannot be used with the dial-up codecs for many of the same reasons that they are not advised for frequency-extension systems. ISDN systems operate similar to dial-up, but the two-channel nature of the digital signal provides the potential for multiple audio feeds on a single ISDN line. Encoder/decoders are required — some serving as the ISDN telephones' terminal adapter.

The Comrex Vector POTS codec delivers 15kHz two-way audio on one standard telephone line.

With a number of transmission algorithms and data-reduction standards on the market, compatibility is an issue. Even though most ISDN codecs are supposed to recognize the major standards, you should plan on prior coordination to insure that the data and sample rates, coding algorithms and levels are compatible. Even though the ISDN option is more complicated than a simple dial-up circuit, it can provide close to CD-quality audio.

Delay

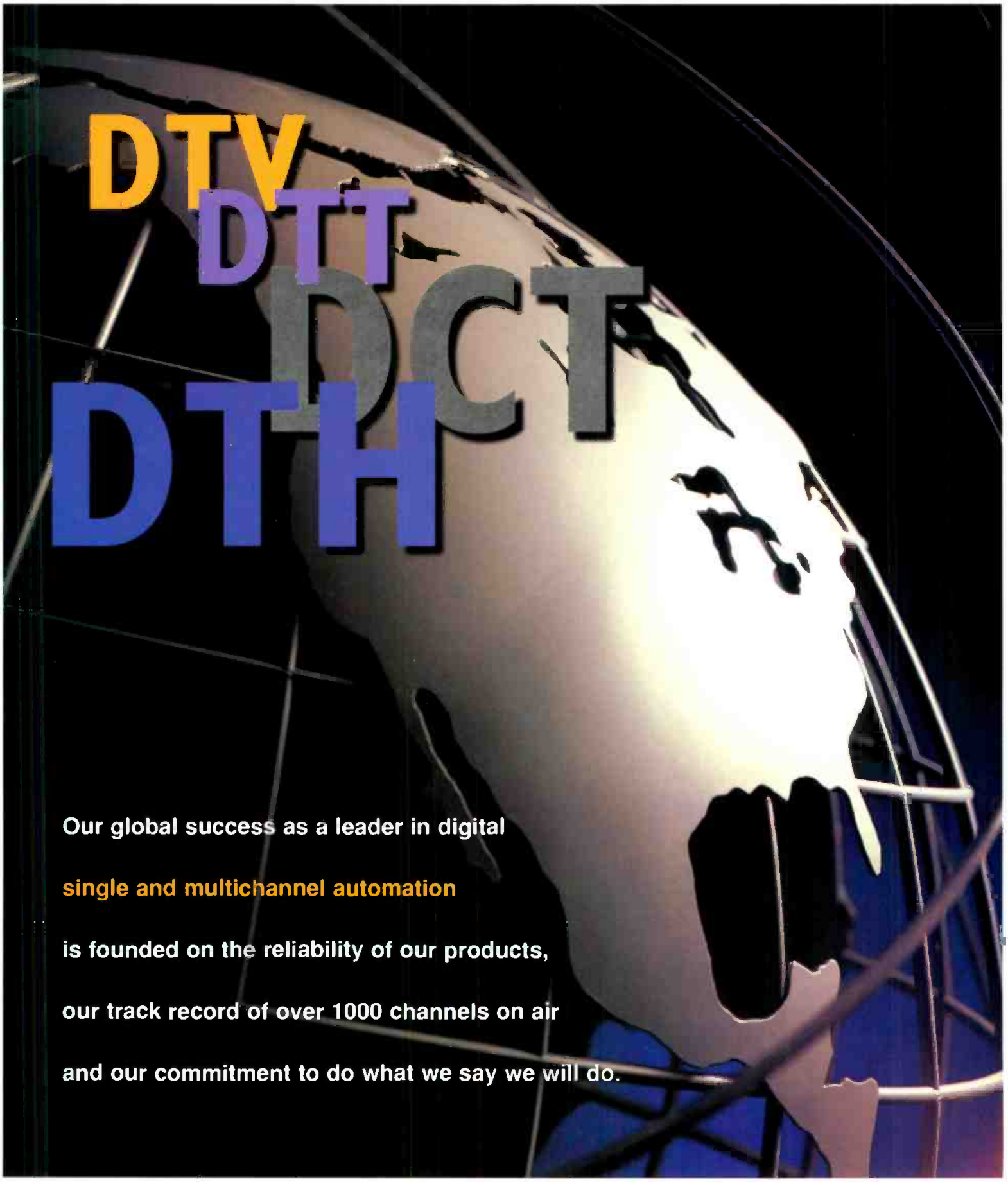
The caveat with any of the digital systems is "delay." Dial-up line systems can result in a delay of up to 130ms, while the delay from a CD-quality ISDN codec may typically be 280ms. This amount of delay is extreme and can make on-air conversations similar to intercontinental telephone calls. Needless to say, on-air talent will not like dealing with this.

The best quality-vs.-delay ratio can usually be achieved by using an ISDN codec with a lower-quality coding scheme like the 7.5kHz G.722 coding standard. Delay on this combination is typically 90ms, which is much less noticeable and more tolerable by the talent.

Remote feeds

Typically, the audio feed will accompany video in a standard remote feed. In some video applications (with DTV, this will increasingly be the case), there may be the requirement for high-quality audio. Radio engineers have great experience in this area and some lessons can be learned from their research. Simple RPU technology provides the greatest mix of flexibility, ease of use and quality. Audio transmitters in the RPU band typically provide an 8kHz to 10kHz response. Audio links in the microwave bands can offer greater bandwidth and quality for fixed-location remote feeds.

Dial-up telephone options are similar to IFB applications, but the feature set will be slightly different. Typically, a high-quality hybrid or coupler is used with a dedicated phone line at the studio that feeds into the control room's audio console. The high-quality systems are typically two-way, allowing IFB and communication to be included for con-



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venience at the remote site. Some couplers offer signaling systems that can start recorders, activate audio channels or turn on warning lights when a call is connected. This can be extremely helpful to reduce the on-air "testing" of an audio feed ("Let's go now to our reporter at the scene. . . Can you hear us?"). The cell-phone interfaces mentioned earlier are specifically designed for this application and can offer a quick and flexible means to transmit sound from a remote site.

Audio frequency-extension systems are particularly appropriate in wired, dial-up applications. Program-quality sound can be transmitted using single or multiline frequency-extension systems at reasonable cost and with ease of use. These systems offer some security for the dial-up link. A simple telephone signal will not be intelligible should the phone number of this audio feed point fall into the wrong hands. Frequency extension systems are, again, not recommended for cell-phone links. This is because of the aggressive processing and digital coding used by cellular systems.

Dial-up and ISDN lines

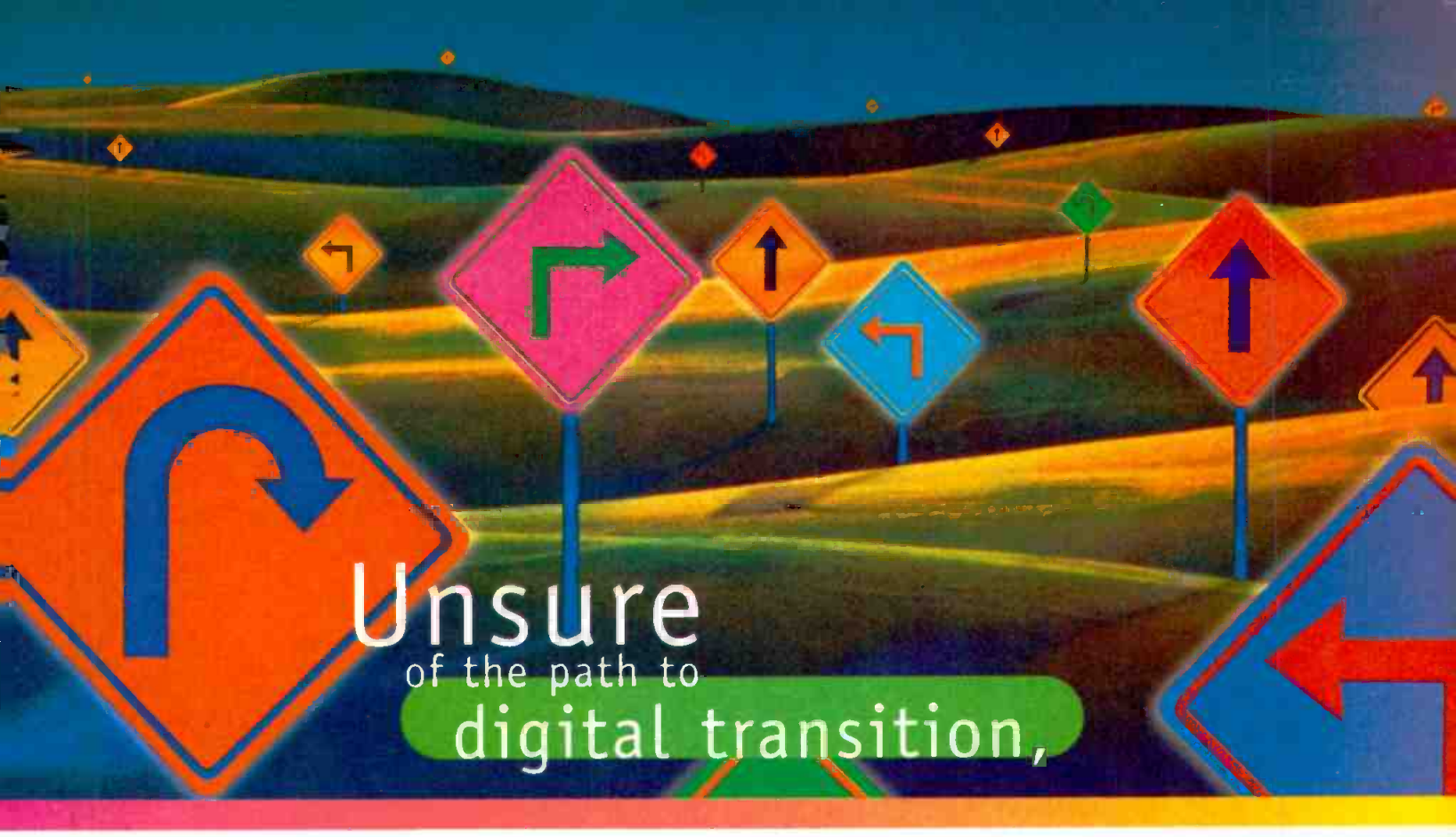
The digital audio coding systems are excellent for this application because delay is not likely to be a significant factor. Dial-up digital codecs can provide excellent medium-grade sound, while ISDN codecs can transmit stereo CD-quality audio.

Because broadcasters are usually in control of both ends of the audio feed, connection over dial-up or ISDN lines can be quick, easy and almost automatic. Cell-phone or wireless connection of this technology is not currently possible. However, there are high-quality wireless broadcast audio modems available that can transmit CD-quality audio over significant distances using spread-spectrum technology. The distance is typically limited to 10 miles or less and can be greatly affected by the antennas and cables used.

Most of the wired digital codecs are two-way, allowing IFB to be sent back to the remote site. Delay becomes an issue when the return feed is used as an IFB. If the talent hears a full IFB that includes the remote broadcast audio, they may be distracted by the coding delay. The audio will be coded twice and can be one-quarter to three-quarters of a second long. This requires that the remote talent be fed a *mix-minus* from the master control console. This is the audio mix minus the remote audio. The remote sound is then mixed at the remote site into the talent's audio feed. The talent can then hear him- or herself in real time mixed with program mix-minus audio, which is digitally transmitted. The good news here is that many of the digital codec manufacturers are including this local mix provision into their designs.

There are several solutions for getting the audio from the remote site back to the studio. Piggybacking audio on the video feed is only one method. Consider some alternatives, especially when the news crews operate without engineering support, or in those cases where high-quality audio is needed. ■

Barry Thomas is chief engineer at KCMG-FM, Los Angeles.



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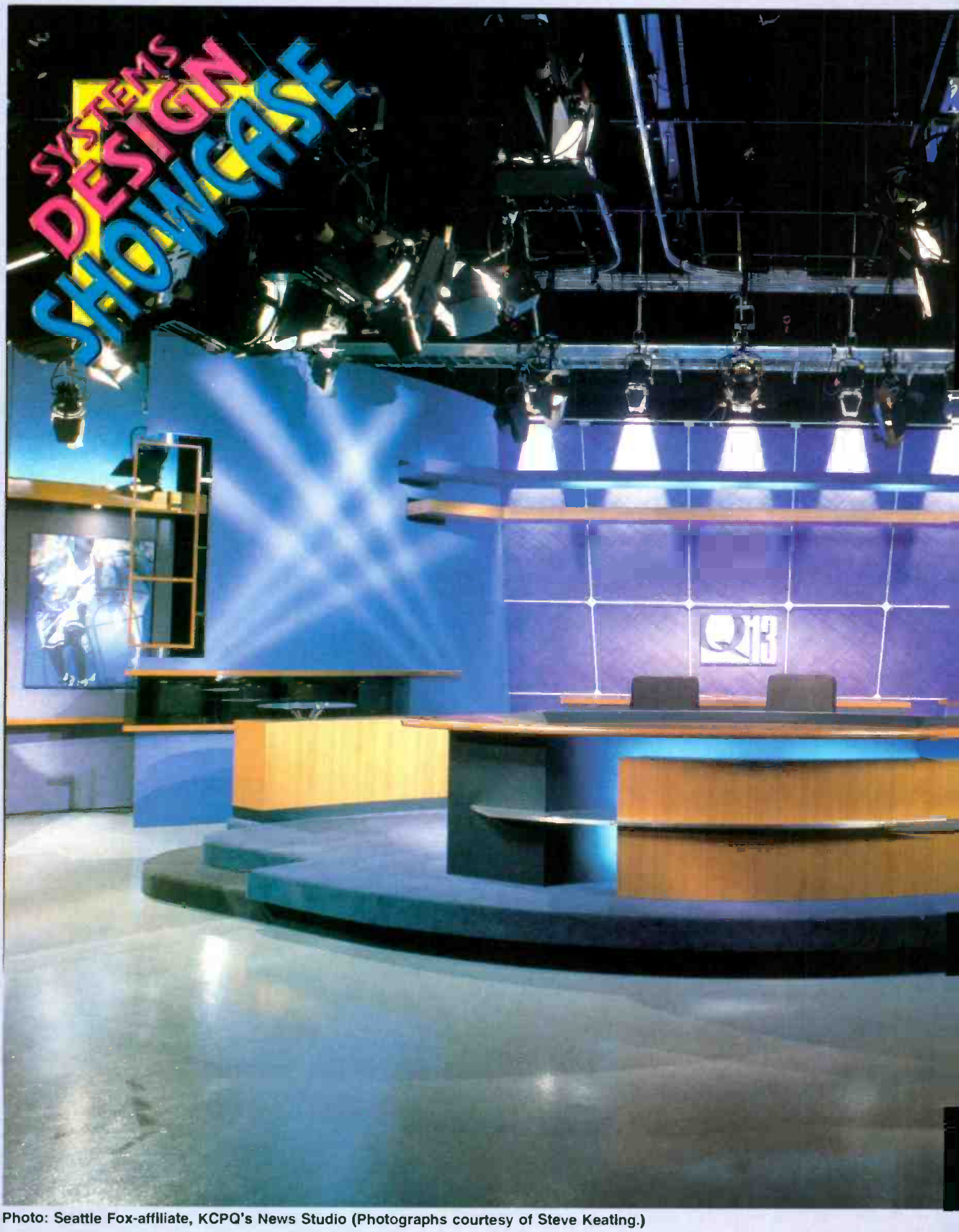

Photo: Seattle Fox-affiliate, KCPQ's News Studio (Photographs courtesy of Steve Keating.)

KCPQ News expands

By Greg Doyle

In September of 1997, Fox-affiliate KCPQ 13 went on-air from its new broadcast facility in Seattle. Designed by Sparling Technology Consultants, this facility incorporates component serial digital video and AES digital audio throughout. When the facility was being designed, news was something that KCPQ thought might happen in a couple of years. To accommodate this future expansion, router frames were oversized and floor space was set aside for the news operation. In September however, KCPQ's business model changed, and news became an immediate priority.

Sparling provided architectural programming and electrical engineering to develop the floor plan and electrical infrastructure for the news expansion. Sparling then worked with Tektronix and KCPQ to design, install and commission the news system, and in mid-January of 1998, KCPQ began broadcasting a 35-minute nightly news cast and 30-second weather breaks at the top of each hour.

The news system is built around Tektronix's NewStar software, EditStar non-linear server-based edit stations and Profile disk recorders. KCPQ uses WSI weather stations for weather graphics and Barron Doppler radar for real-time local weather information.

The system's backbone

It was decided that news would be produced using networked server technology and would again be entirely serial digital video and AES/EBU audio. The primary goal of the

KCPQ News expands

news operation was to share information among multiple workstations in a networked environment for editing and automated play-to-air.

The heart of the news operation is built on three major components provided by Tektronix, including NewStar news automation software, EditStar script-based editing system, and a Profile networked video file server. Using a common networked architecture, these components provided an integrated solution to news acquisition, editing and automated play-to-air.

NewStar operates on Microsoft Windows 95 for the desktop and Windows NT 4.0 for the network. Ancillary devices, such as a character generator or still-store, are connected to the network through intelligent interfaces or machine control units. As a story is being created, graphics and stills are seamlessly added to the story time line. Equipment such as Telestrator and closed-caption devices receives information generated by NewStar during the creation of news stories. Still-store clips can also be assigned during this process. When stories are aired, the system automates the playback of these story elements based on a timeline and edit-decision list. This provides a dynamic method of changing the playback sequence or dropping one story for another since all elements of a story follow the edit list.

At the news-feed desk, incoming feeds are recorded to tape or directly to shared servers.

Profile disk recorders as servers

The storage platform for the news editing system is the Profile PDR204D disk recorder. This is a virtual disk recorder operating under NT4.0. The disk recorder provides four video channels and 16 audio tracks in and out. KCPQ purchased three profile servers that are configured to provide four edit-station channels, one news-feed channel, two play-to-air channels and a NewStar browser output.

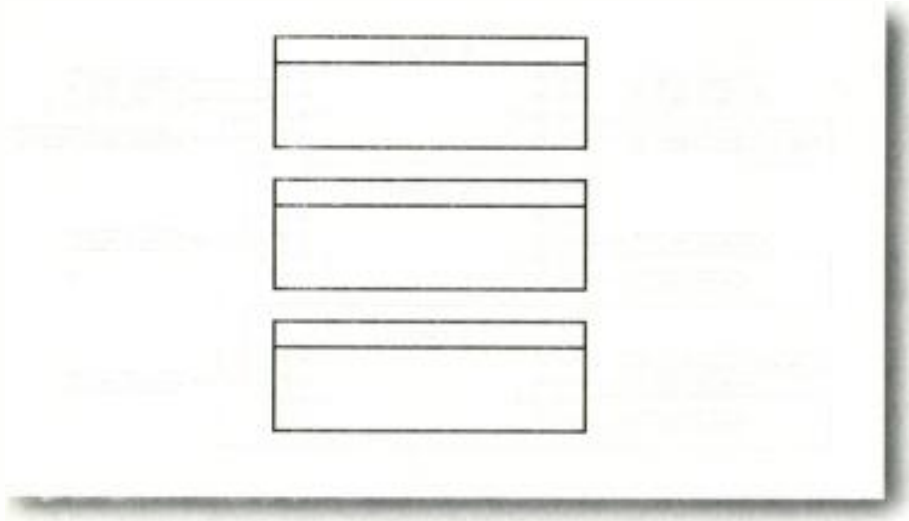

Figure 1. KCPQ configured three profile servers to provide four edit-station channels, one news-feed channel, two play-to-air channels and a NewStar browser output.

The Profile operates with digital video I/O and analog NTSC for monitor outputs. An optional digital audio interface supplies eight AES channels in and out and 16 analog inputs and outputs. The digital I/O ports are used for routing, production and play-to-air; while the analog outputs are used for monitoring of audio and video to the edit suites.

The three profiles are configured in a cascade fashion as Profile A, B and C. Profile A is configured as two edit work stations and a news feed station. Profile B is configured as an edit station and a play-to-air channel, while Profile C is configured to provide an analog audio/video feed to a browser server, an edit station and a play-to-air channel.

When a story is complete, the editor saves it to the system the edit station is seated on. The story may also be saved to the transmission servers. When saving to transmission, the completed edit list is dubbed over to the servers providing on-air channels. Only the audio/video clips in the completed story and the edit decision list (EDL) are dubbed downstream. The original raw clips are still in the server the editor is seated on.

If a story was edited and saved to

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KCPQ News expands

transmission with last-minute edits still needed, they must be made from an edit station seated on the originating server. This would be the only station capable of accessing the original raw data. As story assignments are made, the assembly process needs to be tracked by edit station assignments on out to air. If late-breaking stories are brought in and edited, this should be done on server B or C. The stories are then assigned to play out from the server they are located on, eliminating the need for dubbing.

Acquisition

Field acquisition is performed using Ikegami HL-V77 camcorders. The Ikegami cameras with DVC decks provide exceptional picture quality and a robust recording system. The camcorders are light enough to toss in the trunk of a car, and the quality rivals that of traditional BetaSP systems. KCPQ purchased one satellite uplink unit from Frontline. The Seattle area has quite a few hills and nearby mountains, and while many downtown sites provide a clear microwave shot, the uplink is a necessity in this location.

In September 1997, KCPQ 13 went on-air from its new broadcast facility, designed by Sparling Technology Consultants.

Once media is acquired in the field, KCPQ uses several methods to process the content. Field tapes can be dubbed in to servers at a news-feed desk in the newsroom. The news feed desk is also a point of acquisition in that satellite feeds or intercity feeds are recorded either to tape or to the Profile servers. A limited version of EditStar at the news-feed desk allows raw content to be streamed into the server either from one of our Panasonic AJD650 decks or directly off the router system. Later, the story can be completed from one of four EditStar stations or via any NewStar low-resolution browser station.

Tektronix will eventually implement a fiber channel between servers for the exchange of data. This will allow EditStar clients to browse other servers on the network and dub entire files into their home server at four times the normal speed. Until then, even though the Profiles are called a video file server, it is important to note that the exchange of information between servers is not as a file structure. All audio and video is rendered in real-time back to baseband video and then dubbed to the next profile. The EDL is kept on the NewStar database to track the other elements attached to the story. When NewStar is controlling play-to-air, a machine control unit controls the play-out of the air channels and all other elements of the story.

Editing

As material is dubbed into the servers, it is available to any of the edit stations for non-linear editing. There are four cuts-only stations that operate on a Pentium 200 MMX PC using Windows 95 with EditStar software. The stations are connected to the NewStar network over a 10 Base T Ethernet. Each EditStar station is actually the control interface to the Profile servers. Edit commands are handed off to the Profile servers over the NewStar network. Functions such as audio and video cuts, audio levels and machine control commands are performed within the Profile. Machine control is sent back to the DVC decks in the edit suites as traditional RS-422.

Each EditStar PC has an on-board video input/capture card. The NTSC outputs of the Profile are fed to this card allowing a handy window of video on the PC monitor. The video quality however is useful for checking content only, not quality. A loop through an analog QC monitor is used for a closer look.

Panasonic AJD750 full-function editing machines were chosen for the edit station. While the EditStar workstation can provide shuttle and slow motion, the editors found the simplest way to perform these functions was with a tape machine. The AJD750 meets all of these requirements.

Audio and video from the decks are fed as serial digital video and AES/EBU audio over the router matrix to the Profile servers. This can be done by simply streaming raw material to the server or by editing on the fly from tape directly to disk. With the EditStar system, digitizing to the server off-line is an optional method of getting into the server —not a requirement. The advantages of streaming directly to the servers become especially evident with sports. Located on the West Coast, many sporting events are just wrapping up as KCPQ is going to air at 10 p.m. Final scores and video clips can be assembled within seconds of airing.

Reporters can create voice-overs from within the edit suites with the use of directional microphones. The mics are sent through a mic-to-line amp and then fed to the analog inputs of the DVC decks. Placing the decks in E/E

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mode provides analog to digital conversion. The audio is then available to the Profile server over the router.

When one is working in an all-digital environment, challenges present themselves. One challenge we faced was in creating a mix-down of the four audio tracks.

The station operates as stereo over one AES/EBU channel. The DVC decks provide a single channel of AES/EBU for only two tracks of audio. While the Profile servers provide four tracks of audio over two channels of AES/EBU, the Profiles are not capable of mixing across the tracks. Whole clips of audio can be copied across tracks and individual level control of each track is possible, but it is not possible to mix tracks one and two to a single track within the Profile. In the analog world, as part of the edit package, Tektronix provides a Rane, 1RU, four-channel mixer to accomplish a mix-down. In the digital world, our choices were a 36-input AES/EBU console or an eight-input AES/EBU console. However, a 36-input console was too large to fit on the desktop, and the smaller console was too expensive for our needs.

The solution was the NVision card-frame-based NV1055 AES/EBU mixing modules and the NV9055 control interface. The card frame holds up to 16 cards, and the 9055 controller is capable of creating a dynamic mix on each card. Each module has two AES/EBU inputs and outputs, and any single-input track can be mixed to any output track. The NV9055 control panel is located in the technical center next to the card frame. A preset mix level is determined based on the function of the server channel. Play-to-air channels of the server are mixed as full mono over a single AES channel. Edit stations and the news feed desk are also configured to mix to a single channel of AES/EBU with some twists. Tracks 1 and 3 are mixed down to track 1, and tracks 2 and 4 down to track 2 of the AES channel. This keeps reporter tracks from the field and voice-overs created within the edit suites together, while protecting ambient audio tracks. This is necessary due to the archiving of news material. At the end of each day, audio and video are played out to the DVC decks at the news feed desk and the servers are then purged.

The KCPQ newsroom lobby.

The analog monitor outputs and AES/EBU outputs track each other as levels are changed within the Profile. As we create a mix-down for an edit station in the AES/EBU world, we duplicate the same mix-down in the analog world with inexpensive mixing modules. This analog mix is fed back to the edit suite where it is monitored on a pair of Dorrough loudness meters and self powered speakers.

KCPQ news at 10

NewStar's lineup forms the heart of the news room automation system during the on-air process. NewStar is an ODBC program that displays and controls all elements in the newscast. By dragging and dropping story "slugs," a producer can quickly change the story lineup and all associated elements that follow the story. This includes all of the devices that make up the elements, such as character generators, still stores, teleprompters and clips.

When the system was first implemented, backup DVC recordings were made and simultaneously rolled against the NewStar automation. It took a couple of weeks for the staff to get used to operating on an automated playlist with drag-and-drop capability. Initially mirroring the automated newscast saved the show a few times. Tape backups are still made for each show, but are no longer simultaneously rolled. Automated play-out has been operating reliably and efficiently since March. A few hiccups early on were attributed to NT configuration issues, software switches, and possibly, operator error.

Weather at the top of every hour

KCPQ purchased a Barron 250kW, high-definition Doppler weather radar unit that is located at the transmitter 20 miles southwest of Seattle. Another unit will be installed on Orcas Island, approximately 40 miles north of Seattle. This will allow KCPQ real-time radar coverage from Vancouver to Portland, OR.

WSI weather graphics are used for forecast and satellite photo presentation and animation. These are based on SGI O2 systems with Miranda VIVO SGI to SMPTE259 interface. A weather graphics station is located downstairs in the newsroom with a full duplicate of the news set. The WSI system provides about 30 seconds of disk-based video. The WSI video clips are played out live

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Decision makers from DTV pioneers like KITV (the nation's first fully-licensed digital television station) and FOX, as well as a variety of commercial and in-house production companies, have chosen the video tape format that delivers the quality they demand today and the technology they'll need tomorrow.

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RELIABILITY–exceptionally durable construction and long-wearing heads have exceeded the expectations of even the most demanding users.

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Solutions for the Embedded Audio Blues

In the past we have explained the difficulties encountered with systems that utilize embedded audio within the digital video stream. Those difficulties include the frequent inability to perform a clean switch of the audio content due to timing errors and confusion regarding the actual channel allocations in multi-channel audio systems. Current users will know these problems well by now and, although we have often provided explanations as to why these issues exist, we have never offered a solution.

The engineers at NVISION, Grass Valley, California, have pondered the technical issues in search of affordable answers for some time, and are now pleased to announce that, with the introduction of the new 4000 series of processing modules, they can finally provide the industry with the necessary solutions.

PROBLEM 1 – Noisy Audio Switching

When a switch is made between two video sources that contain embedded audio data, it is very difficult to resolve a clean audio transition at the receiver, due to two primary factors. (a) The audio data is commonly asynchronous to the video data and other audio channels. (b) In NTSC systems, any efforts to synchronize audio data with the video information can be lost if the video paths have differing processing delays. *See Fig 1.*

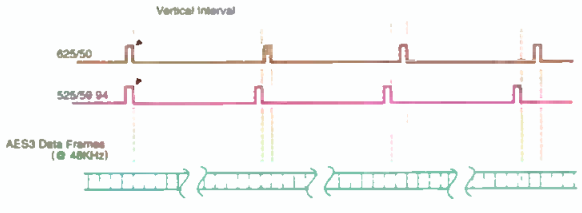


Figure 1: Timing Charts

CLEAN SWITCHING – The NVISION Answer

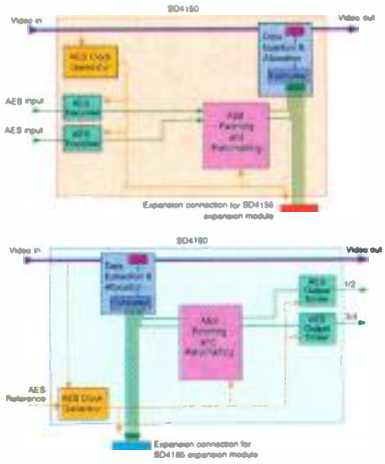


Figure 2: Internal diagrams of the NVISION SD4150 and SD4160

Unfortunately, it is impossible to ensure that all audio and video data is always correctly timed so that recovered audio framing is maintained. However, if audio framing is correctly timed at the insertion point, a higher percentage of error-free switching is achievable. In order to ensure satisfactory audio reception, it is necessary to take care of data alignment at the point of insertion and subsequently provide a method of error concealment at the point of extraction.

NVISION has developed new embedder and disembedder devices that incorporate our proprietary audio re-framing circuitry that ensure all audio data carried within each video stream is correctly timed. The output circuits provide constant AES framing patterns, regardless of input signal; this ensures that AES receivers maintain constant lock and eliminates aberrations due to receiver PLL recovery. Also, our error detection circuits within the disembedder ensure effective error concealment, regardless of the embedding method or device used during the insertion process. *See Fig 2.*

PROBLEM 2 – Arbitrary Channel Allocation

When more than four channels are required, the normal technique is to cascade embedders together. This process relies on the ability of the embedder to determine ancillary data content and decide where to allocate its audio channel group data. Receiving disembedders are also cascaded and must have a preset determination of which audio group to extract. *See Fig 3.*

The result of this methodology is that it becomes difficult to determine channel location as more channels are added. For example, the first channel pair from the first audio group may be received as the first channel pair of the second group, placing channels 1/2 as channels 5/6. The more channels inserted, the more difficult it becomes to determine location.

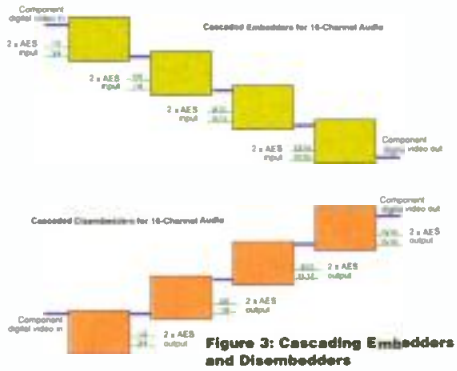


Figure 3: Cascading Embedders and Disembedders

DETERMINED CHANNEL ALLOCATION – The NVISION Answer

The new NVISION SD4150 Audio Embedder module provides for one group of four audio channels to be inserted into the SDI data stream. (This is similar to other available products.) However, if more than four channels are desired, another module (the SD4155) provides for an additional twelve audio channels (three groups) to be directly fed to the SD4150 for allocation

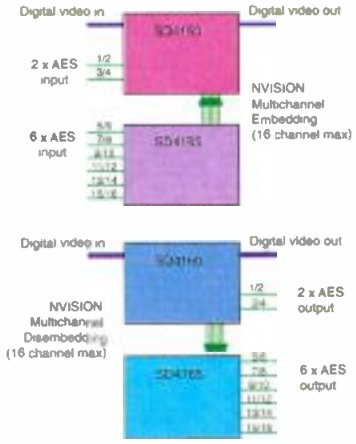
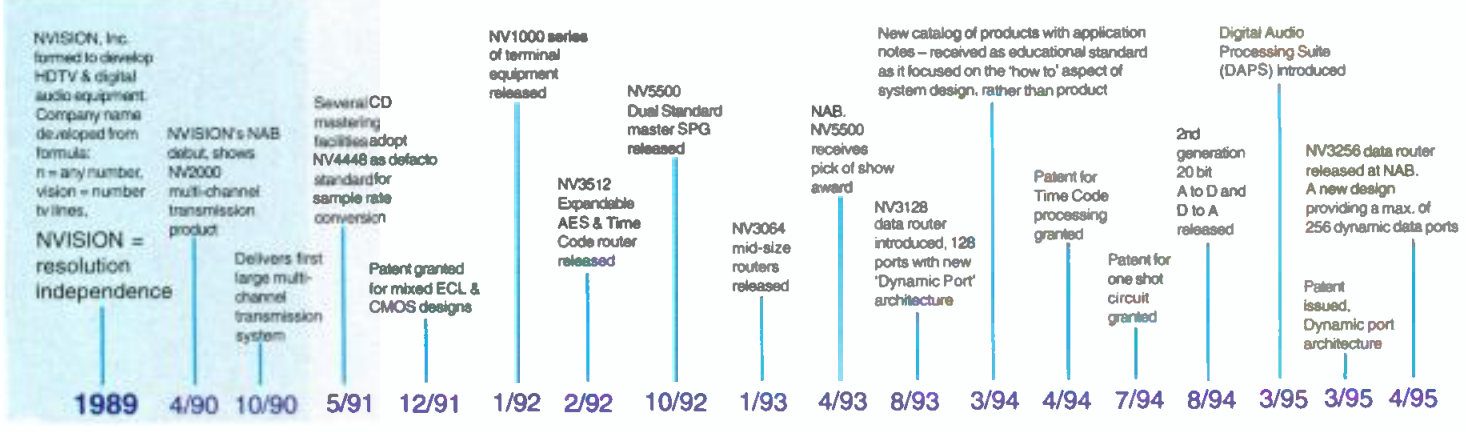


Figure 4: NVISION Multichannel Embedding and Disembedding (16 channel max)



In the Pink with the Latest DTV Processing Modules

Newly developed specifically for the DTV environment, is the 4000 line of digital signal processing modules. This new line is based on a choice of two rack mount module frames, the FR4001, a 1RU frame that holds up to four modules and the FR4002, a 2RU frame to hold up to eight.

These new frames have been designed to accommodate the latest in high speed processing modules for HDTV signals as well as our traditional processing products, while remaining compliant with US and International safety and emissions regulations.

The basic module layout is a departure from our previous designs, as each module is mounted horizontally in the frame and is a double width board. This new layout allows us to incorporate complex designs or to include dual processes on a single module. For example, our new 24 bit AES A to D (DA4030) contains two individual A to D's, allowing us to supply the highest quality of processing module at lower cost and greater utilization of rack space. The successful NV1000 2RU frame can hold up to twelve individual modules, but the FR4002 can provide sixteen A to D processors in the same space.

The following is a listing of 4000 Series products that are being introduced during the first half of 1998:

New Equipment Frames:

FR4001 — 1RU frame with optional redundant power supply will accommodate up to 4-4000 series modules.

FR4002 — 2RU frame with optional redundant power supply will accommodate up to 8-4000 series modules. Includes alarm function.

New Processing Modules:

DA4010 — AES fan-out distribution amplifier. 1 input with loop, 8 outputs (twisted pair or coax options).

DA4011 — AES jitter removing distribution amplifier with reclocking and EQ. 1 input with loop, 8 outputs (twisted pair or coax options).

DA4030 — Dual AES A to D converter. Superior performance, 24 bit converters with sample rates from 28 to 96Khz. 2 individual stereo analog inputs, 2 AES outputs per stereo pair.

DA4040 — Dual AES D to A converter. Superior performance, 24 bit converters with sample rates from 28 to 96Khz. 2 individual digital AES inputs, 2 stereo analog outputs.

SG4410 — Master Digital Audio Reference Generator. Will generate constant digital tone and silence at 44.1/48Khz or 88.2/96Khz as well as SDIF (wordclock). Can lock to PAL/NTSC/HD 1125-60/59.94 or 750-60/59.94 as well as AES or SDIF inputs. Will provide phase accurate outputs from audio input reference.

SD4110 — Digital Video distribution amplifier. 270/360 Mbits, 1 input, 8 outputs.

SD4111 — Digital Video distribution amplifier with reclocking. 270/360 Mbits, 1 input, 8 outputs.

SD4150 — 4 Channel AES audio embedder. For insertion of 4 audio channels into a SDI video data stream. Includes NVISION re-framing technology to ensure correct audio data alignment.

SD4155 — Expansion module for SD4150. Allows for the addition of up to 12 audio channels (6 AES inputs) and ensures channel allocation and timing is maintained.

SD4160 — 4 Channel AES audio disembedder. For the extraction of 4 audio channels from a SDI video data stream. Includes NVISION re-framing technology to ensure correct audio data alignment as well as 'switch point' error concealment.

SD4165 — Expansion module for SD4160. Allows for the extraction of up to 12 additional audio channels (6 AES inputs), providing a total of 16, and ensures that channel allocation and timing is maintained.

HD4270 — 1.5 Gbit Electrical to Optical converter. Provides conversion of 1.5 Gbit serial video data on coax to optical for signal distribution by fiber. Required for any installation where 1.5 Gbit signals need to be received at 100 meters or more.

HD4271 — Optical to 1.5 Gbit Electrical converter. Provides conversion from optical signals sent over fiber to 1.5 Gbit serial video data via coax.

HD4272 — Optical to Electrical / Electrical to Optical converter. Provides for bi-directional conversion of 1.5Gbit serial video signals from coax to fiber & vice versa.

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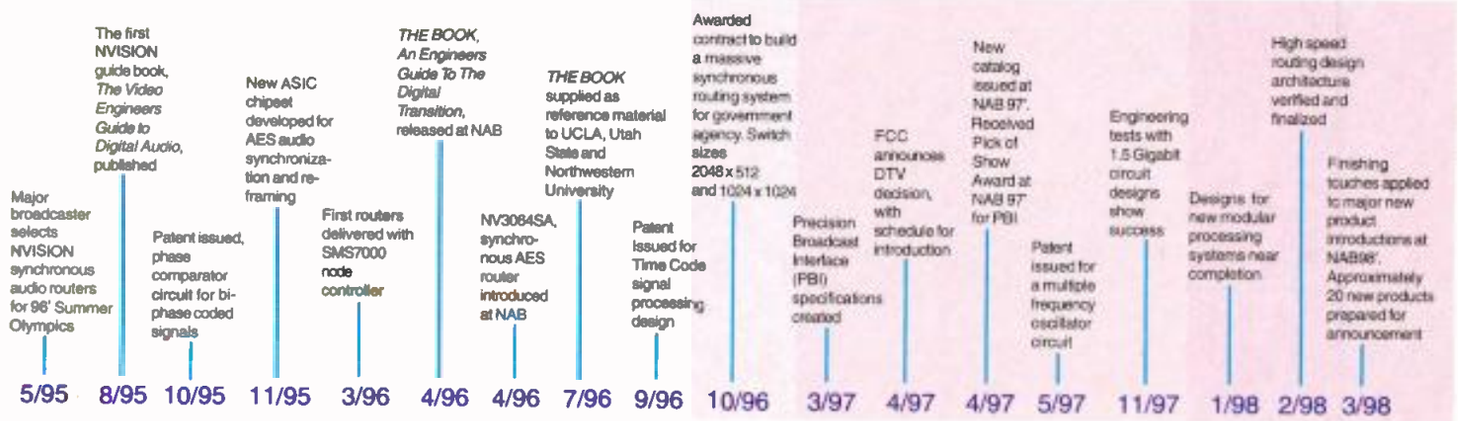
and insertion. This method provides two benefits: 1. The exact channel group location can be determined by the single embedder module. 2. "Piggybacking" embedders is unnecessary; therefore, costs are drastically reduced. ***See Fig 4.***

The disembedder (SD4160) module can detect the presence of channel groups and allow the operator to select which group to extract. If the embedded data contains multiple groups, the addition of an SD4165 expansion module allows a single disembedder to extract all channels in the order received. If the data was inserted by an NVISION SD4150, then all channels are extracted in the order inserted and therefore no operator intervention is required. If the data was inserted by another manufacturer's product, then the operator can select which group appears at each set of outputs. A further feature of the disembedder is the built-in, monitoring quality D to A converter and mini headphone jack, for convenient output channel assignment. ■



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Building HD remote trucks

By Jim Boston

Now that the first wave of DTV stations are moving from the planning to the implementation stage, with air dates this November, thoughts are quickly turning to filling the ATSC programming pipeline. As we all know, stations are wrestling with which entries in ATSC's Table 3 to offer viewers. Looming over these considerations is the fact that Congress has let it be known that they want their HDTV. Network-affiliated stations will naturally look to their networks for cues as to the digital infrastructure they will adopt. In most cases, HD will play some part in these plans.

HD paths imply HD programming. A large inventory of programming shot on 35mm film provides an excellent start for the HDTV roll out. But to provide the same variety in HD as SD (standard definition), it's important to start building electronic HD production facilities. It's generally accepted that HD really demonstrates its value in field production. Until recently, HD field acquisition was an EFP type activity. Now, complete mobile HD production facilities are getting ready to hit the road. These facilities are commonly known as remote or OB (outside broadcast) trucks. A few years ago traditional, analog OB trucks saw their first digital offspring. Now, this digital generation is about to witness another big evolutionary step with the arrival of the higher bit-rate HD digital truck. This article will examine the logistical and engineering challenges facing the builders of these trucks.

Three-in-one

First, let's come to grips with the scope of a project like this. For those who have added digital infrastructure to an existing analog facility, you know the result is generally a digital layer over the existing analog layer. A common lament in this case is that if building from scratch, one could build a digital-only plant. But those who have had the luxury of building a digital facility from scratch will tell you that even in this case, you still end up with both analog and digital layers. The same holds true when building an SD digital truck from scratch.

Many have already surmised what must happen when building an HD truck. You still need an analog NTSC layer, a serial digital interface (SD-SDI) layer, and an HD-SDI layer. To build an HD truck, you really have to build three trucks in one.

Let's look at why this is so. Although most sources will have an HD path through the truck, not

Photo: Remotes will be the first, and probably the most important, source of new HD programming. Trucks like the National Mobile Televisions's DX-4, equipped by Sony, will be reincarnated in HD versions. This story illustrates the design process required to bring an HD truck from concept to reality.

all sources have HD outputs yet. Almost all have SD-SDI, so some sources will also need paths to an HD upconverter. Additionally, just because you have an HD truck doesn't mean you still won't have SD customers. Therefore, many outputs of the truck will have to be downconverted back to SD. Up/down converters are not cheap; they currently top out at over $100,000. This forces a desire to limit the number of these used on a truck. This also means that an SD digital router is required, along with the HD router.

Today's remote trucks often have upward of 150 monitors onboard. Few of these usually need to be high-quality evaluation monitors. So, it makes economic sense to use lower-priced monitors (often with analog inputs) for less critical applications. Because most HD (and SD digital) gear also has NTSC analog outputs, this infrastructure, complete with its own router, is usually desired. Surprisingly, the HD router matrix may be the smallest, and the NTSC router matrix maybe the largest.

In some cases NTSC waveform monitoring still makes sense. Many video operators find that camera balance and matching are easier to perform using NTSC test equipment than SD or HD digital component test equipment. This is because baselines are easier to quantize. Plus, the NTSC test equipment is much cheaper. Generally, the only paths that are solely in the HD layer are those tangential to the production switcher and DME/DVE.

The audio side of the truck undergoes a similar stratification. The main audio layer today is AES, but often a sizable analog audio layer is also present. The two audio layers will generally each have their own routing matrices. A third level will probably evolve over time as 5.1 surround sound, which requires six channels of audio, might have to be encoded into one or two AES channels. Most VTRs today still accept only four separate audio feeds. This leads us back to the video. If a network distribution standard (network to affiliate feed) becomes dominant, this might extend back to the origination truck, or the contribution feed, historically known as the "backhaul." This would mean an ATSC-type signal might need to emanate from and be processed on the truck. Add a machine-control layer to the truck, and we have eight layers of signals, each probably requiring routing capability.

HD means heavy-duty demands

Superficially, we have just stated what fabric needs to be woven into an HD truck. However, the truck has to be deemed useful and worthy of its clients. What amenities must be loaded into the van to accomplish this? Most first-rate trucks today must carry at least 12 cameras, but trucks carrying over 20 cameras ply the interstates. A dozen onboard VTRs is not uncommon and operational space and seating for a couple dozen people is not considered unreasonable. On top of this, it is assumed that the mobile facility will be extremely flexible and highly fault tolerant, hence all the routing and patching on all the layers previously mentioned. And we have to keep the interior warm in the winter, and more importantly, cool in the summer.

As expected, everything about an SD-SDI truck is more than an NTSC truck, and everything in an HD-SDI truck is more than an SD-SDI truck. Let's start with price. To produce the facilities mentioned in the previous paragraph would cost $4,000,000 to $5,000,000 on an NTSC truck. An SD digital equivalent would come in at $6,000,000 to $7,000,000. The HD example could easily approach double the price of an NTSC truck. Most big trucks on the road today have trailers that range in length from 48 feet to 54 feet, and have expandable sides to increase the interior "people" space. A ballpark figure of the weight for an empty trailer of this size is 40,000 pounds. Most trucks this size will end up approaching the bridge weight limit in the United States, which is 80,000 pounds. Generally, an NTSC truck could just make this weight and still carry all its assigned equipment, but SD digital trucks have a harder time accomplishing the same feat.

All trucks start out as shells. Here, the NMT HD-1 truck is shown in the Girling Associates factory being modified prior to equipment installation. These modifications included adding "expando" sections, which are needed as much for more people as for equipment.

Many trucks today travel in tandem with utility trucks. Or some of the operations or functions, such as graphics or VTRs, are off-loaded onto a secondary truck. Whereas an NTSC truck might need 20 racks to house the needed equipment in the truck, an SD-SDI truck of similar capability could require up to a dozen more racks. This obviously cuts into the people space, hence the single-, then double-, and now triple-expando trailer.

The first expandable trailers had single-expando sides that came out from the curb side of the trailer. A second

expandable segment of the trailer was the area where the monitor wall would be in a production compartment turned lengthwise. The third expando trailer area is now out the back of the truck. An HD truck with similar capability to our NTSC example and SD-SDI trucks could require up to 40 racks full of equipment.

There several ways that all this new equipment will place new demands on the truck's design. Where an NTSC truck's rack-mounted equipment would be in the 8,000-pound range, the SD-SDI truck might weigh in at 10,000 pounds, and the HD-SDI truck could add several additional thousand pounds.

More equipment naturally means more power, but digital SD and HD add another element. Component SD-SDI has a clock rate of 270MHz. HD-SDI (all high-definition formats, along with all ATSC formats are component) has a clock rate of up to 1.458Gb/s. High clock rates tend to force equipment to run in high current conduction states a greater percentage of the time, increasing the power draw of that equipment.

The videotape and control area contain nine racks. The first five racks, shown above, contain five HDW-500 recorders and associated monitors. The next four racks provide video control for up to 16 cameras. Note the large black box on the right. It is used to house one of two HDM-20E1U high-definition monitors.

An NTSC truck might consume 75kW to 80kW of power under full operation The comparable SD-SDI truck would require in excess of 90kW. The power requirements of the HD-SDI truck would probably require at least 130kW of service. An extremely small percentage of that consumed power in any facility actually ends up as useful signals, the generated heat is considerably higher in SD-SDI and HD-SDI trucks.

These high current requirements found on digital trucks mean that giving the truck the option of running on single phase is no longer a viable option. Most of these new trucks will require three-phase service. Whereas 10 tons of cooling capability would suffice for the NTSC truck, 15 tons would be prudent on the SD-SDI version, and 20 tons on the HD-SDI version. Actually, the environmental power requirements, lights and air conditioning, usually consume the bulk of the power. Our hypothetical HD truck's tech power would probably be around 50kW. The other +80kW would be to just maintain the internal environment.

There is another reason why the hurdle is raised when contemplating the HD facility. There is energy content in an HD signal that only half jokingly seems closer to light than DC. In an NTSC truck, any energy running through the coax that was higher than 10MHz was noise or spurious harmonics. In an SD-SDI truck, energy over 1GHz down the coax was normal. Now with HD, energy approaching 4GHz is desired.

Why so high? SMPTE 259M and SMPTE 292M (SD and HD serial transmission standards) specify bit-shuffling algorithms designed to create lots of "edges," which are needed in a self-clocking system. In fact, enough edges are created so that for all practical purposes, both signals can be considered square waves. Each bit cell, 1/2706/sec for SD-SDI, and 1/1.5E9/sec for HD-SDI, can be thought of as half the period of that square wave.

What does it take to make square waves? From Fourier's teachings, we know that signals with even symmetry, such as a square wave, require a fundamental sinewave and the odd harmonics to construct. Thus, component SD-SDI requires a 135MHz fundamental sinewave, and the odd harmonics. The third harmonic, which is 405MHz for component SD-SDI, is the most important one. When the third harmonic's amplitude drops below 6dB above the noise floor, the dreaded "error cliff" has been reached, as the SDI signal has effectively stopped being a square wave and has become a sinewave. This prohibits the serial receive circuitry from reliably detecting "edges," and self-clocking at the receiver becomes problematic.

How is HD-SDI different from SD in this regard? Multiply by six and you're there. HD-SDI's fundamental is around 750MHz and its third harmonic is a mere 2.25GHz. This will severely limit your choice in cabling Keep in mind that this six times differential equates to picture quality also. Whereas a SMPTE 259M SD-SDI picture would have 691,200 active elements in a frame of video, SMPTE 292M HD-SDI has 4,147,200. This means that a wide shot of the ballpark in HD will be nearly as good as sitting in the stands.

Weighty issues

This segues into cable size and weight, another challenge in building the HD-SDI facility, be it on wheels or cement. An interesting corollary is racked equipment weight vs. overall cable weight. They usually are close to each other. On a truck it is imperative to eliminate any unnecessary weight. One way to do this is to use the lightest, and therefore usually the thinnest, cable possible. The trade-off is that thinner cable tends to have greater loss as a

function of frequency. Thin coax for NTSC tended not to work as it rolled the chroma off. Then it seemed to hit its stride with SD-SDI. However, it still tended to roll off higher frequencies much faster than lower frequencies, but the lengths used on trucks didn't cause the third harmonic in SD-SDI signals to attenuate to a level anywhere near problem levels. This is not so with HD-SDI.

Whereas an SD-SDI signal might travel 600 feet down mini coax with no problem, an HD-SDI signal would be limited to 200 feet down the same coax. So, as far as trucks are concerned, the renaissance of mini cable seems to be in the SD-SDI domain. As alluded to earlier, cable weights for NTSC, SD-SDI, and HD-SDI trucks should be in the 8,000-, 10,000- and 14,000-pound ranges in association with the weight of the racked equipment. Cable weight on an SD-SDI truck might break this rule due to the use of mini cable.

Cable size found on the truck is not only dictated by the flavor of the video coursing through it — audio has similar problems. If AES-3 audio is used over twisted pair, it requires true 110Ω cable. This is because AES audio pumps energy into its cables comparable to NTSC video. Reflections at these frequencies become important. 110Ω cable tends to be larger than 600Ω cable. With analog audio, the upper frequency limit is typically limited to 20kHz.

Even if cable with the wrong impedance is used, the reflections are such a small percentage of overall path length that they are not noticeable. But at AES frequencies, they would cause problems. This means that AES requires the right impedance, and therefore, larger diameter cables must be used. The result is that AES audio adds to the cable weight and space required on the truck.

AES adds complexity in some other ways also. Large AES mixers can be thought of as audio routers with internal digital processing. This means that outputs are not hard-wired to any particular purpose and can usually be specified to be analog or AES.

Deciding which layer AES mixer outputs belong in can be confusing. AES mixers are serious DSP devices, and they tend to be driven by elaborate computer-based systems. This means that UPS power systems need to be employed to ensure that power glitches do not become major audio events. Auxiliary analog mixing systems used as fail-safe backups should always be employed on HD trucks. Equipment with AES interfaces also requires a reference timing signal. This can be either AES's Word Clock or an analog video reference. It is often customary to feed the video reference into the AES mixer, and to use the mixer's AES Word Clock reference output to lock the other equipment.

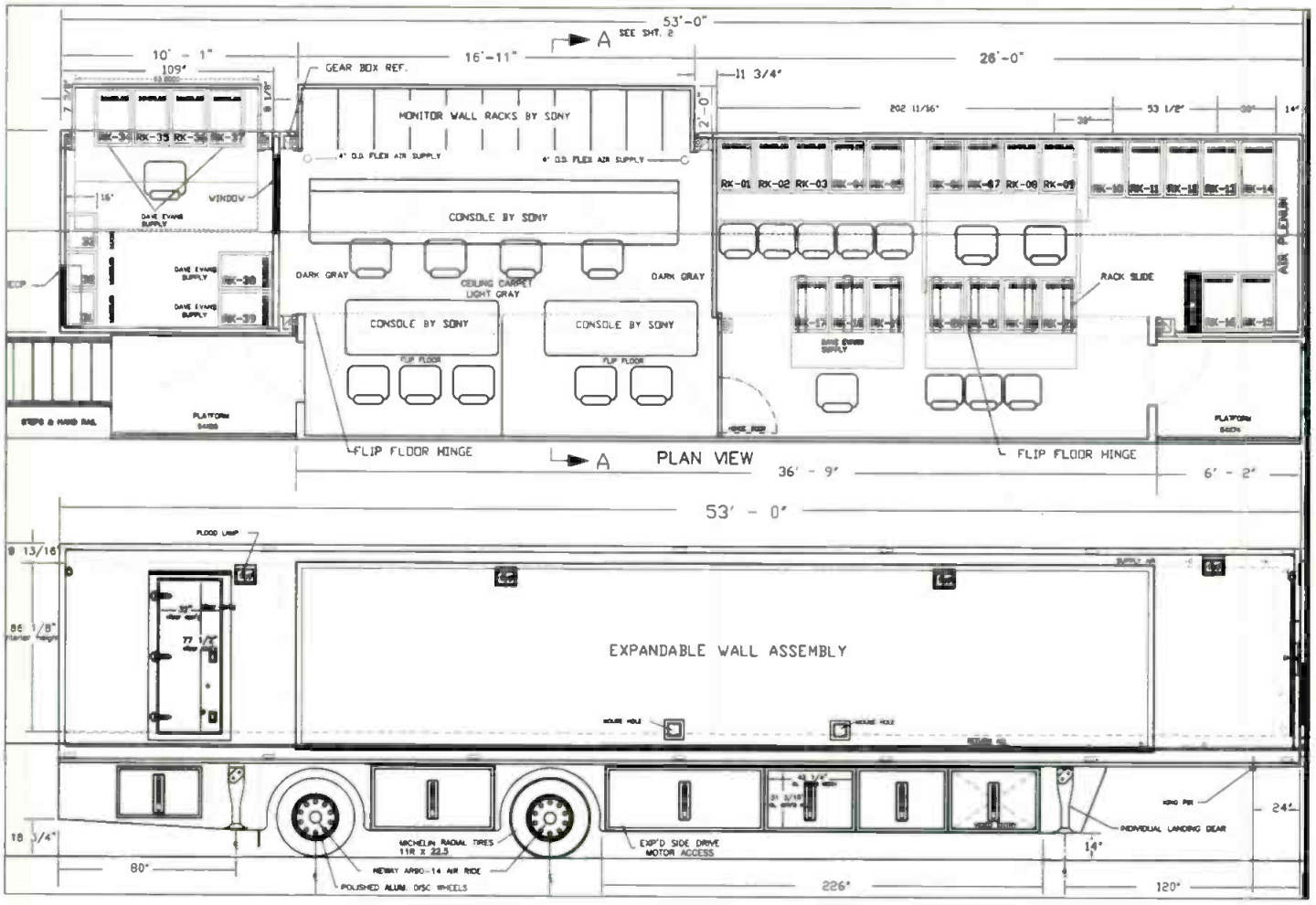
AES allows flexibility not possible with analog audio and it allows audio to be embedded into the video. Up to 16 channels are supported, but the majority of equipment today uses only four channels. Eight-channel use is just now beginning to be accommodated. However, embedding and unembedding this audio adds to system complexity. Plus, routing at the SDI level doesn't tend to support embedded audio breakaway. AES routers are generally smarter about the serial bitstream than SD/HD-SDI routers (AES routers often decode the bitstream, whereas most SDI routers don't). A final consideration is that like HD test equipment, which is more expensive than SD-SDI or NTSC test equipment, AES test equipment is more expensive than analog audio equipment.

Cameras and test

Cameras become slightly different animals in the HD world. The triax camera is no more. Triax is basically coax with an additional shield. Although the losses with triax are slightly less than regular coax, after a few hundred feet, the HD-SDI signal will have fallen apart. Also, as discussed earlier, the HD-SDI signal will consume most of the available bandwidth of the cable. In triax camera systems, we not only need to get HD video from the camera head to the camera-control unit, we also usually want to send control, return video, intercom, and often audio, not to mention power, down the same piece of copper. Triax just isn't going to work for HD. A special fiber/copper cable is needed. This cable has two single mode fibers, two wires for camera control, and four conductors for power. Its diameter is approximately 0.36 inches, and it comes in 50m or 250m lengths. A 250m cable weighs 57 pounds. At least seven of these 250m cables can be connected together, which means camera runs of over 9,000 feet (limited primarily by copper size) are still possible.

Sync and test generators in the HD

The NMT HD-1 truck will be quipped with a full complement of Sony high-definition cameras. Shown here is the Sony HDC-700 being used to record the 1998 Rose Bowl parade.



Note the expanding section shown above is primarily "people space" and adds about 180 square feet of working room. NMT's HD-1 will be the first digital high-definition truck to hit the road. The project was handled by Sony's Systems Integration Center.

realm aren't yet as capable as their SD ancestors. It still might be necessary to use an analog or digital SD sync generator as the absolute reference.

One additional note about monitoring in this new world — truck customers usually want the ability to view all the formats on a video and waveform monitor in three separate positions in the truck during the production. This is insurance that the signal is usable in all worlds. This multiformat monitoring is usually located at the TD/director, shading, and QC positions.

HD integration is like everything else we compared between HD-SDI, SD-SDI, and NTSC. It just takes more planning, more understanding, and more fortitude than the earlier SD formats, not to mention more money. But if we can enlist the viewers to subscribe to the advantages of high-definition viewing, everyone will benefit. ■

EQUIPMENT LIST:

Routing Switchers: NVision Envoy 6464HD serial high definition; Sony DVS-6464B SDI 4:2:2 and DVS-A3232 (dual) AES Audio; Ditech 5881 128x160 NTSC
Production Switcher: Sony HDS-7000 HD digital video switcher
Audio Console: Sony Oxford digital audio mixer
DVE Equipment: Sony HDME-7000 two-channel DME
Recorders: Sony HDW-500 digital HD videotape recorders and DVW-A500 Digital Betacam recorders
Special Effects: eight-channel HD DDR (Vendor TBD); Chyron Infinit! character generators (upconverted to HD)
Audio Effects: 360 Systems Digit-Cart II
Audio monitoring-spot locations: Wohler panels
Audio recorder: Sony PCM-800
Waveform monitors: Tektronix
DAs: Sony digital and analog video DAs and monitor DAs; NVision AES audio DAs; Leitch analog audio DAs
Monitors: Sony HDM20E1U, HDM2830 HD, BVM14F1U SDI/NTSC and PVM series NTSC monitors
Encoder/Decoder Up/Downconverters: Sony HKPF-525 HD downconverters and HKPF-103 HD DA's; Snell and Wilcox HD5050 upconverters and HD2100 Up and downconverters
Cameras: Sony HDC-700 HD studio cameras, HDC-750 HD field cameras and DXC-HD HD POV cameras (model TBD)
Lenses: Fujinon HA66x95ESM high-definition lens and HA20x75ERD HD hand-held lens
Intercom: 80x80 RTS Adam intercom matrix

The author would like to thank Peter Ludé, senior vice president of Systems Engineering and Marketing, Sony Electronics' Broadcast & Professional Group; Jim Oster, Alan Bourke, Chris Pyle, Nequin Scott, and Joe Metzger, engineers with Sony's Systems Integration Center, and Kent Green, an engineering consultant, for their technical guidance and help.

Jim Boston is senior product support engineer, automation and transmission systems, Broadcast & Professional Group, Sony Electronics' Inc.

PREVENTING ILLEGAL COLORS

With all of today's standards, it's easy to create signals that exceed the limits.

By Michael Robin

In all scanning standards, the composite analog monochrome signal amplitude is, nominally, 1Vpp. Figure 1 shows the well-known signal amplitude characteristics of the 525/60 scanning standard as used in North America. The peak-to-peak signal level, from sync tip to peak white is 1V or 140 IRE of which 100 IRE (714.3mV) is luminance (monochrome) and 40 IRE (-285.7mV) is sync. Peculiar to North America is a black level of 7.5 IRE (53.55mV). Figure 2 shows the significant video signal levels as a percentage of the transmitted negative-modulated video carrier amplitude. As shown, 100 IRE represents 12.5% modulation allowing for a carrier overmodulation safety factor aimed at avoiding video carrier cancellations resulting in intercarrier "buzz."

In all analog color television systems, primary green, blue and red (GBR component) signals generated by a camera are processed to produce an analog composite video signal (NTSC, PAL or SECAM). All systems use a wideband luminance (Y) signal, equivalent to a monochrome signal, and two narrowband color-difference signals (B-Y and R-Y). The chrominance signals are scaled in amplitude using different scaling factors, depending on the system (for more information, see "Transition to Digital,"

PREVENTING ILLEGAL COLORS

May 1998). Each of the color-difference signals modulate an assigned subcarrier in a manner peculiar to the specific television system. The luminance and chrominance signals are frequency-division-multiplexed to obtain a single-wire composite video signal with a total bandwidth suited to the specific transmission standard.

The addition of the scaled chrominance information to the luminance information results in an increase of the video signal amplitude. As shown in Figure 3, a 100/7.5/100/7.5 color bars signal results in a signal with a peak positive amplitude of 130.8 IRE for the yellow and cyan bars. This signal will severely overload analog video transmitters. The situation would have been worse if the color-difference signals had not been scaled down. The developers of the NTSC system relied on the fact that high-level yellow and cyan colors are not commonly encountered in nature and assumed, therefore, that transmitter overmodulation would never occur in practice. To avoid video transmitter overmodulation, transmitter tests are carried out using a 75/7.5/75/7.5 color bar signal (see Figure 4), resulting in a peak positive amplitude of 100 IRE. A subset of this signal, identified as 100/7.5/75/75, is shown as a dotted outline of the luminance bar.

Under normal operational conditions, color signals generated by cameras will not result in transmission overload. The color encoder is part of the camera and its adjustments are carried out by qualified maintenance personnel, so operators have no direct access to it. The camera GBR gain controls are entrusted to qualified technical personnel so, under normal conditions, with well-adjusted cameras, careful and knowledgeable CCU monitoring and "gain riding," transmitter overmodulation is unlikely to occur.

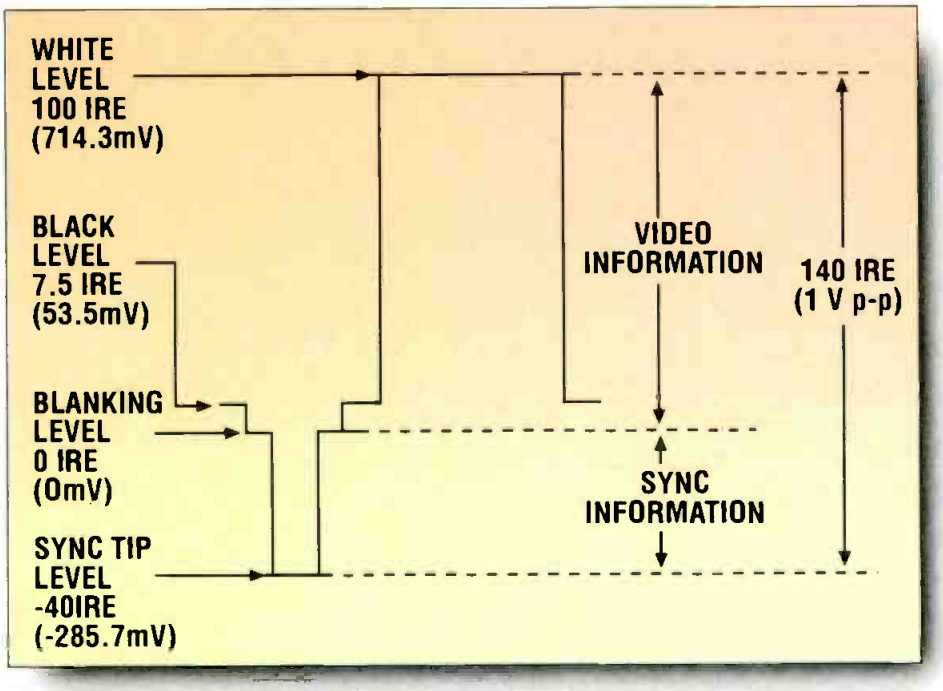


Figure 1. Significant amplitude values of a composite video signal in the 525/60 standard.

THAT WAS THEN, THIS IS NOW

In recent years, there has been an increasing trend toward the use of component video equipment in television studios. The advent of the component video technologies has opened a new era in television technology. Component operation means keeping video signals in component form throughout the production process including switching and special effects.

The new era came about because of the appearance of component analog videotape recorders offering reasonable performance at an affordable cost. These "small-format" videotape recorders offered considerable operating advantages, and manufacturers and broadcasters were quick in recognizing them. This equipment was initially used as a replacement for obsolescent one- and two-inch VTRs, using composite analog NTSC interfaces. It was quickly recognized that improved overall performance could be obtained by using component analog interfaces. This type of equipment interconnection avoids many of the pitfalls typical of composite video NTSC signal distribution and processing. Unfortunately several mutually incompatible analog

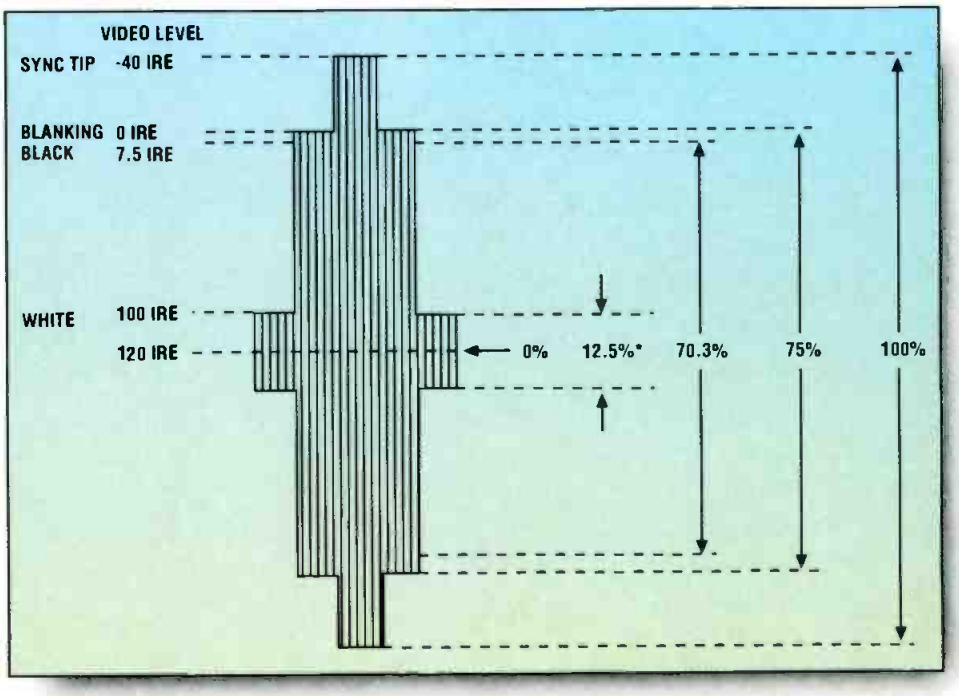


Figure 2. Significant video signal levels shown as a percentage of carrier amplitude in negative amplitude modulated systems.

component video signal formats coexist, making equipment interconnection difficult and resulting in the possible generation of illegal encoded NTSC signals.

The advent of character generators and other digital equipment has resulted in the possible generation of valid component video signals which, when encoded into NTSC or PAL, can result in composite signals that overload a video transmitter. The situation is further complicated by the coexistence of mutually incompatible component analog signal formats. A number of relatively new terms characterizing color video signals have evolved, and their meaning, effects and correction are examined in some detail in this article.

Gamut

The gamut of a set of component video signals (GBR or Y, B-Y, R-Y) describes the range of voltages that the signals are allowed to assume. Signal voltages outside of this range, that is signal exceeding the gamut, may lead to clipping or other distortions.

The range of GBR analog component video signals is described in the SMPTE 253M standard. With a 100/0/100/0 color bar signal the GBR signals feature a maximum positive signal value of 700mV, no setup, and a maximum negative signal value of 300mV (sync). Variations of these signals are likely to be encountered in a studio situation. These variations could be peak signal amplitudes of 714.3mV (100 IRE) with or without setup, as well as the absence of sync. In the latter case, the sync is carried separately on a fourth conductor as composite sync (vertical sync combined with horizontal sync) or on two separate conductors (vertical sync and horizontal sync) with signal amplitudes varying between two and four volts, negative or positive going.

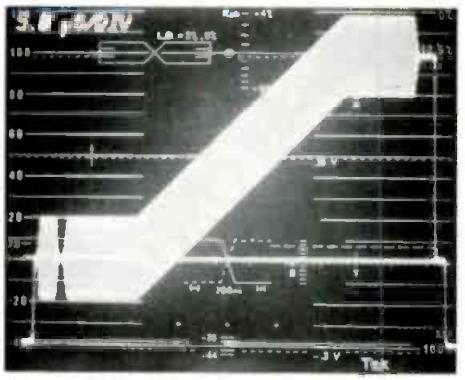


Figure 5. Modulated ramp test signal.

The normalized range of Y, B-Y, R-Y component video signals is described in the EBU N10 standard. With a 100/0/100/0 color bars signal, EBU N10 normalized Y, B-Y, R-Y signals feature a Y signal with a peak positive value of 700mV, no setup, and a maximum negative signal value of 300mV (sync). Both color-difference signals are bipolar and have a p-p amplitude of 700mV. Betacam and MII component analog signals have different signal amplitudes (for more information, see "Transition to Digital," May 1998).

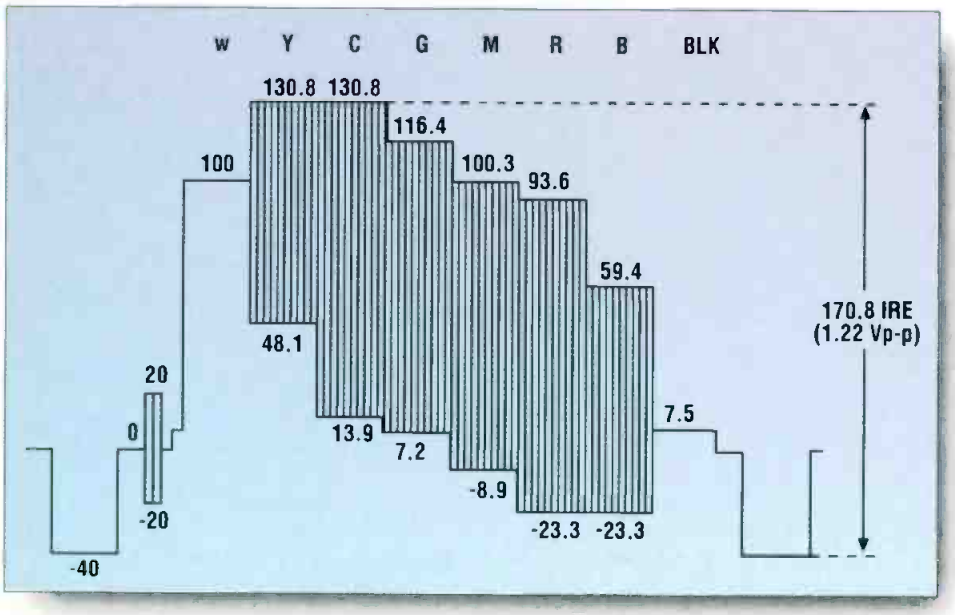


Figure 3. NTSC 100/7.5/100/7.5 color bars signal waveform.

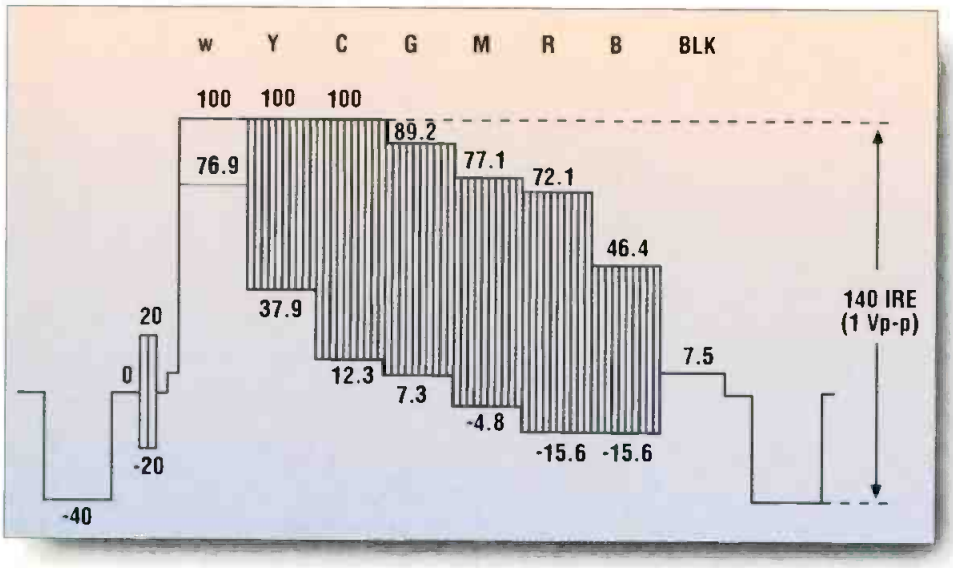


Figure 4. NTSC 75/7.5/75/7.5 color bars signal waveform.

Legal signals

A set of component analog video signals is considered legal if each component is contained within the specified voltage range of the format (e.g., 0 to 700mV). Even if a signal is within the amplitude limits of one format, it can exceed the limits when translated into an alternate format. Component signal distribution channel gain-errors can result in illegal signals. These gain-errors may be due to misadjustments or format incompatibility.

Valid signals

A video signal is considered valid if it remains legal when translated into any other format. Color bars are always valid. If properly generated, processed and distributed to compatible equipment, they reach, but do not exceed,

PREVENTING ILLEGAL COLORS

the gamut limits. A valid signal is always legal, but a legal signal is not necessarily valid.

For example, a character generator operating in a GBR format may generate yellow characters with component Y, B-Y, R-Y signals as previously described for GBR component analog signals may not help here.

TEST SIGNAL CONSIDERATIONS

A wide variety of video test signals have been developed aimed at allowing users to determine whether a specific piece of equipment or system meets certain performance requirements. These signals have well-defined characteristics, and when used properly, are useful in pinpointing sources of trouble and quantifying the impairments. However, problems may be encountered when test signals are transcoded into an alternate format, resulting in incorrect conclusions. Let's examine some of these cases.

THE MODULATED RAMP

The modulated ramp is a special composite test signal used in the measurement of an analog composite system's non-linearities. As shown in Figure 5, this signal consists of a luminance ramp with a p-p value of 100 IRE on which is superimposed a constant phase chrominance subcarrier with a constant p-p

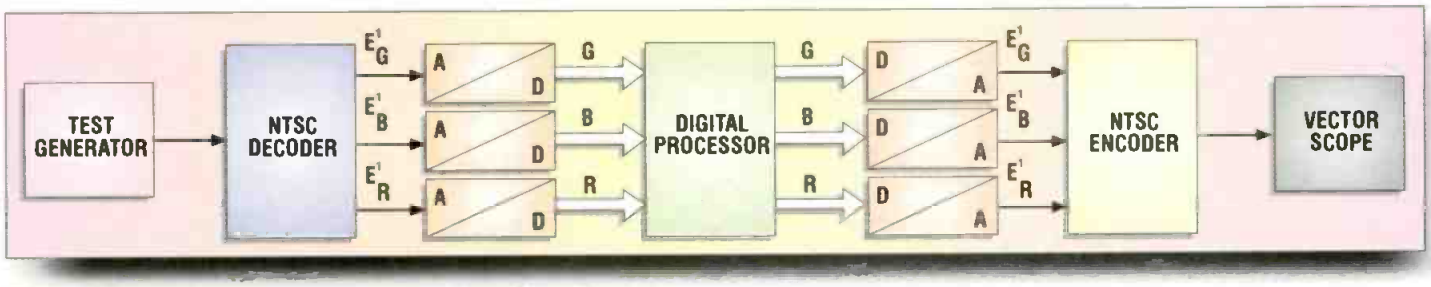


Figure 6. Test setup for measurements of hybrid equipment.

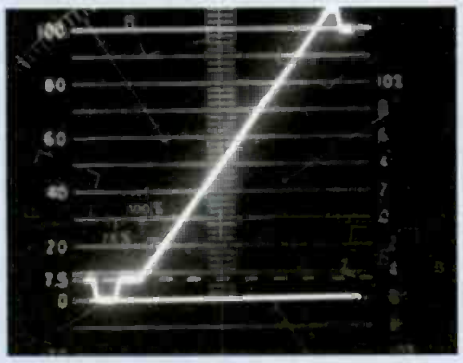


Figure 7. The green component of a decoded modulated ramp.

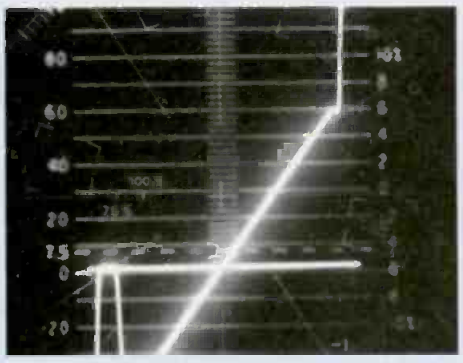


Figure 8. The blue component of a decoded modulated ramp. Note the significant (illegal) negative signal excursion.

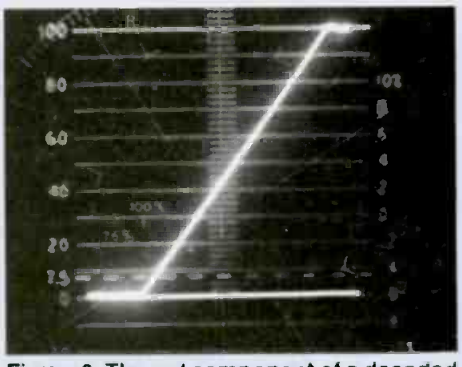


Figure 9. The red component of a decoded modulated ramp.

signal amplitudes of 700mV. These signals are legal in the GBR format. When encoded into an NTSC signal, they will result in a composite video signal with a positive amplitude of 130.8 IRE. This signal is illegal. If transmitted on-air, this signal will cause severe transmitter overload and intercarrier buzz. This situation can be avoided hy sequential display monitoring of the GBR component signals (using a component analog waveform monitor, such as a Tektronix WFM 300), and ensuring that they do not exceed 525mV peak amplitude. Alternately, the GBR analog component signal amplitudes could be limited by design or signal clipping to 525mV and thus avoid encoded NTSC signal amplitudes exceeding 100 IRE.

A legal set of Y, B-Y, R-Y signals may result in illegal GBR transcoded signals, as well as illegal NTSC or PAL encoded signals. Sequential signal monitoring of

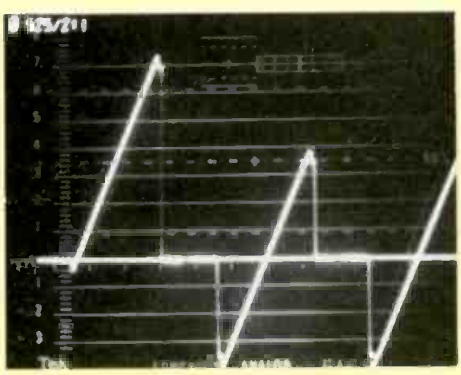


Figure 10. Sequential display of oversized component analog Y, B-Y, R-Y ramp signals on a component analog waveform monitor. These signals are legal in the component analog format.

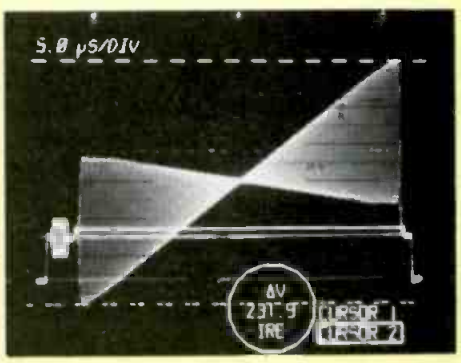


Figure 11. The encoded composite analog NTSC signal generated by the Y, B-Y, R-Y component analog ramps. Note the significant — and illegal — negative and positive exclusions.

amplitude of 40 IRE. This signal is fed to the input of an analog or digital composite video system or piece of equipment. Subcarrier phase changes at varying luminance levels with respect to the burst result in luminance level related hue changes and are measured as differential phase. Subcarrier amplitude changes at varying luminance levels with respect to the burst amplitude will result in luminance level related saturation changes and are measured as differential gain.

The assumption is made that the equipment to be tested does not convert the signal into a different format. As shown in Figure 6, some hybrid analog/digital devices feature analog component I/O ports, while internally, the signal is decoded into GBR components for processing. Figures 7, 8 and 9 show the decoded GBR component analog signals resulting from the modulated ramp. Note that the blue signal features a high-level negative component that is clipped in the internal digital processing. When encoded back into composite analog NTSC, the signal will be distorted and a reading of typically 10° differential phase and 10% differential gain will be measured.

These measurements are essentially wrong and are the consequence of the fact that the modulated ramp is illegal when decoded into GBR component signals. When fed with legal video signals, such as generated by a camera, this type of equipment operates correctly.

The component analog Y, B-Y, R-Y ramps

Testing the individual linearity of component analog Y, B-Y, R-Y channels requires feeding full-size or oversize ramps to the three channels for display and measurement on a component analog waveform monitor. Figure 10 shows a sequential display of this set of ramps on a component analog waveform monitor. This signal is perfectly legal in the component analog format, and the oversized portion of the signals is used to verify that the A/D converters meet the specifications, in terms of analog signal overhead. When encoded into analog composite NTSC, an invalid signal results (see Figure 11). Note that the p-p signal value of the NTSC encoded signal is 231.9 IRE.

The conclusion is that some component analog test signals, while perfectly adequate for testing component analog or digital systems, should not be encoded into composite NTSC signals.

Other component video test signals

A host of test signals specifically developed for component video equipment are available to the user and permit the performance assessment of equipment. Users should note that these signals are not meant to be encoded into analog composite NTSC signals or transcoded into an alternate component video set. The exception is the color bars signal which is suitable for encoding into a composite analog format if the equipment in/out interconnect ports are signal-format compatible.

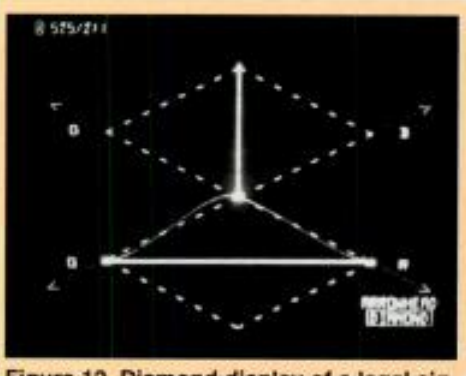


Figure 12. Diamond display of a legal signal.

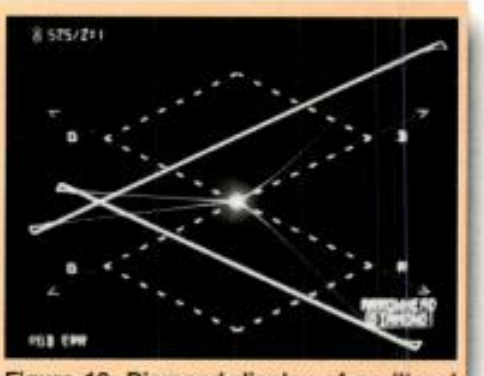


Figure 13. Diamond display of an illegal signal.

Problem prevention

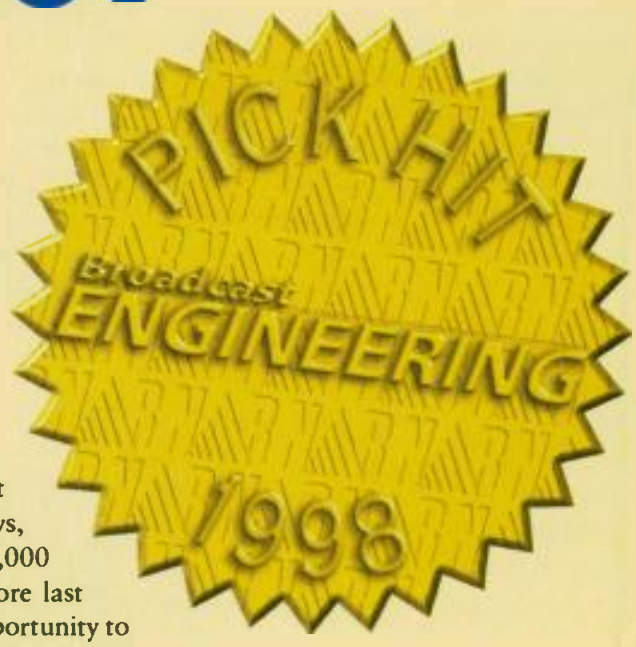
While prevention may appear simple, care must be exercised to avoid generating illegal signals. By following several rules, illegal signal generation can be avoided. These are:

- Understand the different component video formats. This may require training for technical and operational personnel.
- Standardize on the EBU N10 component analog video interconnect standard.
- Use N10 compatible equipment.
- Use format adapters known as *transcoders* to normalize the signals to the input characteristics of the equipment. Although you may be tempted to normalize your equipment by readjusting the input and output gains, it will leave your equipment non-standard. Some analog component video to bit-serial digital 4:2:2, 270Mb/s signal converters offer a choice of input signals such as GBR (with or without setup), EBU N10, Betacam (with or without setup) and MII (with or without setup). Similarly, some bit-serial digital 4:2:2, 270Mb/s to analog component video signal converters offer the same choice of component analog output signals. Such converters are useful when Betacam or MII VCRs must be integrated into a bit-serial digital 4:2:2, 270Mb/s distribution system.
- Carefully design your facility to avoid interconnect incompatibilities.
- Use component waveform monitors at critical locations and establish component video signal monitoring procedures to ensure the component signals are legal at all times.
- Where possible, encode the signal into composite analog NTSC and monitor the signal for NTSC validity.

Tektronix has developed a special component analog monitoring display called the diamond display. This display mode allows users to determine whether a set of component analog Y, B-Y, R-Y signals are legal when format-converted into GBR component signals. Figure 11 shows the diamond display of a legal signal. Note that the vectors are confined to the diamond shaped area. Figure 12 shows the diamond display of an illegal signal. Note that the vectors exceed the area of the diamond displays. Consistent use of the diamond display allows users to determine the validity of the component video signals and alerts users when abnormal situations occur. ■

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

Pick Hits of NAB '98

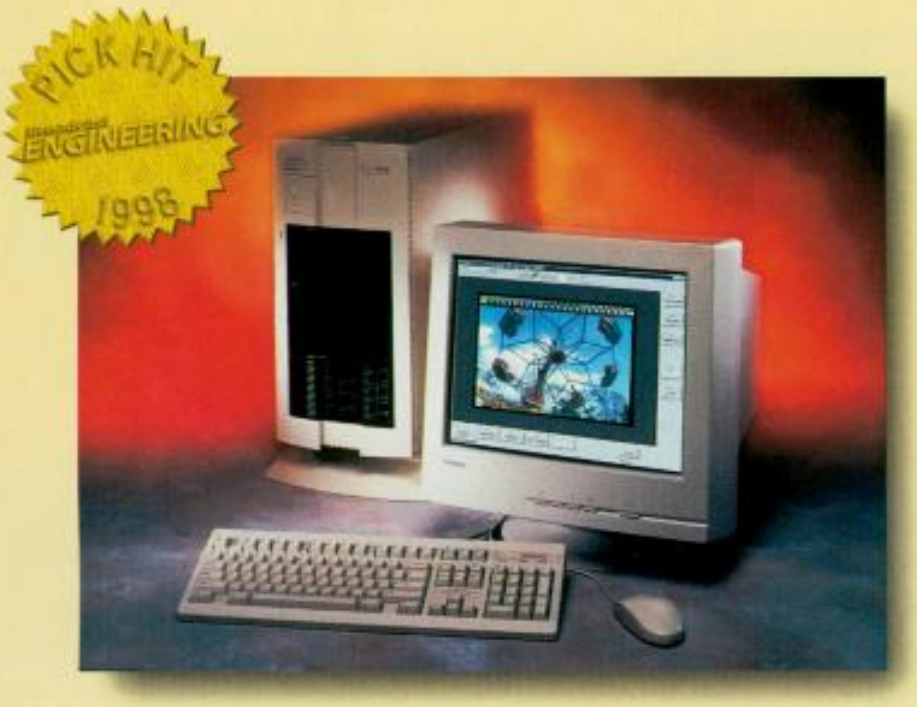


By Steve Epstein, technical editor

In many ways, NAB '98 was much the same as every other recent NAB — too little time and too much to see. However, in other ways, this year's show was quite different. Attendance broke the 100,000 mark, and even though the FCC announcement came just before last year's show, this is the first year that vendors and attendees had an opportunity to really plan for the new DTV paradigm. Although many have predicted that DTV will bring revolutionary changes to broadcast, it is becoming clearer that those changes will likely be more evolutionary than revolutionary — albeit at an accelerated pace.

This year, as in years past, *Broadcast Engineering's* team of judges scoured the NAB convention floor, looking for unique products that will help broadcasters and video professionals move their facilities into the 21st century. As usual, the winners are a diverse group. And I am happy to say that most of these products are already shipping. Instead of the vaporware we have seen in the past, many of the products found throughout the show floor were real. This is a positive change in the industry that I truly hope continues.

Here, in no particular order, are the *Broadcast Engineering* Pick Hits of NAB '98.



Tektronix PQA-200 picture-quality analyzer

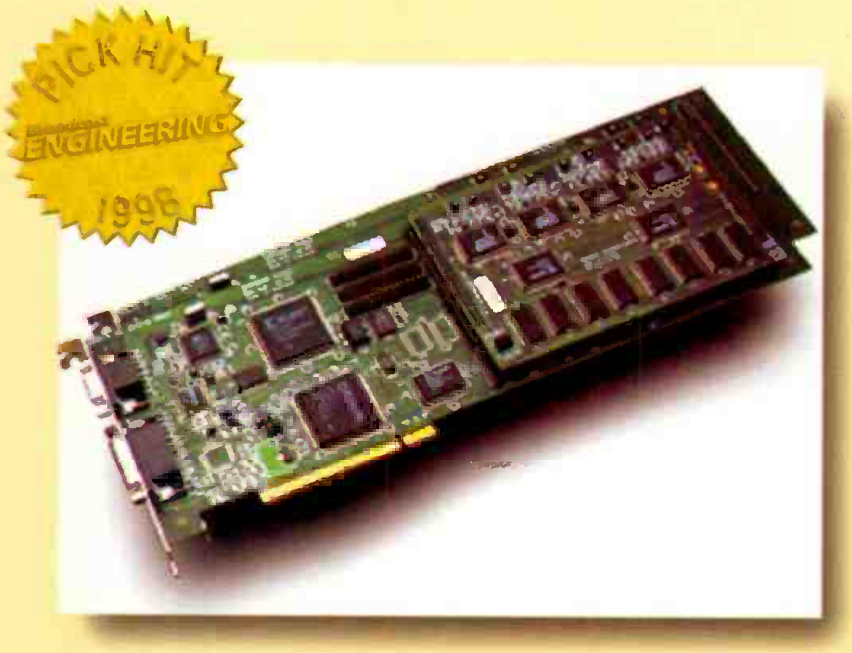
Based in part on the Sarnoff Corporation's JND-metrix, the PQA-200 offers repeatable results in a variety of formats, typically in less than a minute. These results strongly correlate to human viewer trials, and are independent of the types of impairments present, the compression system used or the video material itself. This Windows NT-based system consists of two main modules, one to generate test sequences and the other to compare those sequences against transported, reconstructed versions. Numeric results are provided in two forms: a PQR (picture-quality rating) value and a peak signal-to-noise ratio (PSNR). Graphical, tabular and summary data, as well as a JND (just noticeable differences) map, are also provided. The PQA-200 system offers standard 270Mb/s serial component inputs and outputs, with analog composite I/O op

503-627-2830 or 800-547-8949; fax 503-627-5593;
www.tek.com
Circle (250) on Free Info Card

D-K Audio MSD600C MKII four-channel color LCD audio display

The MSD600C MKII master stereo display offers four-channel analog or digital inputs (user configurable in pairs). This new version features a TFT display with enhanced brightness and contrast ratio, and a VGA output provides for an external monitor if desired. Oscilloscope functions can be assigned to channels one and two or three and four. The PPM bars and the oscilloscope trace colors can be user defined in six different colors, making channel identification easier. Surround-sound monitoring can be enhanced with the optional surround-sound software which offers a "jellyfish" display, instead of the vector display. There is even a built-in pseudo-surround decoder. To complete this display package, an FFT-spectrum analyzer is also available.

+45 44 53 02 55; +45 44 53 03 67; www.dk-audio.dk
Circle (251) on Free Info Card

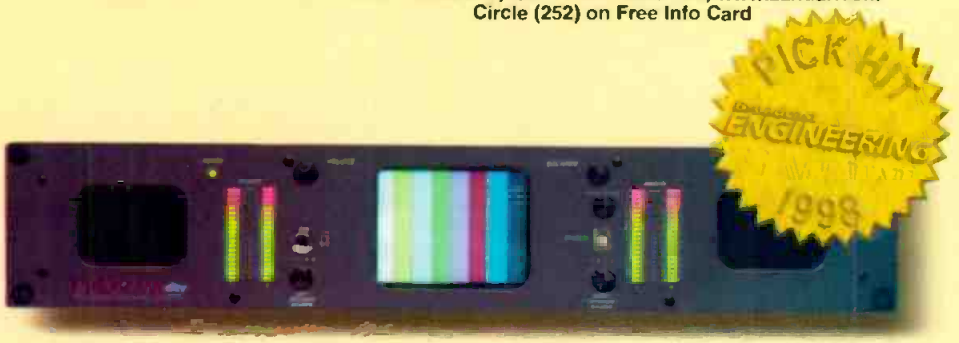


Zandar Technologies MVG16 multivideo window display card

The MVG16 can display up to 16 PAL or NTSC video sources along with flicker-free graphics in real time on a video and/or computer monitor. Each video source can be scaled and positioned easily. The unit consists of two PCI cards linked through an expansion connector. Through the use of an onboard scan converter, computer-generated graphics and text can easily be mixed with the live video display. Twin S-VGA overlay engines allow real-time simultaneous display of two independent video sources on the unit's VGA output. The two sources displayed are the multi-image display available on the video output and an auxiliary input.

+353-1-2808-945; fax +353-1-2808-956; www.zandar.com
Circle (252) on Free Info Card

Wohler VAMP-1-SDI



If you need a compact monitoring tool for digital audio and video, Wohler's new VAMP-1-SDI might suit your needs nicely. This 2RU device includes a built-in LCD display and a pair of amplified speakers. Volume controls, a headphone jack and LED peak meters provide additional capabilities for monitoring up to four embedded AES/EBU audio channels. Embedded audio channels are demuxed from the videostream and converted to analog. The conversion equipment needed to convert SDI signals to analog composite video is also included in the unit. An analog output allows the converted video to be viewed on analog monitors and test equipment.

650-589-1355; www.wohler.com
Circle (253) on Free Info Card

eidria e-trim

e-trim allows video to be logged almost anywhere. Based on the Palm Pilot, it lets you collect clip names, scene names, reel names and other audio/video data information into a database that can be easily uploaded into an edit suite. e-trim's machine-control capability allows users to operate RS-422 or LANC-compatible decks and cameras remotely, while capturing time-code information. With the e-trim package and a video deck or camera, users can create, edit and delete clips. Saved clips are descriptively marked for later review. In the suite, information can be transferred using the Palm Pilot's cradle or a wired/wireless modem. LogWriter software, which works with MacIntosh or Windows 95/NT systems, is included.

530-478-9119; fax 530-478-9889; www.eidria.com
Circle (255) on Free Info Card

Doremi Labs V1D Video Channel for the V1 server

An "accessory" for Doremi's V1 video server, the V1D offers a built-in LCD monitor (optional) and SDI input and output. Analog video I/O is handled through component and composite interfaces. Each V1D provides the server with an additional I/O video channel and is designed for high-end video and broadcast applications. Variable data compression (motion JPEG) allows users to configure the recorder for the best image quality (2:1), editing image quality (34:1) or anything in between. In addition to video, the unit can handle up to four tracks of 48kHz/18-bit audio. A built-in time-code reader/generator supports both LTC and VITC. External control is available through RS-422 and Ethernet interfaces.

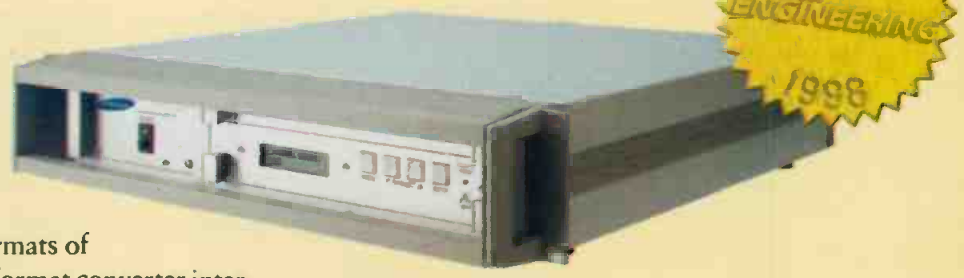
213-874-3411; fax 213-874-3401; www.doremilabs.com
Circle (256) on Free Info Card

Adherent Systems Limited AT970 ATSC Stream View

The AT970 provides a system level solution for real-time monitoring of multiple digital video streams. Up to four streams can be monitored simultaneously in real time to verify conformance with MPEG-2 and ATSC specifications. Designed to integrate seamlessly into a monitoring and control network, the AT970's intuitive GUI provides status of the broadcast network at a glance and reduces operator training. In addition, remote control is available over standard interfaces, including SNMP via Ethernet and RS 232. Configurable alarm outputs, including contact closures, provide the means to alert operators in the event of problems. Dedicated error logs provide a history of the status of each monitored transport stream.

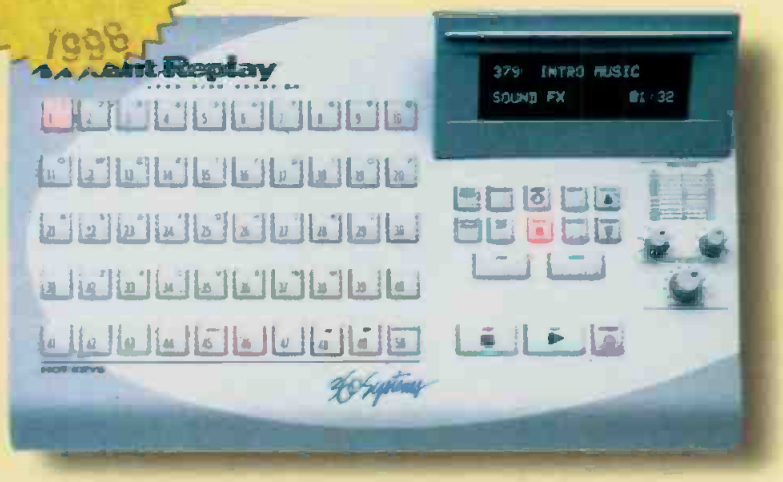
+44 1223 421120; fax +44 1223 421112; www.adherent.com
Circle (254) on Free Info Card

Samsung ARX-100 ATSC broadcast receiver



Playfully dubbed the "rack-top box" by the judges, this 2RU device's 8-VSB front-end processes ATSC digital-signal formats of varying frame rates. An internal format converter interpolates to support 1,920x1,080i, 1,280x720p and 640x480p formats. For monitoring connections to Y, R-Y, B-Y or RGB analog outputs are provided. Through an RS-232 interface, incoming signal parameters, such as signal strength, packet error rate and various IDs within the transport stream, can be easily monitored and logged on any PC. In addition, electronic program guide (EPG) and content advisory data can be checked. Audio monitoring is also provided through unbalanced XLRs (two channels) and optical or coax connections for SPDIF (Dolby AC-3, 5.1 channel).

201-229-4000 or 800-952-8994; fax 201-229-4110; www.sosimple.com
Circle (259) on Free Info Card



360 Systems Zip Drive add-on for the Instant Replay

The Instant Replay has been around for several years, however, new this year is a SCSI port that provides additional connectivity. Among the items that can be connected is Iomega's Zip drive. Zip disks, in their original implementation held 100MB per disk. Newer Zip plus drives now provide up to 120MB per disk. Both 360 Systems' DigiCart/II and Short/cut models also support the Zip drives, making it easy to transfer files from these and other non-networked systems, whether they are across town or across the country. The SCSI port can also be used to support a variety of devices, including increased on-line storage or archival systems.

818-991-0360; fax 818-991-1360; www.360systems.com
Circle (257) on Free Info Card

Yamaha 01V digital mixing console

This full-featured rack-mountable digital mixer has 24 input channels, including 16 built-in analog inputs (12 with +48V phantom power), plus eight optional digital inputs. Digital formats that are available include ADAT, TASCAM and AES/EBU. There are four assignable analog outputs and expansion options for four more or eight assignable digital outputs. A digital expansion slot provides connection to devices such as a multitrack recorder through various interface cards. Coaxial digital input and output connectors, along with balanced XLR-type output connectors, make it easy to connect the unit for a variety of applications. The TO HOST connector allows the unit to be connected to a personal computer, as well as another 01V for increased mixing capacity.

714-522-9011,,714-739-2680,www.yamaha.com
Circle (258) on Free Info Card

Dolby DP567 digital encoder

Dolby's DP567 is a two-channel encoder with both digital and analog inputs. Already encoded signals, such as Dolby Digital 5.1 channel surround sound, pass through the system unaffected, if desired. Front-panel controls allow local setup, and front- and rear-panel serial interfaces allow the unit to be configured from a PC or other remote devices. A separate AES/EBU input can be used as a clock reference signal and as an input for a bitstream multiplexing feature that allows multiple encoded audio signals to be included in a single AES/EBU signal. Multiple DP567s can be connected in a daisy-chain fashion. General-purpose I/O connections provide status and control signals.

415-558-0200 or 800-33-DOLBY; fax 415-863-1373; www.dolby.com
Circle (260) on Free Info Card

Sencore SV953 MPEG-2 Stream Station

The SV953 allows users to record, playout, monitor and analyze MPEG-2 transport streams. Eight gigabytes of hard-drive space provide plenty of room to record MPEG bitstreams at rates up to 60Mb/s. The SV953 provides complete analysis of recorded MPEG-2 transport steams and performs both MPEG-2 and DVB conformance testing. In addition to its real-time monitoring capabilities, users can define conditions in which the bitstream would automatically trigger a recording of the entire stream or selected PIDs. A pre-trigger buffer allows the recording of events prior to the trigger point. An easy-to-use Windows NT interface allows for updates as technology changes.

605-339-0100 or 800-769-2287(AAVS); fax 605-335-6379; www.sencore.com
Circle (261) on Free Info Card

Leader LV 5150D HDTV digital waveform monitor

The LV 5150D provides a way to monitor high-definition digital and analog 1,125/60 signals. It has two serial inputs, plus one three-wire analog input (SMPTE 240M). The unit features waveform, vector, picture and stereo monitoring, as well as full EDH error reporting with alarms. An active serial switched (A or B) output allows the unit to feed a monitor. Operating capabilities include a component vector display with the choice of standard external-illuminated graticule or an electronic scale. Full line select includes a variable (one to 15 lines) window and locator strobe on the picture display. Other features include storage for 10 front-panel setups and remote control capability.

516-231-6900 or 800-645-5104; fax 516-231-5295;
www.leaderusa.com
Circle (262) on Free Info Card

NVision enVoy series of universal digital routers

These routers allow you to route any standard rate SDI and HD-SDI signals within the same switcher at the same time. Starting at a minimum size of 8x8, the enVoy series is expandable in increments of eight inputs or eight outputs up to a maximum of 256x128 in a 23RU frame. The crosspoint structure is combined with various I/O modules to accommodate several data rates. Input and output modules include SDI (143, 177, 270 and 360Mb/s) and HD-SDI at 1.5Gb/s. Dual references allow simultaneous dual standard 59.94 and 50Hz vertical interval switching, and dual outputs for each destination minimize DA requirements.

800-719-1900 or 530-265-1000; fax 530-265-1010;
www.nvision1.com
Circle (265) on Free Info Card

Accom APR Attache DDR

Attache provides uncompressed digital video, key and audio storage. In the eight-bit mode, Attache can store 32.5 minutes of 4:2:2 video and 26.5 minutes of 10-bit recording. In addition to pre-read capabilities, a preread offset allows for up to two minutes of non-destructive pre-read. A confidence record feature allows recordings to be checked as they are made. A program-delay function provides a playback delayed of up to two minutes, allowing the Attache to act as a real-time program delay device for broadcast applications. Both 525 and 625 modes are user-selectable with component digital and analog inputs and outputs.

650-328-3818; fax 650-329-2511; www.accom.com
Circle (264) on Free Info Card

Fujitsu PlasmaVision 42 flat-panel display

These 16:9 screens offer a resolution of 852x480 pixels (16.7 million colors) with a contrast ratio of 400:1. PlasmaVision technology generates light directly, rather than reflecting it from a screen, providing bright images viewable from nearly anywhere in a room with the lights on. These 42-inch diagonal units are less than six inches thick, allowing them to be easily wall-mounted, hung from the ceiling or pedestal-mounted for mobility. Input video signals can be composite, component (Y, Pr, Pb) or S-video in NTSC, PAL or SECAM. A 15-pin D-connector allows the PlasmaVision 42 to be used with PCs or Macs.

973-575-0380 or 888-888-3424; fax 973-575-2194;
www.plasmavision.com
Circle (263) on Free Info Card

Advanced Digital Systems Group (ADSG) digital audio disk recorder

The ADSG digital audio disk recorder offers 16-, 20-, or 24-bit uncompressed digital audio recording on 16 individually selectable record/play channels. Continuous audio output is available at speeds from stop to 1.5x play speed. Among the units' feature set are seamless punch-in/punch-out monitoring, programmable levels of undo, and flexible cut-and-paste editing to sample or frame boundaries on individual tracks, units or across an unlimited number of machines. A position display provides feet/frames, minutes/seconds and milliseconds/samples. The ADSG drives (ADSG's version of the Iomega Jaz drives) offer 2GB each, and an external SCSI port allows for additional disk access. The unit can chase time code and be controlled through Sony 9-pin protocol or over NT network protocols.

310-244-5523; fax 310-204-2123
Circle (266) on Free Info Card

Harris FlexiCoder

The FlexiCoder is a modular MPEG-2 and ATSC-compliant video and audio compression encoder that supports one to six channels of standard-definition encoding with a built-in multiplexer. Users can add to and modify its performance through a series of compatible "hot-swappable" building blocks. FlexiCoder can start as a single-channel standard-definition encoder, and over time, it can evolve into a multichannel, multistandard encoder. If needed, interfaces for DS-3, OC-3 DVB or E-3 are available. To ensure reliable operation, the system supports automatic fail-over switching to optional redundant back-up modules. Multiple FlexiCoders can be stacked for additional redundancy.

217-222-8200; fax 217-224-1439; www.broadcast.harris.com
Circle (267) on Free Info Card

Mathematical Technologies Inc. Intellideck

Intellideck is a self-contained computer-based system that provides resolution-independent uncompressed video recording and image processing. Useable in a variety of applications, the unit is geared toward HD telecine transfers. It provides a full range of aspect ratio and broadcast format conversion. A fully-integrated Intellideck can provide noise/grain and dirt/scratch removal processing, as well as an intelligent interface with color correctors. Through a selection of real-time automatic and non-real-time operator controllable filters, Intellideck can address and correct a wide variety of film-related artifacts. It can even be used to correct videotape problems, such as dropouts and banding. Once complete, video masters can be output in any distribution format in real time.

818-562-6544 or 800-566-6544; fax 818-562-3342;
www.pvpburbank.com
Circle (268) on Free Info Card

THE RULES:

The *Broadcast Engineering* Pick Hits judges operate anonymously. Each year they look for new products that meet the following criteria:

1. Products must be new and not shown at a previous NAB convention. In some cases, distinguishing a new product from a modified older one is difficult. For "Pick Hits" purposes, a new product is one with a new model number or designation.

2. Products must have some positive impact on the intended user's everyday work. Judges search for equipment to be used on a regular basis. Products should provide new solutions to common problems.

3. Products must offer substantial improvement over previous technology. Unique circuit architecture need not be included, but some new approach or application must be involved in the product's design.

4. The prices of the products must be within reach of their intended users. The judges seek products appropriate to a wide range of facilities.

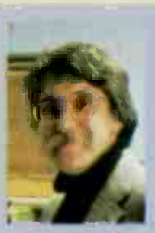
5. The products must be available for purchase within calendar 1998. Equipment must be on display and currently (or imminently) in production. Judges take the exhibitor's word on availability dates.

THE JUDGES:

Marvin Born
Vice President
WBNS-AM/FM/TV
Columbus, OH

Steven Blumenfeld
Director, Strategic Alliances
GTE Imagetrek
Carlsbad, CA

Stephen Damas
Technical Design Supervisor
WGBH
Boston, MA



David Felland
Director of Engineering and Operations, WVMS/WVMT, and Director of Engineering
Wisconsin Educational Communications Board
Milwaukee, WI

Ken Hunold
Audio/Video Project Engineer
ABC Engineering Laboratory
New York, NY

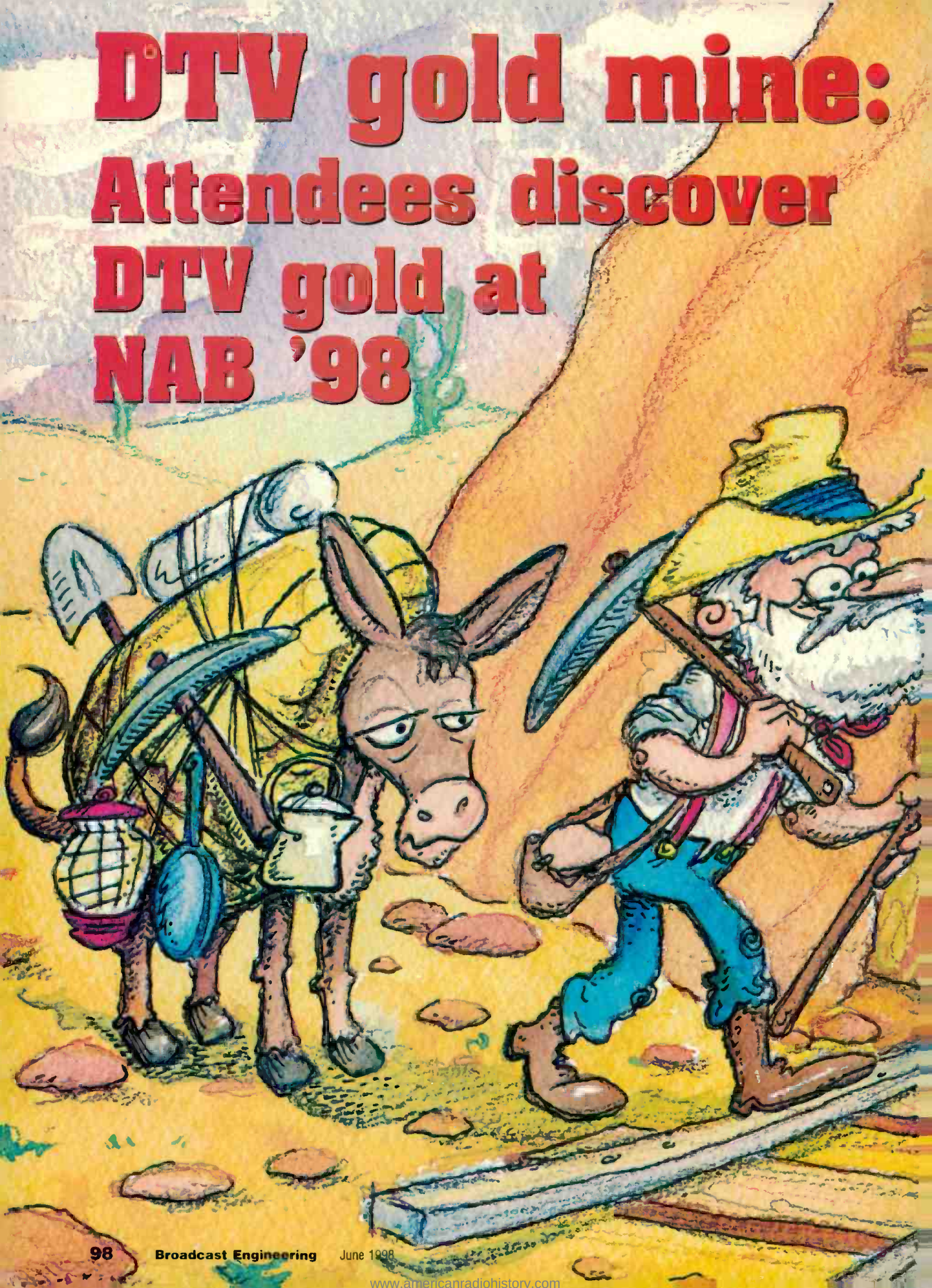
Brad Martens
Director of Broadcast Engineering
TCI
Littleton, CO

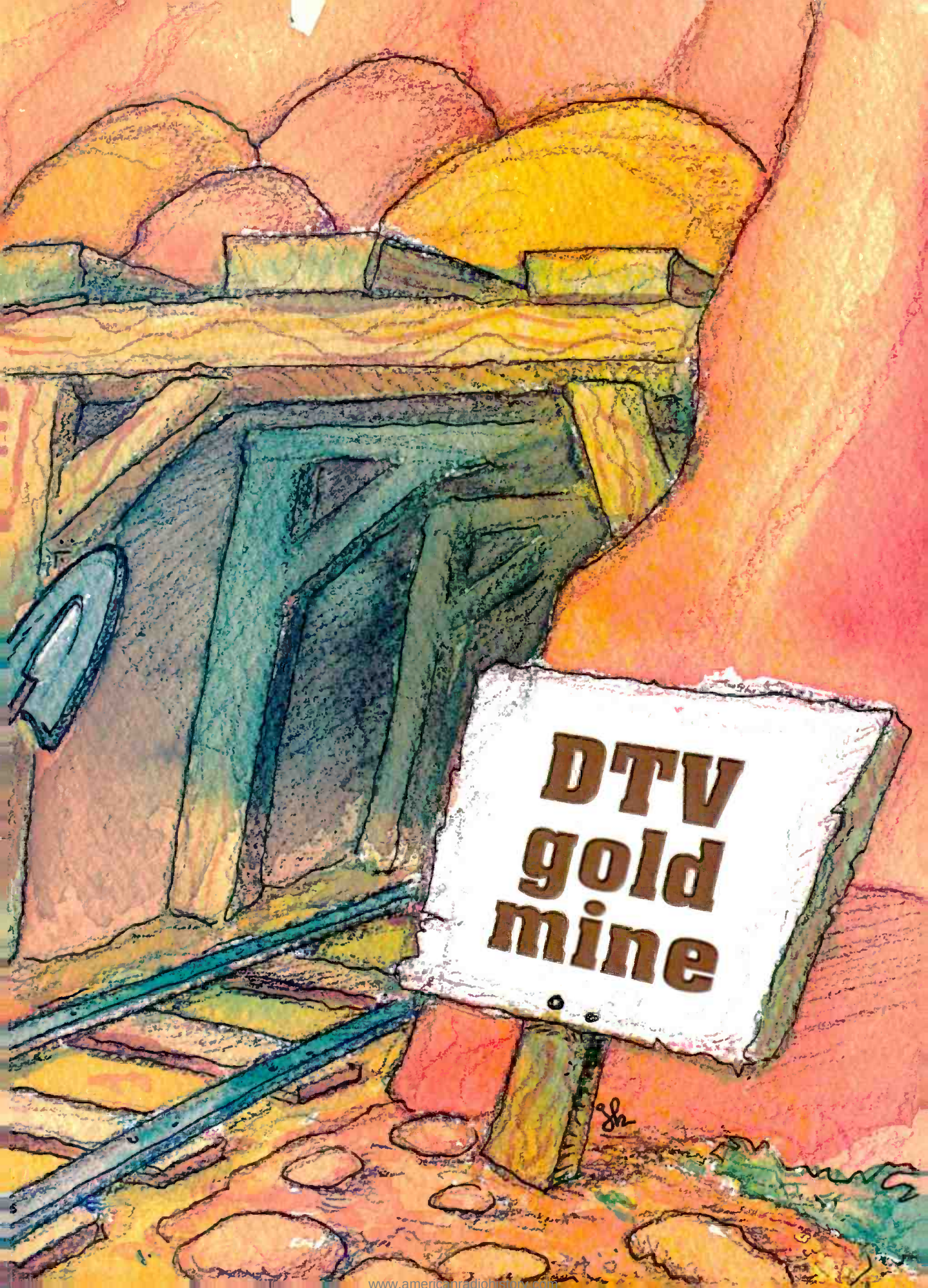
Philip A. Mendelson
Vice President of Engineering
Hollywood Digital
Hollywood, CA

Karl Renwanz
Vice President
Video Transfer Inc.
Boston, MA

Jim Starzinski
Project Engineer
NBC
New York, NY

DTV gold mine: Attendees discover DTV gold at NAB '98





Discovering DTV gold

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By Brad Gilmer

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

This year there were many companies offering video storage products. The two predominant mediums have been, and still are, tape and disk. While I am sure they were represented at the show, I did not see any of the magneto-optical, laser disk, or other storage technologies this year.

While the storage medium has remained essentially confined to tape and disk over the last five to 10 years, one major trend is clearly developing. There is a major war going on in the world of compression formats, and this directly affects storage products. Compression's impact on storage is mostly in the area of cost. Generally, broadcasters are trying to strike a balance between more aggressive compression (lower quality), and lower cost.

While compression has been employed in disk products for a number of years, it is only over the last few years that manufacturers have begun using significant compression to store video on tape. Compression was typically employed in disk products because of their high cost relative to tape (about 75:1). Now there are many tape-based products available using compression, most notably the Panasonic DVCPRO, D5 for HDTV, JVC's Digital-S and Sony's SX format. Also included in this group are the data tape formats typically used in storage silos, including DLT, DCT, and DS-3.

Disk manufacturers continue to employ compression in their products in a big way on the air-playback side. However, several manufacturers of post-production equipment offer devices that store video totally uncompressed, ensuring that what goes in is what comes out. Among the major compression technologies employed by disk manufacturers are M-JPEG, MPEG 4:2:0 and 4:2:2 and DV.

My sense is that most manufacturers, with a few notable exceptions, are moving away from M-JPEG in favor of MPEG or DV. The reason for this is clear — broadcasters are demanding the ability to move video directly from their acquisition format to storage without an intermediate step to analog or 601. They want to avoid the generation loss caused by the decode and subsequent encode. They also find the prospect of moving video around facilities at faster than real-time an interesting proposition, and this is something that cannot be accomplished in the analog or 601 domain.

Since there are no field-acquisition products in everyday use with M-JPEG outputs, this leaves M-JPEG products as legacy equipment. It will continue to be used, but an end to the useful life of these products can now be anticipated.

The other part of the storage equation that relates directly to disk storage these days is how these devices interact with both computer-based technologies and traditional broadcast video products. In the former case, computers like to deal with files. They generally like things with a beginning and an end, and do not deal well with the concept of frames. Of course, a typical VTR knows nothing about file names, but is generally based on the concept of a field or frame of video. This difference between the two must be bridged for broadcasters to use

computer-based technology effectively in the future.

Video servers

Hewlett Packard announced two wide area networking (WAN) connectivity products for its MediaStream products. The HP MediaStream Connect provides WAN connectivity for applications that require near real-time transfers, while the MediaStream Connect+ provides support for applications in which time-critical data and/or large amounts of content are moved. Both products allow for the easy exchange of compressed video content.

Panasonic showed two DVCPRO-based video servers, the AJ-DR7000 and the AV-SS500. The AJ-DR700 is a PCI bus Windows NT-based platform with four physical I/O ports. The unit has sufficient internal bandwidth to support seven DVCPRO streams. It is supplied with 2.5 hours of storage, which can be expanded with external drives. The AV-SS500 is a compact eight-channel server that operates like a multichannel disk recorder. It can transfer eight video streams simultaneously at standard play speed. Its VTR-like protocol allows slow motion and shuttle and playout sequences and edits can be controlled using a typical edit decision list. Odetics control protocol is also supported for playout operations.

Drastic Technologies' VVW-5000 10-bit uncompressed server is one of several new products in the new VVW series. Other products include the VVW-1500, a low-cost DDR, the VVW-2000, an all-digital DV/DVC editing DDR, and the VVW-3500 dual-channel M-JPEG server/workstation/DDR. The VVW system is both hardware and software based. Modules are hardware independent and can be used on any of the VVW hardware platforms. Among the software modules are logging software, playlist management and batch digitizing.

Quantel's Cachebox is designed to be the perfect partner to the Clipbox and for stand-alone applications. When used with Clipbox, Cachebox provides additional channel bandwidth and distributed storage for regional variations/sectionals. In a stand-alone configuration, Cachebox is suited for applications, such as NVOD, time delay and program/commercial distribution. Cachebox uses DVCPRO compression and provides six hours of random access storage. It supports 4x real-time transfer and has four independent video channels. Clipbox can now support 14 independent channels

Doremi added several new capabilities to its V1 video server. At the heart of the system is the file server and video storage unit (VSU). The file server reads video and audio data stored in the VSU and transfers it to video channels, which consist of the family of V1 VDRs. The V1D video channel offers analog and digital I/O, front-panel controls and a built-in LCD monitor as an option (see "Pick Hits of NAB '98," p. 90). The V1 is an analog version of the V1D, while the V1e is a low-cost 1RU version controllable via RS-422.

Philips has been active in the automation and video server markets for several years, and this year they introduced the Newsbreaker networked news-editing solution for the Media Pool digital

video server. Also announced was a cost-effective archive solution for the Media Pool. In conjunction with StorageTek, Philips is offering the rack-mountable TimberWolf 9730, which can hold up to 7,000 30-second interstitials at component video quality in only 17.5 inches of rack space. The TimberWolf series accommodates varying levels of storage needs with features that include automatic error recovery and a patented vision system designed for automation.

ASC, manufacturer of the VR300 video server, announced the NEWSFlash system for server-based newsroom operations. A key advantage is the ability to share information with an on-air video server system on the same Fibre Channel Arbitrated Loop. The ASC VR300 server uses FibreDrive, ASC's patent-pending Fibre Channel architecture. FibreDrive enables users to have instant, simultaneous random access to shared Fibre Channel RAID storage. The VR300 also features RAIDsoft, a software RAID technology that eliminates the need for additional hardware.

Thomson Broadcast's Nexstore is a video server designed to integrate easily into a broadcast facility. It offers 270Mb/s video I/O, AES/EBU and analog audio I/O, as well as RS-422 ports. With up to 72GB available storage, it can provide more than one hour of uncompressed high-quality video. For increased capacity, the compression can be increased to 7:1, and an external UltraSCSI port allows for increased storage if needed.

At the Concurrent Computer Corporation's booth they were demonstrating, the MediaHawk line of video servers. These high-performance UNIX-based servers use MPEG-1 or MPEG-2 compression for interactive video-on-demand applications. The systems are based on an open system architecture that is scalable to support future growth.

Pluto unveiled its AirSPACE multichannel broadcast server. It will initially use DV compression at 25Mb/s and DVCPRO50 at 50Mb/s, other compression formats are planned. Compatible with all DV-based acquisition devices, AirSPACE accommodates up to 10 simultaneous I/O operations. Multiple units can be linked via Fibre Channel for increased I/O capabilities. AirSPACE features an internal bandwidth of more than 100Mb/s, RAID-3 protection and hot-swappable drives.

SeaChange introduced its Broadcast MediaCluster for play-to-air applications. MediaCluster is a patent-pending computer cluster architecture that extends the concept of RAID to computers or nodes within a cluster. Regardless of the number of nodes, the system acts like a single fault resilient video server. The Broadcast MediaCluster can scale from a single server for modest I/O and storage requirements to a multinode cluster with dozens of inputs and outputs. It offers terabytes of storage and interfaces to tape library archives.

Among the many high-end computer solutions at Silicon Graphics, was the Studio Central 1.1. Studio Central addresses increasing digital media demands by providing a solid infrastructure for sharing, repurposing and securing digital assets. It offers a customizable framework that includes software driver keys to a variety of content servers. Windows NT and Windows 95 C++ client support allows users to build powerful custom desktop applications. Improved query capability makes it possible to build complex searches, making it easier to locate specific assets.

Broadcasters are demanding the ability to move video directly from their acquisition format to storage without an intermediate step.

MegaDrive has changed its name to dataDIRECT Networks. The company provides data storage solutions for Storage Area Networking (SANs), allowing users to share uncompressed video (SDTV and HDTV) and image data between an unlimited number of mixed network clients. The EV-1000 RAID storage solution provides a scalable framework for storage from gigabytes to terabytes.

For more information, circle (300) on Free Info Card

Disk storage

Digital Video Systems ProntoVision provides for concurrent storage of virtually all interlaced and progressive SDTV and HDTV formats in a single system. ProntoServer is an uncompressed multichannel digital video server with shared storage for component and composite video.

MountainGate's CentraVision 6200 VDR is based on Fibre Channel network attached storage. When used in conjunction with the CentraVision file system, these VDRs allow shared access to media. Storage can be expanded as needed to more than 40 hours uncompressed.

Videomedia showed the 2XS, a Windows NT-based dual-stream DDR that uses mathematically lossless compression. The 2XS fits within a 6RU chassis and accommodates up to 36GB of removable storage. For higher capacity applications, the system can handle up to 126 drive connections using Fibre Channel technology for an aggregate data rate up to 200MB/s and up to 2.2TB of storage. The VIP-Suite is a line of station automation software modules that can be used in a variety of applications, including spot and commercial insertion. The newest addition the Videomedia's VIP-Suite is the VIP-Play List which is capable of executing time-line sequences from as many as 31 V-LAN controlled devices.

The DPS Whiplash is a slow-motion/instant-replay system that allows video clips to be played back in forward or reverse at any speed from zero to 100% of play speed. The Whiplash combines the Perception VDR with custom software to provide smooth slow-motion playback. Also new at the DPS booth was the DPS Simply Hollywood. This pre-configured system combines the Hollywood board set with a PCI bus expansion chassis, requiring only a one-half length PCI slot to connect it to any

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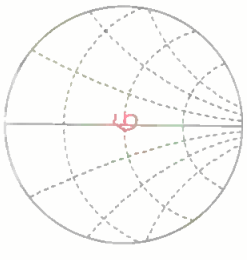

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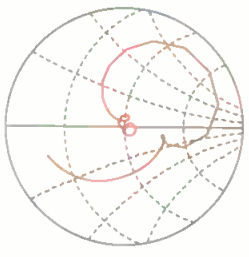

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Fast Forward Video (FFV) showed its Omega line of VDRs. New this year was a Fibre Channel option that allows for video transfers at rates up to 100MB/s. With these speed increases, the Omega decks can be configured for multichannel server applications with up to 15 channels of play from a single common disk array. Also at FFV were the Bandit and Bandit SG animation recorders. These random-access recorders can be controlled via SCSI II by a Windows PC or Silicon Graphics workstation. In addition, they can be used as standalone devices.

The Attache DDR (see "Pick Hits of NAB '98," p. 90) from Accom offers a variety of useful features including a non-destructive pre-read. Also new this year at the Accom booth was the WSD/2Xtreme video disk array, which offers switchable 525/625, 8/10-bit uncompressed digital video storage. It is available in 5-, 10- or 20-minute configurations.

Another device that provides time delay for broadcast is the Time Machine from Prime Image. The Time Machine can actually be used to build delay, as the delay through the unit can be shortened or lengthened dynamically. For an interesting comment on delaying live video feeds, see Paul McGoldrick's "EOM" on p. 212.

Mercury Computer Systems was demonstrating its SuiteFusion. This scalable system provides shared storage for multiple video workstations. It offers no single point of failure and is suited for use in quick-turnaround video facilities.

Rorke Data's StudioNet-FC is a complete Fibre Channel network and storage system. Standard network storage configurations range from 16GB desktop arrays to 2TB+ tower systems. The system offers fast full-duplex serial communications at rates up to 200MB/s. StudioNet-FC's drive arrays can be configured as just a bunch of disks (JBOD) or as RAID 0. They can also be configured for single or multiple host storage.

Also on the subject of networked storage is Transoft Technology Corporation. Its new FibreNet networking and storage management software embraces an open systems architecture. FibreNet SAN software includes features of Transoft's StudioBoss Lite, Standard and Pro versions with advanced support for I/O throttling, new fabric switching technologies and higher performance Fibre Channel networking cards.

For those wishing to store stills rather than full-length spots or programs, Spencer Technologies was showing its Still Store-2000. The SS-2000 features a high-resolution GUI that eliminates the need for confidence monitors, an internal DVE for picture in picture, a powerful database, and Ethernet connectivity. The NEWSTORE is a clip-store that holds all the video and audio source material needed for a typical news production.

Moving video around facilities at faster than real time is an interesting proposition.

From Miles comes the M25 Not-So-Still-Store, that allows real-time multilayer compositing of SDI stills, logos and animated clips. A 160-frame video RAM cache allows instant recall of preselected images and an internal hard disk and PCMCIA memory card provide non-volatile bulk storage.

For more information, circle (301) on Free Info Card

Tape storage

For the most part, there were no new videotape formats introduced this year, however, new levels of existing formats were shown and discussed. Digital-S from JVC currently records at 50Mb/s. A 100Mb/s version was shown that provides sufficient bandwidth to record a 480-60P signal. Also from JVC is an HD extension of the D-VHS format. These new decks will be able to record all of the proposed 19.4Mb/s ATSC/DTV signals at full specs, including 1,080i and 720p. These units are capable of maximum bitrates of 28Mb/s and a maximum record time of 3.5 hours. Also discussed was a 100Mb/s extension of Panasonic's DVCPRO format, DVCPRO 100.

New from JVC were the BR-D92 and BR-D52 Digital-S studio VTRs. Both decks provide four channels of independently editable 16-bit PCM audio. The BR-D92 also has the added feature of front-panel editing control of any RS-422 capable studio VTR. The DY-90 camcorder allows up to two hours of footage to be captured in the field using JVC's new D-124 metal particle cassette.

Among the new tape-based products found at Sony this year were the DSR-70 portable editing recorder, the DSR-V10 video walkman player/recorder and the DNW-A25 portable Betacam SX VTR. On the HD side, the HDW-700 camcorder is a 2,000,000-pixel RGB camcorder that uses Sony's BCD series HD ½-inch metal particle tape. It's studio companion, the HDW-500 editing VTR, records and plays back HDTV signals conforming to SMPTE 274M. Video I/O signals are 1,920x1,080 (16:9), 2:1 interlaced, 10-bit digital component signals at field rates of 59.94 or 60Hz. The unit features video and audio pre-read and a full-featured menu-driven control panel.

Although the Ampex DCT format continues as a product, the main thrust is on the data storage products of the DST line. The DST double-density product line includes the DST 312 standalone tape drive that can accommodate 50GB, 150GB and 330GB cartridges. At the top of the line is the 812-automated-cartridge library that stores 12.8TB of data and provides an aggregate data throughput of 80MB/s.

Panasonic announced the AJ-HD2200, a portable D-5 field recorder. The unit operates on 12Vdc and records compressed 10-bit 1,125i signals on ½-inch 63-minute cassettes. On the DVCPRO front, a dockable, switchable 25/50Mb/s DVCPRO recorder was shown as a 4X play studio VTR. For those looking for a tape library system, Panasonic's Smart Cart can hold up to 210 DVCPRO cassettes in a single rack-sized unit.

The Penta Standards Converter, time-base corrector, and video synchronizer operates on our exclusive five-field interpolation system that reduces judder motion two-to-one. Most video standards can be input or output including NTSC, PAL, and SECAM. Penta also acts as a transcoder for a variety of signals.

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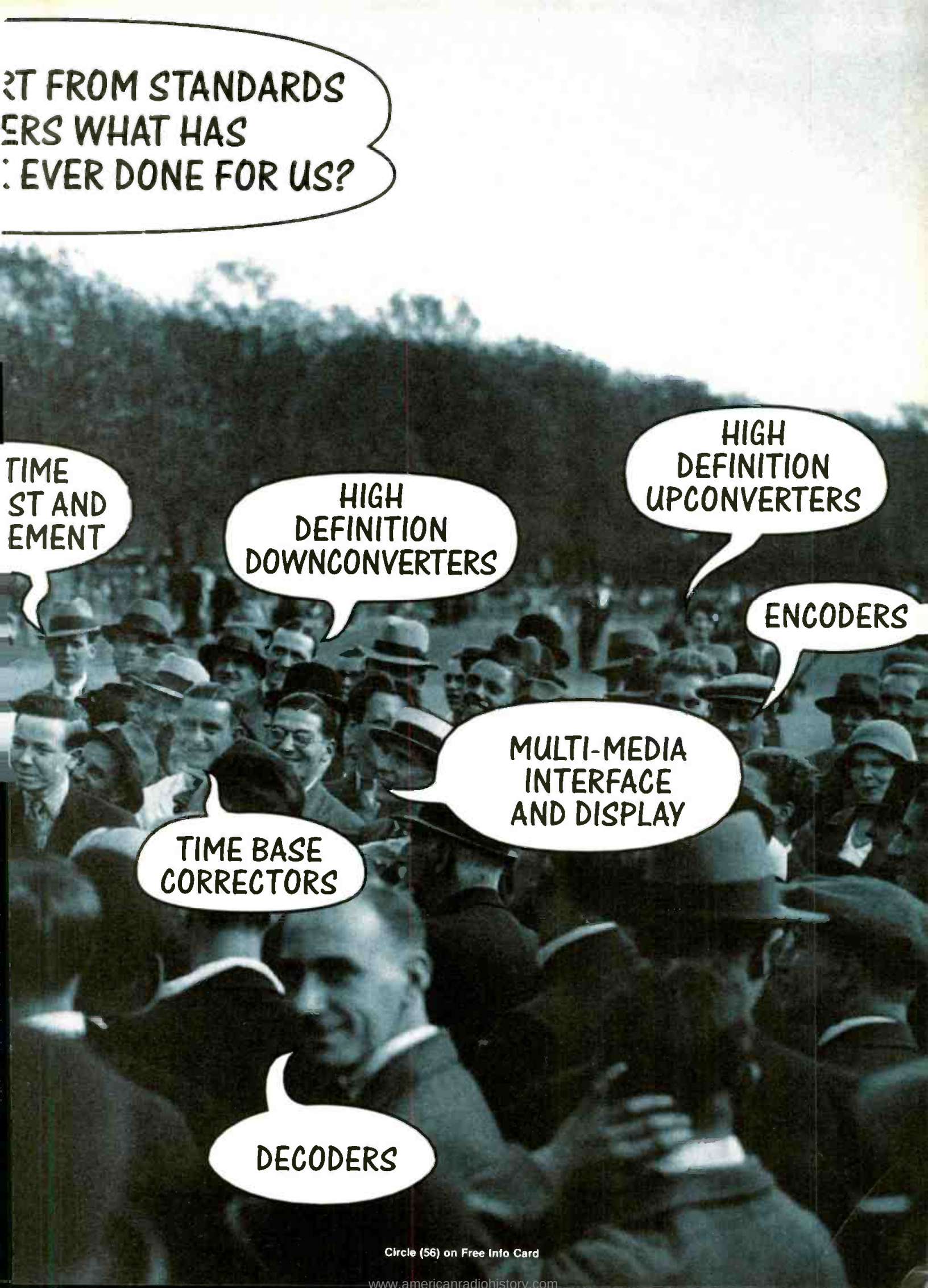

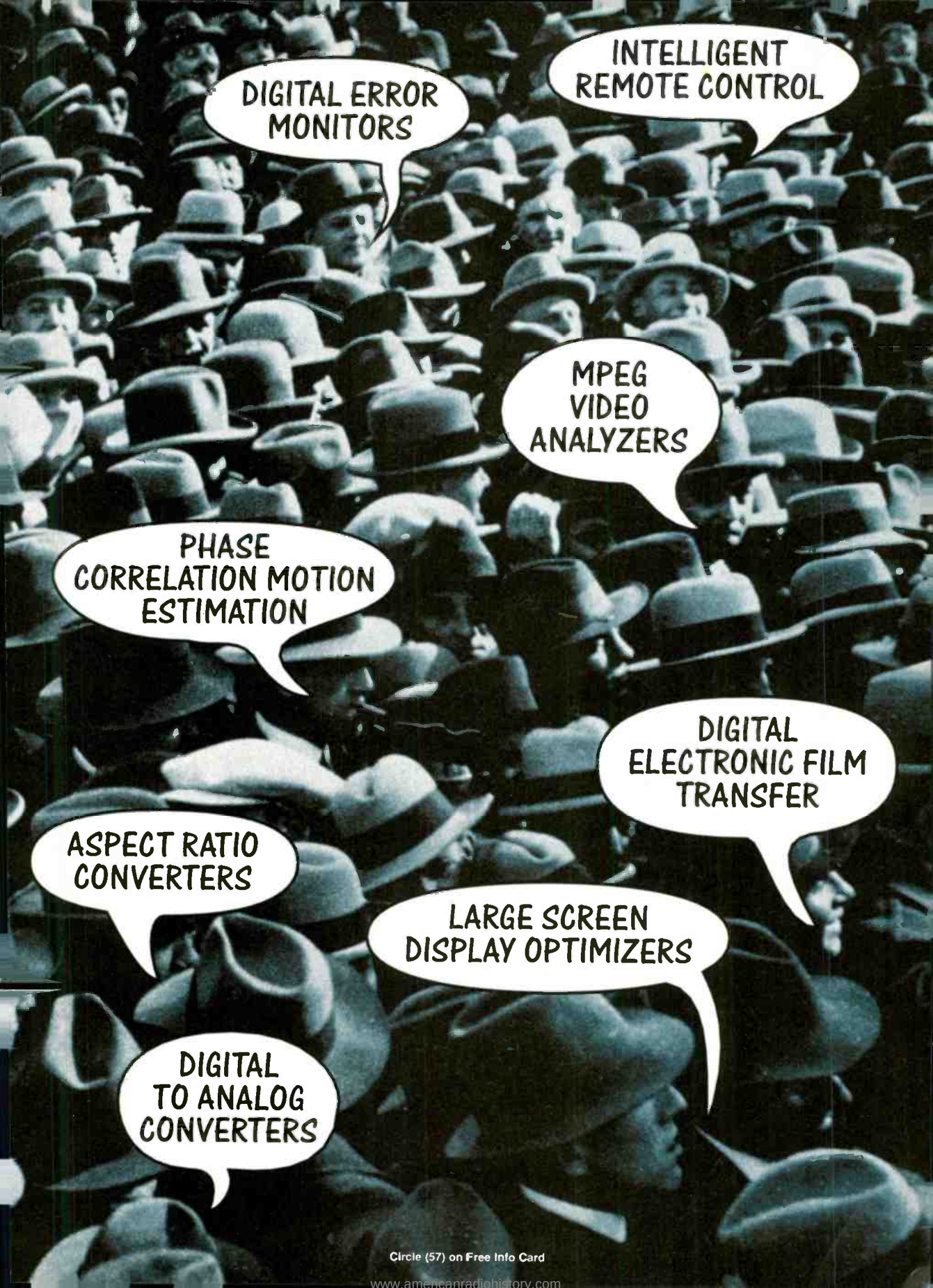

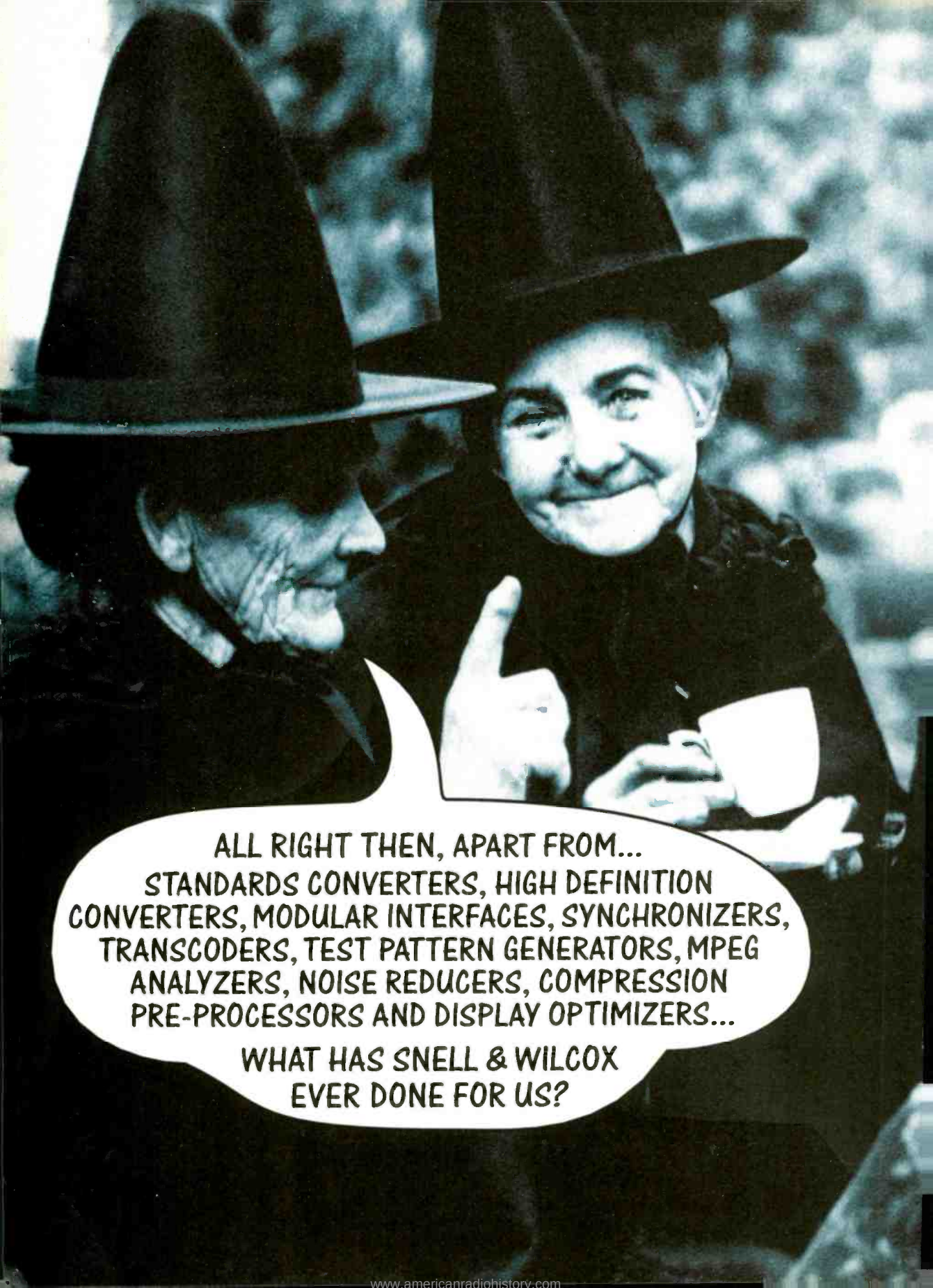

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On the subject of video library systems, Elettronica Industriale, a systems integrator based in Italy, offered an all-inclusive chain for broadcasting 8-VSB signals. At the beginning of this chain is the Cart Machine, a multistandard automatic emission unit that can accommodate 120 to 600 videocassettes and four to 10 professional VTRs. It can also operate in four different standards simultaneously.

AAVS, a French systems integrator, offered a tape library system. The DIVA videocart system is available in DVCPRO, Betacam and S-VHS configurations. The latest implementation, the DIVA DVCPRO holds up to three VTRs, with a library of 160 cassettes.

Odetics unveiled its TCS45 PRO automated video library. The new system accommodates medium and large DVCPRO cassettes and can hold up to 332 hours of video material. The SpotBank Pro was sporting several enhancements at NAB. Among them are resource sharing for VTRs and DDRs used for media preparation and recording and ViewBase, a powerful new database management tool.

While on the subject of tape storage, let's take a quick look at the storage medium itself. Quantegy introduced a full line of Betacam tapes for professionals. The DBC line is designed for Digital Betacam and offers high durability and output. The BSP line is for Betacam SP decks and provides excellent picture and audio reproduction for professional ENG/EFP and studio applications. The BC line for standard Betacam recording offers a consistently low head wear ratio and low dropouts of clean, clear picture quality. Also available is a new line of S-VHS tapes.

BASF had a full line of videotapes that included professional broadcast and studio media. Tape lines include BetacamSP, Digital Betacam, S-VHS, VHS, one-inch type C and a Security Master.

Sony announced several new videotapes this year. Among them are the PDV-M series of DVCAM master grade videocassettes and the Betacam SXA series.

Maxell introduced a family of D-5 cassettes. These tapes use a new formulation that delivers the high performance needed for digital recordings at 288MB/s. These new videocassettes are available in recording times of 63 and 124 minutes. Also from Maxell is an advanced cleaning solution, CL-S, which is environmentally safe and non-flammable. It does not degrade rubber or plastics so it can be used to clean pinch rollers as well as metal transport parts.

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By Marvin Born

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

The next few years will see major changes in the broadcast industry, especially the selling and purchasing of equipment. First, will be the transmission equipment including antennas and transmission lines for ADTV. Followed by studio origination equipment. We will be seeing video tape machines for HDTV probably as the first studio piece of equipment; however, there has to be a method of getting those bits around and switching from one bit-bucket to another.

Presently, local broadcasters are expecting to receive a DTV program data stream in the late fall of 1998. While the exact specifications are still being determined, it appears that the HDTV program material will be 1.5Gb/s as source material. It will then be compressed to something like 44Mb/s for transmission to a broadcast center. Decompressed to be processed for transmission and then re-compressed to 44Mb/s again and sent via satellite or terrestrial connection to the local broadcaster. There, it will be again decompressed for processing and then again compressed, this time to the ATSC 19.39Mb/s, to be fed into the transmission system to the viewer.

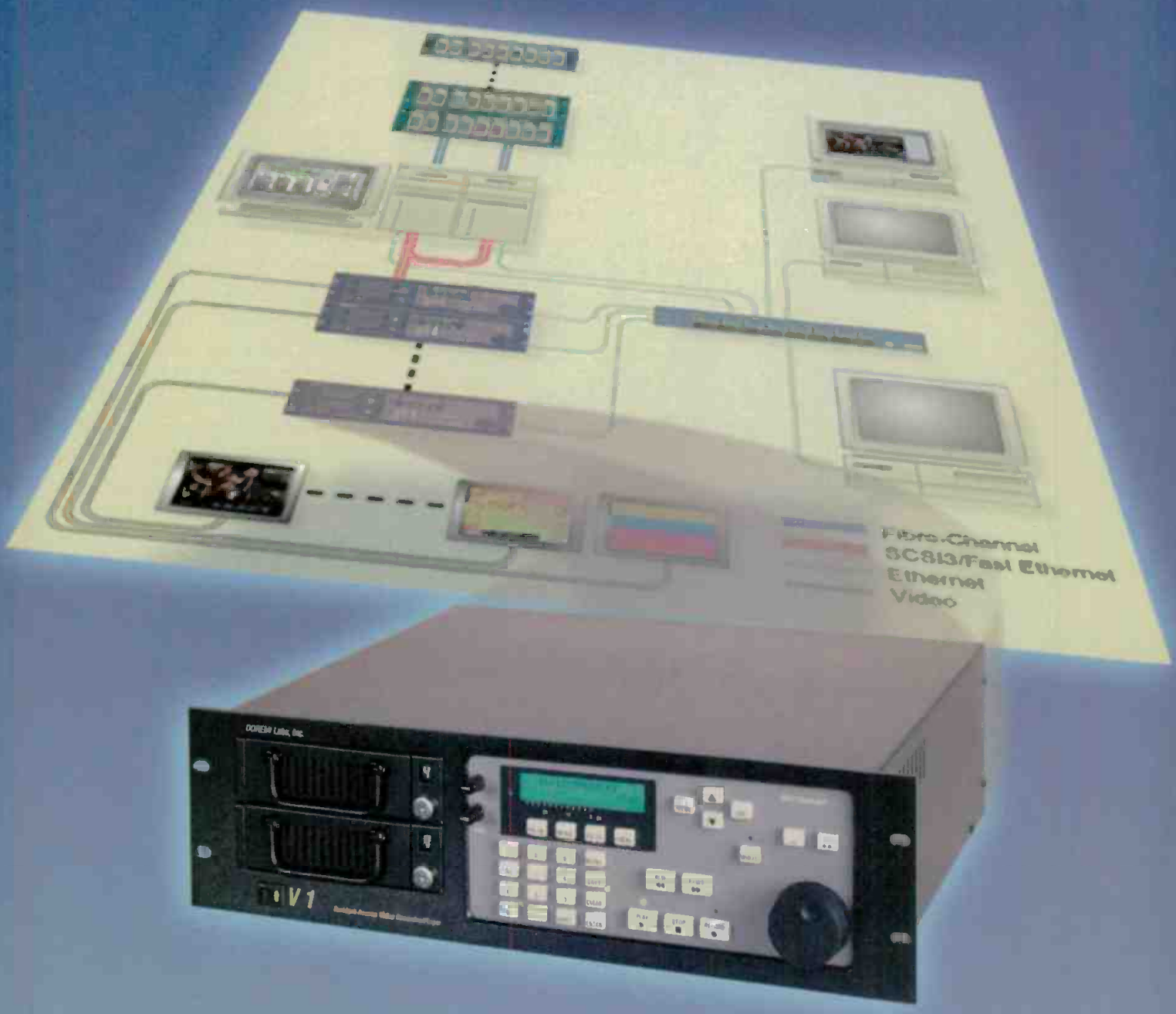
Two of the behind-the-scenes systems will be the routing switcher within your broadcast facility and the connecting cables between routing clusters and the equipment; in other words wire, fiber and connectors.

This year will be the year of the routing switcher and maybe next year too. For the last few years we have been shown literature outlining the advantages of using 270Mb/s and 360Mb/s routing within digital facilities. The cost is less than higher speeds (e.g. 1.5Gb/s) and present digital equipment is compatible. However, these speeds require compressed HDTV formats and dealing with compressed video is a problem when you want to process (read that "supers, lower thirds and bugs") the video. Another surprise is the cost of the compression and decompression hardware that is required to get into and out of these routing switchers. Innovative broadcasters have found that greater than 32 ports are necessary for modest facilities, so compression in and out of this size router is expensive.

However, last NAB and earlier in the year in major meetings, a major network suggested the use of 1.5Gb/s routing within the facility. The major advantage of 1.5Gb/s is that the digital video is non-compressed. The major disadvantage was the extreme cost. Scary numbers were discussed regarding the cost of a large router system. Even less than a year ago a full bandwidth HDTV router seemed impossible.

Several manufactures have been working to bring a product to the market that lowers the overall cost of digital routing. The use of large flat plane routers has been replaced with a cluster routing concept. For example there will be a 32x32 routing system in the newsroom, a 64x64 router in the tech center and another 32x32 in the production control room. Each of the above routers is connected via tie lines. The routing control system must know how to deal with such connection, since two cross points must be active rather than just one to move material from one system to another. Additionally, the use of tie lines requires some discipline, in other words, users can't just leave a satellite receive up all day just to see what is on

Ace Server



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the bird.

Of course the other consideration is that the manufactures are providing routers at greatly reduced costs. One such manufacturer is NVision of Grass Valley, CA. Its enVoy series of routers (see "Pick Hits of NAB '98," p. 90) now operate at both SDI and HD SDI at 1.5Gb/s rates within the same frame. The input and output cards provide for either operation. The frame sizes available are 64x64, 128x128 and 256x128. enVoy supports simultaneous SDI and HD-SDI signals at 59.94 plus others within the same frame. In other words, the Envoy can switch SDI and HD-SDI signals in the same router and the router can be changed at will by changing the input/output cards. An SDI router system for present needs along with a small island of HD equipment switched within the same router. As needs changes, the island can be made larger by changing the cards. enVoy supports or will support both copper wire connections and fiber connections and the control system keeps track of which is which. Most importantly, it is reasonably priced.

Two must-have items from NVision are a couple of books titled *The Book*, an engineer's guide to the digital transition and *The Video Engineers Guide to Digital Audio*. Talk NVision out of a set of these books and make them required reading for your studio maintenance people.

Utah Routing Systems, now a division of Artel Video Systems has an interesting product called the Utah 300 and its companion Smart Architecture system. The 300 allows 143Mb/s NTSC composite and 270Mb/s component to operate in the same switcher frame. The 300 reclocks on the output to reduce jitter and is available in three frame types: a seven RU for 64x64 video; a seven RU for 32x32 audio and video; and a 12 RU for 128x128 video only. Expansion beyond 128 is possible.

While the 300 series is its flagship system, Utah offers a 1500 router which is a full 1.5 Gb/s HDTV switcher in a six RU frame. The control system talks to all of the Utah products, again allowing an island of HDTV equipment to be built within a facility of NTSC and or 270/360Mb/s digital systems.

Another high-end router is the Venus

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by Philips, which features very high-density frames. Venus is an HDTV routing switcher in that it offers wide bandwidth analog video, composite or component. As a digital switcher capable of 400Mb/s serial digital, it is completely standards independent. Additional crosspoints can be added for AES/EBU digital audio and RS-422 for fully automatic routing of machine controls. Configuration is available from 32x32 to 352x128. Typically a 64x64 requires only 11RU and a 160x128 requires only 44RU. Additional frames can be stacked with ribbon cable within the frames connecting the busses. All components are modular and can be removed or replaced while the system is in operation.

Tektronix offered a group of digital video products at NAB, which included its new M-2100-HD master-control switcher, the 110HD production switcher and the series 7000 HD routing switchers, which offer full bandwidth HDTV switching and are compatible with the existing series 7000 matrices and control systems. System compatibility is important in that it allows small islands of HDTV equipment to exist in the same plant as analog and 270/360 DTV formats at affordable costs. Tektronix also offers a small "Performer HD" series of 10X utility routing switchers for uses such as monitor switching and as bypass switching for master control. Just think of this product as a digital HD version of the famous Grass Valley 10X switchers. To work with its routing and production switchers, Grass has introduced a line of HD distribution amplifiers that provide six 1.5 Gb/s outputs with no reclocking.

di-tech of Dear Park, NY offers a series of utility routing switchers offering D-1, D-2, D-3 and 360 Mb/s video switching. The comapny offers an NTSC output port for monitoring by adding an optional plug-in card. These small switchers are offered in 12x4 and 12x8 configurations and have optional AES/EBU or analog audio matrices.

Sierra Video Systems offers a 130-page catalog of digital equipment, the majority of which is digital switching (the page numbers are located on the railroad-cross sign on each page). Sierra's booth at NAB featured a number of electric trains, which attracted a large number of visitors.

The Ponderosa series is SVS's large routing system, and is available up to 1,024x1,024 with data rates of 143,177, 240, and 360 Mb/s. Special-order data rates are available up to 2Gb/s. You should call or e-mail Sierra and request its catalog. Not only is it complete as to product, but it is quite educational. The product descriptions are quite detailed and offer quite an education to DTV components and how they work.

AutoPatch has several small to medium sized matrices, some of which offer wideband video performance up to 400MHz. The 8Y-XL offers 180MHz bandwidth with matrix sizes up to 64x256. The 1Y-16 offers matrix sizes from 4x4 to 16x16 and 400MHz bandwidth with multiple I/O board combinations. For small stand-alone applications, the Half-Y is a 1RU unit that switches video and stereo audio with professional specifications in a matrix size up to 8x4.

Avitel offers some small matrix routers that fit a variety of needs, among them are standard definition routers with matrix sizes of 16x16 and 32x32

Another manufacturer of small matrices is Network Electronics. This company has analog and digital matrices for both audio and video. New this year is the PRO XL series, a 3RU 32x32 matrix that can be used for audio, video or data. For video, the bandwidth is 125MHz. The unit is programmable and can be remote controlled using an RS-232 port or a MIDI port.

Extron, known for its scan converters, was showing several routing switchers. Its MAV 1616 series is a 16x16 matrix that comes in several configurations, including video and stereo audio (the MAV 1616), video only (the MCV 1616) and stereo audio only (the MSA 1616). Each comes with RS-232/422 control and a front-panel controller. A preset feature allows up to sixteen I/O configurations to be stored in memory. Extron also unveiled its CrossPoint 1616 series switchers. These 16x16 matrix switchers also have 16 memory presets.

PESA Switching Systems' new Tiger 144x144 claims to have the smallest footprint of any large scaleable router available today. Also new is the Alliance Master Control Switcher, which is based on NEC's Multi-Format technology. The Alliance allows stations to use a single platform switcher for both SDTV and HDTV broadcasting.

Datatek introduced a high-density digital video addition to the D2800 system. The unit meets digital video standards to 360Mb/s and a 192x192 matrix fits in only 22RU. All of Datatek's routers use the same built-in control system, which offers available tie-line management, Windows-based RouteMaster PC control, matrix mapping and a virtual tally system. Datatek also introduced the D2627 AES/EBU synchronizer, which permits error-free switching of asynchronous signals. The D2627 phase aligns signals external to a routing switcher so that clean switches can be made by an otherwise asynchronous digital audio router.

Purchasing and installing larger or small digital routing switchers is one thing, connecting them together is something else. A quick review of switcher specifications reveals that copper wire has a short run length when dealing with 1.5 Gb/s data. You could almost measure it in inches, actually 10 feet is a good number. Therefore one must conclude that the major connecting runs will be fiber optics. And of course, the wire and fiber must have connectors.

One interesting wire product is Belden's "MediaTwist," which is an unshielded twisted-pair cable with four pairs of conductors within the same jacket. The product is constructed with "extremely uniform dimensions and

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internal physical spacing," which provides performance beyond 100MHz, with some usability to 350MHz that makes it useful beyond TIA/EIA Category 5 standards. MediaTwist is constructed of a bonded pair system that has a crescent shape such that each pair is locked into place, reducing pair to pair movement during installation. This insures that the crucial "mirror image" of the pairs is maintained for exact balance. This cable has been successfully tested to 270Mb/s on a 135MHz system. MediaTwist is 100Ω plus or minus 15Ω to beyond 100MHz.

Belden has also added two new 75Ω SDI video cables to its line-up. Number 1855A is a miniature SDI cable for use in mobile trucks where both digital and analog signals are used. This miniature cable is designed to reduce space requirements and reduce actual vehicle weight to comply with vehicle axle weight requirements. 1855A is approximately 30% smaller and is 50% lighter in weight than the industry standard RG-59/U cables it replaces.

Belden's other new cable is Belden 7731A, which is a replacement for long run RG-11/U. It is intended for studio and post-production houses and useful for HDTV applications. 7731A exceeds the limit of 300 feet for normal installations of 1.5Gb/s, and is available in 10 colors for easy coding. An interesting fact is that the colors match the EIA standard for resistor color codes.

Mohawk/CDT offered its usual line of audio and video cable; however, looking closely reveals a line of hybrid fiber-optic camera cable that has a pair of single mode optical fibers and four 20 AWG and two 24 AWG copper conductors. There is a stranded steel strength member and all is covered by a copper braid and black Dura-Flex jacket. They are UL approved to 300 volts. Another line is the Tactical Fiber Optic Cables. Obviously, they are intended for ENG, SNG vehicles and other outdoor heavy-duty applications. Both single and multimode cable are available.

Canare, famous for its line of colored cables, also offers patchbays, connectors, snake systems and cable reels. Its serial digital video cable is available as a single-run or multichannel digital coaxial cable and up to five cables are contained within the jacket of its V-CFB series. Canare displayed a new combination coaxial cable stripper, the TS100E, which has five strippers in one single hand tool. Just turn the knob and you are ready for another type of cable. No more changing blades or adjusting set screws.

At the CommScope booth, attendees could see a continuous demonstration on the maximum lengths of various types of cable carrying HDTV signals. Also on hand was CommScope's selection of coaxial and optical transmission cables.

On display at the Lemo booth was its line of connectors for nearly every occasion. In addition, Lemo offers patch panels for HDTV, audio and video, as well as fiber-optic applications. If you have special requirements, they can provide you with cable assemblies and even custom design services.

Trompeter was showing its line of patch panels and accessories. Its new J124W series patch jack offers an extended bandwidth of DC to 1.5GHz, with a typical return loss of less than –30dB through 750MHz and –25dB through 1.5GHz. The J214W is designed for data rates up to 750Mb/s. A self-

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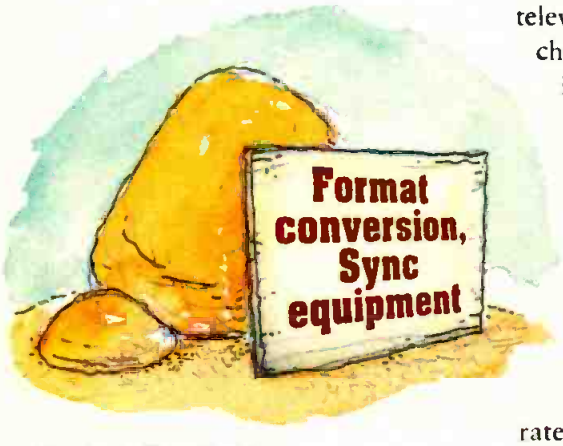
terminating version is the J214WT. Also at Trompeter were its BNC connectors, designed to perform at 2GHz. Straight, 90° and 45°versions are available.

ADC's new ST series of patch cords are available for both standard and midsize switching coax jacks, and dramatically improve performance of patched serial digital and high definition signal. The STS standard-sized patch cords provide a true 75Ω interface when used with ADC's SVJ-2 superjack family. They are compatible with other industry jacks and provide a nominal 75Ω interface. The midsize STM patch cords provide a true 75Ω interface when used with midsize jacks, such as ADC's MVJ-3 family. Additional patch cord features include molded strain relief boots and gold-plated center conductors. Various colors and lengths are available.

Kings Electronics was showing the 7400-5 miniature video jack. Up to 32 of these will fit in a standard 19-inch rack jackfield. The 7400-5 is self-normalling and self-terminating. It features true 75Ω impedance matching for excellent return loss over a 1.5GHz bandwidth. The same design is available unterminated as the 7400-7.

Beck Associates featured the SCP-10 control patch panel. This 2RU unit offers 20 DB9F RS-422 connections and comes complete with 10 patch cords. The SCR 4x8 serial data router can be used to route four controller/editor inputs to any of eight devices.

For more information, circle (303) on Free Info Card



By Bob Bergfeld

Bob Bergfeld is president of Presentation Systems Design, St. Louis.

From the inception of broadcast television, one challenge that has always commanded attention is conversion. Early television brought several conversion challenges. Local news coverage, documentaries, commercials, and most programming were produced on film, which had to be converted to video for broadcast. Station IDs and other stills were produced on 35mm slides, which again required conversion to video. The answer to these early conversion challenges was the film chain. Until rather recent history, the film chain or film island was an integral part of every TV station in the country.

As the industry evolved from film to videotape and from monochrome to color, PAL and SECAM brought another set of conversion challenges to the American broadcast industry. News and information was transmitted via satellite around the globe in different TV standards and it required conversion to NTSC for broadcast on American television. One of the first attempts to resolve this conversion problem was pointing an NTSC camera at a monitor displaying the other TV standard. This technique did not work well, and fortunately the standards converter was developed.

The computer age has brought with it yet another set of challenges to the broadcast industry. Computer video cards, unless specifically designed for television, possess some rather unique characteristics. With an ever-growing need to increase computer resolution, video cards such as CGA, EGA, VGA, SVGA, and XGA developed, and the computer-graphics industry began using SGI and Sun workstations to develop high-resolution images. Unfortunately as computer card and workstation resolutions increased, so did the horizontal scan rate of the image — to well beyond the scan rate of standard television. For broadcast, all these computer-generated high-resolution signals required conversion to video.

Not all the challenges came from other industries. The TV industry developed several unique encoding and decoding systems to circumvent the resolution limitations of NTSC. Component signals including Y/R-Y/B-Y, Y/C and YUV gained popularity and improved image quality, but required conversion to NTSC for broadcast.

Until now, signal conversion for broadcast in the US possessed one common thread — NTSC. No matter what the signal, no matter what the media source, it was always converted to standard NTSC 525-line 15.75kHz video. Until now. Enter the age of digital television and high-definition television. DTV and HDTV are upon us, and the FCC's clock is ticking.

The NTSC TV standard, the framework of the American TV industry, is about to disappear. What will replace it? 1,080i? 1,080p? 720p? 480p? Digital standard-definition or high-definition? Will there ever be a universal video standard within the broadcast industry? If so, what? If anyone knows the answer to the latter question, they probably will become wealthy.

As for the balance of the questions, after talking with a variety of chief engineers and equipment manufacturers, the answer heard most often was "probably." The second most-often-heard answer was "keep all your conversion options open until the digital dust settles."

It is probably safe to say that the complete transition to digital television will not occur within the next few years. But as the transition does progress, the replacement costs for equipment will be expensive. Good business practices dictate that any equipment presently operating within a facility should be fully amortized before it is retired from service.

These reasons will mandate the implementation of several different types of conversion devices to economically bridge the analog and digital worlds, as well as the SDTV and HDTV worlds. The NAB convention was a looking glass into the immediate future of digital television. With nearly all of today's U.S. TV stations operating in analog SDTV, this year's NAB offered a variety of conversion solutions.

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Snell & Wilcox introduced several new products, such as the expanded Kudos IQ modular product system. The Kudos IQ system now features more than 200 modules, including a new advanced frame synchronizer. The IQDQFS advanced frame synchronizer solves synchronization problems associated with digital video, while simultaneously tracking the associated audio delay. The IQDQFS handles imbedded AES/EBU audio signals and ancillary data using sample rate conversion, and provides an imperceptible change to the audio if the video delay suddenly changes. The synchronizer operates in either synchronizer or delay modes, and also has a full complement of proc-amp controls and gamut legalization. Snell & Wilcox also introduced an HDTV frame synchronizer, the HD4000. It operates at 1.5Gb/s and the input is serial digital HDTV, as are the three synchronized outputs.

Digital Processing Systems Inc. (DPS) introduced a digital frame synchronizer, described by one NAB attendee as "The Swiss army knife of frame synchronizers." The DPS-470 serial digital component AV synchronizer provides component, composite, S-video, and SDI I/O. It has 10-bit 4:2:2 processing, a VITS inserter, a real-time transcoder, and a digital test-pattern generator. If it detects a heterodyne source, the internal TBC is automatically engaged. An internal four-channel audio synchronizer provides balanced analog, AES/EBU digital and embedded SDI audio inputs and outputs. The auto-track mode allows all four audio channels to dynamically track the internal delay of the video synchronizer. Up to 40 fields of fixed delay can also be added from the front panel.

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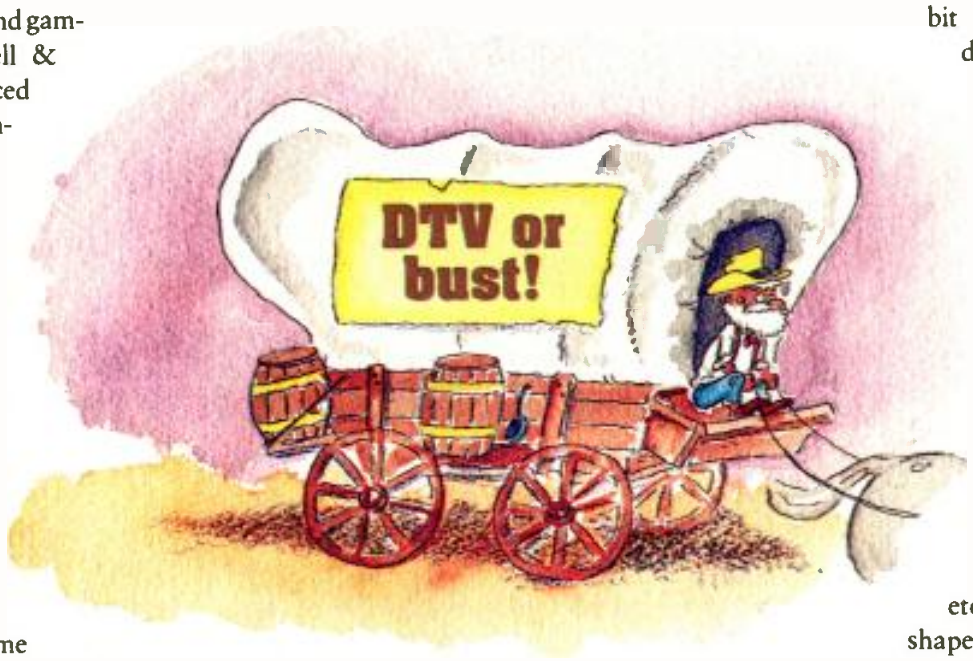
Up/down conversion

For the foreseeable future, or until HDTV becomes as common as color television, broadcasters will need to continually upconvert SDTV to HDTV. Several manufacturers, including Miranda, introduced products to meet these conversion challenges. Miranda's Stellar modular series of upconverters begins with the Carina. It upconverts 16:9 4:2:2 to 16:9 480p. The Aquila upconverts interlaced 4:3 or 16:9 4:2:2 signals to 16:9, 480p, 720p, or 1,080i. The Aruiga upconverts interlaced 4:3 or 16:9 4:2:2 signals to 16:9, 480p, 720p, or 1,080i, and includes digital noise reduction, detail enhancement, color correction and frame synchronization modules. One Stellar frame can accommodate up to six Carinas, four Aquilas or two Aurigas.



Leitch has added a new product family to its "Glue" line. The HDTV Glue line is based on DigiBus and products include a frame synchronizer, test generator, logo generator, serial DA and conversion products. The conversion products convert analog video to 1.5Gb/s HDTV and vice versa. Leitch also introduced an HD upconverter with inputs for all formats (SDI, NTSC, PAL and PAL-M). Outputs are serial 1.5Gb/s and/or analog component.

Tekniche offers the Juno series of upconverters with a number of standard models, each with different interface and processing features. The core of the Tekniche upconverter is a four-field by four-line processor with internal 16-bit accuracy. The Juno series offers 10-bit motion adaptive noise reduction conversion, with impulse noise filtering and recursive noise filtering also available. Signal input formats include serial digital component, analog component, and analog composite NTSC or PAL. Signal output formats include serial digital, analog component, in 1,080i, or 720p, or 480p formats. Options include audio delay and digital comb filtering. The Juno upconverter will also be co-marketed by Leitch.

Snell & Wilcox exhibited its third-generation upconverter, the HD-5050, which accepts a 10-bit serial-digital standard-definition input signal. The output is 1.5 Gb/s serial digital. The HD-5050 supports 1,035 and 1,080 active line 1,125/60 and 1,125/59.94 interlaced HDTV formats as well as 480p and 720p. It offers user control of all output parameters including size, shape and picture position, as well as digital horizontal and vertical enhancement. Other features include Y/C delay correction, freeze mode, an internal test-pattern generator, complete adjustment of all input and output blanking parameters, four system memories, and 20 user display memories. Snell & Wilcox also displayed two downconverter products, the HD200 compact downconverter and the HD-2100 studio downconverter.

YEM Inc. debuted the HSC-1125D1A. This HDTV upconverter offers easy switching of output frequencies from 60Hz to 59.94Hz and effective scanning lines of 1,035 to 1,080. The unique horizontal and vertical image enhancer, in conjunction with YEM's proprietary motion adaptive digital conversion system, offers high-quality picture resolution and clarity. According to the com-

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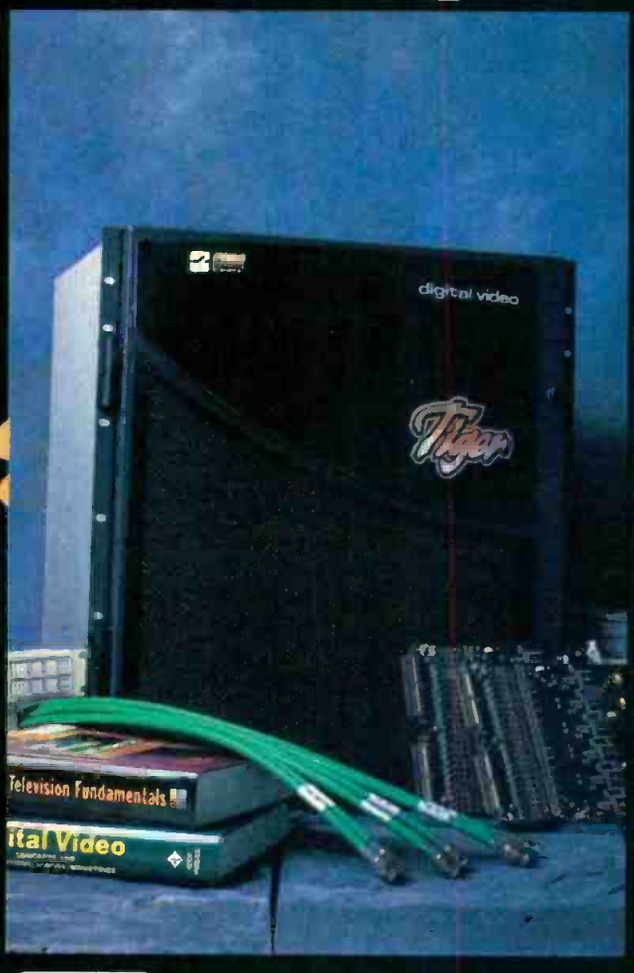

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dard analog composite and component video output in either NTSC or PAL. It accepts computer signals up to 1,024x768 at 75Hz. Also new to the scan converter is the addition of an RS-232 remote port. Other features include phase adjustable gen-lock, a built-in test-pattern generator, image freeze and magnify, and two stages of anti-flicker filtering. For ScanDo Pro C owners, an upgrade path to the Pro/D feature set is available. Communications Specialties also introduced Duece, an intelligent video scaler. Directed primarily toward the line-doubler display market, Duece converts video signals to six selectable computer resolutions and supports 16:9 display formats.

Extron Electronics has redesigned its Super Emotia II scan converter to include a 200% zoom feature. The new zoom controls include panning, horizontal and vertical size/shift, underscan, overscan, and freeze-frame. The output signals are composite or component video. For input, the unit accepts computer signals up to 1,024x768. Extron has also redesigned the Super Emotia II GX. It is similar in function to the Super Emotia II, but includes phase adjustable gen-lock.

New this year from RGB Spectrum is the RGB-1650 scan converter. It accepts interlaced or non-interlaced RGB with resolutions up to 1,600x1,200. Output signals are NTSC and PAL composite and component video. Additional features include gen-lock, pan and zoom with zoom presets, flicker elimination, RS-232 control, and full 24-bit color.

ZoomConverterHD was introduced by PC Video Conversion and is a scan converter targeted to the HDTV market. The ZoomConverterHD accepts computer signals up to 1,024x1,280, and HDTV signals up to 1,080x1,920. The gen-locking converter has programmable zooming and includes panning capability. Output signals are HDTV (SMPTE standard) NTSC and PAL component and composite video. There is also a non-HDTV version available.

Folsom Research exhibited a new scan converter with an optional serial digital component output. Folsom's 9700XL loop-through inputs automatically lock to incoming computer signals with horizontal scan rates up to 105kHz. The converter can be controlled by the front panel or via the RS-232 interface (Windows '95 and NT drivers are included). The converter features dynamic pan and zoom, gen-lock, an internal test-pattern generator, freeze-frame, special filters for flicker reduction, and an internal memory that stores 25 user-defined configurations. Standard outputs are PAL and NTSC component and composite, and optionally serial digital component. Folsom also offered an optional HDTV input.

Another important part of the bidirectional bridge to DTV, especially in our global community, is the necessity to convert to and from other TV standards. New this year from Video International Development is the DTC 1660 Quattro digital standards converter. It is an eight-bit four-field/four-line bidirectional digital standards converter, multistandard converter, video format converter, TBC, frame-based recursive noise reducer, and frame synchronizer. The Quattro supports analog composite and analog and digital component video formats. The Quattro also supports most forms of PAL, SECAM and NTSC. Standard features include digital encoding and decoding, phase adjustable gen-lock, digital adaptive noise reduction, digital comb filtering, selectable aperture filtering, an internal color-bar generator, RS-232 control, and full EBU/SMPTE broadcast standard processing.

Snell & Wilcox exhibited a new single RU 24-point aperture standards converter. The CVR500 10-bit digital standards converter contains Snell & Wilcox's proprietary 24-point interpolation aperture. The new converter provides serial digital inputs and outputs in both 525 and 625 standards. Features include horizontal and vertical enhancement, video proc-amp controls, automatic gamut (illegal color) correction, and a built-in test-pattern generator.

The bidirectional bridge naturally includes both digital and analog encoders decoders and transcoders. Miranda Technologies' new picoLink decoders provide a number of decoding solutions. The picoLink products are extremely compact measuring just 4"x 1"x 0.7". Decoding scenarios offered include component analog to 4:2:2 digital, composite analog to 4:2:2 digital, S-Video to 4:2:2 digital, composite analog to component analog, and composite analog to S-Video. The picoLink line also includes a composite aspect ratio converter to and from 4:3 to 16:9.

New from Snell & Wilcox was the IQDMSDP multistandard decoder designed for the Snell & Wilcox Kudos frame. The decoder includes an integral frame synchronizer, 10-bit adaptive asymmetric field comb decoding, automatic noise floor measurement and control, pattern and caption generation, as well as adaptive recursive noise reduction.

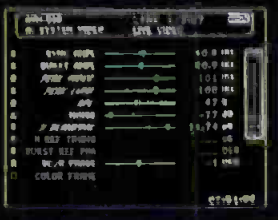
Leitch has expanded its "Digital Glue" products to include both a digital encoder and decoder. The ENC-6801 encoder supports 4:2:2 serial digital, as well as NTSC and PAL-B standards. The encoder has 10-bit overall accuracy and achieves its output stability by 2x oversampling with 12-bit internal digital processing. The outputs provide video pre-equalization, and variable timing via a built-in 2.5 line buffer. The DES-6801 decoder features hot switching, gen-lock, full frame synchronization, infinitely variable H and V phasing, and a three-line adaptive comb filter decoder. The DES-6801 converts either PAL or NTSC video signals to component digital video.

AJA Video introduced new encoder and decoder cards. The RD-20D decoder card features 10-bit adaptive comb filter decoding, composite and S-Video inputs, four serial digital outputs, automatic PAL/NTSC selection, configurable pedestal and narrow/wide H/V blanking. The R20E encoder features 10-bit encoding, four composite outputs (three of the outputs are configurable to component video), two reclocked serial outputs, configurable pedestal and narrow/wide H/V blanking, and jitter filtering. Both cards are compatible with the Leitch 6800 frame.

Prime Image introduced transcoder boards for its Multi-Channel series products. The 10X-TR-D1-IN transcodes serial component digital to composite and component analog video, as well as reclocked serial digital component. The 10X-TR-D1-OUT board transcodes

THE NEXT GENERATION IN VIDEO MONITORING

Whether the requirement is in a corporate video facility or large broadcast operation, the new AVM 510 Automated Video Monitor is the economical solution for video signal error detection, reporting and equipment set up in all facets of production. It is an advanced, multistandard/multiformat, measurement system with all the traditional waveform/vector displays you would expect and more. Choose from an array of measurement sets with easy to read graphic displays and numeric read outs on key video signal parameters. When a problem occurs, the operator is alerted with an onscreen display flag for the specific error. Performance reports can also be generated with a PC or printer which indicate each error occurance with a time/date stamp or time code.



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composite and component analog video to serial digital component. Both boards offer an optional synchronizer.

Numerous manufacturers were exhibiting a wide range of A/D and D/A solutions. The new ADA-1125 A/D-D/A Converter from YEM provides complete two-way A-to-D and D-to-A conversion. The system automatically responds to vertical frequencies of 59.94Hz and 60Hz, adapts to both 1,035 and 1,080 scan lines (or optionally to 720 progressive signals) and can be selected to operate with YPbPr or GBR signals.

Sigma Electronics new DNC-2170 converts digital 4:2:2 to analog color differential. The converter is offered in both card and stand-alone (DNC-2670) form.

Leitch introduced the ADC-6801 A-to-D converter. The converter has a 10-bit signal path and allows conversion from 525- and 625-line analog component, to 525- and 625-line serial digital. Features include automatic calibration, line standard switching, built-in color bars, and 2x oversampling.

Prime Image introduced D-to-A converters specifically for analog monitors. These units are designed to convert serial digital component to analog video. Both the DC-powered version and the internally powered AC version measure 1"x 3"x5" and are designed to Velcro to the rear of the monitor.

Nova Systems, a Videonics company had its StudioFrame line on display. StudioFrame is flexible, modular and scaleable. It offers a wide range of processor modules including 10-bit serial digital converters, component-to-composite encoders and noise reducers. There are two chassis types available for these analog and digital interface modules. Redundant power supplies, networked remote control and hot-swappable modules are some of the features available.

As conversion technology becomes commonplace, it is finding its way into a variety of new products. One such product is from Zandar Technologies. The MVG16 multiwindow display card (see "Pick Hits of NAB '98," p. 90) allows computer graphics and up to 16 video signals to be sized and positioned on a single screen.

Avitech International also offers multiwindow displays — the Avitech mvp2 system displays up to 16 real-time video windows on high-resolution monitors. Networked mvp2 systems can be used for videowall systems, Avitech's Clover4 series can be used to display four live videos on VGA, SVGA, XGA and NTSC or PAL monitors.

In much the same vein is the Kaleido from AAVS. Up to 16 sources can be displayed simultaneously on a VGA monitor. Each picture can be individually sized, and each can be accompanied by graphic source identification. Additional functions that are available include display of tally indicators or fault alarms, control of external functions via GPI contacts and display of up to 32 VU or peak reading meters for audio levels.

Although not specifically a conversion product, one other item deserves mention. The technology was developed by Snell & Wilcox and deals with multiple-generation MPEG encoding problems. "Mole" makes it possible to perform standard production processes, such as real-time cuts, crossfades, wipes, and complex DVE moves between multiple

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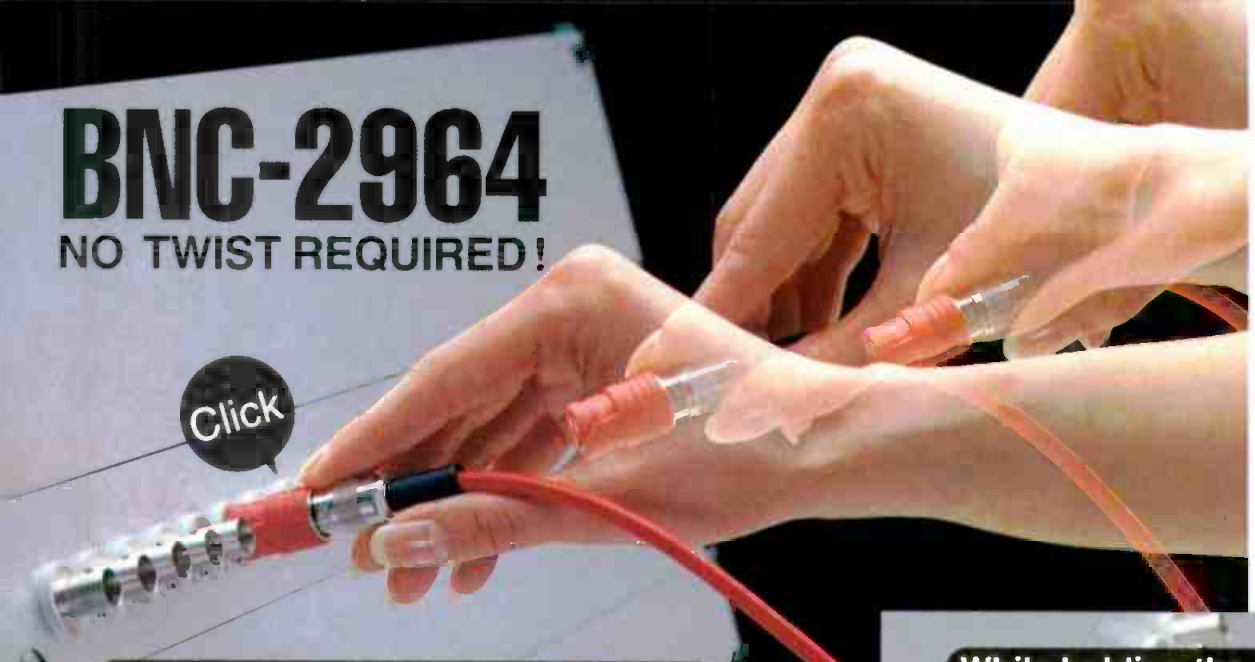

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Circle (54) on Free Info Card

MPEG sources, as well as the insertion of captions or logos into the picture without the signal degradation normally associated with multiple decoding/encoding of MPEG signals. MPEG-2 encoding information is imbedded in the MOLE format and "burrows" itself within video through conventional studio equipment, then emerges at the other end to reconstruct the MPEG-2 stream without the concatenation errors at each re-encoding.

Prime Image introduced A/V Twister, which allows video or stereo audio to be transmitted through twisted pair cable. Video can be sent up to 3,000 feet (with a self-powered line amplifier at each 1,000-foot interval), and audio can be sent up to 5,000 feet. Each transmitter can feed up to 15 receivers.

For more information, circle (306) on Free Info Card

By Philip Hejtmanek

Philip Hejtmanek is director of technical operations at WWJ-TV, Detroit, MI.

With the advent of DTV, TV broadcasters are facing new challenges with respect to the problem of getting a TV picture from the studio to the transmitter. Traditionally, microwave links provided this function, but the loss of spectrum and the virtual doubling of the number of stations on the air through the addition of DTV channels has made it difficult to accommodate the needed allocations. Several companies showed products designed to work in this environment at NAB '98.

Microwave Radio Communications showed the capability to transmit a digital ATSC MPEG-2 transport stream and a digitized NTSC analog video signal, multiplexed together over a single microwave channel. A demonstration circuit is in place between the model HDTV station, WHD-TV in Washington, DC, and PBS headquarters in Alexandria, VA. It uses an MRC model DAR45 DS-3 digital radio system and operates in the 7GHz band. This capability is likely to be critical to broadcasters, as they begin the construction of DTV stations later this year.

Also new from MRC is the DMR18 digital microwave radio system. This new system opens up the less congested 17.7 to 19.7GHz band for medium- to short-haul digital STL and TSL links, as well as other backhaul requirements. The DMR18 can be configured with digital modems for operation at 34Mb/s or 45Mb/s, as well as analog modems, as needed. The key to the performance of the new radios centers on the use of YIG frequency sources, which results in greatly improved phase noise specs.

Nucomm demonstrated the transmission of an ATSC HDTV transport stream and a digitized NTSC program, multiplexed on a single microwave channel, between Las Vegas CBS-affiliate station KLAS-TV and the Las Vegas Convention Center. A key component in the Nucomm system is the GA-Link, developed in cooperation with Sarnoff Corporation. This universal MPEG interface can solve a variety of connectivity problems within a DTV facility. It can be configured as a format translator, a multiformat DA or a multiplexer/modem. The GA-Link can accept any bit rate up to 270Mb/s.

Nucomm also showed a series of component products designed to implement the transmission of DTV over microwave links. The FT/FR7 DIGI-QAM radios, 70DMT/DRM7 modems and DIGI-MUX Multiplexer are building blocks that can be used to form a versatile digital microwave system.

Broadcast Microwave Services introduced the BMT19/BMR19 transmitter and receiver series, a modular system that allows users to configure STL/TSL/ICR systems to their own requirements. Using the basic chassis, the user can add single or redundant power supplies, configure the system as a single-channel transmitter or receiver, a hot-standby or redundant transmitter or diversity receiver or a duplex transmitter/receiver, all within the same frame. The system can be configured to handle analog video with up to six audio subcarriers or a DS3 (44.736Mb/s) digital payload. The chassis provides individual and summary alarms and all modules can be hot swapped.

Specializing in miniature and subminiature microwave equipment for ENG and sports applications, Global Microwave Systems (GMS) showed a variety of compact microwave transmitters and receivers. The STM/SRM frequency-agile multiband transmitter/receiver combination is a compact platform suitable for portable applications. A single transmitter or receiver serves as the basis for operation on the 2GHz, 7GHz, or 13GHz band, with the use of additional compact band adapters. Also shown by GMS was the StarCam, a fully integrated wireless camera system intended for single- and multicamera remotes. StarCam is compatible with a variety of Ikegami and Sony camera models and features full control of camera functions via a 900MHz spread-spectrum telemetry link.

For more information, circle (307) on Free Info Card

Fiber-optic transmission

Multidyne showed the DTV-200 series of modular digital products, designed to provide a cost-effective solution to the problem of transporting high data rate digital signals. DTV-220-FTX and FRX modules combine to form a single-mode fiber transport system capable of handling virtually any type of digital signal from DC to 1.5 Gb/s. DTV-220 equipment supports SMPTE 259M SDI, 4:2:2 component, 540Mb/s 4:4:4:4, SONET/SDH and ATM standards. For less-demanding applications, the DTV-230-FTX and FRX modules work with mul-

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DO YOUR SIGNALS PASS THE CLEANNESS TEST?

YOUR BRIGHTER

Why does my signal need to be spotless in the new digital era?

Digital TV could impress your viewers with enhanced picture quality. But going digital calls for new standards of signal conditioning. Any noise or decoding artifacts such as cross-luminance and cross-chrominance that remain in your video signal will be encoded and transmitted along with the picture. As well as using up expensive bandwidth, these will be magnified if the picture is upconverted to HD. The solution is precision decoding and signal conditioning.

What am I missing with my current decoders?

Your racks may be full of decoders, but for the high-end decoding that is essential in the transition to digital you need a quantum leap forward in quality. The best approach is to use intelligent decoders that analyze the picture on a pixel-by-pixel basis and change the decoding parameters as appropriate. You also need to be sure that your decoder is using the best possible algorithms to guide its processing decisions.

Will my archives be able to match these new digital quality standards?

In the digital era, much of the program content will be archive material. Because this will often be mixed with digitally originated sources, it's vital that you use high quality signal processing when you retrieve it. Without precision decoding and really comprehensive signal conditioning, differences in quality will be clearly visible to the eye of the viewer.

WILCOX

GUIDE TO DIGITAL

What sort of filter do I need to remove different types of noise?

There is no single filter that can handle all types of noise.

Transmission systems such as satellites can cause random broadband noise and impulsive noise like "sparkles", depending on atmospheric conditions. Analog recording onto videotape can produce noise and dropout. And then there are the scratches, dirt or grain found on film transfers. Good signal conditioning will offer combinations of recursive, spatial, median and linear filters, designed and sequenced to deal appropriately with these problems in any particular environment.

Can cleaner signals help me to save money?

Yes. Dirty, noisy signals mean inefficient compressors. That's because compression encoders cannot distinguish between noise and the real image. Worse than that, noise, being random, occupies even more of the compression bandwidth than predictable picture differences. If you clean up your signals thoroughly, you can either broadcast more channels at the same bitrate or provide your viewers with much better quality pictures.

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Unique proprietary technology ensures the highest standard of decoding currently available, no matter what the nature of the source.

MDD1000 Digital Decoder
A patented Digital Gate combined with line comb filters for accurate decoding of even imperfect, unstable sources.

MDD500 Digital Decoder
Adaptive field comb decoder provides crisp, sharp pictures with minimum delay mode operation.

Prefix CPP100/CPP200 Pre-processors
The single-box solution to pre-processing, significantly reduces bit rates while enhancing picture quality. CPP200 adds digital audio embedding.

NRS500 Noise Reducer
Seven advanced digital filters tailored precisely to different noise characteristics make this the definitive image enhancer.

NRS50/30 Noise Reducer
Multi-purpose noise reducers combining 3D median, recursive and spatial low-pass filters.

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timode fiber and bit rates from 10 to 270Mb/s.

Also from Multidyne, the FTX-95/FRX-95 combination provides a low-cost fiber transport solution for analog video, 20-bit digital stereo audio and auxiliary data. Units are available in portable or rack-mounted configurations, for use with single-mode or multimode fiber.

Ortel showed a new set of low-cost fiber-optic transmitter and receiver modules for L-Band and 70/140MHz IF signal transmission in earth station applications. The new products included model 10346A transmitter and model 10446A receiver for transmission of 950-1450MHz L-Band signals, model 10347A transmitter and 10447A receiver for use with 950-2050MHz L-band signals and model 10357A transmitter and 10457A receiver for 70/140MHz IF signals. Each of these products plugs into a standard frame, and up to eight modules may be installed in a single frame, in any combination of transmitters and receivers. They provide a cost-effective alternative to coaxial cable for satellite system interfacility links.

By integrating fiber optics into customized products, Force Inc. of Christianburg, VA, filled a niche in the market and provided solutions for signal "transport" problems. Force offered a "DTV" link which is a 1.5Gb/s serial digital video fiber link. This product transports 4:2:2 and D-1 uncompressed signals up to 50km in single-mode or 1km in multimode. Some of the applications would be studio to studio links, switched digital links between studios and large-scale sporting events, as well as arena applications.

The new Digital Viper from Telecast Fiber Systems can be used in a variety of digital transmission environments. The system uses plug-in modules to mix and match multiple analog (NTSC or PAL) video signals with ITU-R 601 serial digital video streams. Signals can be sent up to 30km without repeaters. Aimed at both fixed and mobile applications, the Digital Viper can accommodate four video channels, eight audio channels (analog or AES/EBU), two channels of intercom and up to four channels of high speed data for machine or camera control. Signals are sent over a rugged military fiber connector that is only 6mm in diameter.

Fiber Options manufactures a wide range of broadcast and professional video fiber-optic transmission systems. New this year is the 601B serial digital video system which offers up to 400MB/s and is HDTV ready. Also introduced was the 1315B for AES/EBU serial digital audio applications.

For more information, circle (308) on Free Info Card

Satcom products

EEV introduced a new line of outdoor mounted TWT amplifiers for satcom applications. The Stellar uplink amplifiers use EEV's latest Traveling Wave Tubes to provide a compact (16"x 8"x 7"), lightweight amplifier, with a typical output power of 150W at the flange. These products provide the high linearity dictated by digital satellite applications, and offer an integral L-Band to RF up-converter as an option, eliminating the need for an external upconverter and allowing lower-cost system integration. Also shown was a 350W C-Band TWT amplifier in a 3RU package, and a wide variety of solid-state and TWT amplifiers, in both rack-mount and outdoor configurations, for C- and Ku-band.

Communications and Power Industries (CPI) offers a variety of amplifier products, including TWTs, and solid-state units, as well as accessories. The CPI compact satcom MPA was among the new products on display. This highly efficient unit is only 3RU tall and features microprocessor control, modular construction and built-in fault diagnostics. Also on display were CPI's C- and Ku-band satellite transceivers.

Standard Communications showed the new Alteia series of MPEG-2 DVB integrated receivers and decoders for professional broadcast applications. The line includes receivers with QPSK inputs, 8-PSK and QPSK inputs and decoders, which can be ordered with MPEG-2 DVB 4:2:2 profile @ Main Level or 4:2:0 Main Profile @ Main Level processing. All Alteia IRDs feature an analog bit error rate meter, a gen-lock port, VBI capability and a remote-control interface. AC-3 audio is

optional, as well as a DVB ASI transport stream option, with a coaxial and fiber interface.

BAF Communications offered a complete line of customized ENG, EFP and SNV vehicles, for a wide range of applications. Satellite trucks ranged from van-based systems, weighing less than 10,000 pounds GVWR, with analog or digital satellite capability, to larger vehicles weighing up to 35,000 pounds. ENG vehicles ranged from units based on the Chevrolet Suburban chassis, through full-sized vans, with a front- or rear-mounted mast. BAF also manufactures the Navigator FSU 1.5, a flyaway system that packs a 1.5-meter antenna and all of the necessary electronics for a satellite transmit-receive system into equipment cases capable of air shipment.

LNR introduced two new earth-station antennas, a 3.7m and a 4.5m C-band Cassegrain design in an azimuth-over-elevation mount configuration. The LNR Digital Video Exciter combines an advanced compression encoder with state-of-the-art modulation and RF frequency conversion technology. The unit can be used for L-, C- or Ku-band transmission and is a plug-and-play replacement for existing analog equipment.

For those simply looking for a way to get a camera or antenna in the air quickly and easily, the Hilomast from Allen Osborne and Associates can be used in a variety of applications, including ENG, field-strength measurements and even temporary floodlighting.

A neat little product from PESA Switching Systems is the LNS-8 Live News Switcher designed for mobile applications. This 8x2 audio-follow-video switcher offers 250MHz bandwidth in a compact 1RU unit. It includes eight loop-through inputs, a PVW and PGM bus with two outputs per bus AFV with breakaway, and both busses may be secured with lock pushbuttons.

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Digital transmission products

ADC Broadband Communications added the capability to transport an ATSC-compliant 8-VSB transport

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stream to the company's widely used DV6000 uncompressed digital video transport system. The DV6000 is a 16-channel, 2.4Gb/s digital fiber-optic transmission system that can transport a wide variety of different signals, includ-

LYNX.sc spread-spectrum radio and provides an alternative to leased analog lines, digital T-1 circuits or traditional licensed microwave paths. The system provides a bidirectional digital system for transmission and backhaul of un-

combination of these two products results in an attractive alternative to leased lines or the headache of frequency coordination in the crowded 950MHz STL band.

Wegener Communications had a vari-

handles multiple TV channels and performs 4:2:2 video compression, MPEG multiplexing, ATM adaptation and network termination. It also provides a SNMP-compliant control and element-management system. Running on a standard PC with Windows NT 4.0, the system offers an evolutionary path for TV communication services over broadband networks.

Rather than a product, Castle Transmission offers services. Castle provides infrastructure and services for analog or digital broadcast transmission and wireless communications. They have been providing these services to the BBC and the U.K. for 70 years, and are now at the forefront of digital terrestrial television network development.

At the QEC (Quintech Electronics & Communications) booth, attendees got the chance to look over its line of proprietary and custom frequency converters. Units can be fixed or frequency agile, and in both up and down configurations. QEC's Q-switch, Magic-Q and Q-stack products are designed to facilitate the transition from an analog to digital platform.

Scientific Atlanta's PowerVu digital video system offers end-to-end solutions for the delivery of digital video. This modular system can be configured for a variety of applications including SDTV and HDTV broadcast. PowerVu is a multichannel system that offers MPEG-2 compression and 4:2:2 sampling and can provide contribution, distribution and broadcast quality video signals. Other services and features offered in the PowerVu line include EPGs, bit-splicing, data broadcasting and even and earth station control system.

FiberHydrant from Synctrix enables facilities to send, receive and manipulate high-bandwidth data in real time over public and private telecommunications networks. Users can send fully-duplexed high-bandwidth digital video and audio, such as SMPTE 259 and AES/EBU audio, from any RS-422 controlled device to other FiberHydrant-equipped facilities. The signal is reconstructed and timed to mesh seamlessly with similar systems at the destination.

Tiernan Communications had a full line of MPEG compression products for DSNG, contribution and distribution. The TE6 is a high-performance MPEG-2 encoder that can provide 4:2:2P@ML and MP@ML encoding. The TDR600 is an integrated receiver/decoder that complements the TE6. Other products include the TMOD1000, a QPSK /DVB modulator for encoders and the TUI10 Universal Network interface for digital turnaround of satellite and terrestrial links.

Vela Research came to NAB with the Argus MPEG encoder. Argus supports 4:2:2P@ML and uses Vela's Cineview Pro, an MPEG-2 decoding board based on PCI bus architecture that can be genlocked. Also on display at Vela Research booth was the Rapid Access compression system.

For higher quality, MPEG-2 4:2:2P encoders are available.

Thomson Broadcast was showing a variety of products for contribution and distribution networks. The ATM multimedia encoder/decoder uses ETSI compression and a data rate between 7.5 and 28Mb/s. For higher quality, MPEG-2 4:2:2P encoders are available. The DBE 4120 uses Thomson's proprietary chipset and provides 4:2:2P@ML and MP@ML encoding. It comes standard with an SDI video input, and an optional composite input.

The versatile RE 4220 MPEG-2 coding platform from BARCO now supports ATSC-compliant MPEG-2 coding at MP@HL for high-definition DTV applications. The RE 4220 also supports Main Profile and 4:2:2 Profile@Main Level for multichannel SD applications as well. Encoders can be configured with up to three SDTV encoders per chassis, with additional channels supported through the addition of a second chassis. Decoders support NTSC, SMPTE 259M and SMPTE 292 analog interfaces, as well as DVB and ATSC transport stream interfaces.

The RE 4220 encoders also feature an integrated transport stream multiplexer that can operate at data rates up to 90Mb/s. This capability can support the transmission of an HDTV channel along with multiple SDTV channels in a single transport stream.

Philips claims to offer a complete end-to-end solution for digital broadcasting that incorporates the industry's finest MPEG-2 video encoder, the flexible TokenMux multiplexer, high-performance modulators for satellite and cable, and a range of commercial and consumer digital receivers. These are enhanced by Philips CryptoWorks conditional access system, StatCast statistical multiplexing, the fully integrated Compression System Manager (CSM), and an MPEG-2 transport stream splicer. The digital broadcasting solutions are available for single channel systems (such as business television applications), multichannel applications (such as terrestrial digital broadcasting), or large direct-to-home systems with millions of subscribers.

NDS Limited was showing products designed to assist broadcasters with contribution, distribution and DSNG for DTV. Among the products were 4:2:0 and 4:2:2 MPEG encoders for 8PSK and 8VSB transmission. NDS also showed the Reflex statistical multiplexer. For conditional access, the VideoGuard can be used for not only revenue protection, but also sophisticated marketing opportunities, such as targeted market segmentation and viewer-programming choices.

Along the same lines, Macrovision was showing a line of conditional access products. Macrovision provides a variety of scrambling products such as the VES-TM Minicrypt, a miniature scrambling system that can be taken on remotes to ensure the video sent back remains private. The Minicrypt II is a pocket-sized unit. The VES-MX transmission multiplexer system can be used to combine two channels of video for transmission over a single-channel microwave, satellite or cable/fiber link.

For more information, circle (310) on Free Info Card

This is as close as some receivers ever get to true 4:2:2 decoding.

Face it. A receiver is either compliant with MPEG 4:2:2 Profile at Main Level or it's not.

And Standard Communications' new Alteia DVB Digital IRD is one receiver that definitely is.

The Alteia offers you some of the most advanced signal processing you can buy, intuitive front panel control, remote access and a flexible front-end design that lets you work with a wide variety of satellite and terrestrial input signals.

The Alteia also offers something no other DVB and MPEG-2 compatible IRD can: the unique partnership of Standard Communications and NDS Corporation. So you know you're getting world-class digital video compression and a reputation — two reputations in fact — for delivering quality you can count on.

To find out more about the new standard in broadcast video reception, call, write, fax or email us now, and we'll send you more information about the new Alteia DVB Digital IRD.

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WS1 85B England
44 1923 800 510 voice
44 1923 800 445 fax

Circle (78) on Free Info Card

Telephone interface and power protection

Henry Engineering showed the Audio OnLine version 4.0 telephone information system. This versatile "listener information" system handles a wide range of applications where information is given to callers, such as concert information, weather reports, scores, and news updates. Audio OnLine is fully caller interactive and automatic. The system can handle up to 16 telephone lines simultaneously and also stores hundreds of discreet messages on a computer hard drive. Messages can be entered on site or "called in" via a phone line.

Best Power offered a complete Uninterruptible Power Supply (UPS) line from 280VA to 220kVA, delivering reliable power protection for a broad range of broadcast and computer applications. The Patriot and Fortress lines are ideal for protecting computer networks, servers and workstations, with loads from 280VA through 3kVA. The FERRUPS line uses patented ferroresonant technology to eliminate the effects of spikes, sags, surges, noise and lightning, while providing full power protection from 500VA to 18kVA. For large load applications, the Unity/I systems provide single-phase coverage from 3kVA to 8kVA and three phase power protection on loads up to 220kVA. Units may be operated in parallel for loads up to 1980kVA, to accommodate system growth.

Gentner's TS612 makes it easy to interface telco lines into your audio system. The control surface is easy to use and operates like a business telephone, simplifying operator training. Installation is easy, and the system's dual superhybrid technology provides crisp clean caller audio.

MGE UPS Systems came to NAB with the Comet UPS system. Designed for broadcast applications, the Comet UPS is a microprocessor-based 3-phase unit that provides up to 150kVA of power protection and conditioning with 95% efficiency. The on-line design offers continuous isolation and correction from utility source or line power problems.

For more information, circle (311) on Free Info Card

By Steven Blumenfeld

Steven Blumenfeld is director, strategic alliances for GTE, Carlsbad, CA.

Many changes have been coming about over the last few

ANALOG? DIGITAL? HYBRID?

Whatever The Future Holds, You'll Be Ready!

The DPS-470 Serial Digital AV Synchronizer

The DPS-470 serial digital component AV synchronizer is the ideal choice for broadcasters transitioning to DTV. Available in video and audio/video configurations, the DPS-470 bridges the gap between analog and digital production facilities. 10 bit ITU-R 601 component processing and adaptive comb filter decoding provide maximum signal transparency. A built-in auto sense TBC and digital test pattern generator round out the features.

For combined video and dual stereo audio synchronization, add the DPS AS-470 internal digital audio synchronizer option. Because all outputs are active, analog and digital devices can be connected at the same time.

As you move to DTV, the DPS-470 is your insurance against obsolescence. And you won't pay a premium!

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Circle (65) on Free Info Card

years, but at the 1998 NAB, it became apparent that this is the year of MPEG compression. In the early 90's when I started working with MPEG, no one knew what it was. I even had to explain it to my professional friends. Back then, the description started with digitization and ended with data compression. During the discussion, words like algorithm, discrete cosine transform and psychoacoustic modeling were continually used. At this year's NAB nobody needed that explanation and MPEG changed from a data compression algorithm to a format. While that may be subtle to some, it is actually a major change.

A format entails support across many different companies and industries with devices made specifically to take advantage of the format. MPEG is now mentioned in the same breath as VHS, Betacam and DV — what a change! What was once only for computer geeks has now arrived in the world of glitz and glamour. Enough about that, let's get on to the real task at hand — a wrap-up of compression and encoding products at this year's NAB. Products were numerous and spread across both the Las Vegas and the Sands Convention Center, and ranged from the high-end to sub-$200 software encoders.

MPEG transmission

Divicom showed a new statistical multiplexing solution called DiviTrack. In essence, they have joined two encoders together, taking the real-time statistics from the first MPEG encoder and feeding that into the second encoder. The demonstration showed a DiviTrack system handling 10 channels of video programming, at full 704 resolution, in 20Mb/s of bandwidth. The quality was fantastic.

DiviTrack is incorporated in Divicom's new MV40 encoder and gives it an innovative "look-ahead" capability. The MV40 has the ability to harness the power of two DVxpert single-chip codec "engines" to first analyze program data, then use the data to perform a refined encoding operation. According to Divicom, "The result is a precise match between program bandwidth requirements and bandwidth allocation. Using DiviTrack statistical multiplexing, service providers can offer more channels of programming while maintaining the same video quality or increase the video quality of existing channels."

The first high-performance encoder within the MV40 'looks ahead,' precisely analyzing video complexity. The arrival of video at the second high-performance encoder is slightly delayed. Statistics from the initial pass (in the first encoder) are used to greatly enhance the performance of the second and ultimate encoding pass.

Expect to see MPEG become a format that can be edited just like tape.

In the labs at Snell & Wilcox, they have developed a revolutionary information bus format that enables the seamless cascading of MPEG-2 bit streams. This new technology, dubbed "MOLE," helps to eliminate the degradation of video signals during repeated MPEG encoding and decoding.

According to the company, "When critical MPEG-2 encoding information is stored in the special MOLE format, it can "burrow" within the video through conventional digital studio equipment and emerge at the other end to accurately reconstruct the MPEG stream without concatenation errors. In essence what Snell & Wilcox has figured out is how to store all the encoding parameters for a macroblock invisibly within the picture. However, when an effect cuts through a macroblock, such as on a diagonal wipe, the information from that block must be recreated and errors are introduced. While this is an annoyance, the overall technological advance is truly amazing and solves the vexing question of lossless MPEG-2 cascading. In light of groundbreaking technology such as this, expect to see MPEG become a format that can be edited just like tape.

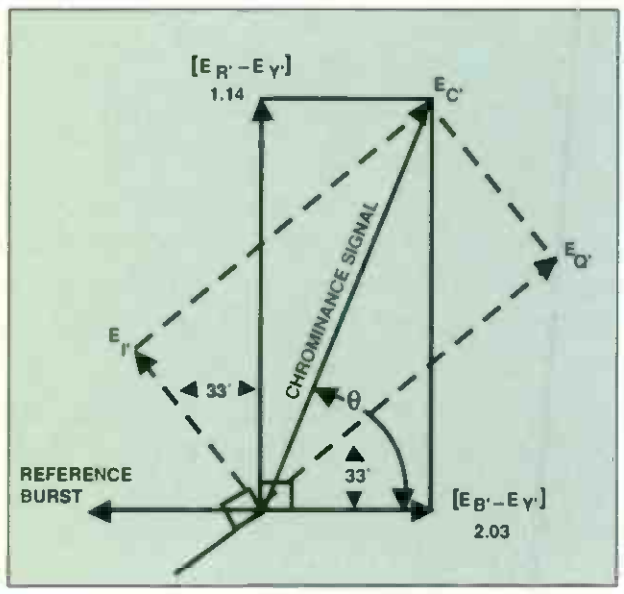
Tektronix's M2T Video Edge Device is an MPEG-2 4:2:2 codec that that uses an innovative encoding algorithm to produce MPEG bitstreams up to 4:2:2P@ML that are compatible with PDH (E3/DS3) and ATM network interfaces. The M2T provides high-quality compressed video and an option for uncompressed audio.

The most interesting Philips developments are the portable MPEG-2/DVB Compression Systems, EZcast and the StreamCutter. EZcast is a portable, go-anywhere compression and multiplexing system in a single 3U box, created for stand-alone operation. It provides flexible bit rate and bandwidth handling plus optional scrambling. The StreamCutter MPEG-2 Stream Splicer is a cost-effective solution for switching MPEG-2 Transport Streams. It offers maximum flexibility working within multistage MPEG-2 distribution chains. The unit features two switching modes: Seamless Splice Point and Near-Seamless Uniform Color Picture (UCP). The StreamCutter allows seamless ad insertion by preventing decoder interruptions while switching in the MPEG domain. This is not an easy task. To ensure proper switching many components must be taken into account such as buffer regulation, clock synchronization and PSI/SI tables.

Viewgraphics has released a similar product — MediaSplice — and claims it is breakthrough technology for seamlessly joining together MPEG-2 digital TV segments. MediaSplice makes it possible to play DTV programs back to back and insert commercials into DTV streams in the compressed domain without undesirable picture breakup. Some of the significant features include: splicing streams of different bit rates together; processing multiple streams simultaneously; no decoder buffer exceptions, overflow or underflow are introduced; and no black frames are inserted at the switch point. As a matter of

...ecs.

Our specs.



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...ormance comparable to the ...housands of dollars less than you ...'s because it's based on an original ...nces that maximizes use of advanced integrated circuits and other parts intended for DTV, and minimizes use of expensive custom-engineered components. An easy to use, dual function, knob is the only front panel control on the **msi 320**, and its 2-line, 40-character display is easy to read in any light condition. It has only 8 internal adjustments, so calibration is easy and inexpensive. It also includes a Nyquist SAW filter, selectable line zero-carrier reference, synchronous video detection, continuous all-channel tuning and a host of other advanced features you would expect to find only on much higher-priced demods.

But don't just take our word for it. Check out the specs yourself, and you'll see what a great value the **msi 320** really is.

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fact, they claim the transitions behave like a normal video vertical interval switch or an insert edit.

MediaSplice splices several valid CBR transport streams in real time, with very modest demands on the host computer system. Streams are processed for splicing as the data is transferred through the MediaSplice interface. Multiple splicing operations occur simultaneously. The spliced streams are then multiplexed together by the Viewgraphics MediaPump into one output multiprogram transport stream. Everything is done in real time.

For more information, circle (312) on Free Info Card

Post-production MPEG

From the broadcast arena, let's move into the post-production world of MPEG where there have been great advances. Price continues to decline while quality and ease of use increase. This year DVD production was a hot topic. The following companies' products and knowledge of the market were impressive.

The new Minerva DVD-Professional EL is a complete DVD desktop production system for $49,995. The system includes the Publisher 200 MPEG-2 encoder with linear PCM, a Dolby Digital AC3 stereo encoder and Daikin Industries Scenarist NT Advanced DVD authoring software.

The Minerva Publisher 200 supports MPEG-1 and full-resolution MPEG-2 with MPEG layer 2 stereo audio encoding. However, the 200 only supports CBR (constant bit rate) video encoding not VBR (variable bit rate). The DVD Professional EL system is upgradable to support SMPTE 259M input, VBR, video preprocessing and real-time Dolby Digital 5.1 surround sound encoding. This upgradability makes this system a great investment to get started in the DVD world and as needs expand so can the system.

A DVD list would not be complete without including Daikin's Scenarist, one of the first DVD authoring tools. The Scenarist NT product family consists of three products: Scenarist NT Professional, Scenarist NT Advanced and Scenarist NT Basic. Scenarist NT Professional is for the entertainment industry, pressing facility
manufa
all the fe
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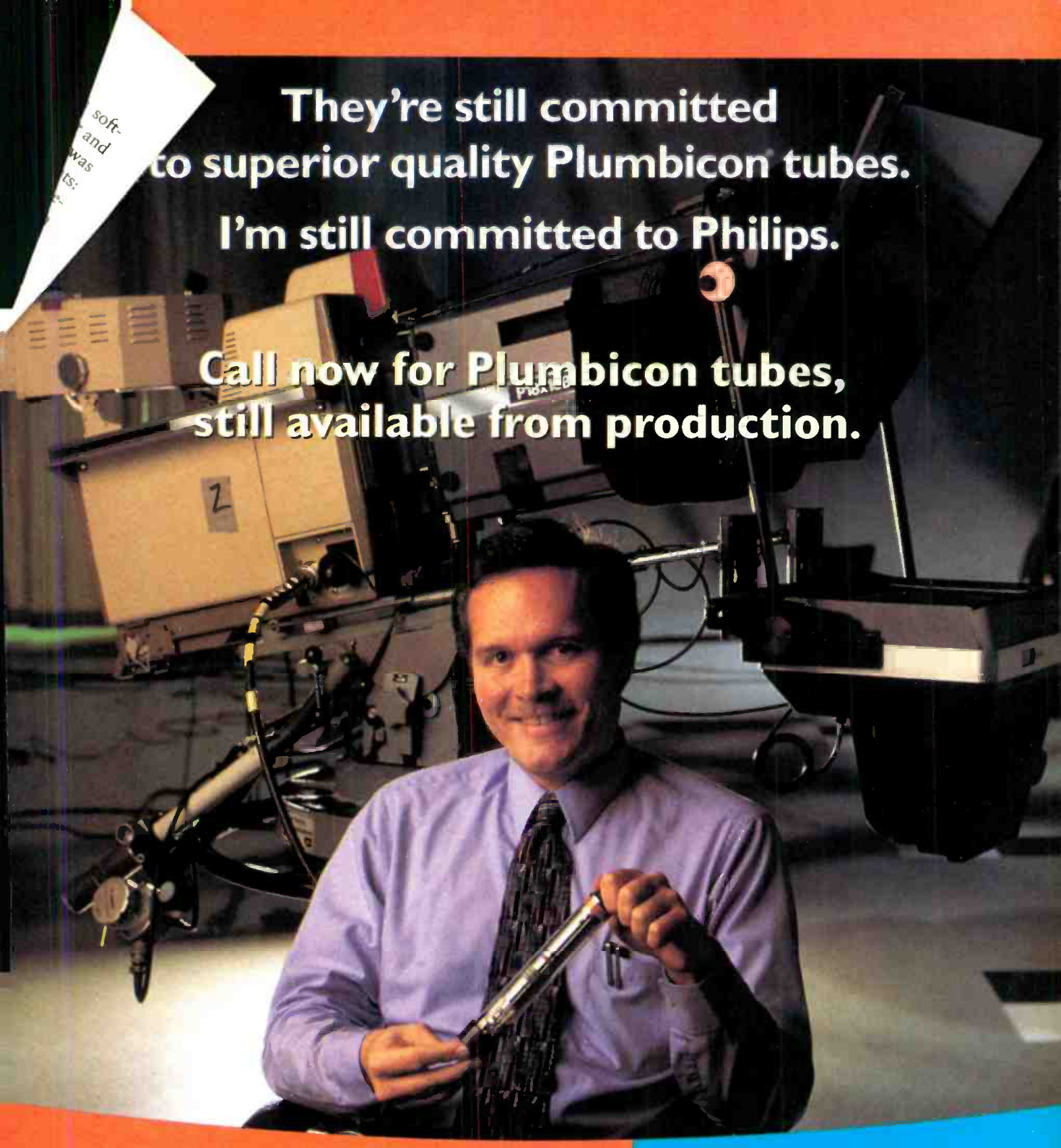

In the world of constant change, it's good to know Philips Components is still producing their complete line of high-resolution, low lag Plumbicon tubes. And Philips is still standing by the broadcast industry too.

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This software/hardware system runs on NT and is scalable to accommodate future growth. Using their MPEG encoding experience, the folks at Optibase have developed a powerful integrated architecture to simplify the task of creating DVD disks. Other products in the Optibase booth included the MPEG Forge and MPEG Fusion professional MPEG-2 encoding family as well as the Video Plex and Video Plus MPEG-2 playback systems.

Last on our DVD post-production tour is Sonic Solutions. The company introduced DVD Creator which integrates all DVD production tasks into a single workstation. It includes an advanced MPEG video encoder with an on-board D1 disk recorder and Dolby Digital audio encoding.

Dolby Digital 5.1 surround sound encoding is integrated directly into the DVD Creator system. It now has the ability to encode 5.1 channels of Dolby Digital audio simultaneously with MPEG-2 video. Additionally it has a real-time decode function that allows for quality optimization.

Sonic has a newly designed MPEG-1 and MPEG-2 variable bit-rate video encoder that has four times the search range of its current MPEG-2 encoding algorithms. A D1 direct-to-disk video recorder seamlessly integrates direct-to-disk D1 video recording with DVD encoding and authoring.

Sonic also has added file translation functionality to allow source content from Media 100 and Avid video systems to be imported directly, therefore maintaining an all-digital file path. Further, DIVX (Digital Video Express) video formatting is supported on all Sonic DVD Creator systems allowing DIVX title authoring and formatting

If you need to protect your DVDs, Macrovision offers tools to help you do just that. They have digital watermarks, and play/record control technologies to provide digital-to-digital copy protection capability for DVDs, DVCs and other digital media.

At the C-Cube booth, the company was showing the latest generation chipsets for compression applications. Although C-Cube is not the only company building compression chips, the C-Cube MPEG chipsets were found in boxes across the show floor. Also on display were a variety of applications and devices that use the C-Cube chipset.

Another manufacturer of MPEG chips is InnovaCom. DVImpact is a single chip solution for MPEG encoding. Their end-to-end solutions include ATM multiplexers/demultiplexers and MPEG-2 over Ethernet networks. DVExplorer is an MPEG data stream analyzer that can be used in a variety of compression applications for troubleshooting and verification.

For more information, circle (313) on Free Info Card

Software solutions

One of the most exciting areas of encoding was some of the low-cost software encoders. While not real-time like their hardware cousins, the cost differences are substantial.

Heuris showed off its MPEG Power Professional DVD software. This amazing high-end MPEG-2 software encoder has a list price of $3500. For that price, you get MPEG-1 and MPEG-2 encoding capabilities with variable bitrate encoding and transport layer multiplexing, variable resolution, inverse telecine detection, NTSC and PAL, batch processing and a much more. Anybody looking to get into DVD should look at Heuris's new software and weigh the time-vs.-dollars issue, but without fear of quality loss.

Downstairs at the Sands Convention Center in a small booth, I found a pretty remarkable piece of software, the DVMPEG, made by Darim Vision Co. It too is an MPEG-2 software encoder, but at a price point under $200. It doesn't have all the professional features of other encoders, but at that price, it cannot be beat. DVMPEG drivers are plug-ins for Windows video editing and animation creation programs. It is simple to use, simply select DVMPEG as a compression method for video and audio, then let your machine crunch out an MPEG-1 or MPEG-2 compliant stream. Darim claims, that no other program in the world can accomplish these things in a one single step. These incredible gains in efficiency and compression are produced with a few clicks of the mouse. You can produce small, portable MPEG 1 video files or you can produce broadcast quality MPEG 2 files.

This week I actually tried thi
ware at home with Adobe Premi
was blown away by its abilities. I
able to output a variety of form
MPEG-2 program streams; video e
mentary streams; MPEG-1 syste
streams -including VideoCD (Whit
Book) compatible; MPEG-1 video elementary streams; and MPEG-1 audio layer II elementary streams. All this on my home 200MHz MMX Pentium computer — simply amazing.

For more information, circle (314) on Free Info Card

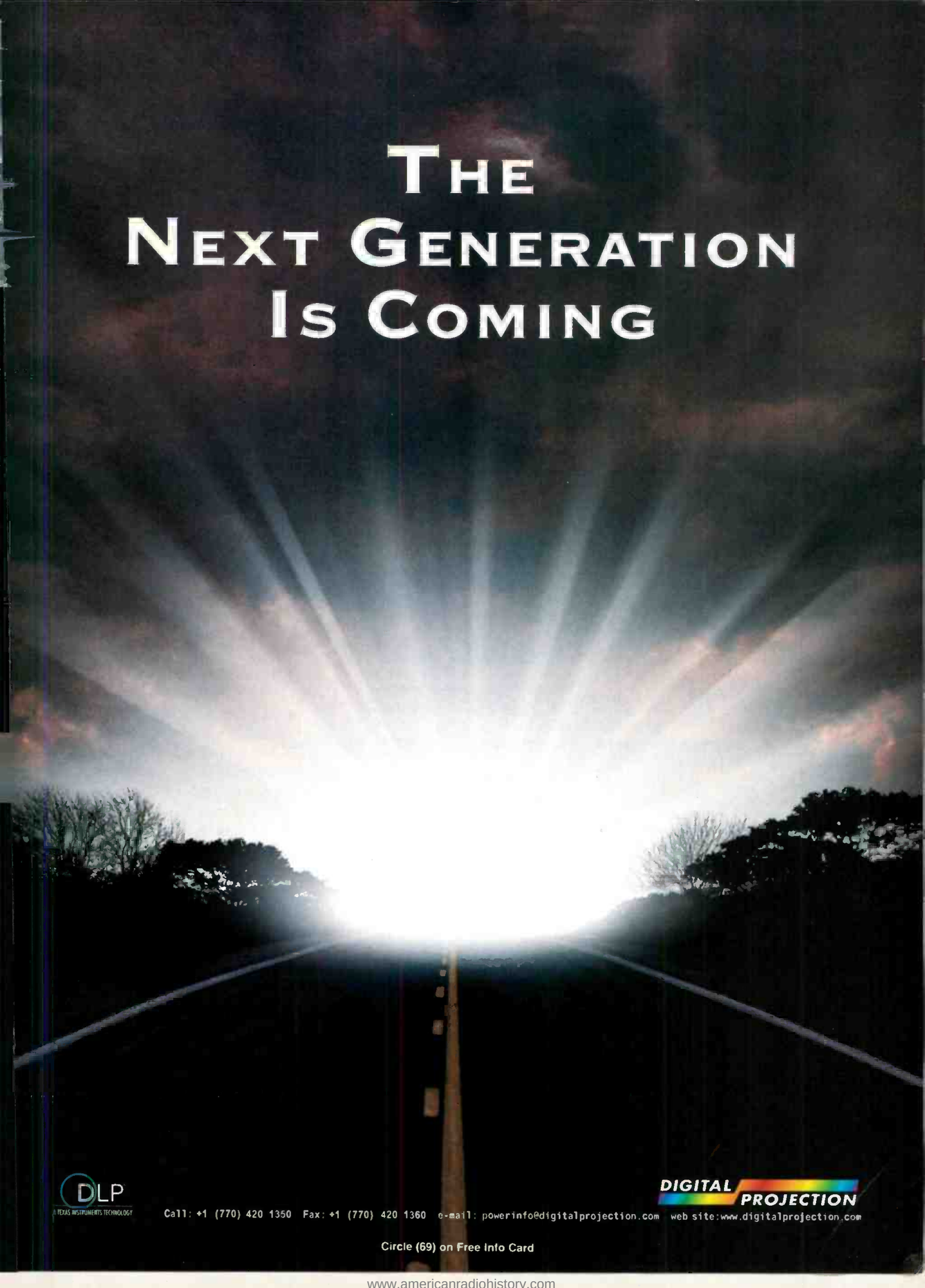
By John Ajamie

John Ajamie is director, network operations, duplication services and quality control for Home & Garden Television and Cinetel Studios, Knoxville, TN.

With the FCC mandate comes opportunities and challenges. Among them is the prospect of converting your facility to digital and possibly managing several broadcast channels.

What follows is a summary of key points from several automation companies offering solutions to the obvious problems you may encounter. These systems are geared toward a total master-control operation scenario. Among the problems we need to face regarding DTV is the need for asset management of material and datastreams, as well as the convergence of multiple data networks within facilities.

One of the systems on display at NAB was Florical's AirBoss, a scaleable multichannel automation system that runs on Windows NT. This fully automated master-control system controls multiple external sources, including video cart machines and video file servers. AirBoss can control various master-control switchers and makes significant use of master-control switcher features, such as audio overs and transitions.



umbine JDS is a complete system that manages all areas of digital TV transmission. From playback to the allocation of bandwidth, TransMission Manager can assure the quality of the material, then plan it for playback and finally manage the transmission for all your channels of programming. TransMission Manager, along with master control automation system (MCAS), gives you full traffic and master-control integration of cart machines, VTRs, switchers, still-stores, character generators, video servers and routers.

Digital Manager, which works together with MCAS, acts as the control center for multichannel digital TV transmissions. This system provides bandwidth allocation tools, including control of encoders, multiplexers, conditional access, subscription info, parental guidance bit rate, closed-captioning data and teletext languages.

The ADC-50 from Louth is a low-cost but high-end solution for automation playback. It can be used with cart machines to cache to videodisk, or it can be used solely with a file server for a tapeless environment. The ADC-50 can broadcast up to six channels and is easily upgraded to the next level, the ADC-100. The ADC-100 runs on a peer interface that communicates directly with external devices, such as cart machines. This system runs with multiple controls over various devices and can broadcast dozens of networks.

Louth's Turbomedia system manages all broadcast material and includes the ability to dub commercials from tape or videodisk to disk or archive to a data storage devices. The Windows-based Autosat satellite control system can record multiple programs through event list scheduling. Autosat automatically positions the antenna, tunes the receiver and routes video to the appropriate destination. In conjunction with Autorecord, multiple feeds can be recorded simultaneously.

The D-MAS system from Drake DAL provides control of broadcast transmission equipment and runs on a proprietary software package. The system always uses two controllers that are in sync. The D-MAS is designed to handle single or multiple channels and can share broadcast equipment. A unique feature is its audio silence sensing that will detect absence of audio and alert the operator with a visual alarm. This feature can facilitate a multiple network playback operation. The D-MAS can also communicate with single or multiple disk servers and control downstream keyers, logo inserters and audio mixers.

The D-ACS is Drake DAL's interface to a video file server. Material can be manually loaded on the disk server from different cassette devices or the material can be managed in a cache mode to and from a file server. D-MAL is the automated measurement and control system for MPEG-2 systems. It's capable of monitoring and testing multiple MPEG-2 digital TV transmissions. The system monitors the multiplex carrier and can perform multiple tests. If a signal exceeds limits, there is an alarm status that can be time stamped and stored in a log file.

Other pieces of the system include D-AIS, which is the automated information system that links the automation with the library computer system. This application is used to find material for caching or cart machine material if information is missing from the traffic download. D-AMA is an automated material acquisition system that automates the steering of satellite dishes, routing and the recording of multifeeds.

Odetics' Roswell is a media and data manager for on-line, near-line and off-line video material. It manages where the material is stored and how to get it from one place to another. Included in Roswell is the station automation for on-air. SpotBank is a spot-insertion automation system that uses video server storage as the playback device and can be configured for a single- or multichannel broadcast operation. SpotBank manages the inventory of spots and their playback, and has an option for use of a master-control switcher. Operators can record in and play back multiple networks simultaneously with all networks accessing one common commercial storage system. SpotBank can control multiple external devices, including video servers, laser disks, tape machines and routers.

The Odetics' MediaPrep is a media manager that automates the loading of new spots into the video server. Media-Prep can track events, manage recording of new material, monitor space allocation on the server and maintain the database of commercial material. A feature in MediaPrep allows for inventory management and tracks material on videotape, video server or an archive copy.

Bowser the browser is a new offering from Odetics that enables users to access the media database from their PC workstations. The Bowser system stores highly compressed proxies of on-line and archive video information.

The MC-2095 on-air automation system from Philips Automation can handle 32 independent on-air channels, while controlling 256 external broadcast devices. Other options are caching of spot playback material into a video file server and compilation reel software. The MC-900 on-air automation system is a low-cost package that handles four on-air channels and 64 external broadcast devices.

The Media Manager software package logs and tracks program numbers and catalogs all media information. Media Manager can interact directly with the automation control and the Traffic Manager package allowing conversion of traffic files. It can track which programs or commercials can be purged and can be used as a centralized database for all video and data information.

For more information, circle (315) on Free Info Card

By Marc Boeddeker

Marc Boeddeker is in the digital video division at Producers Post, Burbank, CA.

"It was the best of times, it was the worst of times. You know Spock, back when they first introduced HD, it really was quite confusing for the humans," quoted from Captain Kirk in the year 2038. Back here in the present, anyone planning an entrance into the DTV future of broadcasting and media has some rather tricky purchasing concerns to keep in mind. MPEG is something we'll all

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become more familiar with, but MPEG is sure to evolve, perhaps along unexpected lines. So, what do you buy today? DV? Digital-S? DVCPRO? BetaSX? Storage is one thing, but when it comes to cameras, it's more important than ever to have a good idea of what you plan to do with the equipment. Low-cost digital camcorders offer many attractive options for industrial strength productions. Firewire or other methods that allow direct transfer to non-linear editing systems allow producers to bypass a host of expensive gear (and rate cards) to deliver higher quality to their end-users.

If you can use it today to make money, the less expensive gear will pay for itself quickly. At a higher price point are the switchable aspect cameras that allow a single purchase to address the present production environment, as well as prepare for the DTV future. These cameras have the added advantage of classing up an SDTV operation of any kind. On the really expensive side is the production and acquisition gear needed for a broadcast HD presence. Time is money is time, so local news operations may have different requirements than a network, web or other operation. Larger investments require more careful analysis, since they must be amortized in the immediate, rather unsettled future of HD and DTV in general.

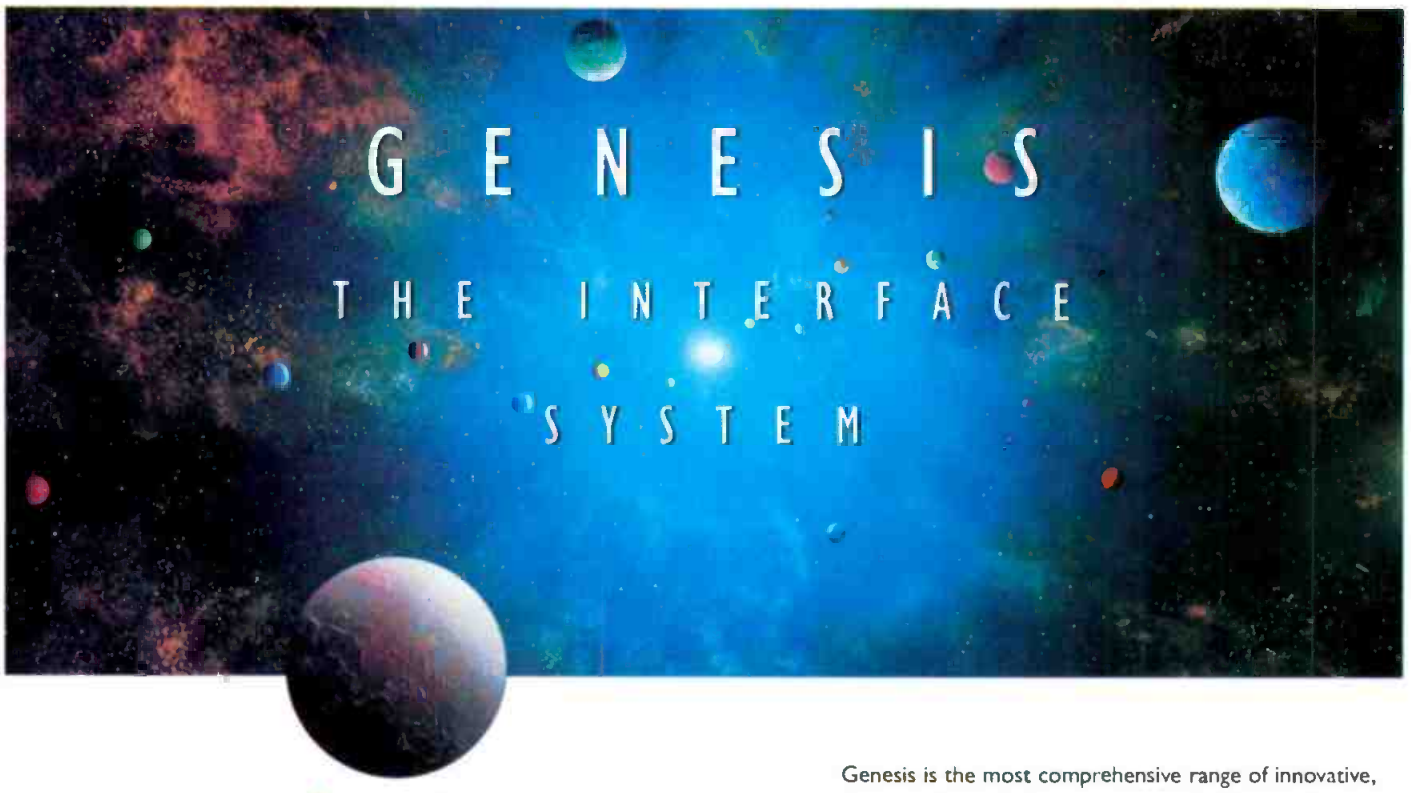
On the HD side of DTV, Sony introduced the first portable, battery operated high-definition camcorder, the HDC-700, as well as the HDC-750, which produces HDTV and SDTV outputs simultaneously. These two camera units interface with Sony's existing studio HD equipment, such as the HDC-700 HiDef studio camera and the HDS-7000 production switcher. Several major network shows have already signed on to use this gear. Sony's line of Digital Betacam products are already installed in a variety of 4:2:2 applications. These products are not going away, and "Digital Betacam" cameras are the standard for high-end SDTV acquisition. The new DVW-700WS is switchable 16:9. Complex setups can be quickly accessed from plug-in cards and color playback is available direct from the camcorder.

The SX line, which Sony based on the industry standard MPEG-2, 4:2:2; compression algorithm, was well-represented at NAB. Maintaining an MPEG format throughout the production process

Maintaining an MPEG format throughout the production process is an interesting idea.

is an interesting idea, and CNN for example, feels that SX is perfect for getting news-quality contribution out to a global (satellite) environment. Each of the DNW series camcorders (7/9/90WS) is smaller and lighter than their analog predecessors and each features color playback without an external adapter. The DNW 7 can run for up to 180 minutes on one lithium-ion battery, and the DNW 90WS is switchable to 16:9. The DNW-9WS is Sony's newest SX camcorder. It is light, compact and 4:3/16:9 switchable. The Power HAD CCDs and 10-bit processing generate superb picture quality. It features variable shutter speeds and computer setups that facilitate production, and there's an optional color viewfinder. This is a good transitional product for broadcast environments. Another advantage of the Betacam SP format is its backward compatibility.

Available in many sizes and shapes Sony DVCAMs are capable of capturing excellent, professional images at all levels of production. The compact DSR-PD1 offers a host of size and portability advantages and is compatible with Pro DVCAM products for transfers and editing. It has a flip-out color viewscreen and a color viewfinder. For entry-level industrial video, the DSR-200A DVCAM digital camcorder gives anyone who's been shooting analog a cost-effective entrance into the digital domain. A cuts-only system can be built around the camcorder and a DSR-DVCAM VTR and a variety of NL editing systems are



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are also compatible. This camcorder is switchable 16:9/4:3 and "well-acquired" images are usable virtually anywhere. The newest addition to the professional line of DV camcorders is the DSR-300. This one-piece unit has most of the function of the dockable DSR-130, including 10-bit DSP and the PowerHAD CCDs, with better power consumption and a number of operator convenience features (finally a comfortable shoulder pad).

Hitachi introduced the SK-3000, a multi-standard studio camera that provides HDTV and NTSC outputs at the same time. All processing is done in the 16:9 format, and the camera features 1,200TVL of resolution. The 1.5Gb/s digital output is sent from the camera head via optical cable to a control unit that provides standard analog and digital HDTV outputs, and digitally converts the signal to 4:3 or 16:9 NTSC for serial digital or analog outputs as well. On the portable side, the Z-3000W is a 16:9/4:3 switchable camera that features enhanced low-light sensitivity and 13-bit DSP. Camera settings can be instantly stored and recalled using Hitachi's SmartCard. Other features, such as internal six-vector color correction and Hitachi's flesh tone detail adjustments, are part of this camera's feature set. One added bonus is that this camera is dockable with most "popular" formats. Speaking of which, Hitachi also offered the Z-V1A, a DVCPRO compatible one-piece camcorder.

Angenieux introduced a new lens technology at NAB that uses new glass and advanced electron beam coating techniques to deliver better resolution, while reducing flare and ghosting. The new High Resolution Series is geared for HD and includes an all-purpose 15x8.3 ENG lens and a 12x5.3 "wide superzoom" lens that offers a great combination of extreme wide angle and zoom. Both use Angenieux's assisted internal focus (AIF) to provide fast fluid zoom control and precise focus. These lenses are compatible with today's 2/3-inch CCD cameras, as well as the growing number of 16:9 cameras coming soon to a market near you. For switchable cameras, an 0.8x converter is available for 4:3 operation. These lenses have a good operational feel and are a cost effective alternative for broadcasters to consider.

JVC has brought its Digital-S format to the DTV wars. It's a ½-inch, 4:2:2 format that currently records at 50Mb/s with plans to extend that to 100Mb/s. The DY-700U is an economical single-piece DigitalS camcorder that offers a cost-effective set of features. In the right environment, this camera can do a lot of good work. The KY-19U and the KY-D29U are full-featured docking camcorders compatible with JVC's DV (BR-DV-10U) and DigitalS recorders, respectively, as well as most other miniDV and ½-inch format recorders. Either of these units is applicable for producers who need to deliver on different formats dependent on client inclination and/or budget. The DY-90U is JVC's newest DigitalS camcorder. It has four channels of audio and good low-light sensitivity. Compact and lightweight, this camcorder offers two-hour record capability. JVC is also offering the KY-D29W, which is switchable from its native 16:9 aspect to 4:3.

As broadcasters evaluate their path to HDTV, system flexibility will be crucial.

Camplex offers multiplexing hardware that allows bidirectional transmission of video and audio as well as supplying control data and power to remote cameras over regular 7Ω coax or triax. Camplex has a variety of systems featuring price/option combinations that let you buy just what you need in terms of camera control and return signals. The ultimate package includes all camera-control functions, remote setup and genlock, and up to three return video streams — again, on a single cable. Many productions would benefit from having such capabilities coupled with the relatively quick and easy setup that these systems offer. The new CP 301B is a primary multiplexing system that adapts to any camera with a tidy little interface that provides power and returns video and audio to "mission control."

As broadcasters evaluate their path to HDTV, system flexibility will be crucial. Most new studio cameras offer multiple output formats to allow the equipment to survive the transition from SDTV to HDTV. The Panasonic AK-HC880 studio camera and the portable version, the AK-HC830, feature parallel 1,125-line HD output, as well as downconverted 525 outputs. Both are available with 16:9/4:3 aspect ratio conversion. These cameras should be available with final feature sets in the fourth quarter of 1998.

Panasonic's DVCPRO format allows producers to enter the world of DTV at several different price points. The AJ-D810 camcorder is a broadcast-quality unit that features three high-sensitivity 2/3-inch IT CCDs combined with DVCPRO's digital component recording system. It is compatible with most 2/3-inch lenses, and is a lightweight, compact unit suitable for any ENG or EFP application. The AJ-D700 weighs a little less than 13 pounds. The unit records 60+ minutes on a single cassette and features low power consumption. It's quick and easy to set up and use, and it delivers high-quality images, even under low-light conditions. Affordably priced, the AJ-D210 is lightweight (a given with the DVCPRO format), power efficient, and accepts a number of 1/2-inch lenses. With an optional interface, you can do digital dubs to another transport or computer.

DVCPRO50 records 50Mb/s on a slightly wider track to provide the higher data rate recording needed for multilayer productions incorporating more complex chroma keys and graphics. It is backwards compatible to DVCPRO (25Mb/s), and is one possible path for upgrading to HD. The AJ-D900W is a switchable (16:9/4:3) camera featuring three 2/3-inch 520,000-pixel (wide type) M-FIT CCD image sensors for a resolution of more than 750 lines. The higher data rate looks great, and the "soon-to-be-released" DVCPRO100

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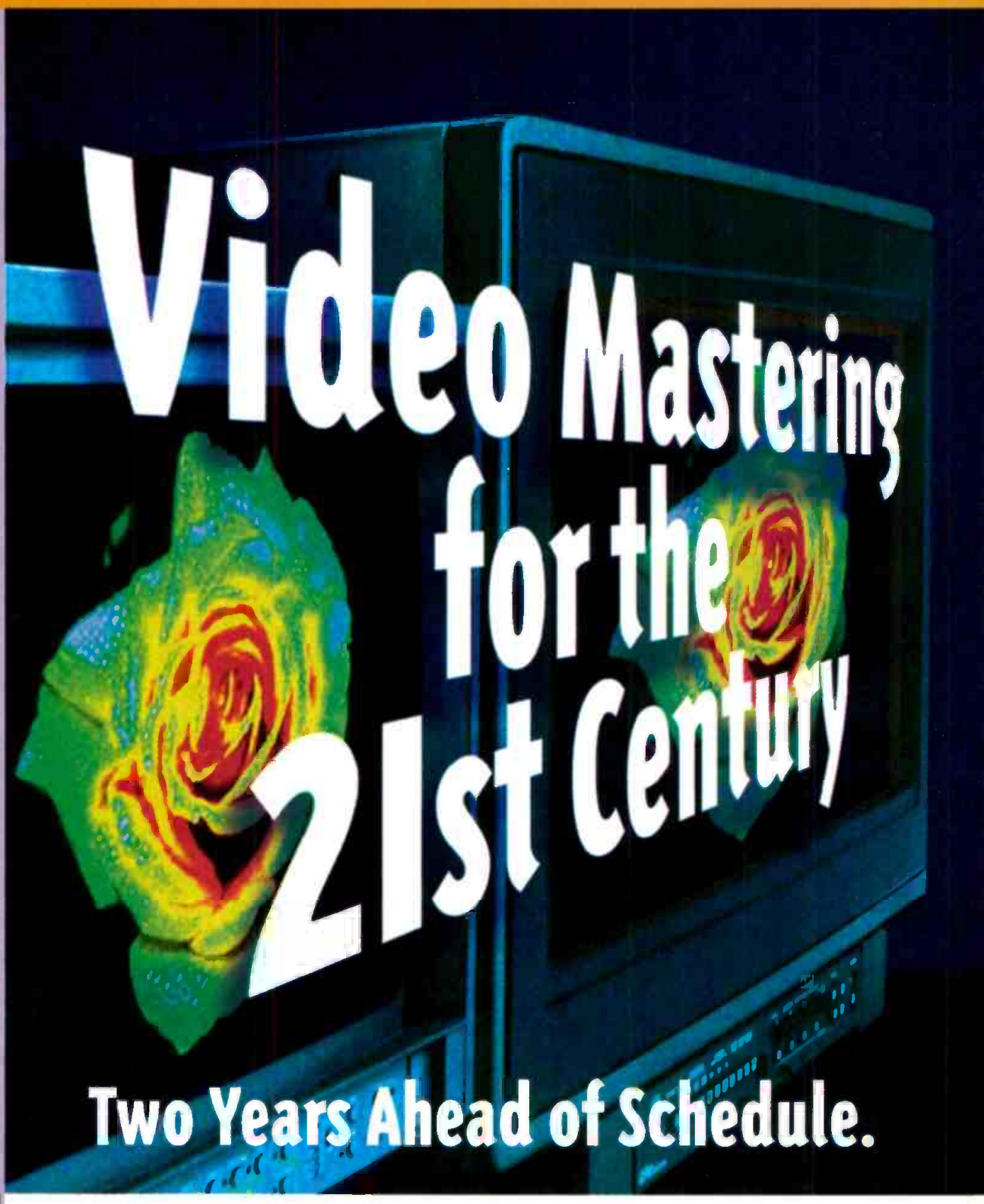

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(recording at 100Mb/s) is expected to look even better.

Panasonic has several mini-DV cameras, but the AG-EZ1U is the cool one. This camera can do anything in good natural light and has many professional features that come in handy. I've seen it strapped to airplanes and motorcycles, as well as more conventional mounts, and it always produces high-quality, cost-effective images.

On the HD broadcast side, Ikegami has a full line of cameras featuring interlace and progressive outputs that are capable of fitting into virtually any HD-implementation scheme. The HDK/HDL-79 series cameras support existing NTSC operations with an upgrade option path that allows conversion to 1,080i/480i or 480p/720p. With the HK-525/525P series, progressive and conventional NTSC signals can be selectively output from the base unit, and the cameras are switchable 16:9/4:3. The HK-388 and the portable HK-388P are 12-bit, full-digital processing cameras that feature newly developed ASICs and deliver incredible image quality. All of Ikegami's studio lines offer full professional feature sets and enhanced ergonomic design to make the cameras "operator friendly."

Ikegami also showed the HL-45 high-performance digital camera. Based on new ASICs and 520,000-pixel IT CCDs, it delivers 900 TV lines of resolution. It docks with a BetaSP recorder without an adapter, but it can be configured for DV or DigitalS recorders, or even Ikegami's Dockable Disc Recorder. The 16:9/4:3 switchable HL-45W is also available. As with most dockable units, this camera can be connected via triax and can be configured as a studio camera. Representing Ikegami's support of DVCPRO are the HL-V73, HL-V77, and the 16:9/4:3 switchable HL-V77W. Each of these lightweight cameras is ergonomically designed around 16-bit digital processing systems with 10-bit A/Ds. Ikegami features such as continuously variable shutter speed and hypergain are just a few of the user-friendly design aspects to remind you that the heritage of the HL series stands behind them.

Philips introduced its line of LDK 2000 digital trueframe progressive studio/field cameras. Immediately these cameras offer a 50% improvement in vertical resolution over today's interlaced pictures. They also allow broadcasters to leap into DTV with technology that is not only 4:3/16:9 switchable, but is also able to switch between 480 active-line progressive and standard-definition interlace, while maintaining 601 SDV output to spec. Philips also debuted the LDK 23HS a high-speed ultra slow motion camera. Triple-speed scanning and recording to disc allow replay of sequences even before the action has finished. Supporting the DVCPRO50 format, Philips introduced the LDK 150 Digital CamcorderPlus. It features switchable 50Mb/s or 25Mb/s operation and aspect switching with exclusive DPM sensors. Software upgrades are possible via serial link, and the 12-bit video and high-end audio processing make this a "smart" little camera.

Thomson's new camera for this year's show was the 1557D studio camera. The 1557D uses 12-bit A/D conversion and can be fitted with the latest CCD IT sensors in either 4:3, 16:9 switchable to 4:3. A picture-in-picture function allow the cameraman to view both the camera and return video simultaneously.

The 1707, also from Thomson, is a 12-bit digital camera that includes an all-new digital triax link. This system transmits a 4:2:2 signal without compression from camera to CCU. The 1707 can be fitted with IT CCDs in either 4:3 or 4:3/16:9 switchable formats. Features include a detail follow zoom, which links contour level to the length of the lens, and dual skin detail. In addition, camera color temperature can be set in steps of 100°K, between 2,200 and 9900°K.

Canon's product line is about as comprehensive as it gets. They have a good-quality, cost-effective alternative for almost every application so, it's no surprise that when Japan's NHK decided to broadcast the Nagano games in HD, over 80% of the HD lenses used were Canon. Their line of HD lenses featur-

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ing internal focusing, "IF +" technology (HD-IF) is becoming industry standards. The HJ9x5.5B IRS/IAS wide-angle zoom features the widest angle for HDTV lenses. Canon's lenses also take the honors for lightest standard zoom and longest zoom. Their line of studio HDTV lenses includes the UJ20x7B, which incorporates the Emmy-award-winning IF+ technology and precise digital servo controls. This digital servo system not only allows the precise focus control needed in the shorter HDTV depth of field, it can also transfer lens information to a computer in a "virtual studio" environment.

On the camera side, Canon's XL1 is a pretty hot miniDV camcorder. It has four-channel audio, digital I/O and many other great features, but the main thing this unit brings to the party is Canon's rather extensive line of lenses. In its normal configuration, this is a capable camera, but with the right lens choice, everyone from microbiologists to mountaintop nature photographers should be happy with its performance. Even smaller is the "ZR" which should come with a secret agent license. For its size, this is an excellent "acquisition device" for web publishing, home video or even some professional applications.

Fujinon showed the new A19x8.7 (2/3-inch) and the S19X6.5 (1/2-inch) Pro-classic Series of lenses for professional digital video cameras. These lenses offer features usually found only on broadcast glass, among them, Fujinon's "Quickzoom" which allows you to snap into focus and then back out to the original framing at the touch of a button. They combine superior optical performance with the highest magnification and widest field of view available in a lens for pro digital video cameras. A "Vformat ratio converter" maintains the proper field of view when the lenses are used on cameras with switchable aspect. On the HDTV side, Fujinon introduced the HA36X, an ENG-type zoom lens for HD applications. It weighs only 10 pounds and is perfect for sporting events, nature photography or other telephoto applications.

Innovision's unique "close focus" lens/camera/control systems have flown over and through some of the most alien landscapes available. Their lens systems are perfect for motor interiors, computer innards, whatever you've got that needs an up-close-and-personal view of tiny components in hard-to-reach places. One of their new products, the "CamPole," delivers another unique POV. It's a combination minijib, steadicam device that the operator runs from a body mount (the SL) or from a tripod (the slightly longer CamPole XL.) The system consists of a miniature 3CCD camera in a watertight housing, controlled by silent servos, all of which are mounted on interlocking carbon fibre tubes. Pan, tilt and focus are adjusted from a control box that can be "worn" or mounted in a variety of ways. This package is ideal for getting close-ups when it's hard for the camera-person to approach the subject, such as when shooting underwater or over the heads of a crowd.

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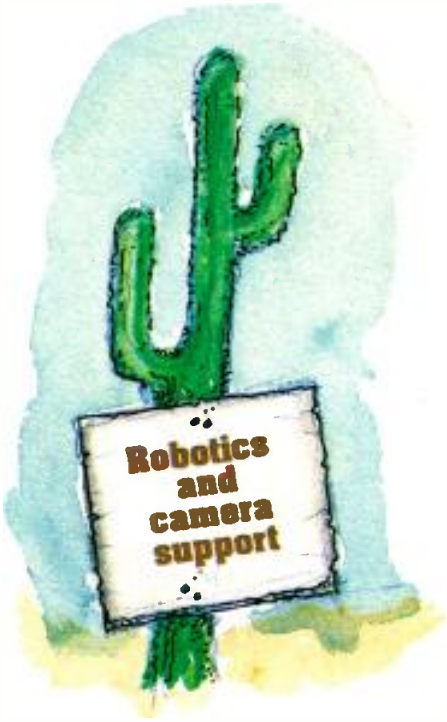

By Marc Boeddeker

Marc Boeddeker is in the digital video division of Producers Post, Burbank.

As cameras have evolved, so to have their support mechanisms. In many cases, this means smaller and lighter units designed to provide professional level features for today's smaller cameras. The prices of many camera-support products have also fallen, reflecting the fact that many of today's camera/lens combinations are far less expensive than those of a few years ago. At the other end of the spectrum are units designed to support HD cameras and provide film-style shooting for those producing material for HDTV/DTV applications.

The Miller Arrow 50 fluid head is the flagship of Miller's line of digital support systems. Designed for digital format camcorders, EFP and smaller studio cameras, it features rear mounting of all major controls that illuminate at a touch. When matched with Miller's series II aluminum or carbon-fiber tripods, it proves to be a solid performer, resistant to nasty environments. The DS-5 and DS-10 are fluid-head tripod systems for the smaller DV cameras. Again, many of the smaller cameras can do good work, in the right light with the "right move," even if that move is just holding still for a nice wide shot. These cost-effective fluid-head systems are the type of "accessories" that can make it all work.

Cartoni's new Omega fluid head, supports studio and film cameras from 60 to 220 pounds. This is a heavy-duty unit for Cartoni, but it retains all the subtle performance features of the rest of the Cartoni line. The Omega has illuminated controls and all moving mechanisms are sealed against dust and moisture. Cartoni's Alfa I & II systems are tripod/head combinations suited for the DV market that bring the smooth Cartoni feel and ease of operation to lower-cost systems.

New for Vinten at NAB were the Vision 8 and 11 systems, featuring the Vision8 and Vision11 pan-and-tilt heads. The new heads feature ergonomic control mechanisms, illuminated controls and digital parameter readout. These are attractive systems with some impressive features for the price. Also new from Vinten was the "Vector 700," featuring a new "thin film" fluid drag system.

Sachtler's DV2 and DV4 are dependable, cost-effective tripod systems for DV support. Compact, easy to use and with a great tradition behind them, these units are well-worth purchase consideration. The DV8 &12 were new at NAB and support slightly heavier cameras under more rigorous conditions.

Gitzo, which has manufactured still camera supports for over 80 years, in-

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troduced a unique tripod that is able to support specified loads with the legs fully spread open for extremely low angle shooting without additional spreaders or support. Complementing the sticks is the new G1380 fluid head. Gitzo also has a line of monopods that I'd use at times even for Betacam shoots and which would certainly support a number of smaller DTV cameras. Bogen also showed a new rolling tripod system, surprisingly called "Roll Pod." The unit is basically a set of big pneumatic wheels and a steering handle that you mount your tripod and accessories to, and then you're off to the construction site, football game, or any other shoot in difficult terrain.

Telemetrics has a solid reputation in the areas of remote camera control and triax/coax transmission technology. In fact, the Telemetrics staff invented triax camera control over thirty years ago. The company's advancements in computer-controlled, programmable pan/tilt mechanisms, as well as trolley and weatherproof camera systems, have allowed them to provide a high degree of performance and reliability at a reasonable price. Telemetrics displayed a new serial controlled pan/tilt mechanism dubbed the PT-LP. The unit incorporates a serial control receiver and power supply to facilitate remote operation of cameras with teleprompters. The PT-LP handles the additional load with ease, with smooth variable speed operation facilitated by heavy-duty cross-roller bearings and Swiss motors with isolation mounts. The unit's lens connector provides an interface to all lens functions. Although their forte may be heavy-duty remote systems, Telemetrics also demonstrated control systems for use with miniature pan/tilt mechanisms.

Parker Vision's PVTV is a cost-effective broadcast-quality production solution for anyone that needs a "one-man" TV studio. Small cable and public TV stations, as well as corporate and government media departments, should consider this product. One TD can orchestrate multiple camera moves, switch video, key graphics and essentially accomplish everything needed to do live television. Transition Macro automation is at the heart of the system, which includes the CameraManStudio control environment, where you create scripts to automate the events involved in a broadcast. Scripts can be updated and revised in a rehearsal mode. During a broadcast, built-in override and step functions allow you to run the show in fully automated, partially automated, or manual mode. Camera modules controlled by the system are 750-line, 3CCD units housed in compact pan-and-tilt mechanisms. Location presets store pan/tilt, zoom and focus data, plus extremely accurate position information. Script Viewer is a full-featured prompter that can be integrated with the cameras, and the autoTRACK feature allows the camera to track the talent around the room.

Chapman's Super Peewee IV hydraulic camera dolly debuted a new three-mode transmission featuring conventional, crab and round steering modes that can all be accessed while the dolly is moving or stationary, without taking your hands off the controls. Other improvements to the Super Peewee IV include reduced maintenance and enhanced "universal head" performance.

The DV Steadicam is Steadicam's solution for today's lighter DV cameras. This hand-held product features the same patented technology that's at the heart of all Steadicam products, producing that smooth, flowing look that is unmistakably Steadicam.

ProFour's product line features small-footprint pan/tilt mechanisms that are unobtrusive and quiet. These systems are perfect for remote operation of cameras in church and government environments, or any application where a low-profile "tech" presence is preferred. The desktop control transmitter can store up to 16 presets for each of eight remote camera positions.

Panasonic fielded a new professional production pan/tilt mechanism control system. The package includes an 800-line CCD camera unit, pan-&-tilt mechanism, and a series of five available control panels. The system is easy to use and can control up to five cameras.

In the virtual set arena, several players were in attendance at this year's show. Radamec's Virtual Scenario Studio system makes use of the Radamec studio pedestals and pan/tilt heads. This year, they added support for 16:9 studios. The widescreen Virtual Scenario can be

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switched from 4:3 to 16:9 as needs change. The heart of the Virtual Scenario is a 2U chassis that comprises an analog to digital converter, a four-field delay module and video and key processing modules. The system works in conjunction with the user workstation, which interfaces between the Virtual Scenario and the 435VR pan and tilt head and stores lens calibration information.

ORAD's CyberSet O is their top-of-the-line system that uses pattern recognition, rather that feedback from the camera head. Because of this, handheld cameras can be used within the virtual set environment. New this year is the CyberSet M, a mid-range solution that delivers all the features of the CyberSet O, but at a 50% cost reduction.

The MindSet virtual studio system from Evans & Sutherland offers "creativity without limits." Four point camera calibration allows cameras to be quickly relocated and calibrated within seconds. The FuseBox online troubleshooting feature makes problem determination and correction fast and efficient. Evans & Sutherland announced an agreement to jointly market WSI's WEATHERproducer service with the MindSet. WSI provides weather data, graphics animation systems and programming services which will be ingested into the MindSet virtual set, allowing broadcasters to create attention getting interactive weather presentations quickly and easily.

Accom's ELSET now features the Free-d camera tracking system. Free-d allows complete freedom of movement without using in-picture pattern recognition. A series of coded targets are placed in the studio's lighting grid and are constantly viewed by a small CCD "tracking" camera mounted on the studio cameras. Free-d calculates the studio cameras exact position based on information from the tracking camera.

RT-SET released its third-generation software (version 2.5) for the LARUS Virtual Studio System. The system supports the new SGI Onyx InfiniteReality workstation and uses proprietary hardware that includes RT-SET's FCU (fast communications unit) which accelerates camera-computer communications. LARUS's 3-D graphics are continuously updated in real-time during program shooting, and the package comes with a complete set of tools for creating and modifying sets, special effects and animations.

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Production equipment

By Ed Fraticelli

Ed Fraticelli is director of engineering at Production Masters, Pittsburgh.

With the development and acceptance of non-linear computer-based post-production systems, new and exciting finds in dedicated post equipment have been rare over the past few NAB shows. Devices such as production switchers, DVEs and character generators have seen less advanced development over the newer, desktop systems. But at this year's NAB, with the three letters D, T & V on everyone's lips, these equipment types have seen a resurgence, from the highest-end HDTV post systems, to the lower-cost personal-computer-based tools.

On the highest end are systems such as Sony's HDCAM. There was a complete HDTV post suite, including HDW-500 VTRs, the HDS-7000 production switcher and the HDME-7000 DVE. All this equipment was completely integrated in a fully functional system showing that totally high-definition post systems are available today.

Also at Sony was the "Sony Select System" suite for standard definition. This Digital Beta-based suite included the top-model DVS-7000 switcher. Along with it's DME-Link system, the DVS-7000's multiple timelines can hold switcher and DME key frames. Additionally, the DME-7000 DVE has a full palette of non-linear effects, shadows and lighting capabilities. Alongside these high-end linear editing systems were two non-linear suites based on the Sony ES-5 and ES-7 editing systems.

On the high end of the video post world, there were new offerings from Quantel, including Platinum, a lower-cost Editbox system, and new offerings from the Henry compositing systems line. The Henry V8 and Henry Straight-8 systems now complement the Henry V-Infinity to offer a full line of price/performance selection. In the upstairs area of the booth, Quantel was showing some amazing demonstrations of the highest of high-definition image manipulation, with a ClipNet system moving 1,080-line *progressive* 60 FPS video signals between HD versions of Quantel production gear. A real glimpse at the future!

A new player in the high-end production arena is Snell & Wilcox. They were showing two new production switchers. The 12-input HD1012 and 24-input HD1024 HDTV production switchers offer 1.5Gb/s I/O. Units include three keyers (two on the M/E and one downstream), a program/preset bus, border generators, two wipe generators, time line control and seven RGB correctors. An integral hard disk provides still storage, and both units are designed to integrate the future option of a high-quality 10-bit HDTV DVE.

Panasonic announced an HD switcher line, the Millenium series. These switchers are designed for use with 1,080i signals and can also handle 525/625 SDI signals (optional). The AV-HS3110 is a 10-input (maximum) switcher with 10 basic wipe patterns and one M/E. The AV-HS3100 offers 100 wipe patterns and an advanced control display panel. The high-end unit, the AV-HS3200, is a 20-input maximum SDI 1,080i switcher with 100 wipe patterns, two M/Es and two keyer M/Es.

Over at the Scitex/Abekas display, the Brutus DVE took the Dveous DVE a step further. With the Brutus combiner

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unit, two twin-channel Dveous units can be combined into one system, allowing manipulation of up to eight live images at one time, from one controller. Of course, all of the powerful Abekas effects are part of the Brutus system.

The Synergy Switcher line debuted at the Ross Video Systems booth this year. Available in models that range from two to four mix/effects levels, the Synergy line is especially designed for live digital production. Innovative features that make these switchers especially adept for this function include a built-in DVE for pushes, squeezes and repositioning, as well as "hot buttons" that can be configured to control external devices like VTRs, DVEs and character generators. This line of switchers joins Ross' extensive line of analog switchers.

The Echolab 5000 series was noted last year for its innovative use of an integral PCI computer, allowing users to add devices such as the Genie DVE from Pinnacle, the DPS Perception clipstore and Inscriber CGs, among others. This year, the integration is further enhanced, with the ability to run these devices as switcher functions, program time lines to run as one effect and store setups of these third-party devices into switcher memory. Echolab has also broadened its selection of input and output module choices. Any video signal from serial digital, composite, YUV to Y/C can be accommodated through the choice of the appropriate input modules.

Another PC-based switcher on the show floor came from PSP Digital, the PVS-2. This cost-effective 4:2:2 component digital switcher can be used for A/B editing and auto-conforming in small digital suites or for keying up to two graphics over background in compositing applications. The optional control panel allows the unit to be used in live applications. PSP's ELITE switcher is a layering switcher designed for post-production. It has 16 video inputs as well as 16 key inputs, and can process eight keyed layers over background in real time. Elite's timeline effect control allows complex compositing work to be performed reliably.

Pinnacle Systems continues to offer its Window-NT-based DVExtreme digital video-effects system, with it's unique Particle and Painterly effects capabilities. Its "3+3" capability allows each of the three video channels to have their own independent key channel. Pinnacle was also showing a version 3.0 software upgrade for the TypeDeko line of graphics generators. Features such as a Keyhole Shader, improved texture shader and live video in a 2-D DVE window complement TypeDeko's real-time effects and text manipulation. Also announced was the capability for TypeDeko to read Chyron files such as the type used in the popular iNFiNiT! character generators.

Snell & Wilcox's "Magic Dave" post-production system has reached the level of a full-function switcher/DVE combination. The eight-input system can be configured with analog or digital inputs and outputs, and it features a new, easier to operate control panel and PC-control interface. "Dave's" DVE was shown with the new version 3.0 software, that features light sourcing and powerful two-channel effects. High-re solution still manipulation within Dave is also an attractive feature.

Also in the integrated production system group, was Play's Trinity system, first offered for sale at last year's NAB, with an eye-opening price. Well, this year, the Trinity is shipping, still at the same attractive price point. Keep in mind that video and audio input/output and storage are purchased separately. An exciting announcement from Play was the integration of Electric Image's high-end 3-D animation software into the Trinity platform. This allows users to model, animate and render 3-D animation in the same box where the keyers, DVE's and switcher co-exist.

In the For.A/Video GainesVille display were post products for every budget and use. The Video GainesVille CV-line of component digital switchers were present, along with the new Mighty-Mix compact digital switcher. The top model CV-332 features 32-bit internal processing (4:4:4:4 digital video), two-channel DVE and chroma-keyer options. The For.A VPS line of switchers offers advanced options such as 3-D

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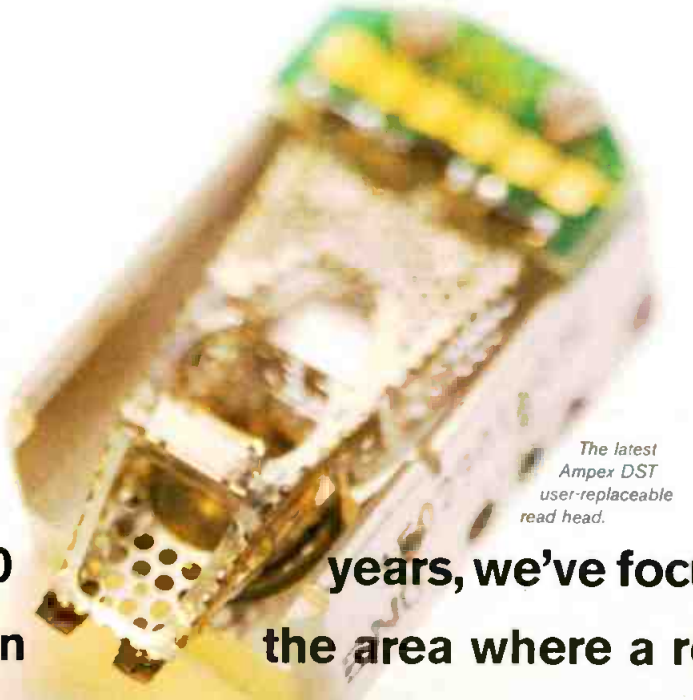

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DVE with warps, lighting and 120 preset effects.

In the character generator arena, Chyron is as venerable as ever. The well-known iNFiNiT! System is still going strong. It has switchable aspect ratios, enabling easy type composition within DTV's 16:9 aspect ratio. Optional features include the Imagestor still-store, Transform II animator and WiNFiNiT! Windows networking, which allows easy image file transfers between systems. A new Chyron product this year is the PC Scribe, an open platform (Windows 95 or NT) full-function character generator. The Scribe consists of a CODI frame buffer card and Scribe operating software. A wide variety of standard TrueType typefaces can be used, with many adjustable character attributes and motion effects available.

Also new from Chyron at this year's show is the DUET, a new concept in an open, high performance media processing platform for real-time 3-D graphics and animation. Its architecture is scalable to handle multiple display resolutions including DTV. Transform II can be used to animate 2-D objects in 3-D space and build animations of character, words or full screen graphics in real time.

Another character generator of note is from U.K.-based Pixel Power, represented in the United States by Major Technologies. The Collage system can be configured from a basic full-function CG, to a 2-D paint and animation system all the way up to a non-linear editing/compositing system called Collage-ED. Even in it's basic CG form, Collage's feature list stacks up against any leading unit. TrueType and Postscript typefaces, texture fills, soft borders, ASCII text file import and timeline operation of rolls and crawls top the long list of desirable features.

Alias/Wavefront introduced MAYA, a powerful 3-D software package that can be used for creating character animation and special effects.

Inscriber Technology continues to pursue the dedicated text generation market with an expanded line of Inscriber CG systems. Inscriber is a software solution that uses frame buffers from companies such as Matrox, VMAXX and Truevision, and can be configured with Windows 95 or NT operating systems. In addition to typical type manipulation features, Inscriber includes capabilities such as a logo compose utility, alpha channel and an event sequencer for building and playing sophisticated transition and motion effects compositions.

The folks at Ultimatte continue to develop the highest level of blue-screen matting technology. The fully linear keying capabilities of it's stand-alone products, such as the Ultimatte 8, are also realized in it's software modules and plug-in series. All of the advanced features, such as Screen Correction and Grain Killer, are fully implemented in these useful, fairly low-cost software additions. They are available for many popular platforms such as Windows 95/NT, Macintosh and SGI, as well as applications such as Adobe After Effects and Premiere, Discreet Logic products, Softimage DS and Avid Media Composer.

The move toward DTV production has caused some technology leaps in the telecine world that are worth noticing. The prospect of re-purposing existing film material for HDTV has many manufacturers showing systems with HD scanners. These new scanners offer many benefits for transferring to standard definition.

From Philips Broadcast Television Systems comes the Spirit DataCine. Spirit offers scaleable resolutions from 256 x 256 all the way up to 1,920 x 1,792, making it useful for any transfer application. The system uses 14-bit scanners and can scan from two to 57 frames per second in forward and reverse. It uses a serial HIPPI port for high-speed transfer of image data.

Sony's FVS-1000 multi-resolution telecine is a modular system designed to produce high-quality film-to-video transfers. It is designed to produce high-quality images from 16mm and 35mm film stock, both negative and positive, at resolutions ranging from 525/625 SDTV to HDTV. Image capture is accomplished using three 2,000,000-pixel HD frame arrays. A 12-bit logarithmic A/D system, with 16-bit internal processing, offers uncompromised signal-to-noise ratio in acquisition and image processing. Finally, the Sony Optical Picture Stabilizer (SOPS) system gently offers frame-to-frame image stability equivalent to mechanical pin registration.

At the Cintel booth, they were showing the new C-Reality telecine. C-Reality will initially support 525/625 and true 2K data. In the fall, upgrades will be available to support real-time, high-definition scanning. At the heart of C-Reality is Direct Scan, a comprehensive image scanning and detection system, that allows full 14-bit digital scanning in each of the three primary colors. C-Reality features two internal color correctors, one before and one after the gamma circuitry, allowing the colorist to correct and manipulate images simultaneously.

One additional piece of equipment that must be considered for anyone doing mastering of video or film is the Intellideck from Mathematical Technologies (see "Pick Hits of NAB '98," p. 90). The Intellideck is a digital transfer workstation that includes a non-compressed video disk recorder, a sophisticated image-correction processor, aspect ratio converter and a video standards converter.

For more information, circle (318) on Free Info Card

By Yasmin Hashmi

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Although DTV

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might be considered more of a problem for those involved in delivery and reception, many manufacturers of acquisition and editing systems must also address the issue. This is especially true for those whose ultimate goal is to maintain content in the same format throughout the production process. Also of growing importance is the concept of asset management, with file-format standardization and format-independent archiving solutions featuring high on several wish lists. The standardization of metadata and data transport specifications are also desirable.

The Sony approach is to encourage the use of MPEG-2 as a worldwide compression standard and to develop open network systems and flexible solutions. With a theme of "Digital Reality" at the NAB convention, Sony maintained that the distinction between the consumer and professional is blurring. Content can be multichannel, can come in many forms and can be seen in different ways. As far as the Sony stance on DTV is concerned, they want a seamless transition, and although they believe that 1,080i provides the best solution in terms of cost performance, Sony is willing to support all ATSC formats.

To assist broadcasters in judging the impact of cascading compression schemes, Barco used its RE 4220 MPEG-2-compliant compression platform to demonstrate how it has been conducting tests with Panasonic showing the effects that MPEG-2 compression will produce on previously encoded DVCPRO material. A complete set of both platforms allowed broadcasters to manipulate compression, GOP structure and delay.

Philips Digital Video Systems offered a full complement of "DTV-ready" studio and transmission products by unveiling a line of compression and transmission systems that conforms with the ATSC specifications. Also on hand at Philips was the NewsBreaker networkable cuts-only editor designed for the Media Pool digital video server.

With the theme of "Avid Open Nonlinear," Avid Technology maintained that it is ready now for DTV and showed how Avid tools, such as its forthcoming Windows NT-based Symphony noncompressed finishing system, can be used for creating HDTV material. Indeed Avid systems are already capable of handling the 16:9 aspect ratio and can upconvert from 601 to HDTV.

For more information, circle (319) on Free Info Card

Transitioning

From the facility's point of view, Tektronix was a little more cautious in its approach, pointing out that the mass-market appeal of digital remains unclear, in terms of price and value of content. Tektronix stressed that the migration from analog to digital will not only involve technology, but also people, and that an open system approach is critical and will require a high level of support and understanding of the business. To this end, the company is promoting a three-year plan to help facilities migrate from tape to tapeless operation.

Quantel emphasized its "Step-by-Step" approach to HDTV, suggesting that the first step has already been taken because all Quantel systems have supported the 16:9 DTV standard for the past five years. The next step is to upresolution the 16:9 DTV picture to HDTV using its multipoint bi-cubic real-time interpolation technology — already widely used for 601-to-film transfers. The third step is its Clipnet standards-independent network that is based on gigabit technology. Clipnet enables Quantel systems to be connected to other Quantel systems and/or third party systems. Quantel is working with Panasonic, Avid and Nexus and has introduced lower-cost entry-level systems, as well as the Cachebox DVCPRO four-channel server. They also previewed the Monty post-production system that can handle all of the ATSC standards.

By offering an open and resolution-independent architecture with 16:9 support, Discreet Logic confirmed its commitment to interfacing SMOKE to other devices expected in a DTV suite, including high-definition recorders and digital-to-analog converters. Discreet also showed the FIRE-HD non-compressed editor designed for the high bandwidth requirements of high definition, and the new version 2.5 of SMOKE that allows up to 15 EDLs to be con-

formed simultaneously.

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Collaboration

One of the key buzz words at the show was "open," in that manufacturers are increasingly concerned with their systems working with other products and/or platforms, resulting in a growing number of cooperative ventures. For example,

One of the key buzz words at the show was "open."

Scitex highlighted new alliances with Truevision and Puffin Designs, the former having licensed the Abekas 3-D and the latter providing the Sphere range with effects software. Scitex also pointed out that a Windows NT codec is available for the Sphere range that is now QuickTime 3.0 compatible, opening the system to third parties. As far as accommodating DTV is concerned, Scitex announced that its new range of Abekas and Sphere products are 16:9 compatible, and version 2.0 software for Sphere now supports widescreen processing.

Taking things beyond the collaborative stage, Play announced its merger with Electric Image (EI), which Play maintains will allow it to integrate powerful EI 3-D animation technology with its video technology, thereby creating a new breed of graphics and video products. The Play Trinity, shown in its shipping version, already includes a live digital production switcher, real-time 3-D effects, linear editor with machine control, character generator, paint, animation and compositing system, virtual sets, dual-channel digital still-store and chroma keyer. Required input and output modules are available separately, and the Time Machine option, due for release this summer, is designed to support real-time non-linear operation by adding two channels of video playback from a dedicated hard drive.

For more information, circle (321) on Free Info Card

Formats

Hailed by FAST Electronic as the "Native Digital Editor," its Windows NT-based blue. system is designed to allow editing of video in its original format. It includes non-compressed, MPEG-2 and DV codecs, supports two real-time video layers, plus an additional graphics channel. It also has a totally configurable user interface. FAST claims that the system is future proof, completely open for third-party development, and also allows up/downstream hardware expansion via the onboard Movie-2 bus and FASTWire high-speed shielded link.

Arguing that "the Windows NT market lacks a non-linear standard," Media 100 offered a solution in the form of its forthcoming FINISH on-line finishing system for Windows NT. Designed as a digital video hub that allows audio, video, text, animation and graphics to be assembled and output in real time at broadcast quality, the system supports analog and digital video content, including standards such as ITU-R 601, DV, IEEE 1394 and QuickTime 3.0.

Meanwhile, maintaining that Digital-S is "more than DTV ready" and that it provides the ideal signal for conversion to MPEG-2 compression systems, JVC announced delivery of its TimeGate MW-S1000 hybrid 4:2:2 non-linear system. It not only supports Digital-S, but is also compatible with all analog and digital tape formats, including various DV formats. Housed in an all-in-one structure with a Pentium CPU running Windows NT, the system provides real-time effects including 2-D and 3-D, graphics and chromakey.

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Networking

A marked difference from the last year's NAB convention was the number of manufacturers now claiming support for networking, particularly Fibre Channel. For example, IMC demonstrated file sharing between three networked Incite editors via Fibre Channel, with other new features for the system including 3-D DVE, live video input making a total of four real-time DVE channels, voice over, slow-motion control and audio/video scrubbing.

Avid announced its DV native news editing system, NewsCutter DV for Windows NT, that will be compatible with DV cameras and decks. According to Avid, broadcasters will be able to transfer media from DV decks, edit stories on NewsCutter and send completed stories over Fibre Channel to the NewsPlayer DV multichannel playback server. Developed in conjunction with Pluto Technologies, NewsPlayer DV will be able to accept incoming feeds from NewsCutter

DV, while simultaneously playing material to air, allowing for last-minute newscast revisions.

Videomedia showcased its 2XS Windows NT-based dual-stream digital disk recorder (DDR) that comes standard with cuts-only non-linear timeline-based editing software. In addition to providing a dual RS-422 remote interface, the system can be equipped with multiple network interfaces. Multiple users can share media on the same or different projects simultaneously by connecting several 2XS DDRs and deploying the Fibre Channel-based Fibrecast shared storage broadcast automation network. For possible expansion to DTV applications, an optional InnovaCom MPEG-2 encoder board is available.

Panasonic announced the DVpix option for its AJD900W DVCPRO camera. It stores shot logging data on the tape, which can then be read by the NewsBYTE non-linear editor. Panasonic also now offers the DVedit real-time Windows NT-based editor and announced two new compact video servers that will connect with NewsBYTE and DVedit, initially using 100BaseT Ethernet and SDI, and in future via Fibre Channel or gigabit Ethernet.

For more information, circle (323) on Free Info Card

New systems

Although not all manufacturers made announcements that specifically related to DTV, there were plenty of new system launches with noteworthy features. Matrox and in:sync, for example, released the Windows NT-based Speed Razor Mach 4.0RT running on the Matrox DigiSuite board set and supporting two streams of non-compressed quality component serial digital video, plus 32-bit animated graphics in real time. Other systems based on Matrox hardware included the United Media On-Line Express that uses DigiSuite, the newly released D-Vision version 4.0, renamed for the show as EDIT, which is based on the new DigiSuite LE, and the forthcoming IMC Incite LE based on DigiSuite LE and supporting two real-time 2-D DVE layers.

DPS introduced the Perception RT real-time dual-stream editing package comprising the new DPS RDR2 dual-stream card and the DPS Video Action RT editing application for Windows NT. The system features an on-board SCSI controller for fast video data transfer and the DPS Virtual File System for integration with third-party image processing programs.

Adobe launched Adobe Premiere 5.0 for Windows 95, NT 4.0 and Power Mac, featuring a revised user interface with three main windows, three-point editing, keyframe audio and video filters, and QuickTime 3.0 and Microsoft DirectShow compatibility. Adobe Premiere is also bundled with the new Pinnacle ReelTime Windows NT-based dual-stream video capture card with on-board real-time effects. Available in PAL and NTSC versions, the card also supports optional interfaces, including ITU-R 601 serial digital and IEEE-1394, allowing it to be used with a DV camcorder.

There were plenty of new system launches with noteworthy features.

Blossom Technologies introduced the Windows NT 4.0-based Blossom Real Time Fury family of real-time editing workstations. Designed to be unpacked and plugged in without any assembly required, the system is bundled with Adobe Premiere 5.0, Photoshop LE, the Sonic Foundry Sound Forge for audio manipulation and the Caligari TrueSpace for 3-D effects.

And finally, for those with a need for all of the functions required for rapid editing, but with the minimum of controls and options, the new OmniBus System's EDITion can be operated from a standard OmniBus workstation using a custom hard panel. As part of the OmniBus station automation system, the system also offers audio mixing and video transitions using the Tektronix Profile PDR200 server.

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Video accessories and projectors

By Michael Heiss

Michael Heiss is a marketing and technology consultant based in Southern California. He is a contributing editor for BE's *sister publication,* Video Systems, *and may be reached at CaptnVid@aol.com.*

At an event as important at this year's NAB, it is difficult enough to make certain that you pay attention to the "important" things. Looking around for cameras, recorders, image manipulation systems, RF systems and more probably left you without time to consider anything minor. That's a shame, because in broadcasting, as in life, it's the little things that count. Those items can make your life much simpler in the day-to-day hassle of getting shows produced and on the air.

To help you keep the station running, *BE's* editors took numerous trips around the floor searching for items to help glue all the big guns together: the accessories and display technologies that work as hard behind the scenes as you do. Just as the on-air talent and sales management may get praises when you help keep the station running, the items we'll discuss in this section work to unsung praises in the shadow of the heavy electronic iron. Without them, those fancy cameras and VCRs would be little more than expensive paperweights.

Many of the new accessory products we saw take a very literal part in keeping things running — for example, batteries and power sources.In the case of power source pioneer Frezzi Energy Systems, NAB presented an opportunity to present a triple threat. Frezzi's new NP1-3P Hot Swap Battery Box allows the use of up to three NP-1 batteries at one time. When one battery loses its charge, it can be replaced without losing power.

The result is basically infinite run time. The other parts of this triple play provide varied options for charging the batteries that support that infinite run time. The FSP Sun Panel will charge a 12V, 2.3 Ah NP battery in less than three hours when placed in direct sunlight. Out in the field, this can be a lifesaver. When you are closer to AC power, Frezzi's new M2100 was designed to be a "does-it-all" product that charges almost any type of professional battery, while offering advanced microprocessor controlled analysis and display of all charging functions.

Anton/Bauer, another battery mainstay, brought some new products to NAB, including the QR-LT75, designed specifically to provide a power source for Panasonic's new DVCPRO portable field editor. Anton/Bauer also introduced a multiple battery holder, the QBH. Doing one better than its competition, the QBH can hold up to four batteries, in two banks of two each. When one bank is discharged, the second bank takes over, permitting the dead cells to be replaced with fresh ones.

From Cool-Lux comes the COOLBrick, a step forward for brick battery technology. COOLBrick is designed so there is no recessed pin to wear out. Plus, the casing can be opened, making it easy to re-cell the unit. What makes this really innovative is a lighted panel that can be used as a sign for station call letters or network affiliation. Lighting is provided by another Cool-Lux product, the Pan-El-Lite. Pan-El-Lites use electroluminescence technology and are made up of a flexible, translucent material that is half the thickness of a credit card. Available in widths from one inch to 22 inches, they can be ordered in any length.

When one thinks of batteries, portable lighting cannot be far behind, and that was certainly the case this year. Lighting the way for field applications is the Paglight from Pag Limited. The XLR-4 is billed as the world's first two-in-one portable camera light, accepting lampholder units for either halogen or arc type light sources. It is light in weight and fully focusable. The XLR4's dual source capabili enables photographers to quickly change modules and use the light that best suits the equipment and situation at hand.

One portable light that provides studio punch is the Diva-Lite from Kino Flo. It displays a soft, cool light with features to control the spread of the beam. An onboard dimming ballast provides precise brightness control. This lightweight, versatile design is great for fast setups and easy transportation.

In the Lowel-Light booth, their full range of lighting products were on display. Among them are the id-light, Fren-L 650 core kits and the Rifa softlights. Lowel products are rugged and innovatively designed to provide years of service for video professionals.

Lighting was also in Frezzi's bag of tricks with the introduction of its MA-50 Full Spectrum Sun Gun. This 50-watt portable HMI "Mini-Arc" is equivalent to a 400W quartz light, and may be powered from any 65W 12V, 13V or 14V battery. The product itself is worth looking at, but the mere mention of the term "Sun Gun" took us back to a simpler, earlier era when Frezzi licensed the Sun Gun name that was so popular with home movie photographers and film crews in the days of film. You remember film, don't you?

At NAB '98, however, nostalgia had little place in the digital world, so onward was the march to search for other accessory items. The trip was not a long one, as innovation was everywhere.

While talking about lights and batteries, the next accessory-related topic that comes to mind is things that relate to cameras, and there was news on that front at NAB, as well. With DV tape and smaller digital-format cameras becoming popular, it was only a matter of time before the support people took special aim at that market.

Most notably, Sachtler Corporation met the small-format camcorders head-on with its new Monopod 2CF. More than an enhanced consumer product, this professional monopod has been a long time in coming. The single leg is made from strong, lightweight carbon fiber and features a choice of quick-

release mounting options for your camera. A unique pivoting footpad delivers both stability and support, making it easy to have a firm base of support, while having the freedom to follow the action. We tried this unit out on the convention floor, and it delivered the goods.

Once you've got your camera firmly supported, the next step is to take the pictures, and that requires a lens. Here, too, the specter of digital production was ever present. Meeting the need for critical resolution production were products such as Fujinon's new HA36X, the highest magnification ENG-style zoom lens designed for HDTV. Weighing only ten pounds, the HA36X's focal range is 10.5 to 378mm, or 21 to 756mm with a 2x extender. As HDTV moves out of the studio and into the field, products such as this will be an essential production element.

Throughout the years of analog production, small sizes, seemingly inconspicuous electronic accessories have always played a key role in the system chain. While many aspects of production will change with digital broadcasting, this is one area that will not. NAB was full of examples, and here is a small selection.

Always ready to surprise us with a new gadget, Horita did not disappoint with its new VS-50 Video Stopwatch. Overlaying an up/down counter over video, this flexible unit will help keep the pace of newscasts and time sensitive programs. Horita's other catchy name for this year's NAB was attached to an equally useful accessory, the VIC-50 vertical interval cleaner. This inexpensive device clears the entire VBI of added signals and restores the original black level. When signals are continually processed, transmitted and edited, they tend to pick up a great deal of VBI data; this unit cleverly sets things back to right.

Also in the area of VBI cleanup is the VBI-10 from Broadcast Video Systems. The VBI10 can be used for several different tasks such as transferring selected VBI data from one feed to another or deleting any VBI line and inserting new data. It has a fail-safe relay bypass and the single board plugs into any Leitch video DA frame or BVS FR3 frame.

Also on the leading edge of signal accessories is Evertz Microsystems, and they were quick to adapt to the needs of DTV and HDTV. Indeed, one of Evertz's major NAB announcements was an entire new platform for DTV applications. The 9000 series models will include a digital downstream keyer and a digital VBI processor, with other 9000 series products to follow.

Even more important in the multistandard production world we will all face in the next few years was Evertz's GG-8090 digital graticule generator. With one 4:2:2 input and two 4:2:2 outputs, the GG-8090 has all the markings for safe area, center cross and horizontal/vertical centering that are needed for both 4:3 and 16:9 aspect ratios. Many of the "Road to DTV" engineering sessions at NAB dealt with the problems in shooting dynamic action scenes, such as sports for two aspect ratios at the same time. Products such as Evertz's new release should be a great assist to anyone caught in that situation.

Many of the "Road to DTV" engineering sessions at NAB dealt with the problems in shooting dynamic action scenes.

Something handy in many of today's facilities is a device capable of converting protocols and handling those miscellaneous machine control tasks. Pacific Computing's OmniJET machine server can do just that. Among its capabilities are machine control and protocol conversion for Ethernet, RS-422, and Sony S-bus interfaces. It features an LTC reader input and provides a network point-of-presence for serial controlled devices.

While Leightronix is a full member of the accessory manufacturer's world with its line of event controllers and telephone remote control systems, its NAB introduction was a bit different. The new MVP-2000 includes a routing switcher and event controller, but it is also a scalable digital video recorder that uses MPEG-1, or optional, MPEG-2 to record anywhere from 90 to 210 minutes of audio/video information on a built-in 2GB hard drive. As the world of DTV expands the need for programmed playback to accommodate datacasting and multicast situations, devices such as the MVP-2000 will move from the background to the foreground because of their ability to share the load with a facility's servers and tape-based playback systems.

Another manufacturer that is keeping up with the DTV world is Miranda. Aside from distributing a comprehensive and informative wall chart that tracks all of the different digital TV standards and the routes available to convert one to another, they brought some interesting new accessory products to NAB. In particular, the new picoLink line of miniature signal converters caught the fancy of many attendees. Weighing a few ounces, these compact units are just the thing for remote emergencies, or behind-the-rack connections. Available in a variety of configurations, they convert component, S-Video or composite to 4:2:2, or they go back the other way, encoding the digital 4:2:2 signals back to the various analog states. With all the attention given to signal conversion at this NAB, the picoLink of most interest was the ARC-371P, which changes the aspect ratio of a picture from 4:3 to 16:9, while at the same time conversing composite PAL, NTSC or SECAM video into another one of those three standards. Don't be fooled by the tiny size of these units, they are powerful additions to your tool-kit of signal processing tricks.

While we are on the subject of tiny, Hitachi came to NAB with another small wonder. Its new HV-D3 is a small 3CCD camera designed for remote-con-

trolled applications where a wide light range must be tolerated. Able to produce high-quality pictures from as low as 0.0001lux to as high as 100,000lux, this 5.5-pound wonder sports the same digital processing system as Hitachi's larger studio cameras to deliver 62dB signal-to-noise ratios at 2,000lux sensitivity. The HV-D-3 is perfect for "traffic cam" applications, and early models are already serving that purpose in the harsh conditions at the top of New York City's World Trade Center.

If you are looking for a portable logging system, the eidria etrim (see "Pick Hits of NAB '98," p. 90) is based on the Palm Pilot and makes it easy to log footage almost anywhere you can roll the camera. When you are finished, simply upload the Palm Pilot's database into the edit suite, and you are on your way.

Now that you've taken, controlled and transported your signals, what are you going to look at them on in the new digital world? In many cases, this will be a video projector or plasma display used behind an anchor desk or as part of news set.

When high brightness and crisp resolution is required, new units from Digital Projection or Electrohome maybe the answer. Both had new models on display at NAB that featured the latest 1,024x768 fixed array DLP light engines from Texas Instruments. Digital Projection's 5gv with 5,000 ANSI lumen output or Electrohome's 2,000 ANSI lumen VistaGRAFX each have the light power to replace the video walls used in many newsrooms with a single projection screen.

NAB saw two new alternatives to DLP in the area of reflective LCD technology. Electrohome's new DLV-1280 uses chips from IBM that offer 1,280x1,024 resolution. JVC's DLA-G10 offers the highest resolution of the group at 1,365x1,024, despite the lowest price in the category at $17,000. JVC's unit is also a reflective LCD, using the D-ILA technology developed as an offshoot of the Hughes-JVC large venue projection products.

However, for all the talk of fixed-array devices, the CRT is definitely not gone from the scene. Perhaps the most incredible affirmation of that was the new BarcoReality 812, which uses a high scan rate chassis and 12-inch CRTs to deliver pictures of unmatched image clarity and color fidelity. That's right, you are not seeing a misprint; the new 812 has three CRTs that are 12 inches diagonal, for high brightness without sacrificing spot size for the sake of light output. The pictures are a wonder to behold.

If your sets or offices do not allow for large-screen projection, plasma screens may be the way to go. Available from a number of manufacturers, including JVC, Fujitsu (see "Pick Hits of NAB '98," p. 90) and Pioneer. Fujitsu's Plasmavision 42 has a 42-inch diagonal screen and is only six inches deep. The concept of plasma received market validation with Sony's entry, the PFM-500A1W. Curiously, this is a standard 42-inch AC plasma set, not the more exotic PALC (plasma addressed liquid crystal) set Sony showed in prototype at CES. However, as with any category, Sony's participation makes it possible for some management to accept a reasonably new technology even when others have already offered product.

On the small side of monitoring, comes the VAMP-1-SDI (see "Pick Hits of NAB '98," p. 90) from Wohler Technologies. This compact 3RU device allows users to monitor digital audio and video. Internal D/As do the necessary conversions, and the video is displayed on an LCD. Audio appears on bar meters and can be monitored with built-in speakers or headphones.

Boland Communications offers a full line of LCD monitors for a variety of applications. New this year is the ViewPort series. The ViewPort 1.8" and 2.5" are color LCD NTSC/PAL monitors, while the 20.1" can display NTSC, PAL and SXGA signals. Boland also showed a line of economical, high-performance desktop monitors for computers. Boland's Digital uniVUer is an onscreen audio meter for the serial digital video/AES environment.

Sometimes, no matter how bright the monitor is, it is not enough. That's where the sunshades and monitor hoods from Hoodman come in. The new soft Hoodman #H789S fits eight- and nine-inch

monitors. It is made of lightweight durable nylon and folds flat when not in use.

If you need more information than what is found on the monitor, Avitel was showing under-monitor displays and tally systems. Other Avitel products provide alarms and audio monitoring capabilities. In today's busy control rooms, many of these items become must-haves.

The final stop on an NAB tour is the perfect way to wrap up a look at accessories: How to hold all of these gadgets in one place and maintain a functional workplace environment? One interesting new alternative on display was the LRx file server system from Winsted. With high tower cases and RAID arrays becoming a growing part of many editing and graphics/image manipulation stations, this new modular system provides multiple slide-out bays designed to handle large computer systems. However, it also preserves the ability to configure the balance of the work bay to your specific needs.

One final rack solution is in an area often overlooked in transmission area construction: racks specifically designed for stability during seismic events — or earthquakes to the uninitiated. This may seem like a bit of overkill in many areas, but earth movement is not restricted to those of us who live in California. Other parts of the country are prone to the possibility of catastrophic structural failures, either by earth movement or wind force. Spending a few extra dollars on racks such as the Seismic Racks displayed by Zero Corporation's Stanton division is an easy way to insure that your facility is less prone to outages in the event of a natural disaster.

Looking at all the accessories and display devices at NAB was a daunting task, and space does not permit us to list every item of interest. This small sampling, however, returns us to the original point of reminding you to not dismiss the parts of your system that do not receive all the attention due to their cost or complexity. Paying attention to what is new and on the edge is essential throughout your facility as the technology shifts and production techniques rapidly change from analog to digital.

For more information, circle (325) on Free Info Card

By Roy W. Rising

Roy Rising is a systems engineer and production mixer based in the Los Angeles area. He is also a contributing editor for BE's *sister publication,* Video Systems.

The arrival of digital television imposes a whole new rulebook on video production and broadcasting. However, DTV's impact on audio work is smaller than you might expect. Digital audio standards are well-established, and the related practices have been learned and understood. Even Dolby AC3 surround sound is but an extension of what movies and music already had going.

The soundmixer's task remains much the same — capture sound that goes well with the picture. This means it should not call attention to itself, lest it distract from the program. Still there always are new tools, both digital and analog. Here's a look at some of the new audio products at this year's show.

DAs and converters

Longtime manufacturer of premium audio products for broadcasters, Ward-Beck Systems introduced an arsenal of products for DTV. The 8200 series includes digital DAs and converters. Of special interest is the D8400 75Ω digital converter/DA with analog outputs. The latter eliminates the need for additional monitoring converters at the digital signal's destination. The new SELECT series launches with the versatile RAV24 1RU 12x1 audio/video switcher and the ASM4 1RU digital/analog monitoring system. Its displays, features and conveniences handle a good range of monitoring requirements. The WBS PODS family of cost-conscious devices adds a 6x1 digital switcher, an AES/EBU 1RU monitor, a reclocking DA and a dual D/A converter. The new ABS-1 audio bit splitter is a portable digital and analog test-signal generator. Mate to last year's ABB-1 Audio Bit Buddy, the pair is perfect for testing devices and continuity.

Nvision has been active in digital audio for post-production since 1989. DTV benefits from this experience as the company introduced its new 4000 series of processing equipment. Two frames are available to accept a total of 15 new modules. The 1RU FR4001 takes four modules, the 2RU FR4002 holds eight. The 4000 series modules cover a broad range from digital audio DAs, through 24 bit/96kHz converters to the SG4410 master digital reference generator. Video modules include DAs, audio embedders and disembedders for up to six simultaneous AES-3 stereo channels and 1.5Gb/s HD DAs and electro/optical converters.

Telect introduced the VersaFrame II 1RU modular digital conversion system. Holding four modules, the VersaFrame II is a little brother to the 3RU VersaFrame that holds up to 10 modules. Telect's collection of conversion tools for digital, component and composite video also will include single and dual AES/EBU converters and delay lines.

It just got a little easier to monitor multichannel audio thanks to the folks at D-K Audio. Among this year's new products was the MSD600C MK II, a four-channel color LCD audio scope (see "Pick Hits of NAB '98," p. 90). This master stereo display has both analog and digital inputs and a VGA output if a larger display is desired. These units are available in the states through t.c. electronics.

Miranda Technologies introduced five new imaging (sic) series audio interfaces. Companion AMX- and ADX-101i mux and demux embed and extract two channels of analog audio in SMPTE serial video signals. The mux includes color-bar and tone test, plus automatic 525/625-line detection. SDA-702i is a dual digital audio DA. Inputs include clock regeneration for jitter reduction. Versatile outputs may be mixed among

110Ω balanced and 75Ω unbalanced. The SDA-721i is a digital audio DA with selectable analog outputs for monitoring. The SDM-722i is a dual AES/EBU monitoring DAC with signal correction and clock regeneration.

At the Beck Associates booth, several items were on display for TV audio, among them the AESIO digital audio converter panel for simple conversion between 110Ω and 75Ω audio connections. The VU-2P provides simultaneous peak and VU displays, as well as phase indication.

Among the products at the Dolby Laboratories booth were decoders and encoders designed for multichannel digital sound. The DP561B is a multichannel reference encoder that incorporates all the signal processing features, channel configurations and bit rates encompassed by the AC-3 standard. The DP567 is a 1RU, two-channel encoder (see "Pick Hits of NAB '98," p. 90). For reference decoding, the DP562 provides multichannel decoding in a compact 1RU unit.

For more information, circle (326) on Free Info Card

Mixing consoles

Aysis Air by Solid State Logic is a 48-channel all digital console for live broadcasting. The control surface is made for real-time operation incorporating a one-knob-per-function layout. Snapshot reset of all controls provides efficiency and versatility in production. Connection to SSL's Hub Router extends flexibility to over 2,000 sources and destinations, 20 mix-minuses, channel inserts, direct outputs from every channel and fader-up logic enhance the operation. Full multichannel surround is provided and may be expanded to meet future needs.

Euphonix has been listening to broadcasters. The result is the new CS3100B digitally controlled mixing system available with 16 to 104 inputs. Featuring version 3.11 Mixview software, the system addresses on-air requirements. Hyper-Surround panning from every fader answers the surround sound question. Improved channel name displays and SnapShot Recall aid setup and changeover. Expandable mix-minus bussing for IFBs and Fader Start/GPI triggering help round out the package and improved redundant power supplies keep the system on the air.

Wheatstone introduced the TV-80 audio console developed for medium market stations' live and network requirements. Based on the TV-1000, the TV-80 uses all electronic switching for high reliability. Available in a range of frame sizes, it features computer recall and display of audio sources, eight mix-minuses and a master IFB panel. Talkback is provided to submasters, aux mixes and mix-minuses for convenient confirmation of paths.

Yamaha was showing several new mixers in its booth, the 01V Digital Console (see "Pick Hits of NAB '98," p. 90), the GA32/12 analog mixing console and the 03D ESAM upgrade. Also at Yamaha was the first product in its DSP Factory, the DS2416 digital mixing card, which can be used to transform a PC into a multitrack recorder and mixer.

Alias/Wavefront was showing Waveframe, along with its new 408+ system. Version 6.20 software is now available, with features such as fast waveform display, file transfer capabilities and a multichannel digital I/O card.

For more information, circle (327) on Free Info Card

Side gear

New from Harrison by GLW is the SMS surround monitoring system. Developed as a self-contained system, SMS may be used with any mixer having eight or more busses. Monitoring and mixing in every surround format is supported, including 5.1 and 7.1. A remote touchscreen user interface may be configured for music/post style or film style switching and matrixing. A 256x256 switcher allows for any range of source selection, plus pre- and post-encoded monitoring.

Presentation environments are prone to feedback problems. Shure Brothers has improved the DFR11EQ with new version four software. Earlier systems may be upgraded. The system seeks, identifies and notches out key feedback

frequencies using precise 1/10 octave digital filters. The new software adds parametric control over frequency, depth and bandwidth. Performance is as a 30-band graphic EQ or 10-band parametric EQ. PC interface and Windows software provide a clear screen display of all characteristics.

360 Systems has upgraded the popular Instant Replay hard disk recorder/player with version 2.0 software. Instant access to 1,000 separate cuts through the find function or 10 banks of 50 hot-keys is now augmented by new storage options. A SCSI expansion port allows use of Zip disks for transporting and archiving materials (see "Pick Hits of NAB '98," p. 90). Edited clips created on 360's Short/cut can be now be saved on a Zip disk and transferred to Instant Replay. The Instant Replay-Short/cut combination is ideal for applications that use audio selections that must be frequently updated and/or cued rapidly. 360's D-NET file transfer system delivers high-speed transfer to other Instant Replay 2.0 units or to 360's DigiCart/II Plus machines.

Also on the subject of removable audio storage, the Digital Audio Disk Recorder (see "Pick Hits of NAB '98," p. 90) from Advanced Digital Systems Group (ADSG) provides uncompressed 16-, 20- or 24-bit recordings on up to 16 channels. Recordings are stored on Jaz disks for easy transport.

For more information, circle (328) on Free Info Card

Intercoms

Telex introduced the RTS Zeus DSP intercom system for smaller installations. Delivering 24 channels in 2RU, the Zeus borrows from the larger ADAM system to deliver CD-quality communications at a reasonable price. A Windows-based software package provides versatile configuration capabilities. User interface is by way of existing key panels and other devices.

Clear-Com unveiled the MicroMatrix Plus 3 system with important new features. Modular in design, the 2RU frame can hold 8, 16 or 24 full duplex channels. The new ICS-2003 12-key programmable master station features an adjustable high-contrast electroluminescent display and individually adjustable listen levels. The new TEL-14 two-channel auto-nulling telephone interface uses DSP to obtain over 40dB of trans-hybrid loss. It provides versatile automatic or manual management of all important functions. Eleven modules fit into the 3RU frame.

Intraplex demonstrated a unique application for its IntraLink ISDN multiplexer. In combination with Telex, ISDN digital circuits were used for remote intercom trunking. In addition to multiple I/C paths, the setup provided data for control and ID of "virtual" broadcast centers. Connection to a Telex RTS ADAM provided one-touch remote intercom control and support for remote broadcasts.

For more information, circle (329) on Free Info Card

Microphones

The USR-100 UHF diversity wireless system by Telex offers 100-channel microprocessor controlled versatility. Precise factory tuning avoids interference problems encountered by other wide band approaches. Found to be least used nationwide, TV Channels 47, 48, 58 and 59 deliver at least 10 simultaneous frequencies for field production. Hand-held and body-pack models come with high quality Telex microphone elements.

Vega revealed the EMP series microprocessor controlled, UHF wireless system. Building on Vega's vast RF experience, the series features easy programming of each system's 16 selectable channels. To save power and avoid digital noise, the processor goes into a sleep mode when not needed. The receiver provides output convenience, including phase, ground lift and mic/line level. Full 50mW output gives the transmitters maximum range.

First to offer a mic with digital output, beyerdynamic adds four new models to the line. MCD 101 is an omnidirectional condenser "vocal" mic with AES/EBU output suitable for cable runs up to 300m. The MCD 800 system provides three capsules offering omni, cardioid and supercardioid patterns. With sensitivities adjusted for speech, these are ideal for presentations and field reporting. The analog output MCE 58 omni condenser is an excellent interview tool. Larger grip size and good balance make handling and movement effortless and natural.

Sennheiser had its new Evolution microphone series on hand. Introduced at NAB, was the EM3532 computer-controlled two-channel UHF true diversity receiver. The unit features 32 programmable frequencies and circuitry incorporating PLL synthesis and HiDyn, plus noise reduction. Also on display were the new HD570 stereo headphones.

For more information, circle (330) on Free Info Card

Accessories

Even when every microphone has a digital output, you will still be using cables. Nemal Electronics International announced a new 54 -pair multicable containing 24 AWG pairs at just over one inch diameter. Also new are an extremely flexible single-pair mic cable and a re-engineered 37-pin (12-pair) connector with improved ruggedness and mating characteristics to reduce rotated inserts.

Canare introduced new cable for AES/EBU applications. Available with braid or foil shielding, this 110Ω wire comes in cables of up to eight pair. For long-run digital systems, new in-line transformers convert from XLR 110Ω to BNC 75Ω for runs up to 2,000m. A truly unique five-in-one cable stripper is also new. It can be set up to handle five different cable or connector types including, BNC, RCA and F connectors. Stripping is fast, accurate and complete in a matter of seconds.

Gepco added several audio cables to its product line. GEP-FLEX, a multi-pair audio cable was re-introduced, this time with color-coded pair jackets for easy installation. Gepco's 5522M is a new microphone cable designed for high-performance analog applications. It is also among the most flexible and rugged digital audio cables available. For those needing smaller and lighter digital audio cable, the 5526EZ is a 26-gauge single-pair cable for 110Ω applications.

Neutrik, long known for innovative audio connectors, introduced its newest XLRs, the EaZyCon. All essential

parts of the female connector are enclosed by a soft-coated surface. Contacts are gold-plated and available in a solder version with contacts pre-tinned and pre-fluxed. Also at Neutrik were NADITBNC adapters for adapting digital audio for use over coax, allowing longer cable runs.

In the ADC booth, they were showing the new Mark IV series of patchbays. Improved features such as slide-out cable bars, standardized designation strips and the QCP IV punch down system make installation even easier. Other features (and benefits) include the 1X8 QCP blocks that replace individual insulators, making panels are more durable and blocks that are insulated on both sides of the panel, to eliminate shorts. Color-coded insulators make panels easy to wire, resulting in fewer mistakes.

A unique and interesting product from Prime Image was the A/V Twister. Using digital technology, the Twister sends video and stereo audio up to 3,000 feet through conventional twisted pair wires. The audio-only model goes beyond 5,000 feet. Up to 15 receivers can be fed from one transmitter. Numerous temporary installations can benefit from the Twister's avoidance of co-ax for video and shielded pairs for audio.

Sometimes audio work in the field encounters the need for a battery-powered equivalent of a favorite AC-powered gadget. Henry Engineering now offers Portamatch. Operating for about 20 hours on two 9V batteries, Portamatch interfaces -10dBv consumer I/Os with +4dBm 600Ω balanced lines. A special HI GAIN mode is provided to accept the lower level outputs from computer sound cards.

As the use of PCs continues to grow in video production, ESE answers an important need. The new PC-471 card synchronizes the computer's clock with SMPTE or ESE time code. Convenient Windows and DOS software are provided. Also new is the ES-101 GPS master clock and time-code generator. Time and date information from Global Positioning Satellites is used to generate precise code in any of seven formats.

For more information, circle (331) on Free Info Card

By Kenneth Hunold

Kenneth Hunold is an audio/video project engineer for the ABC Engineering Laboratory, New York.

For test and measurement, the buzz word at NAB '98 was "analyze." Hardly anyone monitors signals anymore, they analyze them. And with good reason. With digital transmission there is so much information packed into the signal that you just can't look at the interface signal and derive much useful information. Keeping that in mind, let's look some of the test and measurement (and analysis) equipment offered at NAB '98.

Audio Precision introduced the "dual domain" version of its Portable One Audio Analyzer. The dual domain feature means that the unit includes a complete, separate generator and analyzer for analog and digital signals. The unit is capable of analyzing analog, digital, and digital interface signals in their "native domains." In addition, the original Portable One has been upgraded to include 30-test setup memories, expanded printer support, amplitude sweeps, and an internal clock/calendar. Audio Precision also continued to show its System One and System Two families of computer-assisted audio test & measurement equipment.

Belar, a longtime player in the Aural

modulation monitor market was showing its new Wizard TV aural modulation monitor, which features an RS-232 port. In addition, Belar had its DSP-based FM/TV composite spectrum analyzer.

For analyzing VITS, Broadcast Video Systems has the VITS 2 video/audio analyzers. It allows you to do quality control of remote transmitters, satellite links and telco video network using a PC and modem. From the PC, users can access and analyze any line—either field—in the VBI or active video and check video specs and audio levels. Each unit can handle four audio and video inputs, and alarms on each can be used to check signal validity or alert operators.

James Grunder and Associates showed the Hamlet series of analyzers for serial digital signals. The Digiscope 601 is a 10-bit serial and analog component analyzer that displays digital data information (EDH, CRCC, gamut errors, etc.) as well as traditional waveform/vector and audio PPM or VU displays. Hamlet's entire line of traditional analog "waveform rasterizers" was also shown.

Horita showed its TSG-50 and 50B NTSC test generators, as well as BSG-50 black, sync, and tone generators. Horita also has a complete line of time-code generators and accessories, including GPS time and position data.

Leader Instrument Corporation showed its new HDTV generators and waveform monitors. The LT440D Test Generator provides HD serial outputs conforming to SMPTE 292M. The 440D provides standard and pathological signals as well as embedded audio. Leader also showed the LV5150 Waveform Monitor (see "Pick Hits of NAB '98," p. 90) capable of monitoring digital and analog HDTV signals. The unit provides CRCC checksum monitoring for serial digital signals as well as vector, picture, and X-Y audio displays.

Leitch showed its STN1 serial timing analyzer for serial digital systems. The STN allows digital system timing to be set, analyzed, and maintained. Leitch also showed a new line of HDTV "digital glue" devices, including an HDTV test generator and logo generator. Standard line-based and frame-based static test signals scaled for HDTV scan rates (both 720- and 1,080-line) will be available.

Magni Systems introduced enhancements to its AVM-510 series of automated signal monitors for base-band video and transmitter testing. The AVM-510N and AVM-510T provide a PC interface that allows remote or local control, data storage, and waveform printout. Magni also featured the WFM-720, designed for multisite/multichannel monitoring via computer control.

Microvideo Ltd. introduced its Digital Proc Amp. The unit provides typical composite proc-amp controls for a component digital (ITU-R 601) signals. Selective blanking of individual VBI lines is also provided

Modulation Sciences showed its MSI 320 Precision Demodulator for transmitter measurements. It is intended for measurement quality demodulation of television signals. Features include synchronous video detection, selectable line zero-carrier reference pulse, Nyquist SAW filter, flat RF passband and all-channel operation. Designed for use either off-air or at the transmitter, the unit features quadrature outputs for ICPM measurements and wideband composite outputs for external audio demodulators.

NewTek showed a new digital version of its Calibar portable generator. The Calibar is a cigar-sized video generator that can be slipped into your pocket (or toolbox) for quick video testing. The analog version of the Calibar is still available.

Philips TV Test Equipment, now known as PTV, ProTeleVision Technologies showed its line of digital TV test equipment, including the PT5230 digital video generator, PT 5210 digital sync generator, PM5664D digital SDI monitor, and PT5474 digital video analyzer. Also on hand was the PM5639 series of CRT analyzers.

Prism Sound showed its products for testing and measuring the digital audio signal. The DSCOPE test set is a computer-assisted test set for testing signals in the digital domain. The JM-1 Jitter Modulator provides a method for testing the jitter susceptibility of digital audio equipment. The DSA-1 portable analyzer is a hand-held digital audio tester that can be used to make detailed observations of digital signals, or provide quick go/no go testing. The unit also includes a built-in speaker for confidence monitoring and channel identification.

Rohde and Schwarz showed new MPEG transport stream tools. The DVG MPEG-2 measurement generator and DVDM MPEG-2 measurement decoder provide source and measurement capabilities for MPEG and DVB transport streams.

Sencore showed its SV951 MPEG stream player, which provides a reliable, repeatable MPEG signal source for testing ATSC systems. Many output interfaces are available, including G703, OS3, and SMPTE 310M, among others. The unit can be upgraded to a full SV953 (see "Pick Hits of NAB '98," p. 90) transport stream analyzer for comprehensive testing and analysis. Sencore also showed Adherent's AT970 (see "Pick Hits of NAB '98," p. 90) real-time ATSC stream monitor, capable of monitoring up to four ATSC transport streams. Also shown was the Sencore complete line of standard definition SDI test equipment, including the S310 and DSA309 digital video analyzer.

Hewlett-Packard announced several enhancements to its MPEGscope digital video test system. MPEGscope users can now define, compile and then display decodes of their own private tables and descriptors, such as electronic program guides, in plain English, rather than hexadecimal code. The latest version of MPEGscope Plus includes a transport stream composer, allowing users to create multiprogram transport streams. Finally, the MPEGscope Plus video elementary stream compression analyzer now supports testing of HDTV streams as defined by the ATSC.

Another company that makes MPEG-2 test and measurement equipment is Digital Transport Systems. This company offers real-time solutions that include its transport stream analyzer, as well as its transport stream generator. These units can be used in a variety of MPEG-2 DVB/ATSC applications. A portable unit makes it easy to test systems, regardless of where they are located.

Snell and Wilcox showed several pieces of DTV test and production equipment. For MPEG testing, they showed the MSA100 transport stream analyzer, MSP100 MPEG bitstream player, and MVA100 video analyzer. For standard definition testing, Snell & Wilcox showed its TPG 20 and 21 generators and KUDOS D! generators and monitors.

SyntheSys Research introduced its BitAlyzer HDTV, model HDVA292. The HDVA292 is a format analyzer for 1.5 Gb/s HD serial interfaces conforming to SMPTE 292M. The unit produces real-time statistics for format errors and includes logic analyzer features for capturing data and analyzing it offline. The HDVA currently supports the 1,080/1,035i HDTV standards and will support 720p in the future. SyntheSys continued to show its DVA184C Video BitAlyzer for 270/360 Mb/s serial interfaces. The DVA 184C now includes support for embedded packet analysis, including EDH embedded audio analysis.

Tektronix showed many HDTV and DTV test and measurement products. For MPEG systems, the company showed its MTS 100/200 MPEG test system. New software will perform syntactical and semantic analysis on video streams. On audio streams, the software will enable testing of audio formats including MPEG layer I and II and multichannel audio. Also shown was the PQA-200 picture quality analyzer (see "Pick Hits of NAB '98," p. 90) for evaluating the quality of compressed video systems. 8-VSB modulation measurements were also demonstrated.

Videotek expanded the VTM-200 signal monitoring system, adding analog-only and CAV (component analog video) modules. The VTM-200 is a monitoring device for displaying the combined output of many monitoring products on a single SVGA screen. Typically a single SVGA screen can show a picture, waveform, and vectorscope display along with audio bar graphs. Also introduced was a new four-channel audio option for VTR and embedded audio. Videotek also showed rack-mount VGA monitors for broadcast use.

YEM showed a series of A/D and D/A converters with RGB or YPbPr analog I/O. These units will add flexibility to HDTV testing and measurement.

For more information, circle (332) on Free Info Card

By Don Markley

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

As was to be expected, the hottest items in the RF field this year were related to DTV. This included transmitters, STL links, transmission line systems and antennas. Also anticipated was the announcement by some manufacturers that the dreaded n+1 combination problem was solved.

Probably the biggest new item was the Harris DiamondCD solid-state transmitter for DTV. The transmitter is available in powers ranging from 1.25kW average power (5kW peak) up to 25kW average (100kW peak.) As with other solid-state transmitters of all ilk, the amplifier and power-supply modules are hot changeable and the complete system is monitored by a master controller. The Harris booth drew large crowds with its DTV van, which was on the convention floor. Hinted at last year and shown this year was a dual-channel NTSC/ATSC STL, which has was developed by Leitch and will be sold under the Harris name MultiLinkCD. Harris' new Flexicoder (see "Pick Hits of NAB '98," p. 90) is a modular system that provides a migration path to HDTV. It can be used to compress and multiplex video, audio and data signals into an ATSC compliant bitstream.

A bit of a surprise came from an old name in transmitters. Continental Electronics Corporation was showing a totally new TV transmitter. Developed with the cooperation of

Telefunken, the new transmitter is solid-state through 5kW average power. For power levels above that value, IOTs are added with the solid-state system being used as a driver. One big feature is that the exciter is totally digital for either NTSC or DTV use. The change between systems is accomplished by simply instructing the built-in computer to reconfigure the exciter operation. That means that the transmitter can be used for NTSC until needed for DTV. Then, change the input to the exciter and tell the system to make the change. Continental states that higher power solid-state units will definitely be shown next year.

ADC, through ITS Corporation, was showing a solid-state DTV transmitter for average power levels through 5kW. They also had IOT transmitters through 280kW peak or 100kW average for DTV. New was a 10kW common-mode transmitter using the Diacrode in the final amplifier. ITS also announced an adjacent-channel combiner for n+1. The company states that versions will be available for both VHF and UHF use.

Advanced Broadcast Systems (ABS) showed its line of IOT transmitters ranging up to 300kW peak power output. The transmitters offer individual correction on each common mode IOT to optimize the overall system performance. The biggest feature (no pun intended) is its size. ABS subscribes to the theory that maintenance is much easier when components are easily accessible. As a result, they have allowed a lot of space in the cabinets to allow everything to be easily reached.

Acrodyne was emphasizing its dual-channel transmitter wherein both the NTSC and the DTV signals use a common final amplifier tube. In this case, the device is a Diacrode. One transmitter will operate with 25kW NTSC and 2.5kW DTV at the same time. This operation was further discussed by Thomson, manufacturer of the Diacrode. They had measurement data showing the results of operating the Diacrode on adjacent DTV and NTSC channels with good results, fully meeting the DTV emission mask.

Thomson was also showing a new IOT, the TH770 which operates at 60kW common-mode output for NTSC or at 25kW average power in DTV service. Measurement data for the TH 770 in both types of service was on hand which indicated excellent performance at those power levels.

Not to be outdone, EEV was showing the new IOTD3100W for DTV use at 25kW average or 100kW peak power. For analog use, the sister tube IOT9505 will operate in the combined mode for 50kW visual and 5kW aural. They were also showing a new Stellar uplink amplifier. The most interesting system was a 150-watt unit weighing only 26 pounds.

Burle is also in the game of broadcast tubes. They offered a complete line of tubes and cavities for VHF, UHF and FM broadcast applications.

From CPI's Eimac division comes a new series of IOT devices designed for the digital TV market. These new liquid- and air-cooled units provide an average power of 10kW to 27kW. Peak-power handling is in the range of 40kW to more than 110kW. CPI also announced the K3 IOT, a compact air-cooled device that handles 12kW average and 60kW peak power

Another supplier of broadcast tubes was Litton Electron Devices. Litton offers a complete line of IOTs, klystrons and constant efficiency amplifiers (CEAs). Rebuilding and repair services for IOTs and internal and external klystrons is also offered by Litton.

Comark, a Thomcast company, showed its Advantage line of transmitters for DTV. These transmitters, in a wide range of powers, are flexible units that work with several different tube types from multiple vendors — air or water cooled. Perhaps its biggest feature is the digital adaptive pre-correction (DAP) system coupled with wideband IPA stages. The effect of the system, including some great graphics in the interface unit, is to allow the user to pick a wide range of hardware to tailor the final system to the exact needs of each individual DTV station.

The big news at LDL Communications is that it isn't. All outstanding shares of LDL Communications have been purchased by Larcan. In addition, LeBlanc has formed a new LeBlanc Broadcast Inc. to serve the U.S. market with a new president, George Patton. That group now becomes the marketing company for Larcan transmitters, LeBlanc towers and antenna systems. The antenna systems are by RFS and RFS Australia. In the RFS booth, one of its panel antennas was shown along with slot systems for both DTV and NTSC use.

At Itelco, they were showing new DTV transmitters, a liquid-cooled solid-state unit, as well as an IOT unit that uses an innovative high-voltage switch mode power supply. Itelco also had a high-performance DTV exciter with an integrated 8-VSB modulator.

At the EMCEE booth, they were showing the TTU2500HD transmitter. It offers 2.5kW (average) output power on any UHF channel. For DTV operation, it will use the Harris ATSC 8-VSB exciter. Several other transmitters were

shown including the TTU1000F, a frequency-agile unit that can be used for backup and the TTS20DS a digital wireless cable transmitter.

NDS showed products to help usher broadcasters into the digital era. Among them, MPEG encoders for 4:2:0 and 4:2:2 transmission, as well as 8VSB modulation. NDS also demonstrated seamless MPEG splicing.

For those simply wanting to monitor their digital broadcast signals, the ARX-100 from Samsung (see "Pick Hits of NAB '98," p. 90) can provide that capability. The ARX-100 ATSC broadcast receiver's 8-VSB front-end processes ATSC signals and provides operators with parameters such as signal strength, packet error rate and EPG information.

Micro Communications showed its n-1 combining filter with test data demonstrating that it fully meets the new DTV mask. A new product was introduced which is a dual-channel common line coupler. This will allow VHF and UHF signals to be combined into a single transmission line and then split at the top of the tower to feed separate antennas. This may eliminate the need for adding an additional line to the tower, which can be helpful in situations where the tower loading is critical.

A similar device was shown at the Shively booth and Shively also introduced a new series of antennas for DTV use, including a panel with bat-wing like radiators for improved bandwidth. In addition to the panel antennas, Shively was showing slot-antenna systems for both DTV and NTSC stations. Some of the new products are the result of an exchange agreement with Radiacion Y Microondas, S.A. (RYMSA) of Madrid, Spain. RYMSA is one of Europe's leading manufacturers of FM and TV antennas and related RF equipment.

Dielectric introduced a new coaxial cable in the 7 3/16-inch 75Ω size. This line will be available Dielectric's digiT-Line and a new series of cable known as EHTLine. The new EHTLine increases the average power rating by up to 45% over previous coaxial line allowing the use of smaller lines on the tower. This reduces wind load as new antennas are added for DTV. Other new products included a new adjacent-channel combiner for n-1 applications.

Dielectric also showed a new panel antenna for any combination of DTV and NTSC systems. These antennas can be configured for power inputs up to 120kW average. Its new series of motorized coaxial switches have been redesigned to improve reliability and to increase the peak-power rating.

As was to be expected, the hottest items in the RF field this year were related to DTV

Andrew was showing its new panel antenna for NTSC and DTV use. As with other manufacturers, the panel antenna is ideal for multiplexing several stations into a common system. By varying the number of panels, the orientation and phasing, almost any pattern can be generated in both the horizontal and vertical planes.

Andrew also showed a new coaxial line in the 7 3/16-inch size with standard flanges. Also new was an 8 3/16-inch line, available in the HR series or the Maxline. The additional sizes and types serve to meet the DTV needs while minimizing the windloads on the tower.

The 7 3/16-inch standard line is also available from Myat along with combiners and the company's standard line of rigid line components.

Among the many antennas in the Jampro booth were the JUHD series of broadband UHF panel antennas. Jampro also showed stacked NTSC/DTV antennas for dual operation and the high-power JTW series was on display.

Antenna Concepts was showed its antenna lines, including the Blaster, Spanner and Champion series, as well as the Ultra Tracker series for FM broadcasters. Antenna Concepts offers a variety of antenna styles, including batwing and panel systems for a wide range of power levels. In addition to antennas, a wide range of antenna accessories was also offered.

At Central Tower, some self-supporting and guyed tower designs were displayed. In addition to designing new structures, Central Towers also offers tower analysis services and inspections for those looking to add to present towers.

For those whose towers are not co-located, some method of transmitter control is required. Gentner was showing its GSC-3000 remote controls. New macro capabilities improve the GSC-3000's capabilities, and the Voice Interface allows the unit to talk, simplifying the human interface.

From Electronic Associates comes two PC-based site control systems, the RF-Manager and the RF-Director. RF-Manager system range from 32 to 256 channels in 32-channel increments. For smaller stations, the 16-channel RF-Director may be more appropriate. The RF-Manager Studio is a dual-site controller, while the RF-Host Multi-Site system can handle up to eight sites. There is even a palm-top Windows CE computer "Pocket Monitor." ■

For more information, circle (333) on Free Info Card

Applied Technology

Key issues in 8-VSB transport for broadcast applications

BY ROBERT W. HARRIS

In 1996, the FCC adopted the digital TV standard based on the recommendations from the ATSC. The standard will be used for the transmission of HDTV and SDTV. The ATSC also defined the over-the-air transmission format to be digital 8-VSB (vestigial sideband) modulation. The DTV services may include a combination of both HDTV and SDTV. Broadcasters are exploring the possibility of providing data services, such as web browsing, to their viewers also using the 8-VSB modulation format.

With the FCC-mandated deadlines fast approaching for over-the-air delivery of DTV services, broadcasters are scrambling to address a number of issues that involve the transport of the 8-VSB modulated services from the studio to the transmission tower. Should the new DTV services be transported in 8-VSB format from the studio to the tower? If so, in what form should the signal be transported/modulated at intermediate frequency (IF) or modulated on the transmission carrier. Perhaps the service should be delivered as a raw bitstream (19Mb/s to 38Mb/s) to the tower over some digital circuit, such as a DS-3. In this case, an 8-VSB modulation unit would be required at the transmission tower site. What impact would this have on maintenance, access and monitoring? Will two separate platforms be required for simulcasting NTSC and HDTV services?

There are key issues broadcast engineers encounter when deciding on transport options for studio-to-transmitter links carrying the current NTSC channel and the impending DTV services. One possible solution is a high-speed multichannel digital fiber-optic transport system. This solution provides a transparent delivery mechanism supporting up to 16 separate services on a single, common digital transmission platform over a single fiber wavelength.

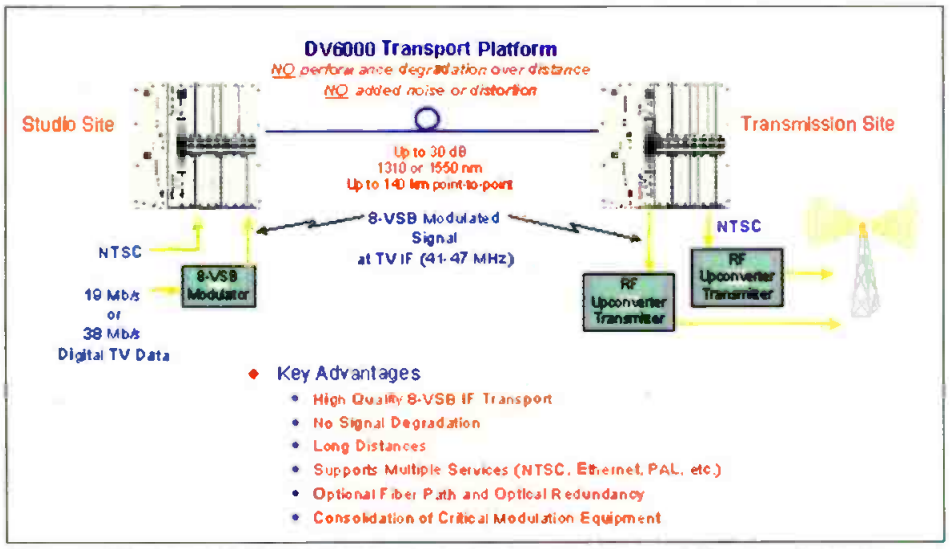

Figure 1. High-speed digital transport platform for delivering 8-VSB modulated IF and NTSC video.

A digital transmission platform

Figure 1 shows a typical system configuration for a high-speed digital fiber-optic transport platform when used for transporting a single 8-VSB IF modulated signal and an NTSC video channel. Since most stations will be simulcasting analog and digital for some time, both signals will need to get to the tower. This type of a platform allows the 8-VSB modulated DTV service to be transported at TV IF, in the range of 41MHz to 47MHz. This technique provides an economical, reliable and scalable common transport platform solution that supports multiple 8-VSB IF channels, as well as the other related services. The NTSC service is digitally encoded at 10-bit resolution delivering EIA-250C short-haul performance regardless of the distance or the number of channels carried on the transmission platform.

Each shelf may process up to 16 different channels. Each of the channels is digitally encoded to a line rate of approximately 150Mb/s. All 16 channels are then time division multiplexed to an aggregate data transmission rate of 2.4Gb/s. Using fiber-optic transmission, point-to-point distances in excess of 100km (30dB of fiber loss) are easily achievable.

Multiple- and single-service support

A digital transport system capable of carrying analog NTSC video, HDTV and SDTV video in 8-VSB modulated IF, and data communications can be valuable to the broadcaster. This type of digital transport platform supports nearly every major video standard, including 8-VSB, 16-VSB, 64/256 QAM, CCIR-601, NTSC, PAL and SECAM, as well as various data formats including 100Mb/s Fast Ethernet, DS-3 and DS-1.

Figure 2 shows how this network can be expanded to deliver multiple channels to multiple sites using advanced digital processing, redundant ring net-

working and digital switching techniques. The network uses drop/add/pass multiplexing, demultiplexing and digital switching to allow the flexible insertion, termination and/or pass-through of video and data services at any or all of the sites. Bidirectional data communications on this platform is helpful, and necessary, for remote transmitter control and monitoring and viewing equipment status and alarm messages.

The digital network supports not only the 8-VSB service but also a variety of other service formats (see Figure 2). This allows the broadcaster to send and receive direct feeds from post-production houses, CATV headends, local sporting events and advertisement insertion agencies.

Additionally, a single digital-channel fiber-optic transport solution is possible. This allows a remotely generated service to be transported on its own point-to-point link or to serve as a direct fiber tributary in and out of the multichannel digital platform. Likewise, a single-channel fiber tributary may be taken directly from the multichannel shelf and delivered to some remote site. Further, a single-channel 8-VSB IF transport solution could also be used for the studio-to-transmitter link for cost-sensitive applications.

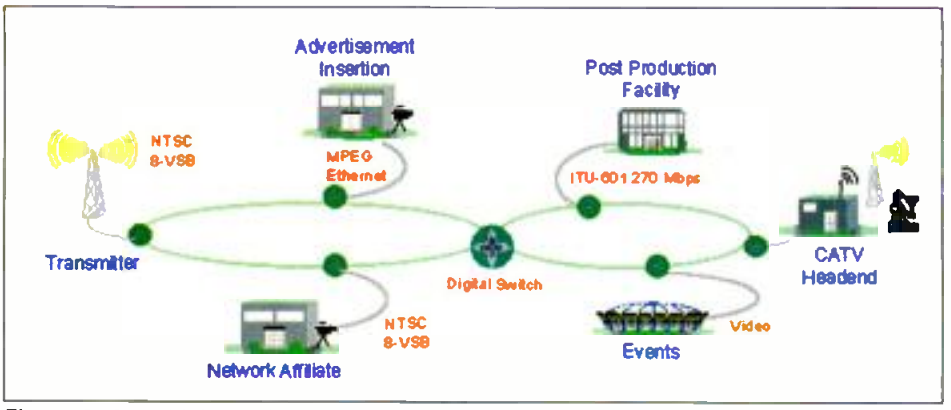

Figure 2. A multichannel, multiservice digital transport network with digital switching and service insertion, termination and/or pass-through.

Transparent digital transport

Local TV stations need to maximize their coverage area when broadcasting an 8-VSB service over the air. The transmitter used for broadcasting an 8-VSB modulated service will produce some unwanted distortions. Current designs allow for transmission to the outside boundaries of the viewing area for reception at the customer's set-top box receiver with some error margin to spare. To accomplish this, the 8-VSB IF signal present at the transmitter input must be free from unwanted distortions. Otherwise, the signal performance and maximum coverage area may be reduced.

When transporting an 8-VSB IF signal on a digital transmission platform, one of the most important issues is providing a transparent digital transport without distortions over any distance. Key to this solution is its minimum performance impact on the 8-VSB IF signal. A digital transport system will accept the entire 8-VSB modulated IF envelope and perform standard A/D conversion and multiplexing in preparation for transmission over the fiber-optic network. This process requires input filtering, digital sampling and clock synchronization, among other things. Design deficiencies in any of these steps could cause unwanted distortions in the 8-VSB service, due to filter nonlinearities, clock jitter and phase noise. Fortunately, these anomalies are well-understood by the experienced digital design engineer. A properly designed digital processing and transport system will eliminate or greatly reduce these distortions. The resulting output of the digital transport system is an untainted 8-VSB IF signal that will not compromise the integrity of the end-of-line performance at the furthest reaches of the viewing area.

Centralization of key equipment

Ideally, local stations would like all key equipment located within the studio. This would allow performance monitoring, maintenance and security to be accomplished with minimal cost and high efficiency. However, transmission towers are usually unmanned, not close to the studio and sometimes difficult to get to in poor weather.

Because the digital transport system described here delivers the 8-VSB IF envelope without unwanted noise and distortions, the relatively expensive 8-VSB modulator can remain within the station. All that's required at the transmission tower is the lower-cost IF to RF upconversion section of the 8-VSB modulator. This eliminates a substantial burden on the broadcast engineer because the critical component, the 8-VSB modulator, is located at the studio. Adjustments, repairs or unit replacement can be made without leaving the studio.

Redundancy and failure prevention

Another key issue for studio-to-transmitter links is redundancy and failure prevention. Like the NTSC broadcast service, the 8-VSB feed will be an important revenue stream for local stations. A fully redundant digital transport system providing both opto-electronic and fiber-path redundancy is not only appropriate but necessary.

Like the current NTSC video, the forthcoming DTV services will need to be transported from the studio to the transmission tower. A high-speed multichannel, multiservice digital transport platform provides an ideal solution for transporting the NTSC and the DTV services. It allows the 8-VSB modulated service to be transported at TV IF with minimal signal degradation so that over-the-air transmission distances are not compromised. This technique also eliminates the need for locating the 8-VSB modulator at the tower site, making maintenance easier. Finally, the digital platform offers a scaleable solution for adding new services using multiple formats for multi- and single-channel delivery. ■

Robert W. Harris is marketing program manager for digital transmission at ADC Broadband Communications, Meriden, CT.

HDTV conversion equipment

BY KENNETH HUNOLD

Will your station be starting from scratch — creating a brand-new facility dedicated solely to digital high-definition broadcasting — complete with HDTV cameras, recorders, production and editing equipment, and feeding those programs to that new transmitter and tower located right next door? Great! You won't need any of the DTV conversion equipment listed in the accompanying table (see p. 190).

For the rest of us, simultaneous DTV and NTSC production 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 introduction, and perhaps at the expense of simplicity or consistency, 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, 1,035 or 1,080) with a notation for scanning mode where appropriate (480p, 1,080i, etc.).

Broadcasters and program producers will need to convert their signals between or 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 support.

All SDTV 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. Anytime you are trying to make more out of less, the challenge is to make the resulting high line rate signal look like it has more information than it had with fewer lines. The 525 to 480i conversions are a relatively straightforward case of analog-to-digital conversion, often including composite (NTSC) to component decoding, if the conversion has not already been performed elsewhere in the system.

As HDTV production becomes more prevalent, it will be necessary to have SDTV versions of HDTV programs. This has already been experienced in such varied program sources as the Over America series of programs, the Woodstock '94 concert broadcast and pay-per-view programs, and the recent 1998 Olympic Winter Games in Nagano, Japan. It is also being experienced in the motion-picture community, where HDTV transfers of films are being converted to 525- and 625-line formats for video release. It is theoretically possible to create a better 525-line version of an image from a 1,080-line camera than you could have gotten with a "native" 525-line camera. This is due, in part, from "oversampling" the image and creating the image "in post." Down-conversion may also become popular in broadcast operations to allow 525-line monitors to be used as confidence monitors for HDTV feeds. Indeed, most new HDTV production equipment offers the option of simultaneous HDTV and SDTV outputs.

As different flavors of HDTV develop, program material will need to be exchanged between formats. Archival footage originally acquired in 1,080 may need to be converted to 720p for inclusion in productions operating in that standard and vice versa. The politically correct term for these devices could be "cross converter" or "format converter" or just "converter," but their function will be just as necessary as 525-625 standards converters have been for SDTV program exchange.

The introduction of DTV, and more specifically HDTV, has created the need to bring our legacy TV system into the digital age. A change of this magnitude will take years, ensuring the necessity of SDTV and HDTV conversion equipment for years to come. ■

Kenneth Hunold is an audio/video project engineer for the ABC Engineering Laboratory, New York.

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Windows to the Web

www.stortek.com

StorageTek: StorageTek's MediaVault is a complete storage management system for broadcasters migrating to digital systems. It combines ultra-fast automated tape libraries, ultra-high capacity SD-3 helical-scan cartridge drives and applications-enabling software.

www.pinnaclesys.com

Pinnacle Systems: Pinnacle Systems' broadcast products give professionals the cutting edge tools needed to create dazzling productions faster and more affordably than ever before. These innovative digital video manipulation tools perform a variety of on-air, production, and post-production functions such as the addition of special effects, image management, capture, storage, and play-out, as well as graphics and title creation.

www.e-trim.com

eidria: e-trim is the logging and machine control package for the 3Com PalmPilot and PalmIII series of handheld devices. e-trim provides complete connectivity to most cameras and decks, including RS-422 and LANC (Control-L) devices, as well as LTC timecode feeds - all without any adapters or converters. Simply connect e-trim to your source, mark in and out times to create clips, then HotSync with any Macintosh or Windows computer and your log is ready for import into a variety of editing systems. Questions? www.e-trim.com

www.broadcastengineering.com

Broadcast Engineering: *Broadcast Engineering* is the only technology-driven online magazine in the industry. Its editorial environment delivers practical, informative articles on digital technology, systems integration, management, how-to installation, and systems and equipment maintenance. It is a package geared toward TV stations, cable/telcom, production, post-production, business TV, satellite and interactive television.

www.nova-sys.com

Nova Systems: A leading manufacturer of signal processing equipment for television broadcast, teleproduction, and industrial video applications. Nova's product line corrects, converts, and distributes video as well as audio signals.

Company	Product name/Model number	Input scan rates	Output scan rates	Input formats	Output formats	Colorimetry conversion	Input color standards	Output color standards	Genlock format	Audio delay compensation	Special features
Axon +31 13 511 0000 www.axon.nl RS# 350	10b Aspect Ratio Converter	525/625	525/625	Serial digital 270Mb	D7 serial digital 270Mb	NA	N/A	N/A	Not 1 frame delay	internal (1 frame)	
Communications Specialties (516) 273-0404 www.commspecial.com RS# 351	ScanDo Pro/D	Up to 1024x768, refresh rates up to 75Hz and 60kHz	Serial digital output, CCIR 601 component, composite, Y/C, YUV and RGB	VGA, SVGA and Mac	NTSC, PAL serial digital component, composite, Y/C, YUV and RGB formats	CCIR 601 component, SMPTE 259M	N/A	NTSC, PAL, Component	Genlock input/pass-through, BNC	N/A	
Evertz (905) 335-3700 www.evertz.com RS# 352	HDTV DA HD9501-DA	525/625/720/1080	525/625/720/1080	Serial digital SMPTE 292M	Serial digital SMPTE 292M						
RS# 353	HD9590 HD Graticule Generator	1080i/720p/525-/625	SMPTE 292M	Serial digital, SMPTE 292M, -277M, -296M	SMPTE 292M					N/A	
Faroudja Laboratories (408) 735-1492 www.faroudja.com RS# 354	DFT5000 Digital Format Translator	Analog and digital interlaced 15.75kHz	480p, 720p, 1080i	composite, Y/C, YUV/RGB, D1, D2	YUV/RGB/HD SDi	YCrCb or YPrPb	NTSC, component, RGB	RGB, YPrPb, YCrCb, HD, SDi	HD, SD, Bi- and Tri-level sync	3rd party, output audio delay information	Proprietary algorithm, motion prediction, film mode, diagonal filter, NT server, Time-code control
Leitch (757) 548-2300 www.leitch.com RS# 355	Juno HDTV Upconverter	525/59.94 & 60; 625/50	1080, 720, 480	Analog composite, SDI component	Analog component, HDSDI	CCIR Rec. 709	All world standards	CCIR Rec. 709	SD & HD	External/Internal options	Motion adaptive, film mode
Miranda (514) 333-1772 www.miranda.com RS# 356	The Stellar Series	525i/29.97, 525p/59.94	525p/59.94, 525p/60, 720p/59.94, 720p/60, 1080i/29.97, 1080i/30	Serial digital	Serial digital, YPbPr		Component	Component	SD or HD tri-level	External	Edge motion compensation
Panasonic Broadcast & Digital Systems (800) 528-8601 www.panasonic.com-/PBDS RS# 357	AJ-VFC1800 Universal Video Format Converter	All ATSC-DTV formats	All ATSC-DTV formats	Analog, parallel/serial digital, RGB, YPbPr	All ATSC-DTV formats	CCIR Rec. 601 or 709	NTSC, Component, SD/HD	NTSC, Component, SD/HD	HD, SD, SMPTE 259/294/292	8 channels	Spatial conversion (no artifacts)
Ross Video Ltd (613) 652-4886 www.rossvideo.com RS# 358	DAC-8013 D/A Component Converter	525/625	525/625	4:2:2 Serial digital component	Analog component		NTSC	Component	SD		
RS# 359	DAC-8015 4:2:2 to NTSC/PAL Enhanced Encoder	525/625	525/625	4:2:2 Serial digital component	NTSC		4:2:2 Serial digital component	NTSC	SD		3-line adaptive enhanced encoding
RS# 360	ADC-8033 RGB/YUV to 4:2:2 Serial Converter	525/625	525/625	Analog component	4:2:2 Serial digital component		Component		SD		2x Oversampled/10b
RS# 361	CDT-8031 NTSC/PAL to 4:2:2 Serial Digital Decoder	525/625	525/625	NTSC or PAL	4:2:2 Serial digital component		NTSC	Component 4:2:2	SD		3-line adaptive comb filter decoding with frame and field modes
Snell & Wilcox (408) 260-1000 U.S. www.snellwilcox.com Europe +44-181-607-9455 RS# 362	HD5050 Upconverter	50Hz, 59.94Hz	60Hz, 59.94Hz	Parallel/serial digital, Rec. 656	1125/60, 1125/59.94 (1035 active lines); 1125/60, 1125/59.94 (1080 active lines); 750/60, 750/59.94 (720 active lines)	Rec. 601 (SMPTE 274/240)	Digital component	N/A	HD Tri-synch, SD Bi-sync	No	Proprietary filtering algorithms, built-in aspect ratio control with smooth pan-scan and picture position
RS# 363	HD200 Downconverter	60Hz, 59.94Hz, 50Hz	59.94Hz, 50Hz	1125/60, 1125/59.94, 1250/50, 720p, 480p analog component HD serial digital	Rec. 601 digital, analog component, analog composite	Rec. 601	Analog component, HD serial digital component	NTSC, PAL, PAL-M, PAL-N	SD Bi-sync	No	Proprietary interpolation algorithms
RS# 364	HD4000 Frame Synchronizer	60Hz, 59.94Hz	60Hz, 59.94Hz	SDI SMPTE 292M	SDI SMPTE292M	None	NTSC	NTSC	HD Tri-sync	TBA	In-built test pattern generator, freeze function, four memory presets
RS# 365	HD50 Upconverter	59.94Hz, 50Hz	60Hz, 59.94Hz, 50Hz	Analog compoent YPbPr, GBRS, Y/C, Analog composite NTSC, PAL	1080/59.94, 1125/60, 720/59.94, 480/59.94, 1250/50	None	Composite NTSC, PAL Component YPbPr, GBRS, Y/C	Analog component	HD Tri-sync	TBA	Proprietary interpolation algorithms

Table 1. Simultaneous DTV and NTSC production will be a reality for the next decade. This table shows some of the DTV conversion equipment that will be needed during the transition to DTV. The production information was supplied by respective vendors in response to a questionnaire supplied by the *BE* staff editors. For more information, circle the appropriate RS# numbers (see column 1) on the Free Info Card on page 197.

Company	Product name/Model number	Input scan rates	Output scan rates	Input formats	Output formats	Colorimetry conversion	Input color standards	Output color standards	Genlock format	Audio delay compensation	Special features
RS# 366	HD6000 Crossconverter (field rate converter)	60Hz, 59.94Hz	60Hz, 59.94Hz	SDI SMPTE 292M	SDI SMPTE 292M	Not needed	NTSC	NTSC	HD Tri-sync	None	Proprietary interpolation algorithms with "Soft drop or add" capability for seamless conversion
RS# 367	HD5100 Upconverter	60Hz, 59.94Hz, 50Hz	1125/60, 1125/59.94, 1250-50, 525/60, 625/50	Rec. 601 parallel and serial digital,analog component, YPbPr, GBRS, Y/C, analog composite	1125/60, 1125/59.94, 1250-50, 525/60, 625/501.5Gb serial digital and analog component	None	NTSC, PAL, SECAM, PAL-M, PAL-N, NTSC4.43	N/A	HD Tri-sync, SD Bi-sync	No	Proprietary filtering algorithms, built-in aspect ration control with smooth pan-scan and picture position. Key channel option
RS# 368	HD3100 Cross-Downconverter	60Hz, 59.94Hz, 50Hz	50Hz from 1250/50 input, 59.94Hz from others	Analog component: 1125/60, 1125/59.94, 1050/59.54, 1250/50	Digital serial and parallel: Rec. 656; analog component: YPbPr, GBRS, Y/C; analog composite: NTSC, PAL, PAL-M, PAL-N, SECAM, NTSC4.43	None	Analog component	NTSC, PAL, SECAM, PAL-M, PAL-N, NTSC4.43	HD Tri-sync	No	Ph.C motion estimation option, cross conversion of field rate, built-in aspect ration control with smooth pan scan and picture position
RS# 369	HD2100 Downconverter	60Hz, 59.94Hz, 50Hz	50Hz from 1250/50 input; 59.94 from others	Analog component: 1125/60, 1125/59.94; 1050/59.54, 1250/50, 525/59.94, 625/50	Digital serial and parallel: Rec. 656; analog component: YPbPr, GBRS, Y/C; analog composite: NTSC, PAL, PAL-M, PAL-N, SECAM, NTSC4.43	None	Analog component	NTSC, PAL, SECAM, PAL-M, PAL-NNTSC4.43	HD Tri-sync	No	Built-in aspect ration control with smooth pan scan and picture position
Sony (408) 955-4114 www.sony.com RS# 370	HKPF-525 HDTV Downconverter	1080/1035 automatic detection	525	SMPTE 292M	SMPTE 259M, 270 Mb/s component	CCIR 601 or 4:4:4:4	Component (HD)	CCIR 601 or 4:4:4:4	HD	External	Aspect ratio selection, image enhancer adjustable
Team Systems (408-720-8877) www.team-systems com RS# 371	ASTRO SC-2024 Scan Converter	Anything from NTSC to 1080i (including 1280x1024)	Anything from NTSC to 1080i	Comp.v.d./SVH-S/RGB/YPbPr/Y-UV	RGB/YPbPr/YUV		NTSC/PAL/Component	Component	Bi- or tri-level/separate/S on G	N/A	Aspect-Ratio correction/700-M/up to four presets
Thomson Broadcast Systems RS# 372	HDE5100	NTSC	60Hz 59.94Hz	SDI, SMPTE	1080i, 720P 480P, and SDI	NA	NTSC				
VAS Group (818) 843-4831 www.vasgroup.com RS# 373	RTC HD3:2 Downconverter and Format converter	480/720/1080 progressive or interlaced 525/626/625-2-4f/s	525/625/625-2-4f/s	RGB, Serial digital, HD-SDI	Serial digital	CCIR-601	RGB, component digital	component digital	Bi- or tri-level, SD and HD lock	2-frame delay	3:2 pulldown, proprietary digital filters
YEM America (310) 544-9343 www.yem.com RS# 374	ADC/DAC-1125, 720P A/D, D/A Converter			Analog (RGB, YPbPr, 2 and 3 sync select) and Digital (parallel/serial)	1080i or 720P						

Management

Be the safe center in a skirmish

BY KARE ANDERSON

Recently, in a heated office meeting, I became aware that Clay, a new person in our organization, was gradually becoming the most powerful person in the meeting. He said little initially, however, he would turn and lean slightly toward whoever was speaking. Then he would occasionally nod or write down a note. Although Clay didn't offer an opinion, he did ask clarifying questions and sometimes would nod in agreement. He had what communications coach Arch Lustberg calls an "open face," with slightly raised eyebrows.

Look for positive intent

During the meeting, two people became exasperated with each other. Clay remained unruffled, and looking around to include the others who had been left on the sidelines of the main battle, he said, "Let's see what points we all agree on right now, and then discuss where we aren't in agreement. OK?" Thus, he managed to open the discussion back up to everyone at the meeting. At the same time, this allowed the most intense parties to back down from their verbal rock throwing without losing face.

"Let me see," Clay said slowly and casually, using the Columbo technique of easing into a process, "as Ruth suggested, it seems that we all want some kind of . . ." and he summarized a point that we all had agreed upon earlier. "Then it seems that some of us also want . . ." and he briefly summarized two other points. ". . . Is that right Brian?" he asked turning to the person who had first advocated the action. Because Clay built some positive momentum into the group, we deferred to him.

He continued in this fashion, writing down the actions after people elaborated on their version of the recommendation. When others felt strongly on a certain position, Clay would make a note of their comments. His writing kept the tempo of the meeting from becoming frenzied again. If someone started to bring up a point after it had been discussed, he'd look down at his paper and say something like, "Good, we seem to have that one down already. Thanks."

As Clay moved on, people interrupted each other less and waited until he was done writing before bringing up a new point. Finally he said, "It appears that we have some different approaches for the last points." As he looked directly at one of the two involved in the initial argument, Clay said, "What if we hear from people who haven't told us their views on it?"

He managed to open the discussion back up to everyone, while allowing the most intense parties to back down from their verbal rock throwing without losing face.

Artful weaving

After others had voiced their opinion, Clay then said, "May I tell you my view?" After we had nodded agreement, he began by characterizing his proposal as a partial synthesis of what others had said earlier: "Well, Jim, you and Maria both seemed to prefer a version of. . ." He went on to summarize their view as the groundwork for expressing his own. Clay concluded with, "Am I at all close on this?"

He continued to weave together areas of agreement keeping everyone involved. The more time we invested in the meeting, the more motivated we became to agree on a plan, so that we would not have to go through the process again.

By listening and clarifying, Clay also brought the speed and tempo of the meeting down. While it initially appeared that we were moving more slowly toward a solution, we actually were more efficient. As Daniel Schorr said recently when speaking about the loss of civility in our daily conversations, "Civility itself is strength today. The people who move us to polite discourse strengthen themselves and their positions by contrast with the unbecoming war around them." The most important time to speak more warmly and slowly and be more genial in word and action is when others are least polite. The contrast will be vivid.

Clay's technique of handling the agreement process showed that *how* you do something may become more important than *what* you say or do. Clay's power to bring out the best side in each of us, rather than the bitter or rancorous side, was the key to his power in the group. He emerged as "safe center" we could trust to fairly represent all of our interests. As a result, he became the leader, not by dominance, but by default.

The next time you find yourself caught in the beginnings of a group argument, try one of the techniques described above. The next battle may give you the opportunity to practice being a "safe center." ■

Kare Anderson is a speaker and author. Visit her web site at www.sayitbetter.com.

The GALLERY

Business

Lockheed Martin Space Mission Systems and Services of Houston purchased encoders and decoders from **Ross Video**. The RossGear is being used in an Image Processing Unit (IPU) that Lockheed Martin designed for the International Space Station Japanese Experiment Module (JEM). Lockhead chose the encoders and decoders based upon commercially proven designs. Ross built and delivered special VME-bus versions of its CDT-8031 NTSC/PAL to 4:2:2 serial decoder and SMA-8014 serial component monitor adapter to comply with the project's requirements.

The Systems Group completed the broadcast systems integration contract for the new MTV studios in New York at Times Square. The facility is the permanent home and central production facility for MTV. The contract included the design and installation of two state-of-the-art TV studios and control rooms. The Systems Group designed, engineered, fabricated and installed the technical systems and also supplied the equipment and materials. The facility is digital component based and includes a six-camera studio/control room operation, a second studio/control room for simultaneous productions and a 12-station graphics area.

Pro-Bel America, Chyron Corporation's routing and automation subsidiary, received a purchase order valued at $5 million to provide a large serial digital video routing matrix to DIRECTV for its Los Angeles Broadcast Center (LABC). The LABC will share broadcasting responsibilities with the existing DIRECTV Castle Rock Broadcast Center (CBRC) located in Castle Rock, CO. Both centers will be points of origin for the DIRECTV entertainment and informational programming service.

Tektronix will tap into high-growth networking, telecommunications and broadcasting markets through its newly formed business unit, VideoTele.com. The business unit will provide video communications products to service providers so that they can deliver the Tektronix broadcast-quality video as a service through their standard network infrastructure. VideoTele.com offers a portfolio of synergistic products, including software and hardware for trunking or managing distribution of video over private networks, for interactive conferencing, and for delivering video content to desktop computers via intranets. Stephen J. King is vice president and general manager of VideoTele.com.

Tektronix also announced that Florida's News Channel (FNC) ordered the Tektronix M2 Series MPEG-2 video edge device. The system will form part of a major new ATM-based fiber-optic networking that will link FNC's principal Tallahassee location to six affiliates across the state. The M2 Series video-edge device enables video service providers to move digital video material intrafacility with higher quality at less bandwidth.

Sparling was presented with a 1998 National Engineering Excellence Honor award by the American Consulting Engineers Council (ACEC) at its annual convention. Sparling received the award for designing the electrical, telecommunications and broadcast systems at KCPQ Channel 13 Fox. At the outset of the project, KCPQ managers asked Sparling to design a DTV system capable of accommodating present analog programs. Sparling delivered an all-digital production facility where analog signals are converted to digital at the front-end.

Communications Engineering Inc. (CEI) was contracted by NBC for its recent technical renovation at Rockefeller Center. NBC's multiyear plan prepares the network for the expanded requirements driven by television's ongoing move to DTV. The facility enhancements include a CEI-implemented upgrade to the audio and video routing systems that provide signals to NBC's New York operations.

Calrec Audio Ltd announced that NEP Inc. has placed an order for a third 60-channel Q2 dual in-line analog console. The company also owns two Calrec S Series consoles that have been in service since 1996. The new console will help handle on-location audio mixing requirements for NBC Sports. The desks will be installed in OB units ND1 and ND2.

In a major upgrade of its electronic newsgathering equipment, CBS affiliate WDBJ-TV, Roanoke, VA, completed a conversion of its news department to **Panasonic** DVCPRO. The purchase includes 57 DVCPRO units, including 10 AJ-D700 camcorders, three AJ-LT75 laptop editing systems, 14 AJ-D750 studio editing VTRs, 15 AJ-D650 studio editing VTRs and 15 AJ-D230 desktop VTRs.

Snell & Wilcox was presented with a Queen's Award for Technology by His Royal Highness, The Prince of Wales, on behalf of Her Majesty, The Queen, in a ceremony at the company's headquarters. The award was given for technical and innovative achievement in the production of the new Alchemist Ph.C (phase correlation) motion compensated standards converter and is the sixth Queen's Award for Snell & Wilcox.

Snell & Wilcox

Philips Digital Video Systems has sold five LDK 2000PS digital *TrueFrame* progressive field cameras to Los Ange-

les facility company Video One. The LDK 2000PS features the *TrueFrame* progressive scanning technology, which improves vertical resolution by 50% over present interlaced pictures. The camera is able to switch instantly between 480-active-line progressive and standard-definition interlaced in either 4:3 or 16:9 aspect ratio, while its 601 SDV output fits into existing 270Mb/s infrastructures.

The company has also entered into an agreement to form a strategic marketing alliance with Video Products Group Inc. to provide integrated systems for digital video transport applications. Video Products Group is involved in the design and production codecs and allied products for optical transport of contribution-quality digital video signals at both full and reduced bit rates.

Softimage announced that the SOFTIMAGE|3D animation tool was used by Centropolis Effects (CFX) to animate *Godzilla*. This film is the latest in a string of more than 30 major feature films in which SOFTIMAGE|3D has been used to deliver character animation and computer graphics effects. CFX used SOFTIMAGE|3D for character animation, as well as for lighting and texturing of Godzilla. CFX also employed Softimage mental rayR for rendering of the creature. In addition to animating the Godzilla character and its progeny, SOFTIMAGE|3D was used to animate the climactic scene in which Godzilla's terror reigns on a computer-graphics version of the Brooklyn Bridge.

Additionally, **ViewpointR DataLabs International** announced that the movie features Viewpoint 3-D computer models. Viewpoint created the monstrous 3-D model of Godzilla in a detailed and extensive digitizing and computer-graphics (CG) modeling project. Among the many firsts of the Godzilla production, Viewpoint's CG model of Godzilla appears in over 90% of the shots featuring the star character — the most extensive use of a full-screen CG character animation in feature film history. Viewpoint's 3-D Godzilla model is so realistic that Centropolis was able to use Viewpoint's CG Godzilla interchangeably with physical miniatures and animatronics of the creature, as well as incorporating it with live-action background footage.

Quantel announced that Group W Network Services (GWNS), Stamford, CT, purchased a fully configured Hal 504 video design suite to enhance its full-service TV production, origination and satellite distribution complex. With the addition of the Hal, GWNS will be able to handle a project from start to finish, and will also offer high-end graphics.

Tektronix announced that Turner Entertainment Networks chose the Profile video file server to transition the Turner Network Television (TNT) cable network to an MPEG-2 server-based solution. The Profile servers will replace TNT's tape-based cart system. Turner Entertainment Networks plans to install the system in its Atlanta-based programming origination facility.

Sony Electronics announced that WTKR-TV in Norfolk, VA, has selected three of its DXC-D30 digital cameras. The purchase marked the beginning of the facilities planned transition from analog to digital. The DXC-D30 cameras

are being used as studio cameras, along with Sony's CCU-M5 camera control unit, offering engineers remote access to the camera's features.

Sony also announced that Crawford Communications, a full-service post-production facility in Atlanta, is using its HDM-2830 HDTV monitors to evaluate film transfer in various aspects of the company's work, including TV series and commercials. The high-definition monitors are being used for color-correction sessions when transferring film images to videotape.

NTL awarded NDS Systems a digital terrestrial technology contract, worth over $40 million, for digital terrestrial TV (DTV) networks in the United Kingdom. NDS will supply its System 3000 DTV video compression, modulating, multiplexing and transcoding solutions, and will work closely with NTL to provide support through a five-year service contract. The contract was made after NTL received two major contracts to construct and operate digital terrestrial TV networks for Digital 3 & 4 Ltd and for S4C/Channel 5/SDN.

People

Robert Mueller has been named president of Panasonic Broadcast & Digital Systems Company (PBDSC), Secaucus, NJ.

Lawrence S. Brody

Lawrence S. Brody was elected president and chairman of the board at Communications Engineering Inc., Newington, VA.

Quantegy Inc., Peachtree City, GA, has named Alex Sorokin as president and CEO of the company, and Tony D. Wilson as vice president of sales and customer service for the United States and Canada. Also announced were the promotions of Brian McCarthy to field sales manager of distributor programs; Dori Talbott as manager of distributor programs; and Myra Rockymore as manager of marketing, sales and service.

Discreet Logic, Montreal, announced the creation of a new advanced TV team designed specifically to work with the broadcast industry to deliver a complete suite of effects, editorial and graphic solutions. In conjunction with this announcement, the company has appointed John Spencer, director of broadcast and production, to head the new team.

Randy Hood has been named CEO of Pathlight Technology, Ithaca, NY.

Chyron Corporation, Melville, NY, appointed Michael Carrieri as vice president of engineering.

Wayne Alonso

Azden Corporation, Franklin Square, NY, has announced the promotion of two executives to the position of vice president. Wayne Alonso, formerly the national sales manager for video products, has been appointed vice president of sales/video division. David Olivier, formerly national sales manager for pro sound products, has been promoted to vice president of sales/pro sound division.

David Olivier

QUICK DIAL 14

SONY

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

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

- Variable servo 10X optical power zoom lens goes from 5.9 to 59mm in 1.7 to 24 seconds. The manual zoom rocker is continuously variable right up to where the digital 20X zoom kicks in.
- Sony's Super Steady Shot reduces high frequency camera shake without compromising image quality. SteadyShot uses horizontal and vertical motion sensors that allow it to work accurately while zooming, moving (even shooting from a car), and shooting in low light conditions.
- Has digital effects including audio and video fade, overlap and Slow Shutter.
- Automatic and manual focus, iris, shutter, gain and white balance. Iris is adjustable in 12 levels from F1.6 to F11, shutter from 1/4 to 1/10,000 of a second in 12 steps, Gain from -3dB to +18dB in 8 steps.
- Zebra Pattern indicator, built-in ND filter.
- Custom Preset function lets you preset, store and recall custom settings for color intensity, white balance (bluish or reddish), sharpness and brightness.
- Stores Photo, Date/Time, Shutter Speed, Iris, Gain and F-stop for easy recall. So if you have to re-shoot, you know your original settings for every scene and frame.
- Records Drop/Non-Drop Frame time code. Time code can be read either as RC time code or as SMPTE time code.
- Has a large 1-inch B&W viewfinder with 550 lines of resolution for easy focusing even in low contrast lighting situations. Separate information sub panel displays time code, battery time, tape remaining and other camcorder functions without cluttering up the viewfinder.
- Records 16-bit/48kHz audio on one stereo track or 12-bit/32kHz with two pairs of stereo tracks (L1/R 1, L2/R2), so you can add stereo music or narration.
- One-point stereo electret condenser mic for clear stereo separation. Directivity can be selected from 0°, 90° & 120°.
- Automatic & manual (20-step) audio level record controls. Monitor audio with headphones or from the LCD panel which has an active VU meter.
- XLR input connectors for mics and audio equipment.

DSR-200A Field Package:
- DSR-200A Camcorder • NPA-1000/B Battery Case Adapter
- 3 NP-F930/B 7.2v 4000 mAH Batteries
- AC-V900/B AC Adapter, Triple Battery Charger
- VCT-U14 Tripod Adapter • LC-2000CP System Case

DSR-30 DVCAM Digital VCR

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

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

PVM-14N1U/14N2U & 20N1U/20N2U
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-14N1U/20N1U are designed for simple picture viewing, the PVM-14N2U and 20N2U 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-14N2U/20N2U 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.

QUICK DIAL 12

SONY UVW-100B

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.

- Three 1/2-inch IT Power HAD CCDs with 380,000 pixels attain sensitivity of F11 at 2000 lux (low light is 4 lux), S/N ratio of 60dB and 700 lines of resolution.
- 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.
- Diecast aluminum, 1.5-inch OXF-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.
- 8-digit LCD display indicates time data, warning indications and video status. Battery status audio level are also shown in a bar graph meter.
- 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.

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

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

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

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 2000 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.

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

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

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.

Classifieds

Services

Help Wanted

MAINTENANCE ENGINEER Qualified candidates must have experience repairing and maintaining a TV broadcast facility and can trouble shoot to component level. Experience with UHF a plus. FCC or SBE certification preferred. Candidate must be a self motivated person. We are a very progressive station, preparing for the digital future. Our friendly community has a high quality of life. Send resume, cover letter and references to Chief Engineer, WLFI TV18, 2605 Yeager Road, West Lafayette, IN 47906. EOE Employer.

ACCOUNT EXECUTIVE WCFC TV38 seeks an Account Executive with 3 yr. Broadcast Sales experience. Must have excellent communications and presentation skills and be a highly motivated self-starter. Send resumes only (no calls) to: Human Resources Dept. WCFC TV38, 38 S. Peoria, Chicago, IL 60607. An equal opportunity employer.

CHIEF ENGINEER Successful candidate must be well-versed with News operation and support, capital budgets and all broadcast engineering practices. Hands-on experience with studio operations and UHF transmitters required. Should be a "quick thinker", "quick mover", who has the ability to get things done on time and within budget. If you are a trainer and a mentor, send cover letter, resume and salary history to Hugh Breslin, NBC 25, Dept. Z, 13 East Washington Street, Hagerstown, MD 21740. Comprehensive benefit package, including 401(k) and section 125 plans. Drug screen required. EOE

CHIEF ENGINEER opening at Vermont's ABC affiliate. WVNY TV has a full-time opening for a Chief Engineer. Hands on manager would oversee all aspects of the engineering department. Strong computer and/or RF knowledge preferred. Applicants should have a minimum of five years broadcast engineering experience. WVNY will be under new ownership in June. Call Ken Kasz @ 802-658-8022 with any questions. Send resume to: Director of Broadcast Operations, WVNY TV, 100 Market Square, Burlington, Vermont 50401. EOE

Help Wanted

CRAWFORD COMMUNICATIONS Television Maintenance Engineer. Crawford Communications, the premier post production facility in the Southeast, has opportunity for bright, experienced maintenance engineer. Minimum five years experience with online and offline editing systems. Digital and analog tape transport experience required. Windows experience a plus. Submit resume and salary requirement to: J. Fortner, Chief Engineer, CrawfordCommunications,5354PlasamourDr., Atlanta,GA 30324 or jfortner@crawford.com

TECHNICIAN/OPERATOR - Tribune Broadcasting owned ABC affiliate has an opening for experienced TECHNICIAN/OPERATOR. Duties will include operation and maintenance of the station's ENG live trucks, remote broadcast activities, and light field and studio equipment maintenance. SNG experience is a plus. FCC General Class or SBE TV Certification and 3 to 5 years of news experience preferred. A valid drivers license and clean driving record required. Send resume and cover letter to Keith Cibulski, WGNO-TV, #2 Canal St.-Ste 2800, New Orleans, LA 70130: fax (504)581-2182; eMail KCibulski@tribune.com. No phone calls. EOE.

BROADCAST TECHNICIANS The National Digital Television Center is looking for broadcast technicians. The successful candidates will have two plus years experience in component level VTR repair (Beta, Digital Betacam, etc.) and video monitor repair. Tektronix Profile and Alamar automation experience highly desirable. A high level of digital and analog audio and video knowledge and computer skills essential. A drug test and background screen will be required of all successful candidates. Send resumes to: TCI-NDTC, 4100 East Dry Creek Road, Room 118/Attn: Rodney Beelow, Littleton, CO 80122. EOE

NATIONAL SALES MANAGER, WJTV, a CBS affiliate owned and operated by the Media General Broadcast Group is seeking individual with a proven track record in National Sales. The ideal candidate is a self-starter, organized, goal oriented and interested in growth oriented broadcast company concentrating its efforts in the Southeastern region of the U.S. Qualifications for the position include: a 4 year college degree, preferable in business; computer skills, and a general understanding of marketing principles. To apply send cover letter and resume to: Human Resources Dept., WJTV, 1820 TV Rd, Jackson, MS 39204. EOE M/F, Pre-Emp Drug Test req.

Classifieds

Help Wanted

MEDIA SYSTEMS ENGINEER Purdue University, West Lafayette, IN. The Media Systems Engineer works in the Instructional Technologies Facility of Continuing Engineering Education (CEE) which provides credit and non-credit courses through media-based delivery to practicing engineers throughout the world using IHETS (Indiana Higher Education Telecommunication System) Television network (one-way video, 2-way audio). Credit and non-credit courses are also delivered via videotape. CEE offered its first course delivered via the Internet in the 1997 spring semester. Plans are currently underway to begin producing courses on CD-ROM. The Media Systems Engineer is responsible for recommending, maintaining, setting and monitoring computer, telecommunications and other technologies applicable to distance learning. The position plans for and installs new technologies as well as assists in the preparation and faculty training in the use of distance learning technologies. The Media Systems Engineer also participates in program production and delivery. Qualifications: Bachelor's degree required, master's preferred in telecommunications, electrical engineering or broadcast engineering. Three plus years of experience in broadcasting; determining the needs and be able to maintain broadcast television electronics and equivalency, computer equipment as it relates to broadcasting and distance education needs. Special consideration will be given to individuals with industry licensing and certification. Excellent oral/written communciation skills and the ability to work in a team environment and knowledge of current PC/Mac and desktop computing applications necessary. Send cover letter and resume to Team 4, Personnel Services, 1126 Freehafer hall, West Lafayette, IN 47907-1126. CEE is a pioneer in distance learning and has a reputation of providing high quality, customer-focused programming. This position offers the opportunity for professional growth in a dynamic environment providing interesting work in a team-based operation. Salary: Commensurate with education and experience. Purdue is an EO/AAE.

IMMAD+ECVS,(www.immad.com/ www.ecvs.com) one of the North America's largest combined system integration companies, is seeking both Senior and Mid-level Television System Engineers for our new Boonton, NJ facility. Our growing public company is currently designing and building DTV solutions for the broadcast community and have positions open for the right candidates. The Senior Engineering candidate should have the following: a E.E., and/or P.E.; a strong background in Television engineering; departmental management experience; financial management skills at the project level; computer literate and a working knowledge of Office97/ AutoCAD. The Mid-level Engineering candidate should have the following: a good background in television engineering; extensive knowledge of AutoCAD; and computer networking and management skills. An EE or PE would be a plus. Please send all info to Rich Bisignano, at rbisign@immad.com.

VIDEO MAINTENANCE ENGINEER Join The Expanding News 12 Networks As We Continue To Innovate Local Cable News News 12 Regional Networks is seeking an Engineer skilled in analog and digital electronics repair. Candidate must possess a good understanding of system wiring and design, and the ability to service Betacam VCRs, field and studio cameras, monitors, switchers, routers, digital editing, paint boxes and still stores. Must be a self-starter requiring minimal supervision while producing high quality and high volume results. Ability to work all shifts and weekends. Please send your cover letter and resume to: P.O. Box 999-MK, Woodbury, NY 11797. EOE

TELEVISION ENGINEERING POSITION A suitable candidate should have an Associates degree in Electronics Technology plus 5 years experience with UHF transmitters and related broadcast studio equipment. A general FCC Radio Telephone license or SBE certification is a plus. The ability to supervise others, solve inter-departmental problems, and relate to and communicate effectively with upper management are important skills in this position. This is an excellent career opportunity for a highly motivated individual to join a growing, progressive company. Send resume and letter of interest to: Broadcast Engineer, WRGT-TV, 45 Broadcast Plaza, Dayton, OH 45408. No phone calls please. EOE M/F

MAINTENANCE ENGINEER WXIA-TV is looking for a maintenance engineer to provide technical support for all station activities with primary support to news operation and programming. Responsibilities include repairing and installing a wide variety of television broadcast equipment. A minimum of five years broadcast maintenance experience or commensurate education and/or experience in a related field required. Must be able to troubleshoot state of the art electronic equipment to component level with minimal supervision. Familiarity with E.N.G. recording, editing and RF equipment is essential. Applicants should also have a solid working knowledge of PCs and typical PC software. Send resume and salary requirements to: WXIA-TV, Attn: Paul Tanton Engineering Supervisor, P.O. Box 77010, Atlanta, GA 30309. No phone calls please. EOE M/F

TV CHIEF ENGINEER KOED-TV, Tulsa, is seeking a hands on chief engineer with a strong transmitter background along with studio maintenance experience to be responsible for the transmitter maintenance and supervision of 2 Maintenance Engineers. Need supervisory and organizational skills. 3 years RF broadcast experience required. Great opportunity for someone in an Assistant Chief Engineer position. Send resume and salary history to Personnel, Oklahoma Educational Authority, P.O. Box 14190, Oklahoma City, OK 73113. AA/EEO

CHIEF ENGINEER

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Send resume and cover letter to:
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34 KMEX-TV
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Engineering

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Please forward your resume with salary requirements to: **Disney Channel, Attn: ms/esse/50806, 3800 West Alameda Ave., Burbank 91505** or FAX: to: **ms/esse/50806 818/846 8281.** EOE

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Broadcast ENGINEERING Broadcast ENGINEERING

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Please send resume and cover letter to:

Kurt Hanson, WABC-TV,
7 Lincoln Square,
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abc 7

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EOM

A product that needs designing

BY PAUL MCGOLDRICK

One Thursday afternoon in May, stations in the L.A. basin broke into their regularly scheduled programs to bring live coverage of a human in distress. Two of the stations actually broke away from children's cartoons to air the live event taking place.

A man who had some kind of beef with his HMO (haven't we all), armed with a shotgun, parked his pickup on a connecting ramp to an L.A. freeway. He brought a sign with him that he spread out on the deck. He probably knew that the news helicopters would be there quickly, as they were already airborne to start the evening's coverage of the commute. Certainly he would have been able to hear them throbbing above him.

While a standoff with the authorities continued, the L.A. stations were joined in their coverage by MSNBC, so cable viewers nationwide would have the chance to see this "unfolding drama." Nothing happened for about an hour. The man sat in the cab of the pickup, with his dog, and no doubt contemplated the effectiveness of his demonstration and the reaction it would cause. Then he ignited himself and the pickup cab exploded into flames. He leaped out and started to tear off his burning clothing — the dog didn't make it.

When the news coverage interrupted the cartoons, the kids watching must have thought it was great: here was this funny man doing his funny dance ripping his funny clothing off — just like another Bugs Bunny cartoon. But then the man calmly went back to the pickup, pulled out a shotgun, rested it vertically on the center median concrete and blew off the back of his head. Unlike Bugs, he didn't get up.

That evening, a couple of the L.A. stations apologized to viewers for airing the event live. The next day, after they were obviously shamed into it, even more stations apologized. But nothing can undo what that scene must have done to young minds who unexpectedly saw the news coverage. It should not have happened. It is my fault, and it is your fault.

Human nature

Since time began, man has needed to show off in front of his fellows — to be more absurd, to make a point in public by acting stupid, crazy or dangerous. The first self-immolations I remember were of the monks in Vietnam, but I'm sure they didn't invent the practice in making a point to their fellow man.

Radio has recognized for years that there are crazies in the world; nobody would risk their licenses by putting a talk-radio show on the air without the eight-second delay box. It was originally conceived of as a protection against foul language, but these days there are far worse things that people would be happy to declare over the airwaves to further their cause. There are just too many people out there, totally dedicated to themselves and the destruction of everything else.

Nobody would risk their licenses by putting a talk-radio show on the air without the eight-second delay box.

Why should TV broadcasting be immune? Maybe we thought that the occasional streaker at a sporting event was amusement. But what other things could the extremists perpetrate at national and international events that could cause public horror and be covered live by the networks?

Let's volunteer

Even before the FCC wakes up to the fact that this needs to be done, we should delay live coverage. As a responsible engineering community, we need to design a means for delaying all live coverage by somewhere between five and 10 seconds.

No, it's not an engineering problem with a simple solution, or we would have done it before. Or is it? Obviously, for analog signals, it would be fairly straightforward to design a deck with a record/playback delay (it might not have been for a 15 in/s quad machine) by literally feeding one deck to another. And such a solution wouldn't be that klutzy and expensive if done right. If done with decks that could handle both composite and component, it would cover all the needs of the analog remote.

For digital signals, we need to think of a time-base-corrector-like box with 5+ seconds of buffer (150+ frames). Surely that is totally feasible in today's PCs. A 400MHz Pentium II with enough memory should cope with even HDTV. If properly set up, today's disk-based recorders also provide a possible solution.

Can someone please get these products to NAB '99 so the industry can do the "right" thing before the government threatens stations' license renewals? Helicopter news coverage is cheap drama, but we should not allow our kids' minds to be cheapened. By developing equipment to delay programming, we can avoid this problem in the future. ■

Paul McGoldrick is a free-lance writer and consultant based on the West Coast.

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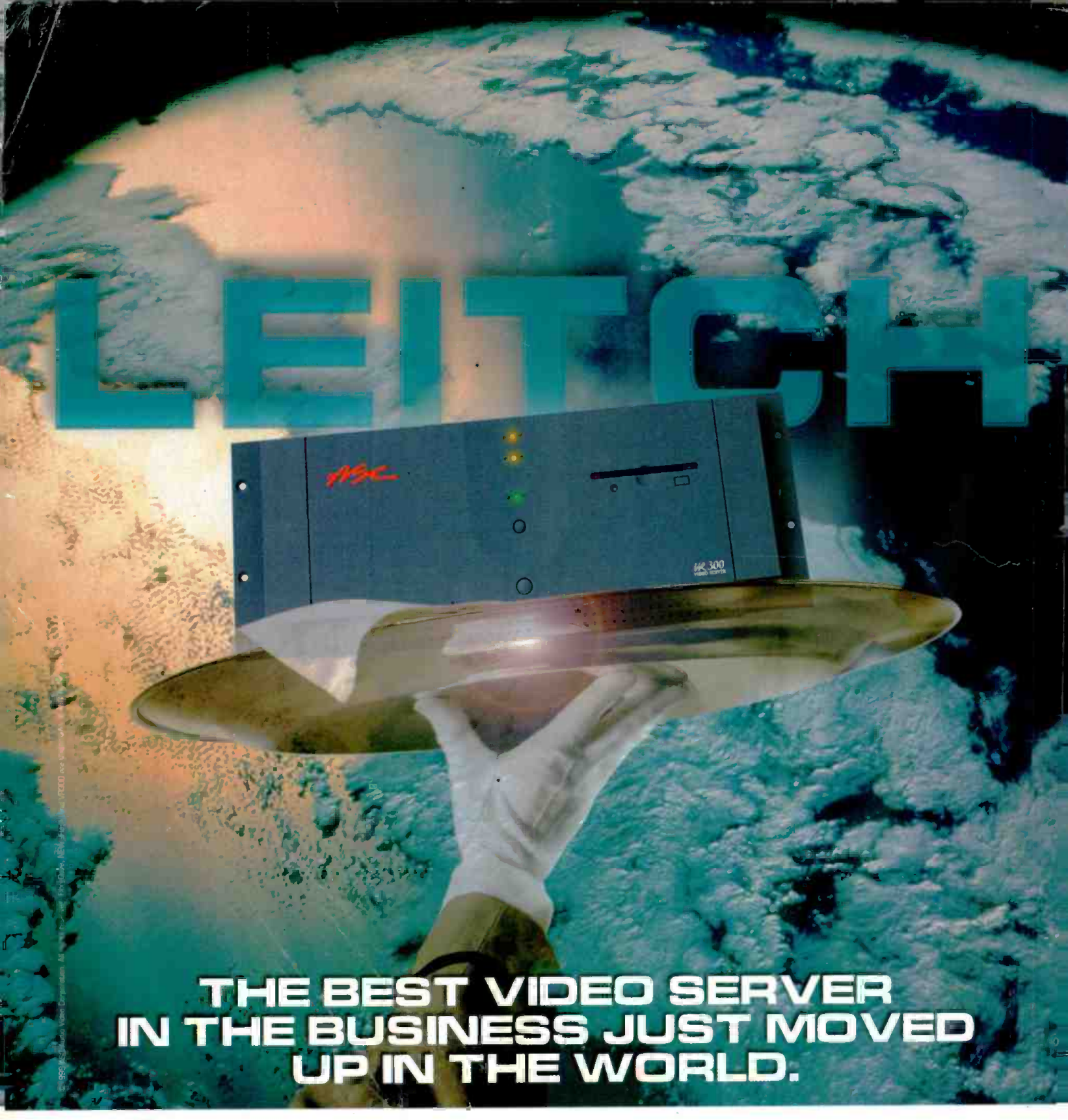

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