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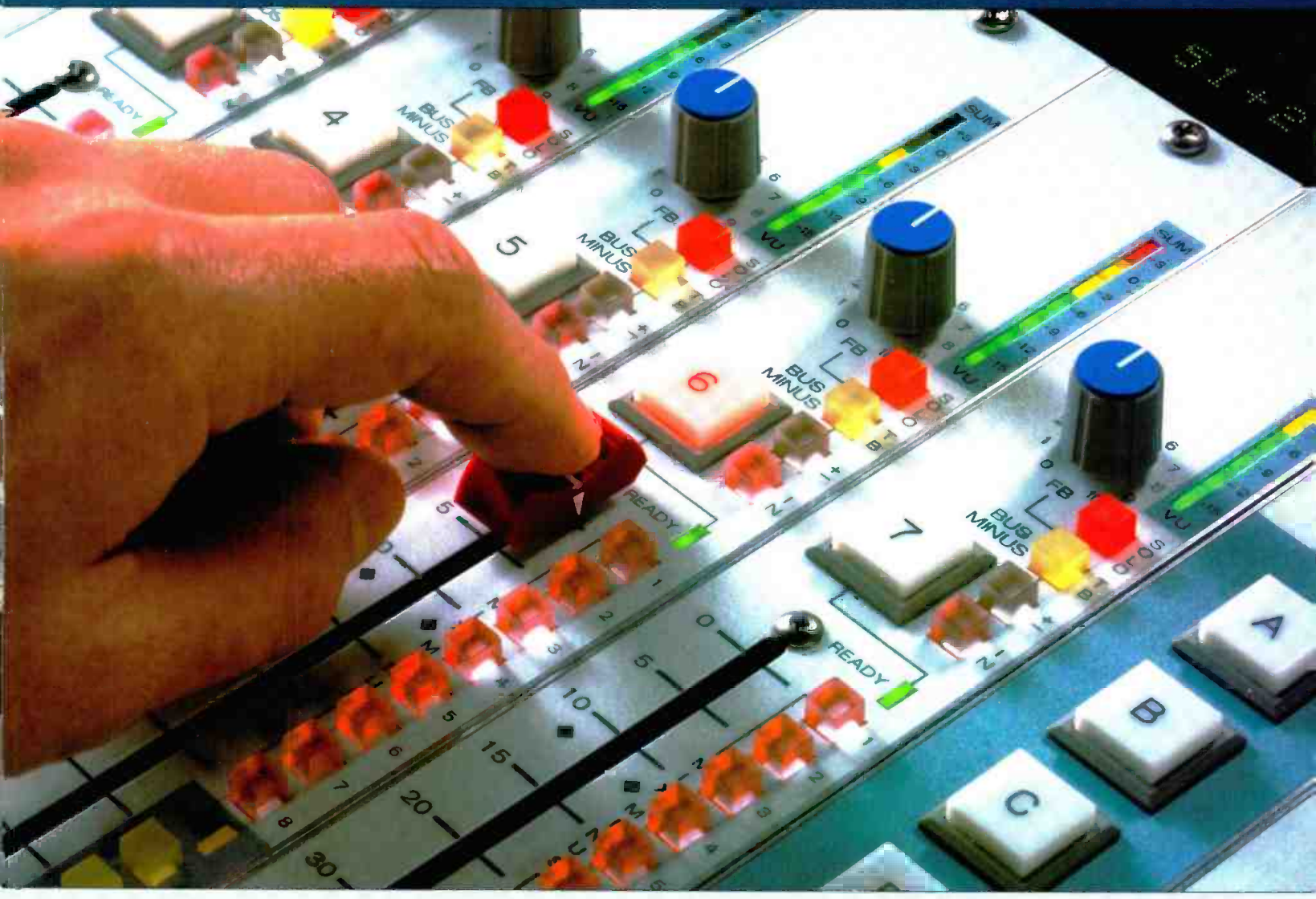

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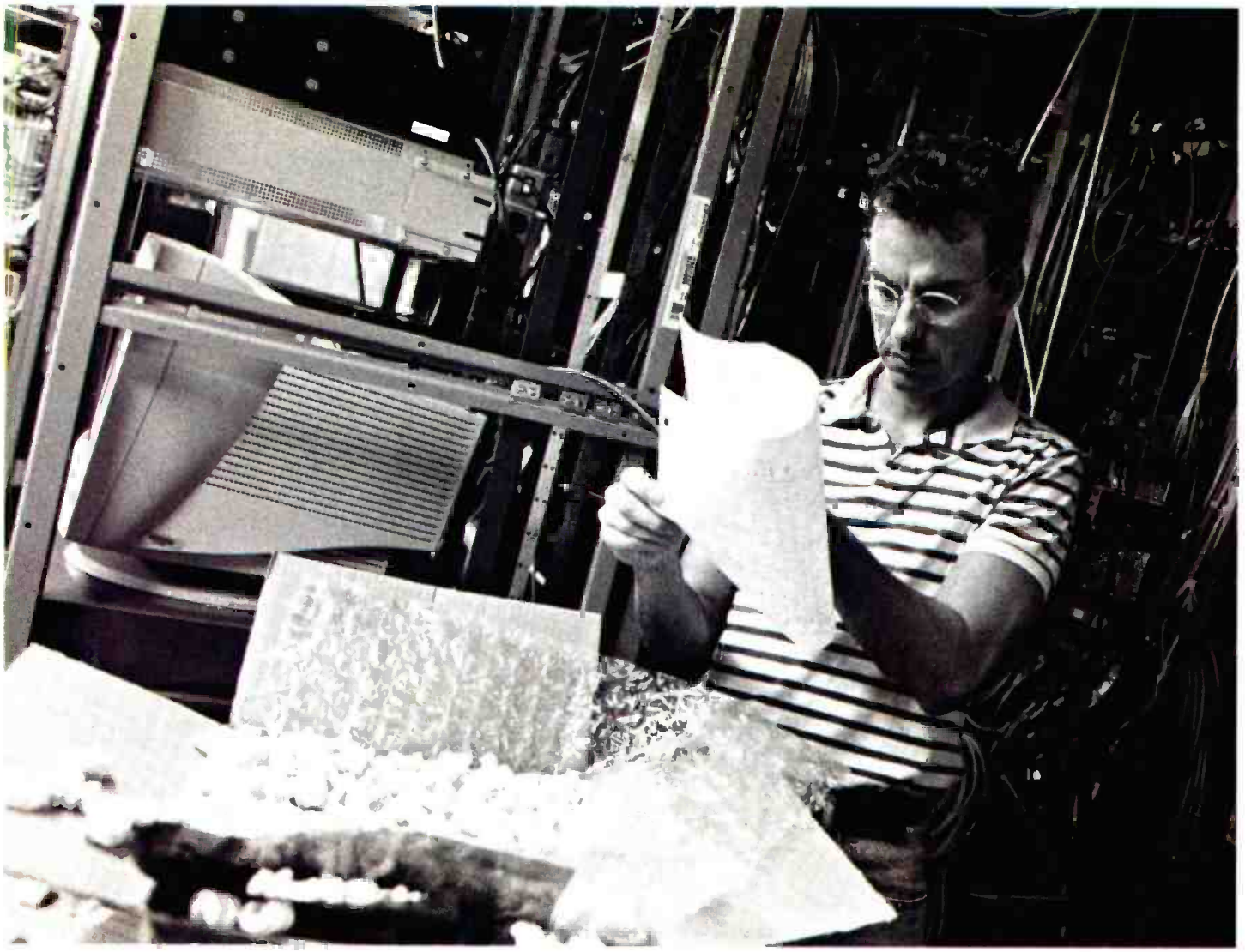

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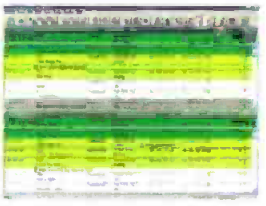

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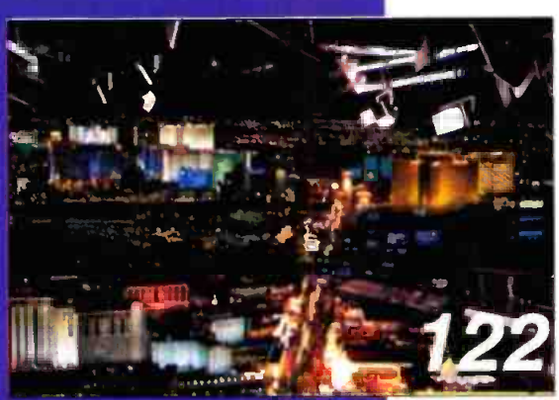

Features

Beyond the Headlines

Digital Handbook

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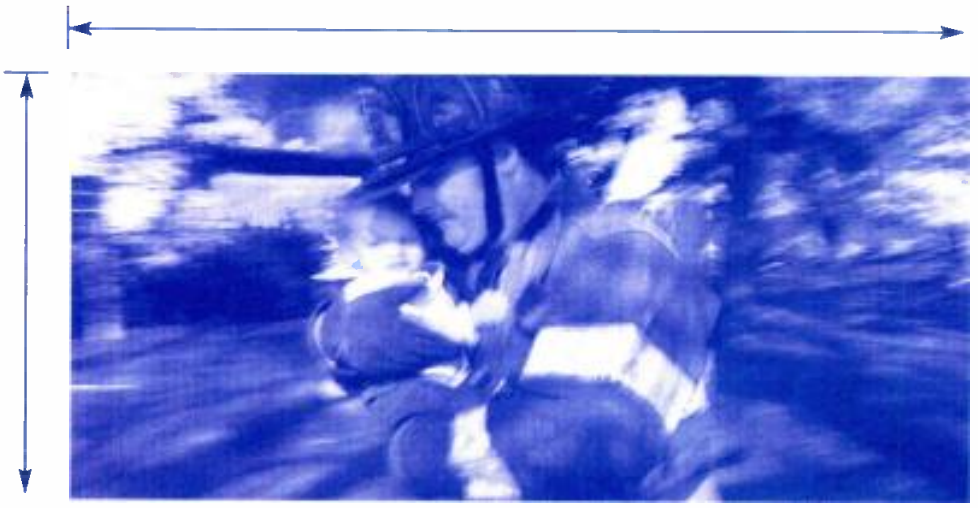

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ON THE COVER: *Shown on the cover is the master control room monitor wall of the DISH Network, which provides 500 channels of digital programming. The "wall" contains 1020 monitors, each tied to an individual satellite receiver tuned to one of the six EchoStar satellites. Photo courtesy, IMMAD ECVS, Boonton, NJ.*

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FREEZE FRAME

A look at the technology that shaped this industry.

Do you remember?

At the 1976 NAB conventions, 1" helical VTRs were just becoming known. At the show Ampex demonstrated for the first time on it helical VPR-1, a key feature, which allowed freezeframe and slow-motion playback. This technology was a key factor in helping set the stage for the demise of the quad format. What was that technology? A bonus will be given to the person who can name the four companies who were demonstrating helical VTRs at that show. entries received by May 30 will be eligible for one of the new Broadcast Engineering T-shirts. Send your entry to brad_dick@intertec.com.

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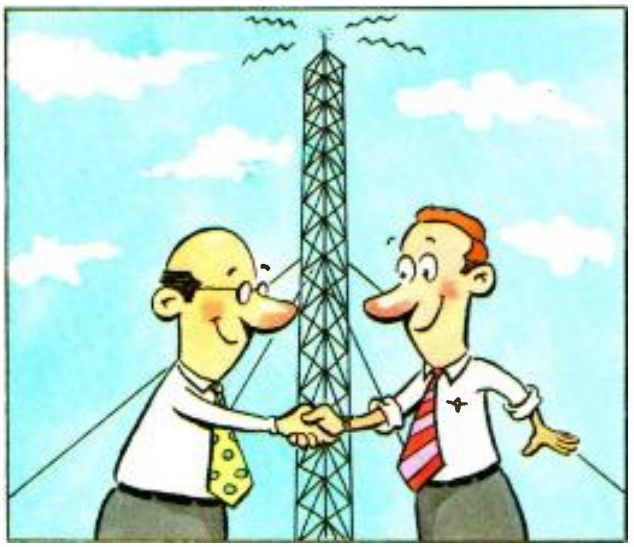
Editorial

Working together for community towers

A reader's recent comment on his inability to get a community tower project off the ground started me thinking. Why is it that most broadcasters demand that they own their own towers?

After a few calls to some broadcasters, the answers were pretty much as I expected. Some stations are suspicious of any cooperative arrangements with competitors. Most stations have always owned their towers. The very idea of sharing space on a tower you don't own along with your competition is somehow uncomfortable for many station engineers and managers. However, with DTV there are several good reasons to do so.



The first is cost. It's cheaper to build one stick and share the cost among several stations than it is for everyone to build their own tower and go it alone. The second reason to consider a community tower also involves money, but more than that, it involves politics.

Local governments have buildings full of lawyers and code enforcers, all just waiting to take you to court or prevent you from moving one shovel of dirt for a new tower. If that's not enough to scare you, don't forget nice old Mrs. Smith, who has lived on that perfect site for 50 years. There will be some that claim you want to irradiate her and her cats, probably causing cancer and who knows what else with your TV tower. Are you sure you want to face those obstacles alone?

Let's consider the viewer. A friend in California wanted to buy an HDTV set. However, he wasn't going to part with that significant chunk of cash until he could be assured that he could get off-air reception. To help answer the reception question, I checked out his location with the CEA's antennaweb.org website. The results were not encouraging.

The CEA website predicted that he would need a large antenna complete with a preamplifier. Even worse, because the stations were spaced more than 180 degrees around his location, he needs a rotor! A rotating receive antenna to get DTV signals. Can you spell dinosaur? Does any *Broadcast Engineering* reader really expect someone to plunk down $4000-$9000 for an HDTV set and then be willing to rotate the antenna every time he changes channels? That's simply not going to happen.

We all win with community antenna projects. We reduce the number of towers — a trend both the FAA and the city governments like. We reduce construction and maintenance costs, which stations like. Finally, we place our DTV signals all in one general direction, which consumers will like. Everybody wins. Isn't that the goal?

Brad Dick

Brad Dick, editor

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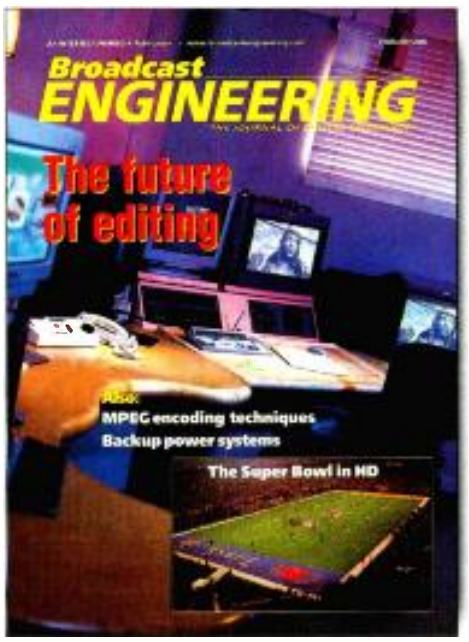


Hollywood cheats movie goers

Dear Larry,

I found your article quite interesting and you hit on a number of points we all need to become more aware of. I wonder, though, if there is not one more dimension to the actual achievable resolution in a film system.

You start off using 35mm film as a benchmark and state that the film, has a resolution which is about twice horizontally and twice vertically the two megapixel resolution of 1920x1080. You note that some in the film industry claim only 2K resolution (about two megapixels) for 35mm film. CBS, in a study a couple of years ago, seemed to come to the same conclusion. That indicates a difference of opinion between the film manufacturer, Kodak, and users over the resolution capability.

What about the limitations in the optics? Will camera and projector lenses tend lower resolution? If the film has a resolution capability an order higher than the optical systems will support, that would not be a bad thing, as it would render invisible minor grain imperfections in the film while still achieving the desired result.

Karl Black
Broadcast Technology Instructor
Harris Broadcast Systems

Karl:

There is no simple answer. We use 35mm film as the benchmark for digital cinema. Native film resolution is not dependent upon characteristics of the film camera lens nor the theatre projection lens, nor does it include the losses encountered when making an interpositive dupe negative and release print.

The film grains in modern motion picture film average around 3.5 microns. The 3.5-micron film grains are about 0.0001377 inches in size. If each film grain just touched each other you would have about an average of 5,987 film grains across a full aperture of 0.980 inches (24.89mm). We know that the film grains in the three-emulsion process are randomly spread and as more light photons arrive, more of these silver halide film grains are going to become exposed. The exposed film grains are then developed and replaced with the appropriate dyes during processing and dye clouds are formed where their density is proportional to the number of photons that strike the silver halide grains. If you photograph a chart made up of high contrast black and white lines, the theoretical maximum number of line pairs (black and white lines) that the film negative can resolve then is somewhere around 190 line pairs per millimeter (lp/mm). Experience and published documentation show that the film negative does resolve better than 85lp/mm. In other words, using 85lp/mm, the film negative can easily resolve more than 2000 horizontal lines in a "full aperture" film camera.

In order to scan a film of that resolution, the scanner must be capable of least 3000 samples of that image. The number of samples will be tied to the actual distance across the image and will have a spatial sampling rate measured in cycles per picture width or cycles per picture height (c/ph). For a 16:9 (1.78:1) aspect ratio then you would have to have a sample grid of about 3000x1687 pixels to equal the resolution of 35mm motion picture film. That's a lot more than the two megapixels used for HDTV with its 1920x1080 sample grid.

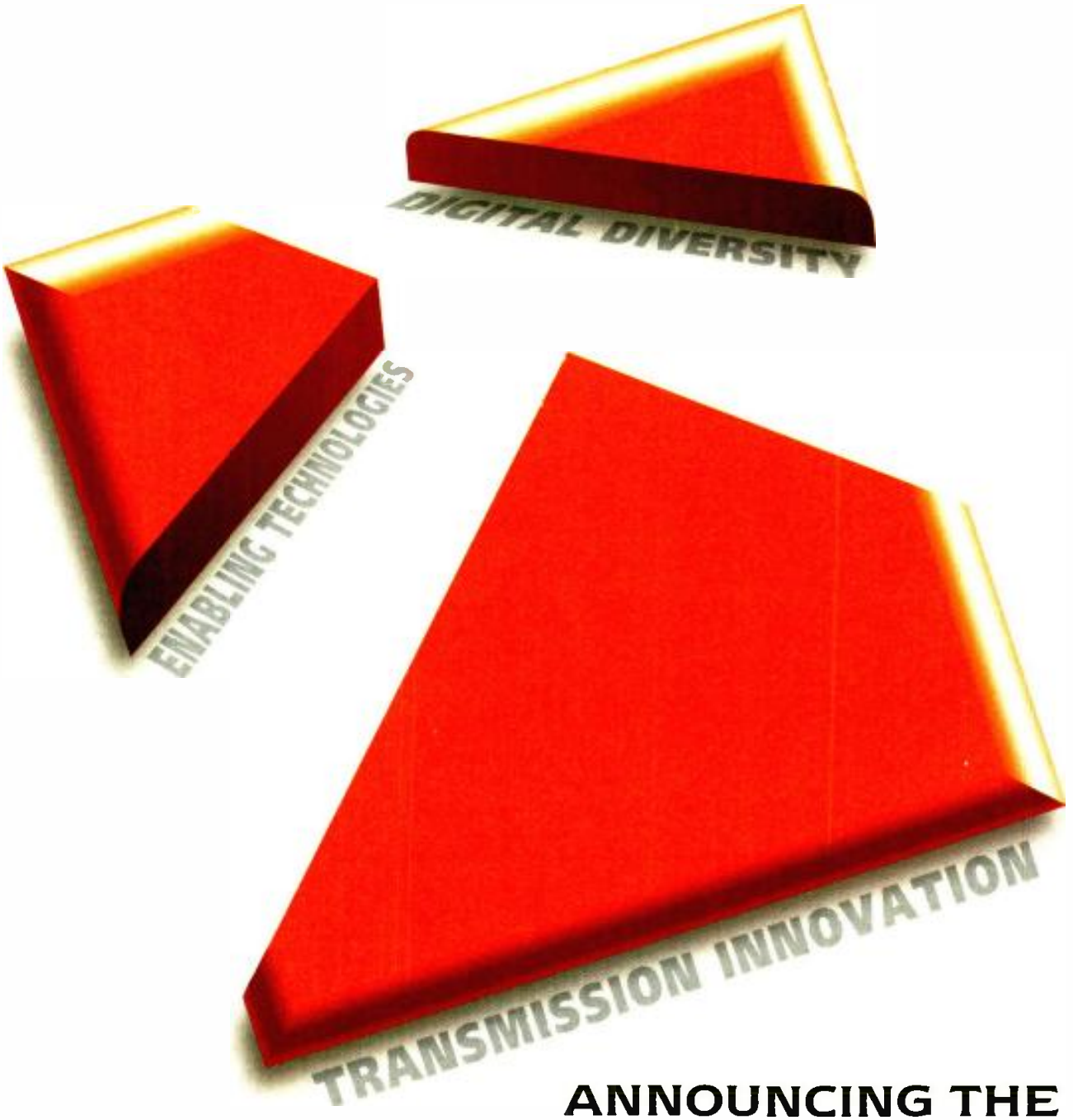
Kodak claims that film resolution is equivalent to 4096 pixels, which is true if you measure from sprocket hole to sprocket hole across the film. However, the image does not go from sprocket hole to sprocket hole. It is slightly narrower to allow for a sound track. Most release prints are shown with apertures of only 0.825 inches (20.96mm) across. This is called Academy Aperture. Assuming no loss from making a print, this results in an image with a resolution of only 3562 x 2000. Notice that the 2000 is c/ph. This is where the often-quoted figure of 2000 lines comes from.

The CBS tests you mentioned tried to equate release print resolution and came up with similar data. It also included the losses from the printing, MTF of the projection system and included both lenses and the projector weave.

The optics definitely will lower the resolution of the image as will the printing of the IP dupe negative and release print. The goal for digital cinema shouldn't be to reproduce what the theater patron now sees from a release print, but to show an image similar to what the producer and director see when viewing and approving the answer print in the lab.

Thanks for your inquiry.

Larry Bloomfield
News Technical Editor



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AVSTAR 20 YEARS OF MAKING NEWS

News

Cable-broadcast compatibility — an oxymoron?

BY LARRY BLOOMFIELD

As if the migration from analog to digital by this country's television broadcasters hasn't been plagued with enough problems, the cable industry done their part to support this process either. With a July 1, 2000 deadline facing the cable industry to settle on a standard for interfacing their services with digital television in all of its various scan rates, frame rates and definitions. Federal Communications Commission (FCC) Chairman William E. Kennard, seized the moment during his address to this January's Consumer Electronics Show in Las Vegas to warn the cable industry and CEA that time was running out to resolve some important technical issues.

Kennard said, "In January, I urged the industries to accelerate and complete negotiations to resolve four major issues that were delaying digital television sets that connect directly to the cable system, and, therefore, the transition to digital TV." According to Kennard, those issue that posed the most formidable obstacles are a lack of technical standards for direct connection of digital TV receivers to digital cable television systems; a lack of agreement on how to provide tuning and program schedule information to support on-screen program guides for consumers; a lack of agreement on the labeling of TV sets without two-way digital connections to other consumer electronic devices; and a lack of agreement on licensing terms for copy protection technology. Recently the chairman was quick to take credit for the resolution of two of these issues.

Like the first time, this agreement is just as notable for what it doesn't include as for what it does.

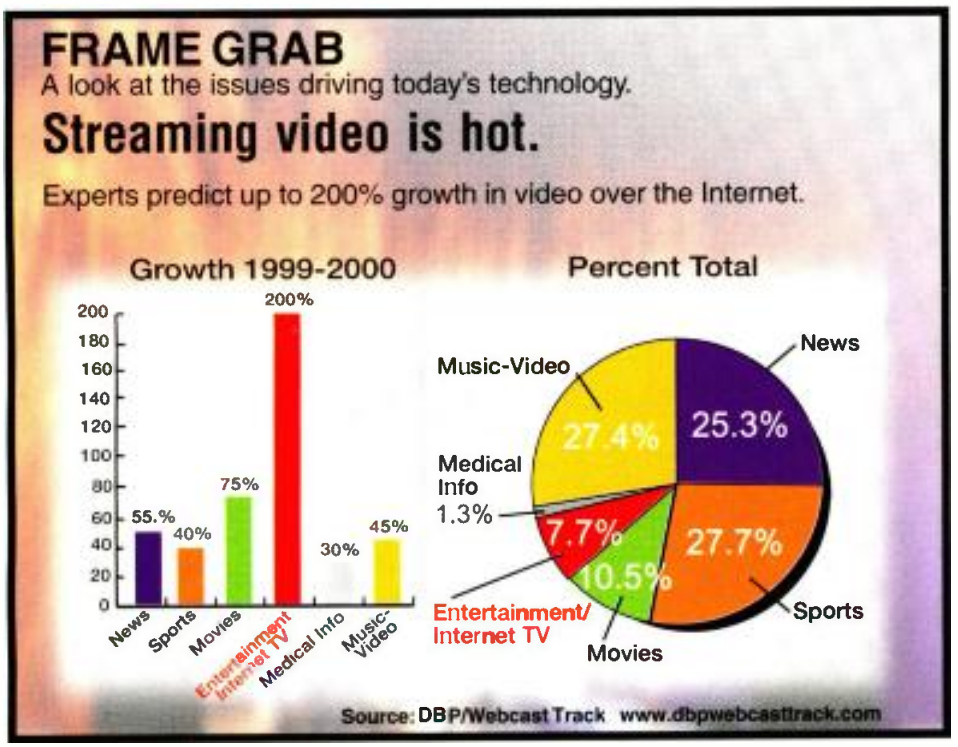
In late February, the cable industry claimed it and receiver manufacturers had resolved some of the key issues regarding the interconnection of set-top boxes and displays.

CableLabs is a technical clearinghouse for cable television system operators and does research and development. CableLabs is the keeper of the "OpenCable" process that is intended to be the fast-track initiative to attain interoperable digital set-top boxes and other advanced digital devices manufactured by multiple vendors.

CableLabs stated, "OpenCable specifications with these amendments now provide a complete technical blueprint for construction of compatible digital television receivers. Receivers meeting these guidelines will be interoperable with cable systems throughout North America."

Robert Sachs, president of NCTA, said, "This is good news for cable customers contemplating a purchase of a digital television receiver. This voluntary solution makes unnecessary government involvement in setting compatibility standards for the dynamic digital TV marketplace." Gary Shapiro, president of the CEA, sees this as, "yet another giant step forward in the transition to DTV." Both Shapiro and Sachs praised Kennard and the FCC for expediting industry resolution of these issues and contributing greatly to the success of the joint CEA/NCTA discussions.

These agreements mark an important milestone in the U.S. transition to digital television. They detail the technical requirements that permit the direct connection of digital television receivers to cable television sys-



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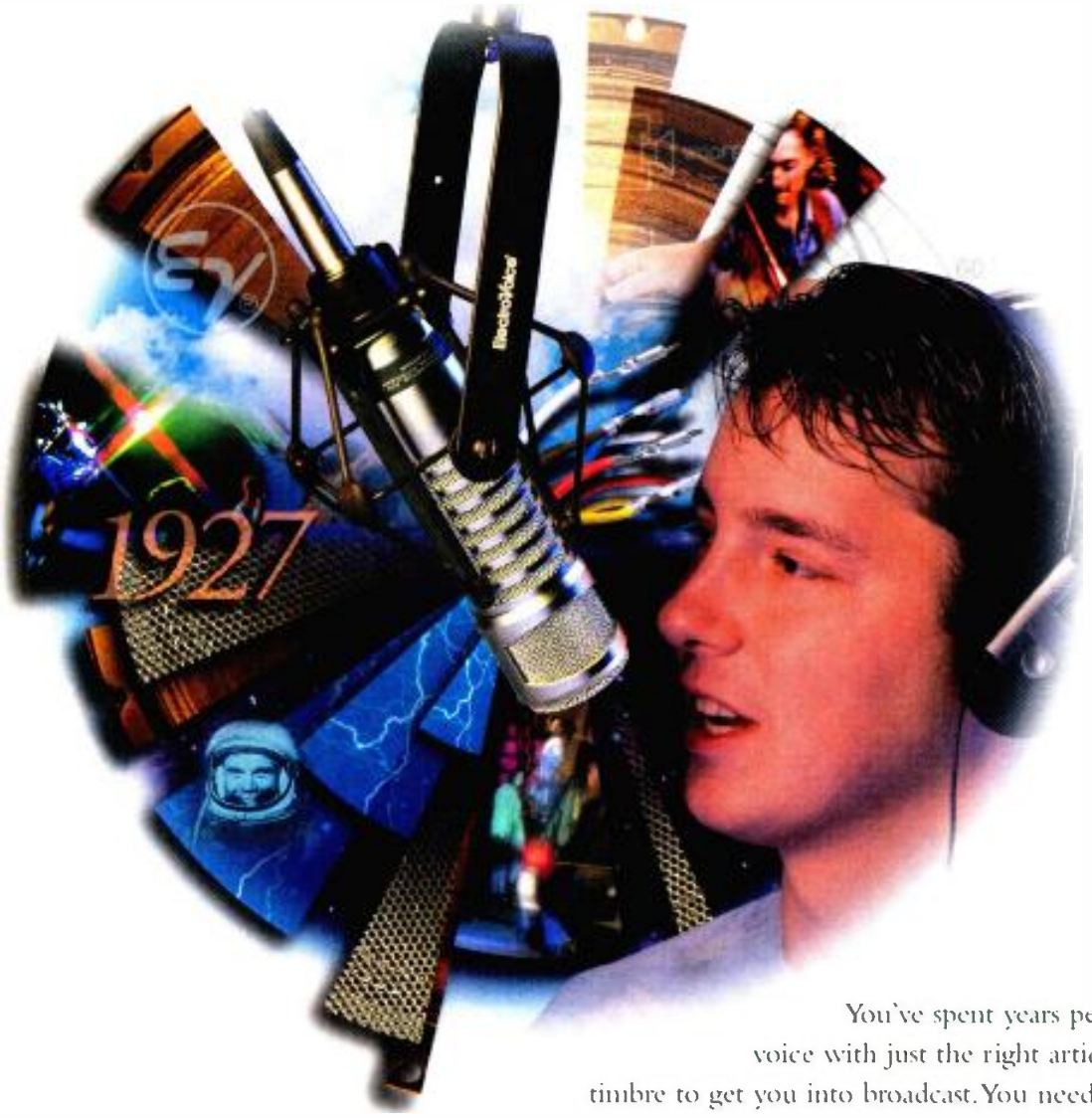

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tems, specifying the signal levels and quality as well as video formats. They also provide for the carriage of Program and System Information Protocol (PSIP) data on cable systems to support on-screen guide functions in digital receivers. Subject to certain conditions, PSIP data enables features such as on-screen program guides, virtual channel tables, program name and description (for a minimum 12-hour period) and content advisory information.

Chairman Kennard praised CEA and NCTA and said the industry agreement on digital TV technical standards "will jump-start the digital revolution for television" while permitting "the benefits of digital programming on their digital TV sets from both over-the-air broadcast stations and cable systems." Kennard attributed the issues that were "holding up DTV set production" were a lack of agreement on the direct connection technical standards and the program guide issues.

"Taking into account the lead-time required for TV set manufacturing," Kennard added, "this will allow consumers to buy digital cable-ready sets by Christmas-time next year."

Kennard said, "I stated that if the industry could not reach agreement, I would recommend that the Commission write rules to protect the public and speed the digital TV transition." Proposed rules on FCC-imposed compatibility were pending before the FCC when the joint announcements were made. Kennard concluded, "I will recommend to my fellow Commissioners that proposed rules on the technical standards and program guide issues be removed from consideration but that we continue to review proposed rules on the two remaining issues."

Stalling tactics

This is the second time the CEA and NCTA have made such an announcement and like the first time, this agreement is just as notable for what it doesn't include as for what it does. It isn't difficult to understand why there are those who view this as nothing more than a ploy to keep the FCC out of the mix. It's one thing to take positive action. It's another to generate political stratagem. Probably the most important of the "remaining issues" includes just what really constitutes a "cable-ready" digital television set.

Although Commissioner Susan Ness praised the CEA/NCTA interoperability agreements and sees it as "a significant step toward facilitating the Nation's transition to digital television," she did not dismiss the remaining issues: "We can't declare victory when the game's only at halftime."

Cutting to the chase, Ness said: "There remain significant issues of disagreement that could have profound effects on the digital transition. We must bring to resolution the outstanding issues of copy protection and the accurate labeling of digital television receivers. I would support a Notice of Proposed Rulemaking that properly addresses these questions, should the consumer electronics and cable industries fail to reach an agreement." Concluding her statement, Commissioner Ness said: "I am hopeful, however, that just as industry forged a consensus on network interface and PSIP disputes, it will do so with respect to copy protection and labeling."

Despite this agreement, the compatibility issue is a long way from being settled. The National Association of Broadcasters said, "The agreement is a sham." ■

Hollywood pursues copyright protection

A long debated issue that raises its head occasionally is copyright protection. Broadcasters will become more involved as they move on into the digital era. With more digital services, in addition to normal programming, begin to find their ways into the bit stream, terms like "conditional access," "encryption" and other "read about" verbiage pertaining to who gets to see a piece of material, will become part of daily practice.

According to the judicial reading of the Digital Millennium Act, virtually anything that circumvents copy protection is illegal.

The concepts of copyright and security have been so intertwined that it is difficult, at best to distinguish where one begins and the other leaves off. Copyright protection is Hollywood's main focus One of the most recent wrinkles in overprotection is the possibility of adding copy protection to the link between a computer or set-top box and a display using the digital interconnect being developed by the Digital Display Working Group (DDWG). Recently Intel announced a copy protection scheme for such links.

New taxes

Although technology may be an answer to some copyright issues, it is none-the-less a very disturbing move toward a "copy protection tax" that could worm its way onto every "bit" and "byte" of digital material: Internet, television, radio and digital cinema. Anyone remember the drive to tax digital recording tape? If the industry thinks they have

problems with compatibility and interchangeability now, just wait until the cages of the cyber-geeks are opened so they can apply their magic to the simple data streams the broadcast industry is just now accepting as common place. There will be more ways of encrypting data than celestial bodies in the firmaments. As one industry observer put it, "This is not only an unnecessary burden and expense for consumers, but may further complicate a rapidly mushrooming nightmare — how to provide interoperability between all of the networks that will be interconnected to create in-home digital media networks."

There are viable alternatives available that could employ appropriate content management schemes based on both digital watermarking and key management techniques. This approach deals directly with protecting content and the collection of revenues for the content owners.

The downside of all this is that the "gatekeepers" have the bucks on their side and will probably force copy protection on the unwitting public. The FCC is monitoring the political winds and appears to be addressing compatibility standards for interconnection of set-top boxes with DTV receivers.

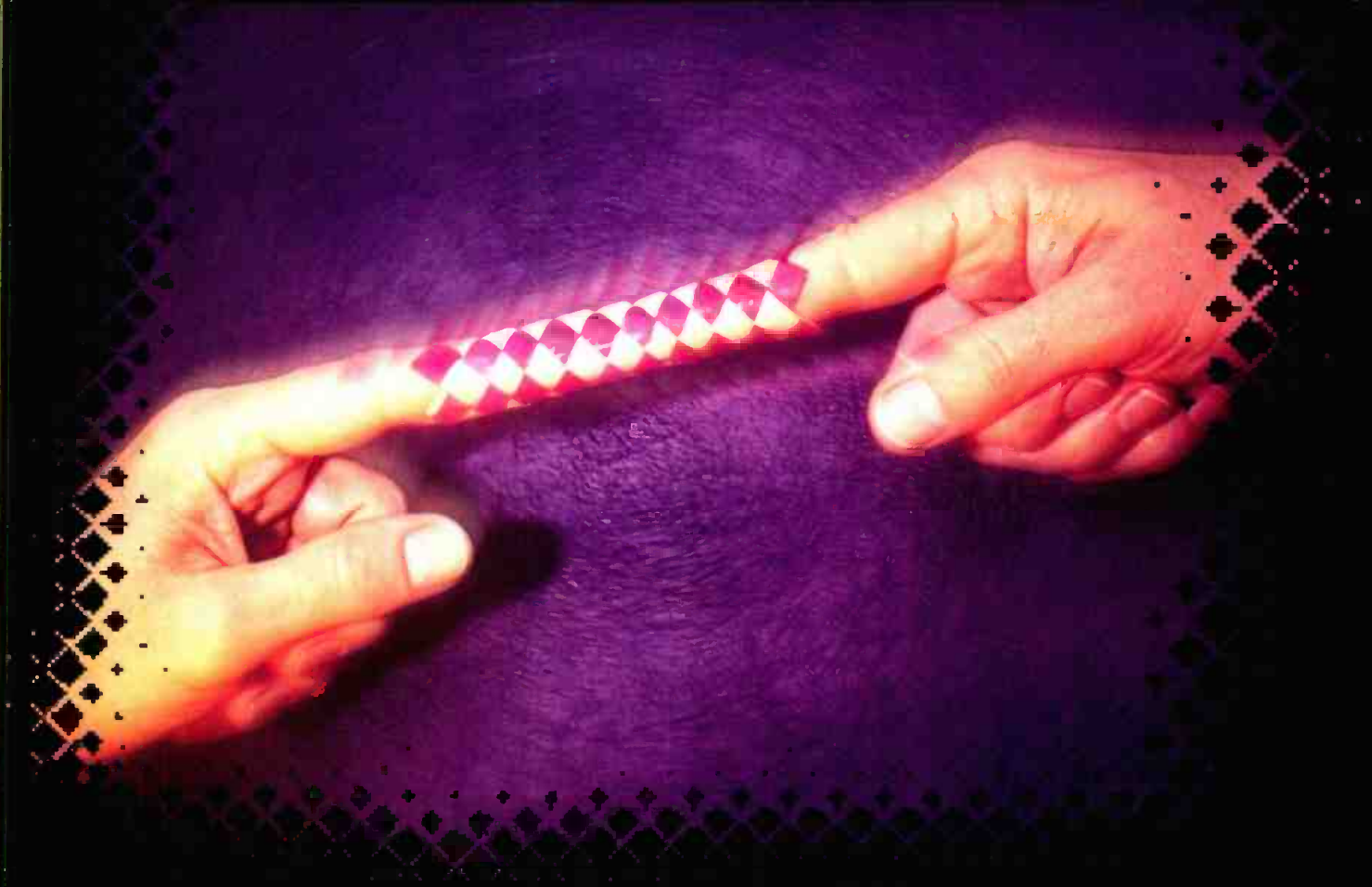
New digital encryption

The front runner in the "protection" racket seems to be a technique called 5C and will work via the IEEE-1394 interface, which Hitachi, Intel, Panasonic, Toshiba and Sony have backed. In addition to this, Intel Corp. unveiled a copy protection scheme earlier this year. It will add a layer of encryption between the system and the digital display. The High-bandwidth Digital Copy Protection (HDCP) approach encrypts each pixel as it moves from either a personal computer or set-top box to the digital displays.

HDCP encrypts the final link, from the device to the display. This has been the missing link in the various copy protection schemes developed thus far. This technology was successfully demonstrated in Silicon Valley in late February. Transmitter and receiver chips performed the HDCP authentication, encryption, and decryption functions, while supporting the digital video interface transmission rate of 5Gb/s between the host and display. HDCP uses a 56-bit key, with individual keys distributed to the various vendors. A violated key could be tracked down and revoked over a satellite broadcast network, for example.

5C, on the other hand will allow a movie to be transmitted with a marker that will allow it to be copied freely, copied just once or not copied at all. The Catch-22 in this equation is that Hollywood and the cable companies must agree on how movies are to be marked. Despite the fact that this will create more problems than it will solve, it seems to be the technology the FCC favors.

The reason that this works without elaborate copy protection schemes is quite simple. A copy requires a new verification. Once the copy has been authorized it can be played anywhere and copied freely. The copies however



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will require re-authentication before they can be viewed. What makes this nice for the content owner is that authentication can be deferred via a cash card; when you have access to a network, the transaction can be completed, or if you already own the rights, the fee will be credited back to the card.

As you might expect, there is virtually no interoperability among today's bit-streams that exist today (digital cable, DBS, DVD or DTV). Each one of these "standards" is based on the popular MPEG-2 compression and encoding scheme, but proprietary add-ons make it nearly impossible for one system to work with another, even when it is similar.

A good example of digital delivery is our country's direct to home (DTH) services. A subscriber can go nearly anywhere in the U.S. and receive good pictures. However, the integrated receiver decoders of the two surviving DTH companies, DirecTV and EchoStar, are not compatible. There is really no reason for these differences as conditional access; subscriber management systems and smart cards are all that is necessary to confine reception by a subscriber to what the provider is being paid for. Cable is gar worse in terms of compatibility, there are more than 80 different STBs and encryption systems used in the cable industry.

The major Hollywood studios have not agreed on whether or how the 5C system will be used and there is still no guarantee in the end that Hollywood will agree to copy protection protocols of any kind, in time. Reports are that 20th Century Fox doesn't think 5C is secure enough. Other studio moguls may be comfortable with 5C but resent the idea that the industries have decided to deploy it before they have "worked out arrangements" with the studios. While another faction feels that this is premature as all the standards have not been set, giving them much less flexibility in "negotiations." The last time Hollywood geared up to fight technology was back in 1984, when it lost a Supreme Court battle to ban the home video player, but today the story could have a much different ending. This time the industry has the Digital Millennium Copyright Act (DMCA), of 1998. This sleeper gives copyright owners unprecedented control over products such as DVDs or CDs. What makes this law such a wicked weapon is that it gives the entertainment industry content control even after the products have been sold and extends over previously legal actions.

One entertainment attorney this could make the use of your VCR illegal, because they can be used to tape copyrighted TV shows or movies. In fact, according to the judicial reading of the Digital Millennium Act, virtually anything that circumvents copy protection is illegal.

It is small wonder that motion picture interests are gearing up to wage war on the open-source culture in general. I have been told that two such industry trade groups are the Motion Picture Association of America (MPAA) and the DVD Copy Control Association (DVD CCA). ■

Exposure deadline looms

The Federal Communications Commission (FCC) recently issued a Public Notice to remind license holders of the rapidly approaching Sept. 1, 2000 deadline about the compliance to human exposure to radio frequency (RF) signals regulations.

There is little doubt that most RF transmitters must already be operated in compliance with the FCC's human exposure to RF signal rules, but certain "devices, facilities and operations" could have postponed compliance until this final date of September 1, 2000. The applicable law is 47 CFR 1.1307(b)(1) – (b)(3). In the notice the FCC points out that if you are not in compliance with the provisions of that law, get your act together and do it or grantee your are taking appropriate action to comply. If it's going to take you longer than the Sept. 1 deadline, then you have to file an Environmental Assessment (EA) with the Commission, but no later than Sept. 1, 2000. The FCC says, "It is your responsibility."

If an EA is required, the FCC says the obligation to file it falls on the licensee presently holding the permit/license to transmit, or the party presently holding the grant of equipment authorization. The FCC points out that: "With respect to antennas located on fixed structures, it is the responsibility of the respective licensees, not the tower owners," to do and file EAs, when required. But that's not all; EAs should include non-RF environmental issues as well.

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You can choose to ignore all this. But if you do, and the areas you are responsible for are found not to be in compliance with RF exposure guidelines, or if you have failed to file the required EA, you could be fined or face FCC action.

It is important to note that the FCC's RF exposure rules apply to "all facilities, operations and devices" regulated by them. While a given facility, operation or device might, for whatever reason, be excluded from routine evaluation for RF exposure; it must still comply with the FCC's exposure guidelines.

The impetus for this "safety limits for human exposure to RF emissions" business finds it geneses in the rules the FCC adopted in August 1997. The effective dates for implementation were staggered over a three year period and specifically included devices such as cellular and PCS telephones, other transmitting facilities and operations, including the Amateur Radio Service. For those authorized or licensed by the Commission prior to the timetable, the FCC gave a break and said: "All existing transmitting facilities, operations and devices regulated by the Commission must be in compliance by Sept. 1, 2000, or, if not in compliance, file an Environmental Assessment."

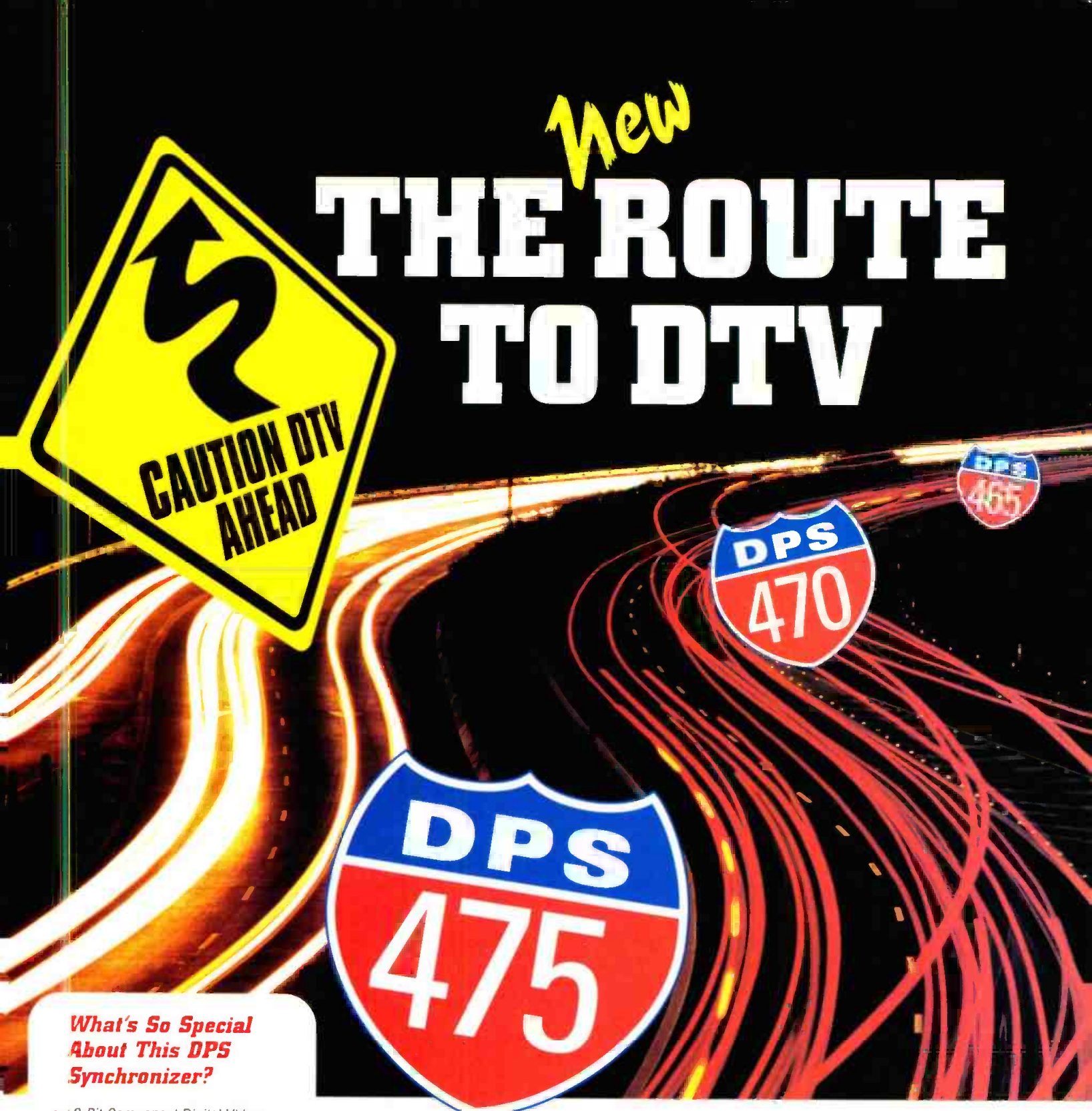
Unless you are an ecologist, the chances are fairly good that you don't know what an "Environmental Assessment" is. An EA is "a formal document required by the National Environmental Policy Act whenever an action may have a significant environmental impact," so says Section 1.1311 of the Commission's rules. This is where you can find out what information must be included in an EA.

The FCC requires that an EA "accompany all applications for licenses, renewals or other Commission actions when there is evidence of environmental impact for a variety of categories." The FCC says they need the EA to determine whether the environmental impact described is significant and if further action is needed to minimize or eliminate the environmental effect. ■

Lookout HDTV! What's next?

The National Association of Broadcasters announced in February that with the addition of KNXV-DT in Phoenix and WRDW-DT in Augusta, GA, the number of digital stations nationwide had reached 119. Looking at total digital penetration into the U.S. market, NAB further says that U.S. digital television now reaches 61.28 percent of all TV households nationwide. With not even 7.5 percent of the full power television stations in the US offering digital service, one would think that concentration would be devoted to developing this technology and all the benefits that digital television has to offer.

According to Hitachi America, that's only the beginning. Gerard Corbett, senior marketing manager at Hitachi America in Millbrae, CA said the company has developed and sold the next generation "stereoscopic cam-



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era," the C-3Dvision HT, to C-3D Digital Inc. who claims to be the world's first 3D television network and 3D Internet media company.

There's a lot more to building a stereoscopic camera than just putting two identical cameras next to each other. The development of the C-3DVision HT stereoscopic camera was a joint venture between Hitachi and C-3D Digital's camera designer, Ken Robings. Robings used two Hitachi HV-D27, three-CCD chip, digital video camera heads, and combined them with a proprietary C-3DVision tracking system to form the "C-3DVision HT."

What's stereoscope?

But who is "C-3D Digital" and what's a 3D stereoscopic network? According to Doug Stanley, C-3D Digital's General Manager, C-3D is a team of inventors who manufacturer and develop 3D imagery and virtual reality entertainment for television and the Internet. C-3D Digital operates C-3D Television, which Stanley says: "is the world's first and only broadcast network to offer 24-hour, 7 days a week 3D stereoscopic programming."

C-3D Digital recently formed "3D.COM," which is a 3D virtual reality portal. It is set to launch later this year and will feature streaming video over the Internet, real-time online electronic video gaming and e-commerce solutions in stereoscopic 3D. 3D.COM also includes Strata software and the Hotel Movie Network.

Hitachi America has developed and sold the next generation "stereoscopic camera," the C-3Dvision HT.

The technology is relatively simple and not really new. Using their propriety Hitachi camera and lenses, C-3D Digital takes alternate fields from each of the two camera heads and combines them into one 525 line 30 frame interlaced picture. When the material is played back, the video is fed through an infrared strobing device, which is triggered by the vertical sync pulses. This turns the right and left lenses of liquid crystal glasses the viewer wears, on and off, corresponding to the proper field that is on the screen.

Stanley said: "C-3D Digital is anxiously awaiting the opportunity to produce material, using our proprietary technology, in 1080i high definition television; the 16:9 aspect ratio and the sharper pictures will only enhance the stereoscopic experience."

For more information, visit www.3d.com.

Send questions and comments to: larry_bloomfield@intertec.com

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FCC Update

New FCC EEO rules adopted

BY HARRY MARTIN

In April, the following new EEO recruitment and record-keeping requirements will become effective.

Recruitment

The new rules provide broadcasters with the following two options ("A" and "B") to meet their basic obligation under the new rules to widely disseminate information concerning full-time job vacancies:

OPTION A

Recruitment measures:

• Send notices of each full-time job opening to qualifying organizations that request such notices; and

• Undertake two (for employment units with five to ten full-time employees) or four (for larger employment units) longer-term recruitment initiatives within a two-year period, e.g. participation in at least four job fairs by station personnel who have substantial responsibility in making hiring decisions; hosting at least one job fair; co-sponsoring job fairs with women's and minority groups in the business and professional community; participation in scholarship programs directed to students desiring to pursue a career in broadcasting; sponsorship of at least two events in the community designed to inform the public of employment opportunities in broadcasting.

Record-keeping:

• Collect, but not routinely submit to the Commission: (i) listings of all full-time jobs filled, identified by job title; (ii) the recruitment sources used to fill each vacancy, including any organizations which requested notification; (iii) the address, contact person and telephone number of each recruitment source used to fill each position; (iv) dated copies of all advertisements, letters, e-mails, faxes, etc. used to fill each vacancy; (v) documentation necessary to demonstrate performance of supplemental outreach initiatives, e.g. job fairs, mentoring programs; (vi) the total number of interviewers for each vacancy and the referral source for each interviewee; and (vii) the date each job was filled and the source that referred the hiree.

• Place in the station public file annually a report including the following: (i) full-time jobs filled during the previous year; (ii) recruitment sources used for those vacancies; (iii) address, contact person and telephone number of each recruitment source; (iv) recruitment source for each hiree; (v) recruitment source for each interviewee; and (vi) description of any other initiatives implemented during the previous year.

OPTION B

Alternative recruitment program:

• Design one's own broad and inclusive outreach program; and

• Demonstrate that the station is widely disseminating information concerning job vacancies by analyzing the recruitment sources, race, ethnicity and gender of the applicants attracted by its recruitment efforts.

Record-keeping:

• Collect, but not routinely submit to the Commission: (i) listings of all full-time jobs filled, identified by job title; (ii) the recruitment sources used to fill each vacancy; (iii) the address, contact person and telephone number of each recruitment source used to fill each position; (iv) dated copies of all advertisements, letters, e-mails, faxes, etc. used to fill each vacancy; and (v) data reflecting the recruitment source, gender, and racial/ethnic origins of applicants for each full-time job filled.

• Place in the station's public file annually a report containing the following: (i) full-time jobs filled during the previous year; (ii) recruitment sources used for those vacancies; (iii) address, contact person and telephone number of each recruitment source; and (iv) recruitment source, race, gender and national original for each applicant.

By June 1, 2000, every broadcaster must select one of these two options. The election statement must be filed with the FCC and placed in the station's public file.

Reporting requirements

In addition to the new public file requirements stated for Option A and Option B above, broadcasters must file a Statement of Compliance (Form 397) every second, fourth and sixth year of the license term, on the anniversary of the date the station is due to file its renewal, stating whether the station has complied with the EEO Rule. Broadcasters must place a copy of their latest Form 397 in the public inspection file.

By Sept. 30 of each year, broadcasters also will be required to file, and place in their public files, a Form 395-B ("Broadcast Station Annual Employment Report"). These reports, which include detailed employment profile data as before, will not be used in evaluating EEO performance; rather, the FCC plans to use them to track overall industry performance under the new EEO rule.

At renewal time, stations must file a modified Form 396 ("Broadcast Equal Employment Opportunity Program") and submit the contents of their station's EEO public inspection file, described above, for the year prior to filing the renewal. Such public file materials (i.e. for the previous 12 months) also must be submitted midway through the license term by stations with 10 or more full-time employees. ■

Dateline

The next deadline for the filing of biennial ownership reports will be February 1, 2001. The first annual ownership report will be due Sept. 30, and annual regulatory fees will again be due in mid-September.

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

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

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Choosing a tape format

BY JIM SALADIN, SENIOR ASSOCIATE EDITOR

Choosing a house tape format is one of the biggest decisions you can make as an engineer. Your choice, right or wrong, will live with you and your facility for years to come through legacy equipment, future questions of expandability and updatability, and archival content. Face it, you need to get this one right.

With nearly twenty digital formats available, it's difficult to know what are the right questions to ask. Toward that end, we've posed the following question to representatives from the three major players in the tape format arena — Dave Wiswell from Panasonic, Tom Evans from Sony, and Juan Martinez from JVC — as well as Paul Black, an industry veteran who has just recently helped to define his station's format needs for the foreseeable future: *With the multitude of options in digital tape formats, what factors are the most important to consider when choosing a new house format?* ■

Send questions and comments to:
jim_saladin@intertec.com

VENDOR

Dave Wiswell, Panasonic

Selecting a digital videotape format today is more complex than the VTR purchasing decision of a few years ago. Where previously, a VTR purchaser's biggest concern was compatibility with other VTR users and cost. Today, with the emergence of DTV, there's a whole new paradigm to consider; there's no longer just one television image format, NTSC.

Today, any major purchase decision needs to factor in the transition to the new ATSC system, with its 18 different video formats. As the industry moves into the ATSC era, Panasonic is receiving great interest in a variety of image formats, including rapidly-growing interest in 480-line progressive, and three HD image formats – 1080i/60, 1080p/24, 720p/60, as well as standard-definition 480i. Selecting a new digital tape format wisely will include deep consideration and thorough research of this new multiple image format reality.

Videotape recorder design is a well-defined science today and customers should expect high-performance features and a high degree of reliability. However, buyers will need to take into special consideration their digital audio and metadata recording needs. The ATSC standard increases the need for audio channels in videotape machines. High-end VTRs may need to provide up to eight channels of high-quality digital audio.

Closed captioning and other digital signals used to be recorded in the VTR video's vertical interval. With ATSC, the vertical interval does not exist like it did with NTSC, so VTRs need to have some new capability to manage data signals like closed captioning. Because almost all modern digital VTRs use an image compression scheme that will destroy digital data signals, it is imperative that new digital tape formats include ancillary data recording. I strongly recommend that buyers consider their current and future metadata recording needs when purchasing their next digital VTR.

Videotape recorders should be based on extensible digital recording platforms that manufacturers will continue supporting and expanding for the extended future. DVCPRO is a good example. The digital video in a DVCPRO recording is directly compatible with computer video .DIF files, and applications, like computer networking, clearly demonstrate the different environments new tape machines will work in. A digital VTR needs to be extensible and offer compatibility with rest of the digital video world.

DV compression is an excellent example of a truly extensible system that works in digital VTRs, in multiple image formats, and at variable data rates: 25Mb/s, 50Mb/s and 100Mb/s. Each level is compatible with the other, because the same compression engine is used; simply putting compressors in parallel to increase video data rates.

DV has also become extremely popular in computer platforms as a compressed video format. This has occurred in large part to the expansion of consumer digital video, as well as its unique ability to be extended into the professional environment. DV's uniqueness is its acceptance by a wide segment of the digital video market, which has led to reductions in VTR prices and a better overall value for VTR users.

In addition to key factors like metadata recording and digital audio, purchasers should add these items to their VTR buyer's check list: the VTR's or format's proven reliability; the durability and quality of its recording tape; its compactness/weight and power consumption; its overall ownership and maintenance costs; and its unique benefits, like time-saving 4X real-time transfer to speed up NLE story editing and SDTI data transfers via ATM networks. Also, in your operation, you may require a range of recorders for different applications, so look for a format that can deliver extensive VTR choices from high-end production to entry-level. Finally, purchasers should compare each digital VTR format's interchange capabilities and future migration path.

Dave Wiswell is group manager, VTRs, for Panasonic Broadcast.

SONY

"Once you get comfortable in HDCAM, you never want to go back."

—Angus Yates, Executive Producer for Discovery Channel's Eco-Challenge

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VENDOR

Tom Evans, Sony

For any video company — from a one-person wedding videographer to the largest global newsgathering organization — choosing a house format is a mission-critical decision. It impacts the long-term value of your content in so many ways.

You need compatibility with future distribution formats. You want the assurance of compatible players and systems well into the future. And you absolutely need a format with the archival stability to protect your recorded assets. Another crucial consideration is the form factor. Smaller media — or longer recording times for a given media size — correspond to lower storage and archiving costs.

As a leader in both video recorders and video recording media, Sony is uniquely qualified to offer guidance. For 50 years, Sony recording media engineers have worked side-by-side with its hardware engineers to refine track widths, design head gaps and ensure robust, reliable performance. With this background, we can make some general recommendations.

- **Think digital.** Acquisition and production must keep pace with the quality of distribution channels. In the age of DTV, DSS and DVD digital distribution, only digital formats will do.
- **Think metal.** As the first to introduce metal particle videocassettes, Sony has created the key enabling technology demanded by today's high-quality, complex recording needs. Sony has maximized capacity and durability performance through continued refinement of metal media.
- **Think compression.** Compression is an enabling technology that allows digital video recording to be more affordable, cost-efficient, practical and convenient. Without compression, recording times are far shorter and running costs are far higher.

Tom Evans is vice president, Marketing for Sony Electronics' Media Solutions Company

VENDOR

Juan Martinez, JVC

Broadcasters choosing high-quality digital video equipment as a "house format" must consider three mission-critical determinants: quality, reliability and upconversion for HDTV.

JVC conceived of its 50Mb/s 4:2:2 component digital D-9 as the logical format to take the industry into the digital future and, ultimately, to HDTV production and broadcasting. With high-resolution 4:2:2 digital sampling, and the ability to record 480/30p signals in 16:9 aspect ratio, D-9 is DTV ready today.

One of the core design elements in D-9 is the choice of 1/2-inch tape. Like the majority of other high-end formats (D3, D5, Digital Betacam), D-9 relies on half-inch tape because it allows for the recording of a vast amount of data – including the high data capacity required for HDTV television — but also for the additional strength and reliability it offers. D-9 uses metal particle tape for high performance and reliability, and because it allows users the ability to record up to 124 minutes of recording time — even in the field.

JVC designed D-9 for ease of maintenance and high reliability. Designed around a proven tape transport mechanism and with a low mass inner drum assembly that minimizes headwear, JVC's engineers got it right in their design of D-9. From genuine sapphire tape flanges to ceramic tape guides, the inner workings of the D-9 machine were designed to provide maximum image quality and low maintenance costs.

The broadcast and production industries are quickly marching toward 16:9 digital television. Once again, the choice of 50Mb/s, data-rich 4:2:2 digital sampling, mild 3.3:1, I-frame only DV compression and half-inch tape is proving to be a strong method for moving seamlessly into DTV broadcast. Because of its data-rich 4:2:2 digital signal processing and mild compression, tapes recorded in standard-definition D-9 achieve a richness of color and a striking clarity when mastering on MPEG-2 or upconverting to HD – an essential for producers and broadcasters alike.

D-9 is capable of accepting 480/30p signals for digital broadcast and multicast. Looking ahead to HDTV, artifact-free, data-rich 4:2:2 images look astonishingly good when upconverted to HD. This allows today's D-9 equipment to work well within today's infrastructure, and to maintain its usefulness and functionality as the industry progresses toward high-definition. D-9 users will have full use of existing tape libraries when the industry shifts to HDTV.

Juan Martinez is manager of Digital Recording Formats for JVC.

EXPERT

Paul Black, KPIX

The criterion that you apply to choosing a digital tape format is much the same as that you would use in choosing any tape format. We'll get to the specifics in a moment, but first, a broader question has to be answered; is tape on it's way out?

We're all aware that some industry prophets are telling us that tape is dying, and that nonlinear editing and hard disk storage is the wave of the future. Does this spell the end for magnetic media?

Absolutely not. Keep in mind two sets of facts about acquiring and editing video, any video, including any form of high-definition.

First, tape is going to be around for a long time. It will remain the media of choice in broadcasting for field acquisition and editing. It also continues to have a variety of advantages for use pertaining to in-house storage and retrieval. Nothing else has the reliability, familiarity, and convenience of use for most broadcasters.

Second, although the cost of maintenance on tape-based equipment can be very high, the necessary maintenance is a known factor. Any tape machine

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DIGITAL MULTI PLAYER (HD)

PLAYBACK CAPABILITY

- HDCAM
- MPEG IMX
- BETACAM SX
- DIGITAL BETACAM
- BETACAM SP
- BETACAM

DIGITAL MULTI PLAYER (SD)

PLAYBACK CAPABILITY

- MPEG IMX
- BETACAM SX
- DIGITAL BETACAM
- BETACAM SP
- BETACAM

SONY

1/2-INCH FORMAT

Engineered for Evolution

SPECIAL ADVERTISING SUPPLEMENT

Engineered for Evolution
1/2-INCH FORMAT
Engineered for Evolution

SONY'S HALF-INCH PLATFORM:

THE WHOLE STORY.

The world of television has dramatically changed since Sony launched the original Betacam® half-inch format. For a decade and a half, the industry has seen unceasing innovation in Electronic Newsgathering (ENG), Electronic Field Production (EFP), studio production and postproduction. We've now embarked on a protracted transition from Analog to Digital Television — one that will see a long-term coexistence of both. And we face the looming transition from broadcasting a single channel to multicasting digital SDTV and HDTV, both heavily predicated on digital compression technology.

Different manufacturers have taken quite different approaches to these changes. Sony has chosen to steer a single half-inch recording platform through eighteen years of transition and growth. Throughout, we've insisted that those in the television program-making business who have chosen Sony's Half-Inch Platform should not be disenfranchised — regardless of their migration path. Over the years, Sony has followed a consistent strategy:

- **To protect legacy half-inch program material, now numbering over 150 million tapes.**
- **To maximize flexibility in industry migration.**
- **To mobilize the most contemporary technologies and industry standards.**

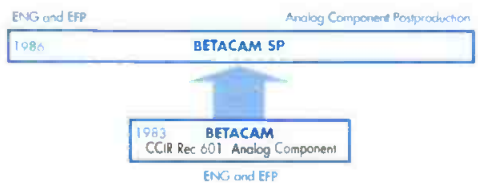
This remains our central strategy.

HALF-INCH GOES PROFESSIONAL:

BETACAM RECORDING.

In 1982, Sony proposed to the SMPTE Working Group on Half-Inch Recording a component analog system. Based upon the new CCIR component set, this was the first Y, R-Y, B-Y recording system. Called the Betacam format, it astonished the industry with superb acquisition images and rich color bandwidth. And it forever transformed the world of ENG and EFP.

Betacam equipment triggered the rapid adoption of component analog post-production. And that soon stimulated demand for more robust multigeneration recording. Sony responded with metal particle tape, new recording heads and improved signal processing to create the Betacam SP® system. Over the next six years, Betacam SP equipment propelled component thinking and component postproduction systems worldwide.



The advent of component video recording radically changed television production.

1986

BETACAM SP
Analog Component
PostProduction
ENG and EFP

1982

BETACAM
CCIR Rec 601
Analog Component
ENG and EFP

Engineered for Evolution

2000
MPEG IMX
MPEG-2
4:2:2P@ML & HL
PLAYS ALL PRIOR
1/2-INCH FORMATS

1996
BETACAM SX
MPEG-2
4:2:2P@ML
WILL PLAY IN
MPEG IMX VTR

1993
DIGITAL BETACAM
Rec 601
4:2:2
WILL PLAY IN
MPEG IMX VTR

TRANSITION TO DIGITAL

1986
BETACAM SP
WILL PLAY IN
MPEG IMX VTR

BETACAM
CCIR Rec 601
Analog Component
WILL PLAY IN
MPEG IMX VTR

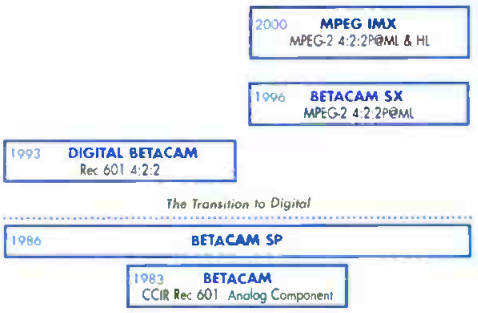
HALF-INCH AND THE MPEG WORLD:

VIDEOTAPE RECORDER MEETS DIGITAL DISK RECORDER.

In broadcast news, the Betacam SX format became a spectacular success. At the same time, the growing adoption of disk-based technologies for nonlinear on-line editing, servers, and networking drove increasing demand for the efficiencies of compression. Emerging interest in multi-channel services, DTV, DVB and DVD distribution also intensified the desire to use one compression algorithm throughout a broadcast infrastructure.

Soon the Betacam SX compression technology, based squarely upon the MPEG-2 4:2:2 Profile at Main Level, became broadly accepted. In concert with some of the world's major broadcasters and encouraged by the many members of the Pro MPEG Forum, Sony developed the next logical extension to Betacam SX recording — this time based upon the high end of the 4:2:2P@ML, namely 50 Mbps. The new system was designed to record all "I" frames (GOP = 1). These specific criteria had become popular for signal interfacing via SDTI-CP between MPEG-2 4:2:2P@ML equipment from diverse manufacturers. These criteria would enable straightforward integration of the new VTRs with a world of servers, digital disk recorders and nonlinear editors, from Sony and other industry leading manufacturers.

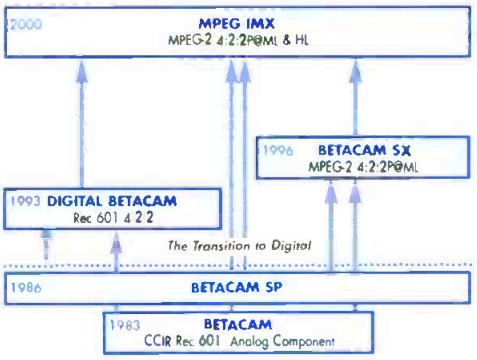
This time a half-inch tape recorder and a disk recorder were developed in concert. The tape recorder is Sony's new MPEG IMX™ VTR, which was originally shown at NAB'99. The companion digital disk recorder is Sony's MAV-555, which was introduced in 1999. Both record and play back the 50 Mbps MPEG-2 4:2:2P@ML format. The combination of the two opens a plethora of applications throughout the broadcast facility, mobile trucks and post-production systems.



The Half-Inch Platform climbs to the highest rung of the MPEG-2 4:2:2P@ML standard.

This new VTR squarely ties the new MPEG world with the expanding world of 150 million Betacam tapes. In addition to recording and playing back the MPEG profile, the new VTR can play back all of the legacy Betacam formats. Also, a new Digital Multi Player will play back all of the legacy Betacam formats.

For example, Digital Betacam tapes, which remain the epitome of 4:2:2 Standard Definition acquisition, can be played back and internally translated to 50 Mbps MPEG-2 4:2:2P@ML via the new MPEG IMX VTR. The signal can then be fed via the built-in SDTI-CP interface into an MPEG-based broadcast system.



The new Half-Inch MPEG IMX VTR will play back all of the SDTV Betacam formats — both digital and analog.

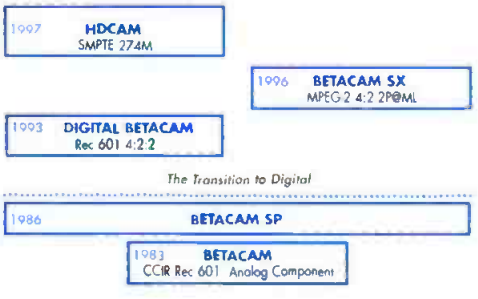
Betacam SX tapes are easily transcoded to the same 50 Mbps I-Frame format, simply by playing them in the MPEG IMX VTR. This enables Betacam SX material to be integrated into many of the server-based systems now complying with the 50 Mbps MPEG-2 format. The above diagram summarizes the legacy playback modes of the MPEG IMX VTR.

HALF-INCH GOES HIGH DEFINITION:

HDCAM RECORDING.

Sony has been building commercial high-definition equipment since 1984. Sony equipment stood behind landmark HD productions in feature films, commercials, music videos and mini-series. Based on this experience, our concept for HDCAM® recording was simple. With the analog Betacam format as a model, Sony understood that a highly mobile camcorder and a cost-effective, "workhorse" editing VTR would spur broad adoption of high definition production. This, in turn, would help propel the much-needed creation of DTV program material.

Once again, Sony designed a camcorder and a VTR in concert — operating on the same half-inch recording platform. The HDCAM format was introduced at NAB'97 and the first product was delivered late that year. The world's first all-digital high definition camcorder electrified the industry. At long last, HDTV had broken out of the studio to become as mobile as contemporary SDTV.



Like Digital Betacam recording, the new HDCAM system used a proprietary compression algorithm, as no standardized algorithm had yet been created for HD.

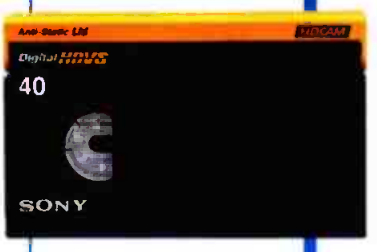
HDCAM RECORDING AS A SYSTEM:

EFFICIENT HD PROGRAM CREATION.

The genius of HDCAM recording lies in its Bit Rate Reduction. The data rate is not much higher than that of Digital Betacam recording. This results in efficiency beyond any previous HD system:

- **A compact, HD camcorder with 40-minute recording and exceptional integrity under all sorts of environmental conditions.**
- **A portable VTR capable of 124-minute recording in the field.**
- **Routing and distribution of HD material through standard 270 Mbps routers.**
- **High recording efficiency on disk-based servers and Digital Disk Recorders (DDRs).**

In short, HDCAM was developed as a working system to facilitate practical DTV production. The low data rate enabled Sony to base HDCAM equipment on the successful Digital Betacam hardware. HDCAM equipment duplicated the successful operating features of Digital Betacam equipment. The resulting economies of scale also made HDCAM equipment remarkably cost-effective. This has been particularly noted by many filmmakers who see HDCAM acquisition as a powerful new creative alternative to motion picture film origination.



1997 **HDCAM**
SMPTE
274M

1996 **BETACAM SX**
MPEG-2
4:2:2MP@ML

1993 **DIGITAL BETACAM**
Rec 601
4:2:2

TRANSITION TO DIGITAL

1986 **BETACAM SP**

1983 **BETACAM**
CCIR Rec 601
Analog Component

Engineered for Evolution

2000 — **HDCAM 24P**
ITU 709
Multi Frame Rate
24P/25P/30P & 60i/50i
PRIME TIME PRODUCTION AND MOVIE-MAKING

2000 — **MPEG IMX**
MPEG-2
4:2:2P@ML & HL

1997 — **HDCAM**
SMPTE
274M
1080/60i
MAINSTREAM DTV

1996 — **BETACAM SX**
MPEG-2
4:2:2P@ML

1993 — **DIGITAL BETACAM**
Rec 601
4:2:2

TRANSITION TO DIGITAL

1986 — **BETACAM SP**

1983 — **BETACAM**
CCIR Rec 601
Analog Component

THE SUCCESS OF HDCAM RECORDING:

HD PROGRAM CREATION.

Measuring the success of 1080/60i HDCAM equipment is easy. Simply consider the wide array of premier programs already created or being created in the HDCAM format:

- **Over 12 current primetime episodics are being posted in the HDCAM.**
- **Four HDCAM camcorders shot 960 hours to produce twenty-two episodes of the prime time production "The Secret Adventures of Jules Verne."**
- **Discovery Channel took 20 HDCAM camcorders to the Andean peaks to cover the 1999 Eco-Challenge race.**
- **In July 1999, an HDCAM camcorder captured stunning images from NASA's Space Shuttle as it deployed the Chandra X-Ray telescope.**
- **Woods Hole Oceanographic Institute brought back images from 3000 meters under the ocean.**
- **No less than six feature length movies, including: "Solid Ones," "Seven and a Match," "Last Mountain," "Divorce the Musical," "Pride and Peril" and "Ivansxtc."**

With more than 250 1080/60i camcorders now in the U.S. marketplace, the HDCAM format is leading the wave of HD production for the DTV era.

THE HDCAM FORMAT GROWS:

HDCAM COMES OF AGE.

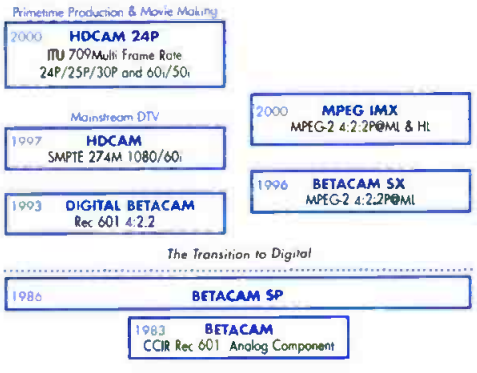
The HDCAM format soon became a *living* system – one that would branch out to encompass all the complexities of the evolving digital HDTV and SDTV era.

- **The HDCAM system established the final major bridge between motion picture film and digital acquisition — with its 24 frames per second, progressive scan (24P) variant.**
- **The HDCAM format encompassed the world HD stage — heralding a new era of *switchable* 50/60 Hz HD acquisition equipment including interlace and progressive variants capable of operating anywhere in the world.**
- **HDCAM players would incorporate legacy playback of ALL our digital half-inch formats, as well as analog Betacam tapes.**

HALF-INCH GOES PROGRESSIVE:

HDCAM 1080/24P.

The HDCAM format helped build the final, crucial bridge between HD and motion picture film. These two media converged on the long-established platform of 24 frames per second. The 24 frame progressive scan version of HDCAM equipment – HDCAM 1080/24P – was introduced at NAB'99 and the first product was delivered to the post community in the summer of that year. Once again, a 24P camcorder and an editing VTR formed the core system. Our 24P switchers, DMEs, editors, and HD displays simultaneously flanked this new HDCAM extension. In 1999, no less than eight major network DTV shows were posted in HDCAM 24P.



The addition of the 24 frame progressive version of HDCAM recording provides a tool for high-end DTV program origination that is traditionally shot on film.

24P HDCAM ACQUISITION:

A SHOOTING AGENDA.

In 1995, Sony established a working relationship with Lucasfilm. Together, we explored the potential for Widescreen Digital Betacam acquisition in digital movie making. A series of tests including transfers to 35mm film established important benchmarks in image quality. Exposure latitude and color reproduction were judged to be fully satisfactory. Resolution, as expected, did not match that of 35mm film, but it was nevertheless encouragingly close. On this basis, Lucasfilm urged Sony to push hard on the development of the digital HD camcorder.

This collaboration helped establish the practical criteria for HDCAM acquisition to become a valuable adjunct to motion picture film. Central to this effort was the very high optical quality required in the lenses for the smaller 2/3-inch HDCAM image format. Sony turned to Panavision to resume a technical collaboration we had begun in the late 1980's with earlier HD studio cameras. This time, Panavision elected to invest significantly in the design of a range of totally new cinematography lenses specifically for the HDCAM camcorder. They also developed a full range of the accessories familiar to the film cinematographer. Lucasfilm and Industrial Light and Magic tested this total system through the past winter. Final versions of these products will soon be delivered to them. Lucasfilm is poised to begin shooting elements of the new "Star Wars" movie soon in Australia, Tunisia and Italy Throughout 2000, significant new horizons in digital movie making will be explored by 24P HDCAM acquisition.

HALF-INCH GOES GLOBAL:

THE SWITCHABLE WORLDWIDE HDCAM SYSTEM.

The year 2000 sees DTV moving into high gear. The impact on program production is immense. The DTV agenda is also picking up speed in other regions of the world, and this, in turn, has significant implications for U.S program production.

In June of 1999, following a decade and a half of international work within the ITU, a seminal agreement was reached on a worldwide high definition format for program production and international program exchange. Based squarely on the 1920 x 1080 digital format, this standard recognizes the world's diverse requirements in field and frame rates. The standard includes 60/50/30/25/24 Frame Progressive origination in addition to the all-important 60 and 50 Field Interlaced.

At NAB'00, Sony unveiled the first generation of HD products designed according to this standard.

The new HDCAM camcorder is the HDW-F900. Originally conceived for our 24P system, it quickly evolved into something more. It's the world's first truly global product — switchable among 30, 25 and 24-Frame Progressive, as well as 60 and 50 Hz Interlaced. That's right — it has five separate picture capture rates! This single unit can shoot HD in every region now moving into DTV: North America, Europe, Asia, and Australia. This is the camcorder now being evaluated by George Lucas and many others for digital origination of movies as well as prime time HD television production.

2000 — **HDCAM 24P**
ITU 709
Multi Frame Rate
24P/25P/30P & 60i/50i
PRIME TIME PRODUCTION AND MOVIE-MAKING

2000 — **MPEG IMX**
MPEG-2
4:2:2P@ML & HL

1997 — **HDCAM**
SMPTE
274M
1080/60i
MAINSTREAM DTV

1996 — **BETACAM SX**
MPEG-2
4:2:2P@ML

1993 — **DIGITAL BETACAM**
Rec 601
4:2:2

TRANSITION TO DIGITAL

1986 — **BETACAM SP**

BETACAM
CCIR Rec 601
Analog Component

Engineered for Evolution

2000 **HALF-INCH HD DIGITAL MULTI PLAYER**
Upconversion to 1080

2000 **MPEG IMX**
MPEG-2
4:2:2P@ML & HL
PLAYS IN MULTI FORMAT PLAYER

1997 **HDCAM**
SMPTE 274M
PLAYS IN MULTI FORMAT PLAYER

1996 **BETACAM SX**
MPEG-2
4:2:2P@ML
PLAYS IN MULTI FORMAT PLAYER

1993 **DIGITAL BETACAM**
Rec 601
4:2:2
PLAYS IN MULTI FORMAT PLAYER

TRANSITION TO DIGITAL

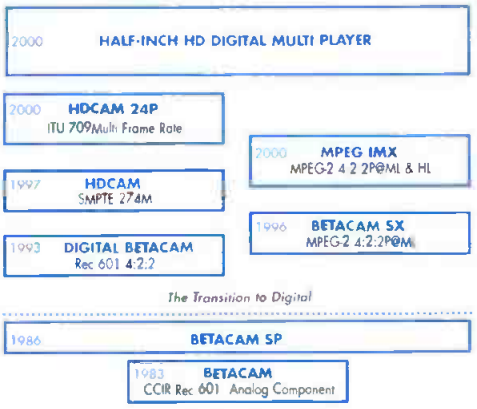
1986 **BETACAM SP**
PLAYS IN MULTI FORMAT PLAYER

1983 **BETACAM**
CCIR Rec 601
Analog Component
PLAYS IN MULTI FORMAT PLAYER

HALF-INCH GETS UNIFIED:

THE HD DIGITAL MULTI PLAYER.

We've seen Sony's tiered approach to the Half-Inch Platform, with a variety of formats serving multiple needs. Now the digital marketplace is demanding the ability to move program material smoothly between HDTV and SDTV. The Half-Inch platform, common to both HD and SD formats, is tailor-made for this requirement. Sony's Half-Inch HD Digital Multi Player is equipped with universal playback capability for Betacam, Betacam SP, Betacam SX, MPEG IMX, Digital Betacam and HDCAM legacy tapes.



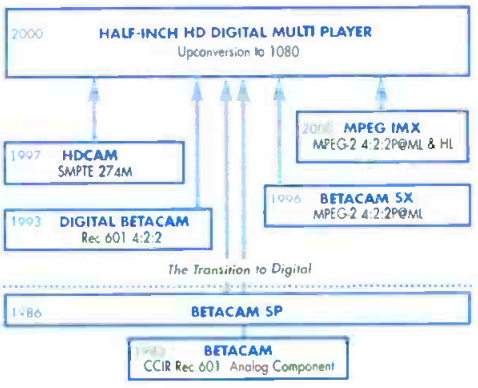
The new Half-Inch HD Digital Multi Player.

There's more. An up/down-converter board outputs both HD SDI signals and SDI signals. So pictures recorded in Standard Definition on any of these formats can all be internally up-converted to the 1920 x 1080 digital format and output as an HD SDI interface signal.

In the same way, HDCAM recordings can be down-converted to the 720 x 480 digital SDTV format and be output as an SDI interface signal. An optional card can even provide 720P HDTV and 480P SDTV outputs, for users who need these formats. With this player, Sony has built an important, cohesive and complete bridge between HDTV and SDTV.

The player is based on our new compact chassis — a mere four rack units in height. The player is also switchable between 60 and 50 Hz interlaced.

These features provide tremendous operational flexibility. They enable a multiplicity of migration paths to SDTV and HDTV programming. And as we've done in the past, Sony plans to support all of the half-inch formats for the long term, with no premature obsolescence. This way, all formats can remain valid for continuous acquisition, feeding and editing.



The new Half-Inch HD Digital Multi Player establishes a crucial bridge between SDTV and HDTV. It plays back Digital Betacam, Betacam SX, Betacam and Betacam SP tapes and upconverts each to the 1080-line or 720P formats, while maintaining compatibility with existing HDCAM tapes.

HDCAM RECORDING:

INTO THE FUTURE.

The HDCAM format continues to advance with these rapidly changing times. Broadcasters and program producers are emphatic about lowering the cost of HDTV equipment. Sony is prepared to develop HDCAM equipment to meet the need. Just as we did with Betacam analog camcorders, we plan to progressively evolve the HDCAM camcorders and VTRs. The ubiquity of the Half-Inch Platform supports economies of scale, for future cost reductions. Smaller, lighter, lower power-consumption camcorders — which will also cost less — are already in development.

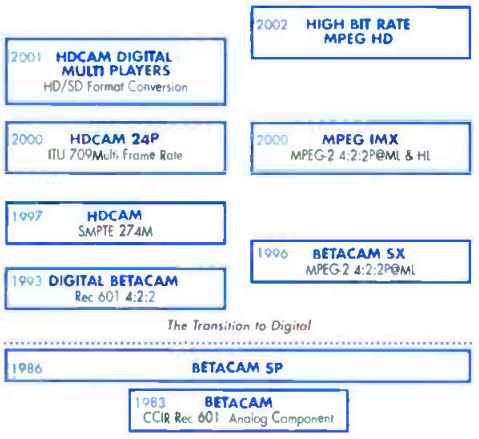
THE HOLY GRAIL OF HALF-INCH:

THE FULL-BANDWIDTH MPEG VTR.

Even as the HDCAM format hits its stride as the High Definition workhorse, Sony is already planning for future HD requirements. The high-end post-production community seeks an HD VTR with even more advanced capabilities:

- **Modest compression.**
- **Higher bit depth.**
- **Full bandwidth.**
- **More digital audio channels.**
- **Sophisticated Metadata capabilities.**

Sony is developing such a machine. In the process, we're maintaining our allegiance to the evolving MPEG studio standards. The MPEG-4 committee is currently studying very high resolution, high bit rate, high bit depth systems. They are converging on an appropriate algorithm to compress such digital video with high performance. Sony is an active member of this committee and we await its outcome before committing to our final design. A standard is expected late in 2000.



The coming High-Level Compression standard will support a High Bit Rate Half-Inch VTR. It will feature full bandwidth and modest compression for high-end postproduction.

But even as we wait for standards, one design decision is already clear. This new high bit rate VTR will embrace the Sony Half-Inch Platform. True to our tradition, it will have legacy playback of HDCAM tapes. We expect the HDCAM format to continue as the mainstay of mainstream HD acquisition and production, while the new machine supports the demanding requirements of high-end postproduction.

SONY'S HALF-INCH PLATFORM:

18 YEARS ARE JUST THE BEGINNING.

Back in 1982, few could have predicted the diversity and complexity of today's television industry. The sudden proliferation of different digital HDTV and SDTV signal formats has posed significant challenges. Manufacturers had to deploy resources carefully, focusing on what might actually happen in the marketplace. Sony has worked hard to maintain close contact with all of our customers as they, too struggled with the dilemmas of the moment. Sony remains deeply involved in the evolving global standards for program production and distribution. Finally, the prior investments of Sony customers have always remained an immovable stake in the ground.

Our Half-Inch Platform strategy has steered through this maze with great care. We're proud of what we've accomplished. And we're confident in the path we've laid out for the exciting evolution of DTV.

2002 **HIGH BIT RATE MPEG HD**

2001 **HALF-INCH HD DIGITAL MULTI PLAYER**
HD/SD Format Conversion

2000 **MPEG IMX**
MPEG-2 4:2:2P@ML & HL

2000 **HDCAM 24P**
ITU 709
Multi Frame Rate

1997 **HDCAM**
SMPTE 274M

1996 **BETACAM SX**
MPEG-2 4:2:2P@ML

1993 **DIGITAL BETACAM**
Rec 601 4:2:2

TRANSITION TO DIGITAL

1986 **BETACAM SP**

1983 **BETACAM**
CCIR Rec 601
Analog Component

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V-1115

certain parameters that will need be checked and adjusted for the achine to work. These parameters e well understood by broadcast engieers who have ever worked with vidtape machines, regardless of format. So, because tape will be with us for a hile yet, longevity is the first thing to ok for in a digital format. If a format s a chance of early obsolescence, it ight not do a good job returning its vestment. The compression algorithm ed is part of this decision, also. Choose e that will be around for a while. void dying audio/video-encoding methds that have been migrated to tape use. Any tape format needs to show good dio and video quality, and digital is o exception. Always have the vendrs or manufacturers leave you a achine and some tape for a couple of eeks, so you can see how it looks and orks in your plant. (If they don't ant to do this, beware. Something's ing concealed.) This will allow you see the playback on a monitor type at you are familiar with, and look at e composite output signal from the achine with a set of waveform/vecr monitors you know well. Take an "I'm from Missouri, show me" attitude with the manufacturer on the issue of quality.

A word about backward compatibility from digital to analog in machines; this is nice, but is it necessary to your operation? True, the ability to play those old oxide tapes in the new digital machine is handy, but after all, you upgraded to get away from some of the problems the oxide tapes caused in the first place. Keep a couple of the old machines around to use as "vault viewers" and use the new machines for more productive purposes.

Make sure there is more than one media manufacturer making the cassettes for the format. Some third-party tapes can be better than those from the manufacturer. Get some samples. All reputable firms will give out samples.

Look to see if there is more than one kind of camcorder available for the format. This usually indicates that a manufacturer has a solid commitment to the tape format and will be keeping it around for a while. If they're willing to do the R&D to field several cameras, that's a good sign they believe it'll pay them back to do so.

Notice that I haven't said anything about price yet? That's because you should factor that in last. You need to get a handle on the technical aspects of a tape format choice first, then start looking at price. Also, remember that new equipment prices are always negotiable. As one astute purchasing agent once said, "List price is for the price sheet printers, not the customers."

Finally, beware of headlife claims. One well-known manufacturer was claiming a 9000-hour headlife on a particular format. It turned out that you could get that kind of life, but only if you did no editing, shuttling, or other continuous handling. The claim applied only to straight record/play use. The reality was closer to 4000 hours maximum before replacement was necessary.

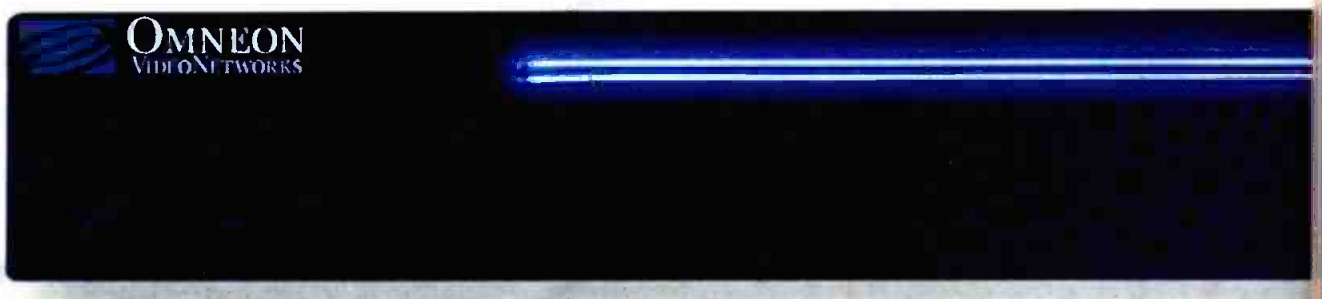
Yes, it's time to go to a digital tape format. Yes, there are many formats available. Yes, you can find one that will fit you just fine. No, I don't want your old two-inch high-band quad videotape gear, even if you will give it away free. Bury it. It's dead. ■

Paul Black is acting engineering manager for KPIX-TV/CBS, San Francisco

INTRODUCING

THE OMNEON VIDEO AREA NETWORK

601 HD DV MPE



IEEE 1394 SDI/SDTI

The Only Integrated Networking and Storage Infrastruct

Finally, there's a digital networking and storage infrastructure that delivers the flexibility to connect leading distribution, production and media management technologies, via standard networks, to a sc pool of multi-format storage; the scalability to deliver more bandwidth in more formats to more cha and production suites than ever before; the compatibility to integrate seamlessly with your current sys so you can painlessly upgrade today, while equipping your operation for the future; price/performance sets a new value standard for the industry; and the power to handle the complexity of your world, wh streamlining your operation. This unparalleled functionality, scalability and value makes the OMNEON VIDI AREA NETWORK the ideal networking and storage infrastructure for the digital television marketplace.

PREMIERING AT NAB 2000 – NORTH HALL

AAF AES IP Data

Ethernet RS422 Fiber

Featuring

Data-type Independence - ITU 601, HD, DV, MPEG, OMF/AAF, AES, IP Data, Metadata **Linear Scalability** - Scales smoothly to hundreds of distribution channels and thousands of hours of storage **Shared-Storage Productivity** - Pooled, multi-format storage for collaborative production and distribution **Open Platform Compatibility** - Distribution, production and data management applications **Modular Architecture** - Scalable network components include Directors, Packet Switches, and MediaPorts **Reduced Cost-of-Ownership** - Lower acquisition cost, lower operational and maintenance costs **On-Air Reliability** - Both system-level and critical component redundancy **Increased Profitability** - Flexibility to exploit existing assets for new services

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OMNEON VIDEONETWORKS

Circle (122) on Free Info Card

The ATSC standard

BY MICHAEL ROBIN

The conventional television standards (525/60 and 625/50) and the related monochrome-compatible color encoding concepts (NTSC, PAL and SECAM) represent a cost/performance choice based on the technologies of the 1930s, 1940s and 1950s. They were geared at reproducing acceptable quality, 4:3 aspect ratio pictures when viewed at six times the picture height. This is now identified as standard-definition television (SDTV). In the 1980s a great number of interested parties began developing concepts of advanced television, high-definition television or HDTV, geared at reproducing superior quality 16:9 aspect ratio pictures when viewed at three times the picture height.

The International Telecommunications Union (ITU) defines HDTV as follows:

"...[A] *system designed to allow viewing at about three times the picture height, such that the system is virtually, or nearly, transparent to the quality of portrayal that would have been perceived in the original scene or performance by a discerning viewer with normal visual acuity. Such factors include improved motion portrayal and improved perception of depth.*"

A great deal of DTV's success will likely depend on the willingness of CATV operators to carry DTV signals in their original format.

A tall order indeed. Two main trends initially emerged:

- Japanese NHK: A 16:9 aspect ratio picture format of 1125 lines (1035 active lines) and 60 interlaced fields per second. This legacy format is described in the SMPTE 240M standard and its digital representation is described in SMPTE 260M. The video and audio signals are transmitted to homes via an analog satellite technology better known as MUSE. This system is still on the air today but will be phased out in the not too distant future.
- European HDTV: A picture format of 1250 lines and 50 progressive frames, part of an evolutionary (SDTV 4:3 to SDTV 16:9 to HDTV 16:9) multiplexed analog component (MAC) satellite transmission concept. This concept has been abandoned.

The North American approach

The North American evolutionary approach took several years. In 1987 the FCC established the Advisory Committee on Advanced Television Service (ACATS) to advise on technical and public policy issues regarding advanced television. What resulted was that 23 different analog systems were proposed, falling under three general categories:

- Improved systems: Offering improved video quality within the parameters of NTSC.
- Enhanced systems: Adding additional information to the signal to provide an improved widescreen picture.
- High-definition television: Completely new systems with improved resolution, a wider aspect ratio and improved sound.

In 1990, in the midst of these never-ending discussions, a revolutionary event took place: General Instruments proposed the first all-digital system. In rapid succession three additional all-digital systems were proposed. By 1991

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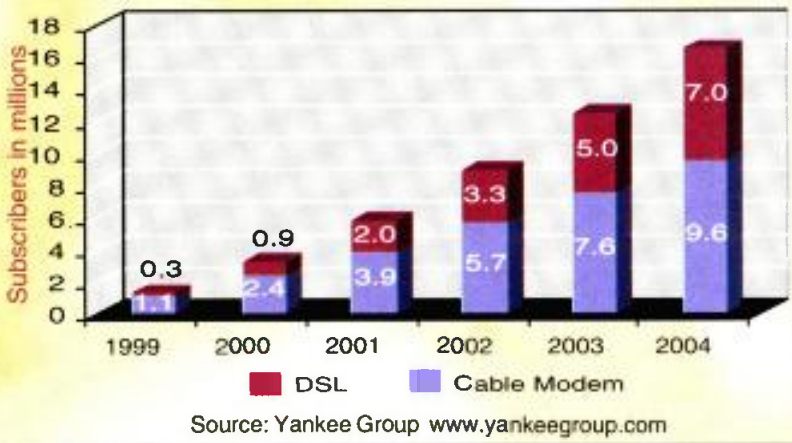

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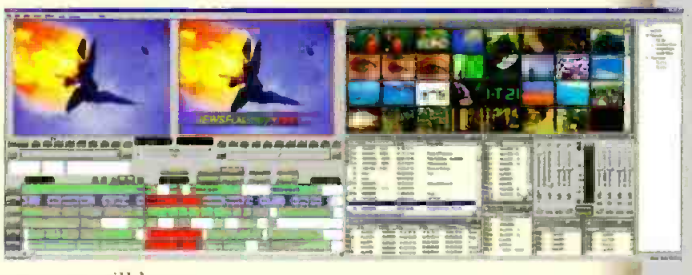

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the number of proposed systems was reduced to six, including the four all-digital systems. In 1991 and 1992 these systems were exhaustively tested by the following laboratories:

- The Advanced Television Test Center, funded by the broadcasting and consumer electronic industries, conducted transmission performance testing and subjective tests using experienced viewers.
- Cable Television Laboratories, a research and development consortium of cable system operators, conducted cable transmission tests.
- The Advanced Television Evaluation Laboratory, a laboratory of the Canadian Communications Research Centre, conducted subjective assessment tests using non-expert viewers.

In 1993 a special panel of the ACATS was convened to review the results of the tests and, possibly, to choose a new transmission standard for terrestrial broadcasts. It took a week to reach the unanimous conclusion that an all-digital approach was both desirable and feasible. To avoid lengthy and intensive testing of four competitive all-digital systems the proponents of these systems formed the Grand Alliance, which was made up of AT&T, GI, MIT, North American Philips, Thomson Consumer Electronics, David Sarnoff Research Center and Zenith.

The tests took place in 1995 using modular equipment supplied by various members of the Grand Alliance and integrated at the David Sarnoff Research Center. In addition to the types of tests detailed above, these new tests included format conversions between various picture formats, compliance with MPEG-2 and subjective audio tests.

The development of the advanced television concepts were entrusted to the Advanced Television Systems Committee (ATSC), a private sector organization of corporations, associations and educational institutions. It was responsible for exploring the need for and developing the documentation of the Advanced Television (ATV) standard based on the Grand Alliance recommendations. The ATSC added several standard definition formats resulting in a family of scanning formats as no single concept could be agreed upon. What resulted was the ATSC standard that was adopted and is being implemented by the FCC.

Characteristics of the video system

The members of ATSC could not agree on a single picture format concept. As a consequence, the ATSC standard supports a range of program materials originating in different picture formats. Two program format levels, HDTV (720 and 1080 active lines) and SDTV (480 active lines), are represented.

ACTIVE H-PIXELS	ACTIVE LINES	SCANNING MODE	FRAME RATE (Hz)*
640	480	PROGRESSIVE	60(60/M), 30(30/M), 24(24/M)
		INTERLACED	30(30/M)
704	480	PROGRESSIVE	60(60/M), 30(30/M), 24(24/M)
		INTERLACED	30(30/M)

*M=1.001 IS A FRAME RATE DIVISOR FOR NTSC-FRIENDLY SYSTEMS

Table 1. Specifications for ATSC formats using a 4:3 aspect ratio. These formats all use 480 horizontal lines and can be either progressive or interlace.

SMPTE PRODUCTION STANDARD	ACTIVE H-PIXELS	ACTIVE LINES	SCANNING MODE	FRAME RATE (Hz)*
293M (PROGRESSIVE SCANNING) 294M (SERIAL INTERFACE)	704	480	PROGRESSIVE	60(60/M), 30(30/M), 24(24/M)
			INTERLACED	30(30/M),
296M (SCANNING AND INTERFACE)	1280	720	PROGRESSIVE	60(60/M), 30(30/M), 24(24/M)
274M (SCANNING) 292M (SERIAL INTERFACE)	1920	1080	PROGRESSIVE	30(30/M), 24(24/M)
			INTERLACED	30(30/M)

*M=1.001 IS A FRAME RATE DIVISOR FOR NTSC-FRIENDLY SYSTEMS

Table 2. ATSC has several options for displaying 16:9 pictures in both a progressive and interlace scanning format.

Table 1 summarizes the 4:3 aspect ratio SDTV ATSC formats. The scanning mode may be progressive (P) or interlaced (I) and several frame rates are specified. The 4:3 aspect ratio SDTV formats are, respectively:

- VGA 640 pixels x 480 lines;
- A slightly modified CCIR 601 format (704 pixels x 480 lines). The modification consists in reducing the number of active pixels per line to 704 and active scanning lines per frame to 480. This is an MPEG-2 requirement to the effect that the number of active pixels per line and active lines per frame be a multiple of the pixels and lines in a DCT block (8 pixels x 8 lines).

Table 2 summarizes the 16:9 aspect ratio formats. NTSC-friendly frame rates are obtained by dividing the nominal frame rate by M=1.001. The formats are, respectively:

- SDTV (704 pixels x 480 lines) modified to MPEG-2 requirements. The modification consists in reducing the number of active pixels per line to 704 and active scanning lines per frame to 480. This is an MPEG-2 requirement to the effect that the number of active pixels per line and active lines per frame be a multiple of the pixels and lines in a DCT block (8 pixels x 8 lines). This format may use the P or I scanning mode at several frame rates. SMPTE Standards 293M (progressive scanning) and 294M (bit-serial interface) define the production aspects of the format.
- HDTV-A (1280 pixels x 720 lines). This format uses exclusively P scanning and is described in the SMPTE 296M standard.
- HDTV-B (1920 pixels x 1080 lines). I or P scanning at frame rates not exceeding 30Hz is used in this format. This restriction is due to the fact that a progressive 60Hz frame rate would result in an essential bit-serial rate of the order of 2.5Gb/s which exceeds the contemporary bit rate compression capabilities. SMPTE Standards 274M (scanning) and 292M (bit-serial interface) define several formats including 60Hz progressive scanning which, currently, is not an ATSC format.

Accounting for all picture scanning formats and frame rates there are 18 picture formats supported by the ATSC standard, based on the nominal frame rates of 60Hz, 30Hz and 24Hz. If we take into consideration the NTSC-friendly rates of 59.94Hz, 29.97Hz and 23.976Hz we end up with 36 picture formats. The latter frame rates will simplify interworking with NTSC material during the simulcast period.

Audio

Audio characteristics are defined in the ATSC standard document A-52. The digital compression system, is a constrained subset of the AC-3 system developed by Dolby Labs. It encodes five full-bandwidth audio channels (3Hz to 20kHz) including left, center, right, left and right surround and one reduced-bandwidth, low-frequency enhancement (LFE) channel (3Hz to 120Hz). The resulting 5.184Mb/s datastream is compressed into 384kb/s. The LFE channel carries about 1/10 of the bandwidth of the other channels, so the AC-3 system is frequently mentioned as carrying 5.1 channels. Table 3 summarizes the audio service types contained in an AC-3 elementary stream.

DESIGNATION	TYPE OF SERVICE	NUMBER OF CHANNELS	COMPRESSED BIT RATE kb/s
COMPLETE MAIN (CM)	MAIN AUDIO	1 TO 5.1	64 TO 384
MUSIC AND EFFECTS (ME)	MAIN AUDIO	1 TO 5.1	64 TO 384
VISUALLY IMPAIRED (VI)	ASSOCIATED	1	128
HEARING IMPAIRED (HI)	ASSOCIATED	1	128
DIALOGUE (D)	ASSOCIATED	1	128
COMMENTARY (C)	ASSOCIATED	1	128
EMERGENCY (C)	ASSOCIATED	1	128
VOICE-OVER (VO)	ASSOCIATED	1	128

Table 3. Audio service for ATSC includes the main audio services at up to 384kb/s and associated services at 128kb/s.

Compression

Table 4 shows the essential (active) bit rates of ATSC recommended production scanning formats, with 10 bits/sample resolution, before bit rate reduction and compression are applied. The total bit rates, including the samples in the horizontal and vertical blanking areas, are shown in brackets. The ATSC terrestrial transmission standard defines the bitstream content and transport and its digital transmission in a 6MHz TV RF channel. The nominal transmission bit-rate depends on the chosen digital RF modulation scheme. The ATSC chosen scheme, 8VSB, limits the transmission bit-rate to 19.4Mb/s. This constraint offers no other alternative but bit rate reduction and compression to accommodate all the ATSC formats.

The video compression scheme is based on the main profile syntax of the MPEG-2 video standard. It uses a motion-compensated Discrete Cosine Transform (DCT) algorithm and B-frame prediction. The video encoder supports the wide motion estimation range needed for tracking fast-motion pictures. In addition it uses source-adaptive coding, field and frame motion vectors and other techniques to improve compression efficiency. In all ATSC suggested formats there is a possibility to transmit film material in its native progressive 24 frames per second format and eliminate the 3/2 pull-down used in NTSC countries. This results in a reduction of the transmitted bit-rate, easing the task of the MPEG-2 encoder. The receiver reconstructs the interlaced or progressive display.

Transmission

The ATSC system employs multiple picture formats, digital audio and video compression. The compressed video and associated audio data streams are packetized into a packetized elementary stream (PES). One (e.g. one HDTV program) or several (e.g. multiple SDTV programs) PES, along with auxiliary and control data as well as program and system information protocol (PSIP) are fed to a transport stream multiplexer which combines them into a 19.4Mb/s data stream. Packetization allows audio, video and auxiliary data to be separated into fixed-size units suitable for forward error correction, program stream multiplexing and switching, time synchronization. This offers flexibility and extendibility as well as compatibility with other formats.

The 19.4Mb/s datastream feeds a channel encoder which in turn feeds the RF modulator of the terrestrial transmitter operating in an allocated 6MHz RF channel. The ATSC chosen modulation scheme, 8VSB, typically provides adequate reception when outside, roof-top, reception antennas are used. In most locations, indoor antennas provide unreliable reception. The 8VSB modulation standard is incompatible with the modulation choices made by the cable operators. The incompatibility of the 8VSB transmission modulation with the CATV modulation schemes and the lack of enthusiasm of cable operators to carry DTV signals will likely put a damper on the sales of DTV receivers as about 70 percent of North American viewers are connected to cable. The use of roof-top reception antennas would likely remove some of the problems of introducing DTV. However, roof-top antennas are no longer common and are impractical, if not impossible, to use in large cities with many high-rise buildings. Alternate modulation schemes may offer more reliable reception under marginal conditions and passionate discussions are currently taking place concerning the acceptable modulation scheme.

The increasing availability of set-top CATV converters will make DTV signals available to NTSC receivers as well as to DTV receivers with compatible interfaces. A great deal of DTV's success will likely depend on the willingness of CATV operators to carry DTV signals in their original format. ■

ACTIVE (TOTAL) VIDEO FORMAT PIXELSxLINES	NOMINAL FRAME RATE (f/s)*	ACTIVE (TOTAL) NOMINAL BIT RATE (Mb/s)*
640 x 480 (840 x 525)	30 INTERLACED	184 (252)
	30 PROGRESSIVE	184 (252)
	60 PROGRESSIVE	368 (504)
720 x 480 (858 x 525)	30 INTERLACED	207 (270)
	30 PROGRESSIVE	207 (270)
	60 PROGRESSIVE	414 (540)
1280 x 720 (1650 x 750)	30 PROGRESSIVE	553 (742)
	60 PROGRESSIVE	1106 (1485)
1920 x 1080 (2200 x 1125)	30 INTERLACED	1244 (1485)
	30 PROGRESSIVE	1244 (1485)

FOR NTSC-FRIENDLY SYSTEMS THIS FIGURE IS DIVIDED BY M=1.001

Table 4. Because of the high bit rates required by the various ATSC formats, MPEG-2 compression is used to reduce the bit rate to fit within the 19.4Mb/s datastream.

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

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Virtual sets

BY BRAD GILMER

As the technology matures and as the economics of virtual sets become more compelling, virtual is set to become commonplace in the broadcast industry. You might have seen virtual sets used during NBA coverage on TNT, on the game show My Generation on VH-1, or perhaps in use at a network affiliate during election coverage. Virtual sets combine high-quality graphics rendering with chroma keying and advanced camera-tracking technology to allow real people to interact with computer generated objects in a realistic virtual environment.

If you are one of the people who saw Roger Rabbit when it first came out, you may have been quite impressed with the interaction between the animated characters and real actors. The effects in the movie were spectacular, but the cost and production processes used were not viable for everyday applications such as game show production or live events. As computer processing power has increased, the ability to animate graphics in real-time has become a reality. The Cartoon Network was involved in one of the first broadcasts of an animated cartoon character that was rendered and broadcast in real time. A dog called Moxie was rendered on an SGI platform and animated using inputs from an array of hall-effect sensors on an actor along with external controls that were used to manipulate other features such as eyebrows and the end of the character's nose. While a long way from a virtual set, the ability to manipulate a graphics image based upon telemetry gathered from external sources was a critical development.

One of the advantages of virtual set technologies is that they are not limited to the size of the studio. Small studios can be used to the same advantage as large ones. Photos courtesy of Radamec.

Personnel costs for virtual set designers and operators can be very high and should be part of any evaluation.

In the mean time, chroma key technology was already well developed. Combining animated graphical images with chromakey had been done for quite some time. This relatively simple combination of technologies had several weaknesses. First, while 3D graphic elements could be easily created, it was not possible for the talent to interact with the objects in 3D space. A 3D weather map, for example, might look very realistic, but the talent could do little more than stand in front of it pointing to regions of interest. A second limitation was that if a 3D graphic element was supposed to be something real, such as a table, the effect was immediately ruined with any camera movement because the perspective of the virtual object remained unchanged. It became immediately obvious that the 3D object had been keyed into the scene.

Virtual set companies addressed these two factors in a way that allowed the talent to interact with objects, walking among them while camera angles changed in a way that makes the virtual elements look like they are part of the real scene. The first advance was to compute the position of persons in the real

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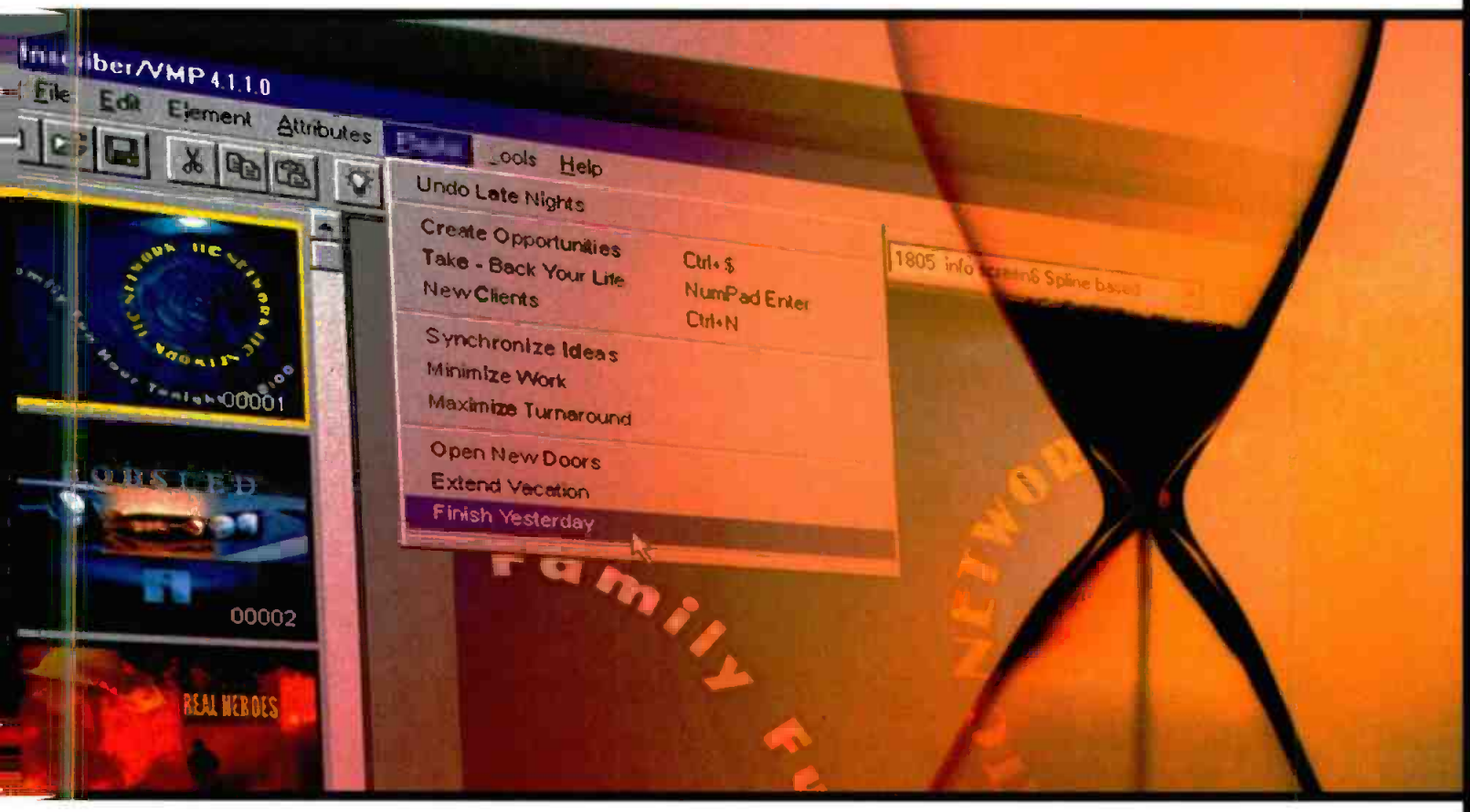

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camera shot so that the rendering engine could figure out whether the talent was in front or in back of a rendered graphic element. The second advance was to equip cameras with an array of sensors that track everything from camera position in the studio to zoom and focus settings. By collecting critical information about the camera's position and settings, the rendering engine could calculate new 3D views of the rendered objects based upon its mathematical knowledge of what the view of the objects should look like.

It does not take a computer scientist to figure out that making the millions of calculations per second that can be required for real-time 3D rendering takes a lot of computer power. Early virtual sets required that the virtual elements be designed so that they were not too complicated for the compute engines involved. Even today, if the virtual elements exceed the capabilities of the processor, the elements may be incompletely rendered and animation of these elements will not be at 30 frames per second.

The basic bluescreen backdrop of the set remains in place while a multitude of virtual environments can keyed upon it, benefiting a station's bottom line through reduced set construction and removal costs.

Virtual set finances

Virtual sets are supposed to be much less expensive than using traditional sets. Is this really true? The answer, as with almost everything in life, is that it depends. For many applications, you can realize substantial savings by employing virtual set technology.

Since there is no physical set, you can save anywhere from $50,000 to $500,000, depending upon its complexity. Offsetting these fees are the fees charged by the graphic artists to create your virtual set. These charges can vary widely, but usually you will realize savings. Set design can run anywhere from $30,000 to $350,000 or more, but this runs the range from a simple news cut-in studio to an elaborate election suite. One important thing to realize is that your design fees, if anything, will be higher using virtual sets. Virtual sets can create new visual opportunities, and you are probably going to pay more to explore those opportunities.

Another area of real savings relates to the handling of sets. It is quite common for stations to have to tear down sets and move them to make room for other production activities. Not only are crew and storage costs involved, but the loss of studio time while it is being turned around for the next shoot is a real out-of-pocket expense if the facility is fully booked. While the sets are being changed, the facility cannot be used. Changing virtual sets requires loading a disk and usually changing some of the lighting in the studio, but this time is minimal compared to physically moving a set. The logistics of moving a set may also be a consideration, and represent a further loss of revenue. In union environments, a set change may result in a minimum crew charge regardless of how long it takes to change the set.

The cost of hardware and software can range anywhere from $40,000 to $400,000 or more. Virtual set software can be run on a Windows NT machine, or on a very large SGI system. As expected, performance, complexity and features all increase with price. One thing is certain — the price/performance ratio of these systems will continue to improve as this technology takes advantage of the major improvements in consumer-oriented hardware and software.

Personnel costs for virtual set designers and operators can be very high and should be part of any evaluation. You may get lucky and find a sharp college student who would work for a reasonable price, but in most cases, these designers and operators will be among the most highly compensated people on your production team.

Virtual sets offer a number of advantages that are hard to put into specific cost terms. They can appear to be quite large while, in fact, the size of the studio is very small. Virtual enables creative possibilities that have not been available before. While this has led to the overuse of the effect early on, as this technology matures, the real gains will be made in creating a believable virtual environment that decrease remote location costs and allow projects to go forward that would have not been economically viable previously. ■

Brad Gilmer is President of Gilmer & Associates, and is also Executive Director of the AAF Association.

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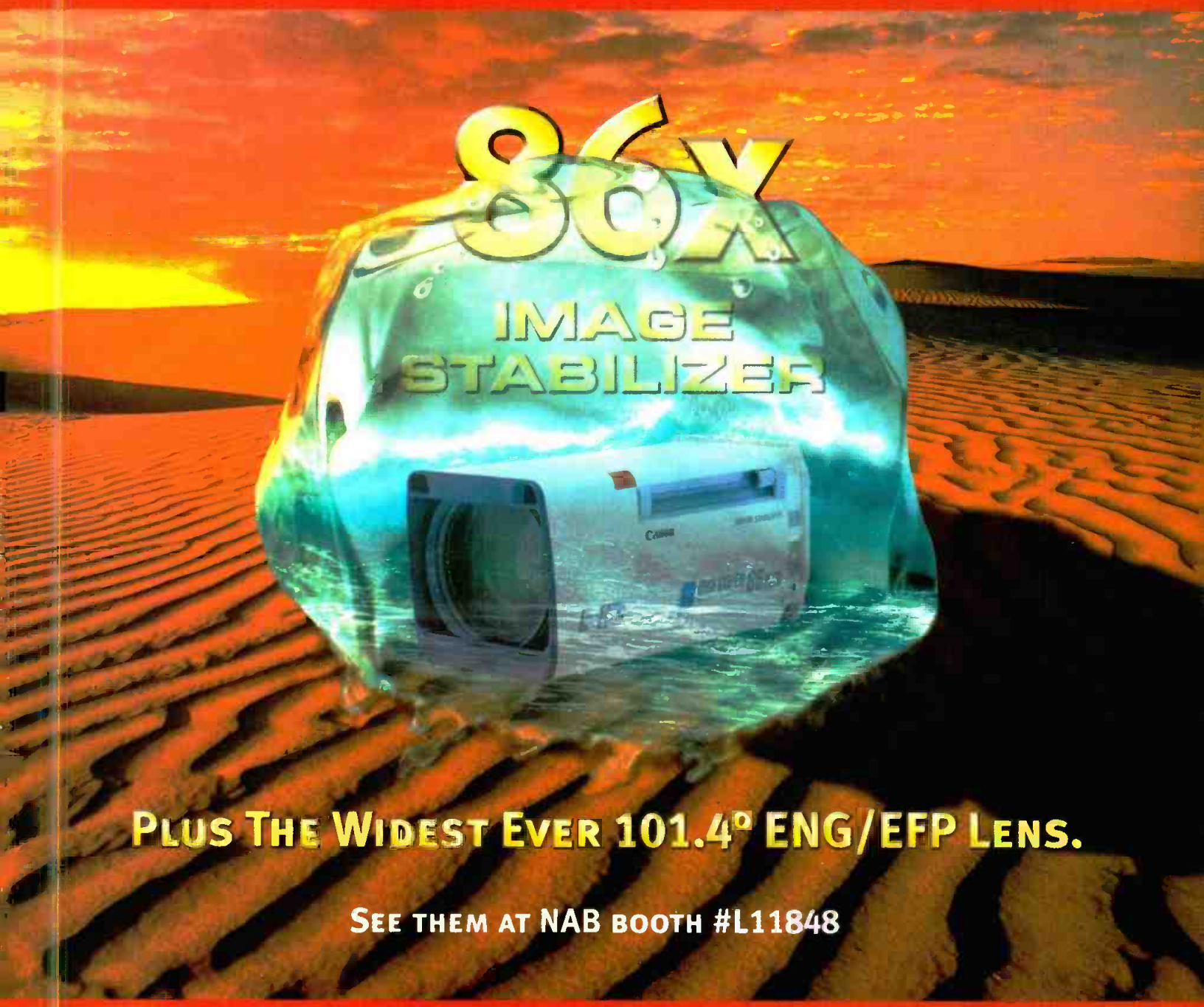

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Ask Dr. Digital

AES-3 distribution: Coax or twisted pair?

BY STEVE EPSTEIN, TECHNICAL EDITOR

As an equipment distributor, we have sold both balanced and unbalanced digital audio systems. My understanding of balanced and unbalanced audio is from the analog audio world, where the balanced audio has a cleaner signal due to the shielding in the balanced cable. Is the same true in digital audio? Or, I guess the question might be: Is there an advantage to deploying balanced digital audio? With unbalanced digital audio able to use standard coax with 75Ω connectors and inexpensive routers/distribution systems, why would anyone ever want to use a balanced AES digital audio system?

Dale Rochon
Vice President, Sales & Marketing
Image Technics Inc.
Irving TX

First, let's look at the difference between a balanced signal and an unbalanced signal. A balanced signal consists of two signals, equal in amplitude, but opposite in polarity. These two signals can be floating or referenced to a common voltage. In nearly all cases, when the signals are referenced to a common voltage, that voltage is 0V or to ground. Obviously, floating signals are not referenced to a common voltage. The key advantage of balanced signals is their increased noise immunity over unbalanced signals. Understanding the reason for this requires an understanding of the relationship between electricity and magnetism.

Anytime current flows, a magnetic field is generated. This is true in audio cables, AC transmission lines and RF radiation. Magnetic fields, interestingly enough, cause electrons to move within conductors — in other words, current flow. The amount of current flow depends on the strength of the magnetic field and how quickly it changes. Because cabling is made of metal — a conductor — it is affected by magnetic fields. As there are changing magnetic fields all around us, they cause current flow in cabling that typically shows up as noise.

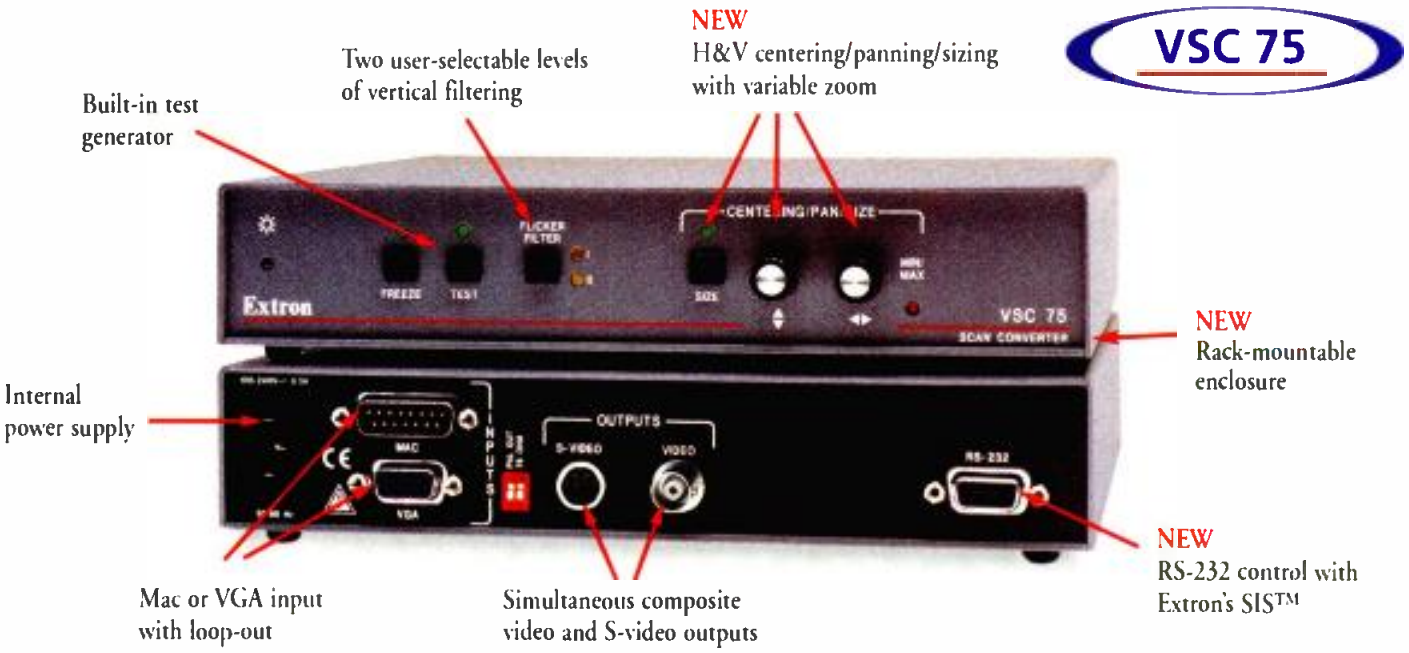
Balanced signals are normally carried on twisted pair cable. At the receiver, the signal goes to a differential input. Differential inputs are configured to amplify any signals that are different on the two wires, and reject any signals that are the same. Signals entering the wire at the other end are different, because they are opposite in polarity. However, any noise that was picked up along the way will be almost identical on each of the two wires, therefore it will be rejected. Adding a shield to the wire reduces the amount of noise picked up.

Unbalanced signals typically use coaxial-type cables and rely on the shield to reduce the amount of noise picked up by the wire. In recent years, manufacturers have begun putting differential inputs on equipment that uses coaxial connectors. Insulating the shield from the chassis and connecting the center conductor and the shield to the two inputs does this. Although the noise reduction produced by this is less effective than when used with twisted pair, there is still some benefit gained.

With the differences between balanced and unbalanced signals covered, let's look at their use with digital audio. First, because this is digital, induced noise on the cables will not affect the audio. The noise, however, can affect whether or not the digital signal can be recovered at the other end. So, what do you use, coax or twisted pair? As usual, it depends. One consideration is length. Coaxial cables can go about 2000ft with digital audio, while twisted pair is only good to about 1000ft. However, only a small percentage of cable runs fall into that length, so that's not much help. Adapter costs are about $45 each and this applies whether you need to go BNC to XLR or XLR to BNC—again not much help. Twisted pair cable is typically less expensive than coax, so there is something to consider, but how much time is required to put the connectors on? How much does that extra time cost? An interesting twist (no pun intended) on the cable/connector angle is the use of Category 5 cabling and RJ-45 connectors by Radio Systems in their StudioHub products. This is more of a distribution solution than something used for termination, but it may be worth looking into. On the BNC side, the tools to strip the cable and crimp the connectors can easily run $300 to $500, or about 10 adapters. My background is video, and with the right tools, I can put a BNC on much quicker that an XLR. However, if your background is in audio, the opposite is probably true. XLR and BNC connectors are comparable in price, but the XLRs can typically be reused, whereas crimp-type BNCs cannot.

I checked with some manufacturers of AES-3 equipment to see if there was a trend one way or another. For the most part, sales of XLR vs. BNC AES equipment is about 50/50, but if the manufacturers are leaning any way, it is toward BNCs. Personally, I can't find a compelling reason to use XLRs and twisted pair cable, but I am sure there are plenty of audio engineers that would disagree.

If you have a problem that I can help with or simply have a comment, you-know where to find me: *drdigital@compuserve.com.* ■



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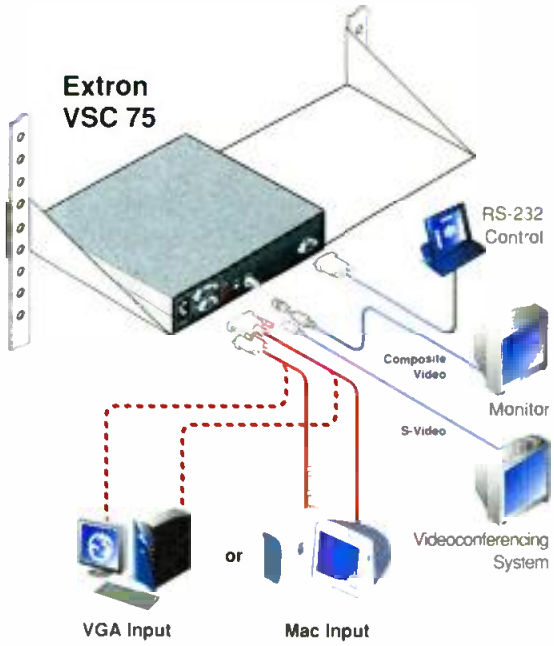

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SYSTEMS DESIGN SHOWCASE

News networks served new video playback solution

By Don Thompson

The networks of CNN News Group are on the air around the world 24 hours a day, seven days a week. Yet, the Atlanta headquarters is in an almost constant state of facility redesign. Some compare it to changing the wheels on a moving locomotive. Very few of us will have the opportunity to experience first hand the challenges of such a large and complex environment but we can, courtesy of CNN, take a snapshot of this constantly morphing broadcast giant and use the lessons they have learned in our own projects.

The CNN newsroom. Located at CNN world headquarters in Atlanta, GA, the facility encompasses more than 18,000 square feet of space, which can accommodate more than 200 news and technical staff. Photo by Ron Sherman.

Control room for CNN Headline News. The main technical operating position, shown on the right, uses a GVG 4000 production switcher

make the minor software and hardware modifications necessary to meet reliability goals.

As work progressed on proving the core equipment to be used, various other facility issues came to the forefront,such as where to locate the servers. Since the current arrangement allowed each network to have its own terminal gear area, the decision came down to which one had enough space to accommodate the new gear. CNN and Headline News had about 13,000 square feet of terminal gear space. This project would necessitate an expansion to about 18,000 square feet, but this would ultimately shrink back to less than the original 13,000 square feet. Space in the CNN terminal gear area was selected for the installation.

Another issue was cabling. CNN News Group networks are located in two multistory towers with a common atrium. Since the networks grew originally as separate entities, sufficient interconnect cabling to support shared server-based playback did not exist. Additional fiber cable was installed between the two buildings.

Meanwhile, testing and configuration continued with the Leitch servers. The design called for 30 dual-channel Leitch VR300 servers arranged in two 15-server arrays with 62 hours of storage on each half. Each array has 18 output ports and 12 input ports with RAID protected Fibre Channel storage. Any clip sent to the server is actually duplicated on both arrays. Sophisticated data management software is constantly checking to ensure that a complete mirrored environment is maintained.

CNN News Group is committed to making MPEG-2 the basis of their operation.

Another important element of this project was writing and testing the software, which would allow the servers to interface productively with the Avstar Newsroom system used by editorial staffers to write, edit and build their newscasts. CNN Headline News was already using Avstar, and plans were underway for the other networks to implement its use as well. Leitch developed custom software for its VR300 servers to accommodate this requirement. And, always mindful of the need for a backup plan, the design team developed an RS-422 controller which is hardwired directly to the server and independent of any other data networks or computers. A control panel was built by DNF of California for each control room. The added hardware allows control room staff to continue to operate the servers in the event of failure of other systems.

As hardware testing and software development continued, the next decision that had to be made was selection of the first network to begin using the server. With its studio and control room renovation completed and the fact that its normal operation involved recorded rather than live playback to air, CNN Headline News was determined to be the best choice for first implementation.

In the fall of 1999, CNN Headline News began using server-based playback in a shadowing mode with their current setup. The new server worked

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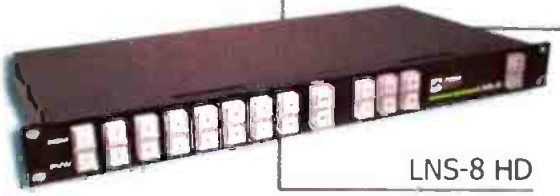

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CNN Headline News media operations area. Note the edit bays in the background.

so well that the network dropped its shadowing after only a few days. This quick success was due to the long months of testing the system had undergone, as well as the involvement of employees at all levels in the design and implementation process.

With Headline News online, the CNN team could consider the next network to convert. CNN International seemed the best candidate. CNNI operates two simultaneous control rooms and often needs access to the same stories at the same time. Throughout the fall of 1999, CNNI's operations staff worked on the conversion details involving not only accessing the server, but also implementing use of the Avstar Newsroom system and rearranging equipment in their control rooms. CNNI spent a significant amount of time getting input from employees on how the new design should be implemented in their operating environment. This hard work paid off in early 2000, when CNNI's conversion to server-based playback was complete.

It is important to remember that for the CNN News Group, implementation of server-based playback was not occurring in isolation. During the time that this project was in process, the CNN newsroom was completely rebuilt and Headline News facilities, including control room, were relocated and rebuilt from top to bottom. In addition, a centralized routing system for video and audio was being installed along with a New Media Operations Area with 40 edit rooms that went on line during the summer of 1999.

Timing and coordination of the various projects became an issue, as well as the application of resources to the projects. The same R&D and engineering resources had to be applied to all of these projects. One lesson learned from the server-based playback project was that for any project that touches so much of an organization, the time to complete is probably longer than first estimated.

With two networks now using the server, the project continues during 2000 to bring the other networks on line. Because of the effective close working relationship with the vendors on the project, any expansion needed in the future can be readily accomplished.

Overall, the lessons offered by the CNN News Groups approach to facility design are:

- Work from a business-focused plan;
- Select flexible vendors who will buy into the design concept;
- Involve all levels of employees; test new systems exhaustively; and most importantly,
- Implement projects in a steady measured way, so that customers continue to receive the high-quality product to which they are accustomed.

Don Thompson is director of marketing for Leitch.

Design team

Gordon Castle, VP of research and development, production
Keith Chandler Project manager
Bob Hesskamp, VP of operation, international
Kevin Ivey VP of research and development, basic technologies
Jack Ormond VP engineering, CNN News Group
Tom Kingsley, director of engineering, CNN
Scott Tiessler, CTO

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SYSTEMS DESIGN SHOWCASE

KVBC-TV

By John Holland

Just a mile north of downtown Las Vegas is NBC affiliate KVBC-TV Channel 3, a 53rd market television station in the final stages of completing its transition to digital. What better audience for this kind of technological advance: Las Vegas' enthusiasm for techno-toys is almost as great as the wattage lighting up the city. Reportedly, VCRs penetrated the market there faster than anywhere in the country, and today one in three people packs a cell phone.

The production control room is built around Grass Valley 4000-3 with four channels of Krystal DVE. An Omnibus automation system provides control over the Profiles, assembling news clips from the EditStar and NewStar systems. Photos courtesy of Grass Valley Group.

KVBC-TV

KVBC-TV, whose slogan is "Where News Comes First," provides news coverage for all of Southern Nevada utilizing satellite trucks, live microwave units, news vans and Sky 3, the station's on-site helicopter. Through its affiliation with NBC, it provides prime-time programming, including news and sports programming.

Nearly two years ago, the KVBC engineering team went shopping at NAB to find a new solution for news editing and overall news product handling at the station. It also sought a digital infrastructure that would enable the station to keep pace with the twists and turns of digital television and related new media. Maintaining a technological edge was key to maintaining leadership in an ever-expanding market.

Today, KVBC-TV has been transformed from a purely analog operation to a fully digital 601 facility. It features a format-independent digital infrastructure for editing, production and transmission provided by the Grass Valley Group and Avstar, a jointly owned subsidiary of the Grass Valley Group and Avid. Omni-Bus Systems provided the control layer for the new KVBC facility, and Beck Associates served as the system integrator.

Digital infrastructure lays groundwork for digital transition

In preparing for a server-based operation, the KVBC engineering team members were initially proponents of a "one-box" theory—a single device that could serve as a central ingest, processing and playout point. A multidevice approach seemed prohibitive, given a lack of fast and reliable media asset management tools that could quickly locate materials across multiple systems. On the other hand, the team reasoned that a single massive box also could become a single massive point of failure. After visiting NAB98 and the Grass Valley Group (then Tektronix), what began as an effort to change how editing and news product handling was supported blossomed into strategic rebuild of the facility. KVBC engineers instead determined a digital media infrastructure based upon a distributed network of storage devices, linked via audio/video routers, data networks and a central automation structure would be the better solution.

As NAB 2000 approaches, KVBC-TV is getting ready to throw the switch on an integrated system for news ingest, news editing, finish editing, live production, news playout, master control and facilities management, all linked by digital routing technologies, including a Fibre Channel network for faster-than-real-time transfers. The new infrastructure will bring KVBC's facilty to the state-of-the-art while preparing for the station's move to digital transmission, which is scheduled to occur over the next year.

The Grass Valley Group, in partnership with system integrator Beck Associates, worked with the KVBC engineering team to reconstruct the infrastructure of the studio. Engineering management is confident that KVBC-TV now has a facility that will upconvert digital transmissions very nicely and a switching and automation structure that will enable key applications, such as HD broadcasting, as programming becomes available and the market warrants.

News and commercial automation system

Just prior to NAB two years ago, KVBC-TV made the decision to go DVCPRO as the standard for newsgathering. The Grass Valley Group Profile PDR400 digital video platform fell right in line with this strategy and KVBC used the PDRs to lay the foundation for keeping the entire KVBC news operation in a DVCPRO format. Now KVBC is able to shoot in the economical digital format, and

News coverage is the station's key branding feature. Supporting the on-air news staff is a fully-equipped studio with low-power consumption Videssence lighting and Philips cameras.

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KVBC-TV

transfer material straight to the PDR400 for editing and playback without changing compression schemes.

In addition to material arriving from the field on tape, KVBC's news operation has several microwave and satellite feeds. Regardless of the delivery method, as the first few frames of material are downloaded into one of two ingest Profile units they are simultaneously available for on-air, editing and treatment as topical promotions. The two Profile machines operate under OmniBus control for manipulating the media. The PDR400s, which offer approximately 22 hours of storage each, enable the station to transfer material to its editing Profile systems via a Fibre Channel network, letting incoming feeds flow directly into the newsroom and to EditStar workstations for editing.

For news editing, the station uses nine EditStar workstations, connected to three Profile digital video platforms. The EditStar system from Avstar provides drag-and-drop control for first cuts-only editing of stories nearly up until airtime. Up to nine journalists in the newsroom can load material directly from videotape into an EditStar-equipped Profile device for editing; digitization takes place with each edit, eliminating the time to predigitize the videotape. As individual clips are finished, the Omnibus system compares the pieces with rundown information obtained from the NewStar system and transfers them to a cache Profile for automated playout during the newscast. For finish editing and special projects, the station is using three Avid Media Composer 1000 systems: one for news and two for production.

Long term, the station is hoping its investments will yield dramatic improvements in its archive and retrieval capabilities. In the short term, it expects its new systems to give journalists the ability to share media much faster and effectively — finding the right clips and getting stories to air quickly.

A facility-wide Omnibus automation and control system provides on-air media management, as well as supporting the dubbing and playout of spots and interstitial. A Grass Valley M2100 can handle both SD and HD playout channels under Omnibus control.

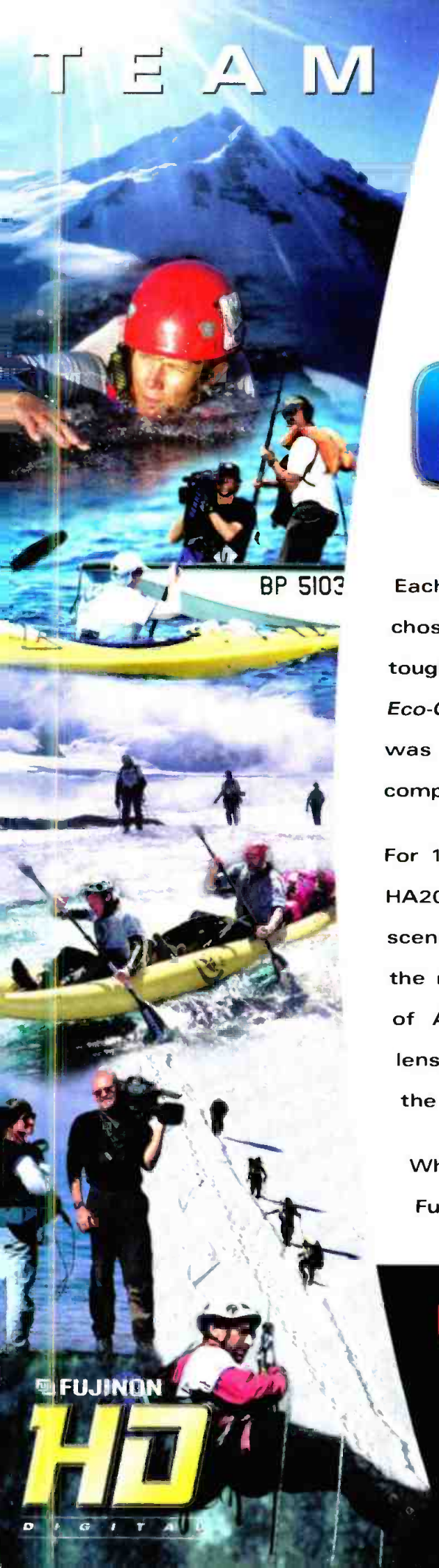
For live production, KVBC is using a Grass Valley 4000-3 production switcher with four channels of Krystal digital video effects. The system also features a Profile PDR200 digital video platform operating under DNF and Grass Valley P-Bus control for higher resolution graphic elements.

Meanwhile, KVBC's new infrastructure is streamlining its commercial capabilities. Interstitial material is transferred either from videotape or from satellite-based servers to two mirrored Profile PDR300 MPEG-2 digital video platforms with 21 hours of storage each. These units are networked via Fibre Channel but operate separately from the other Profile devices. Material stored on these Profile systems consists of commercials (mostly 30-second spots), station identification spots (mostly 10 seconds), promos (mostly 30-second promotions), and Public Service Announcements (mostly 30 seconds). Approximately 30 interstitials are added every business day, and 150 are deleted at the end of every week. OmniBus Columbus software provides the automated media management, dubbing and playout of these materials.

The master control switcher at KVBC-TV is a Grass Valley M-2100. The switcher can be operated manually from the control panel or put under the control of the OmniBus software. The M-2100 is capable of multichannel operation, allowing for expansion into multicast and HDTV. The station is also using a Fibre Channel network to provide faster-than-real-time transfers of audio and video information among the Profile digital video platforms. This configuration will let it transfer and archive material at four times real-time speed without passing it through a codec. While the MPEG-2-based PDR300s handle the commercial material, long-form materials are principally recorded and played back on Panasonic AJ-D950 DVCPRO-50 tape machines, also under OmniBus control.

Linking the KVBC editing, production and on-air replay systems are Grass Valley SMS7000 digital video and audio routing systems. These systems are framed 128x128 and loaded

TEAM FUJINON



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KVBC-TV

Profile video server room. A combination of Profile PDR400s, with native DVCPRO format recording and the PDR200s for on-air clips make a powerful team for the stations' fast-pace news operation. Two ingest PDR400s provide 22 hours storage each. Material to be edited is transferred to PDR200s over Fiber Channel.

128x96 with one stream (two channels) of AES digital audio. Existing analog sources are converted through A/D-D/A converters.

At the heart of the KVBC system is the OmniBus Facility Management System for resource management, media management and machine control. Eighteen OmniBus user interface computers are located within the KVBC facility to provide quick and easy access to media and control over network devices. The station also uses the OmniBus system as an interface to its JDS/Bias traffic and Avstar/NewStar newsroom automation systems.

Looking forward

KVBC-TV is relying upon the strength and flexibility of its new digital infrastructure to help it keep pace with the growth of the surrounding Las Vegas metropolitan and greater southern Nevada areas. With the population of Las Vegas alone growing by 6,000 people per month, the expectations of southern Nevada viewers are much higher today than they were 10 years ago.

KVBC-TV, which has successfully made the transition from analog to digital and from a small- to medium-sized market, now is well-positioned to make the move from medium- to large-sized market and into new capabilities, such as HDTV, Internet streaming and central casting, as the market and industry demand. ■

John Holland is director of engineering at KVBC-TV, Las Vegas.

KVBC Equipment List:

Live Production:
GVG 4000-3 Digital Production Switcher
GVG Krystal Digtal Video Effects (Four Channels with Combiner)
AMS/Neve 32 Channel Series 55 Audio Console
Philips/BTS LDK 90 Studio Cameras (3)
RTS Matrix Intercom
Electronic Graphics:
Chyron iNFiNiT! Character Generator
Quantel Picturebox Twin Still Store
Quantel Paintbox
Quantel HAL
Master Control:
GVG M-2100 Multichannel Master Control system equipped with one SDI frame
Central Video/Audio Storage:
GVG Profile PDR 400 Digital Media Platforms (6)
GVG Profile PDR 200 Digital Media Platform (1)
GVG Profile PDR 300 Digital Media Platforms (2)
Videotape:
Panasonic DVCPro50 VTRs (10)
Panasonic DVCPro VTRs (22)
Sony Betacam VTRs (10)
Sony 1" Type C VTRs (2)
Distribution:
GVG SMS 7000 Digital routing system
Leitch VIA 32 Analog augmenting router
Digital /Analog Distribution by GVG in universal 8900 frames
Seamount Patch panels with Trompeter patches
Leitch DFS 3005 Converter/ Synchronizers (36)
Monitoring/Measurement/Signal Generators:
Master Control: Sony BVM14G5U/ Videotek VTM300
Engineering: Sony BVM14E5U
Production Control: Sony BVM20G1U
Tektronix WFM 601 A/E/M 's and various monitors
Tektronix TG 2000
Tektronix SPG422 (2)
News:
Avstar NewStar for Windows Computer system
Avstar EditStar news editing system (9 stations)
Avid Media Composer 1000
Panasonic AJ-D810 DVCPro Camcorders (15)
Panasonic AJ-DLT75 DVCPro Laptop Editors (5)
Microwave Vans (BAF and Frontline) (4)
SNG Truck (BAF)
Hughes 500 Helicopter equipped with Wescam/Troll Microwave system
and FLIR Systems Ultramedia II gyro-stabilized camera
Adaptive Broadband RF equipment and Troll/Wescam control systems
Trollcam remote controlled camera systems (3)
Creative Services/Online Editing:
Panasonic AJ-D900 DVCPro50 Camcorders (2)
Avid Media Composer 1000 Editors (2)
Linear Tape Suite with GVG-110 Switcher and Sony BVE-900 Editor
Traffic:
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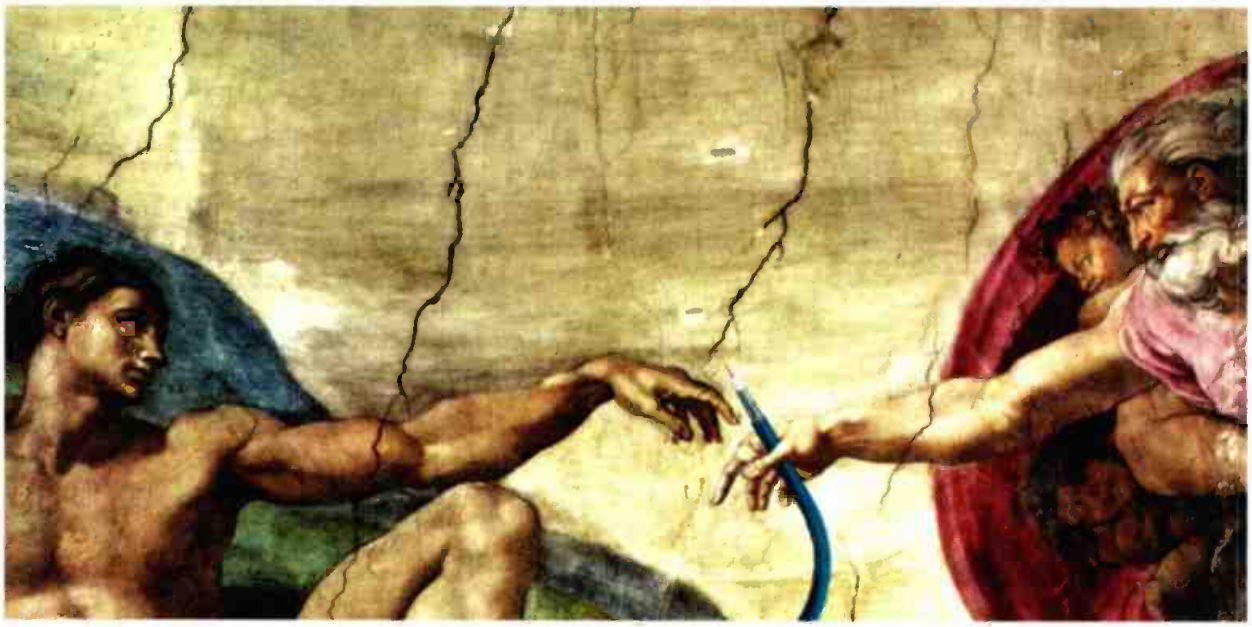

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One of the nearly completed RIBs uncergoing some last minute touch-up before final inspection and preparation for shipment. Photos courtesy Concept: Benson & Rice.

Sony's Olympic RIBs: Racks in a box

By Steve Epstein, technical editor

If you needed to put together a broadcast facility halfway around the world, and keep your costs down, how would you do it? Well if you were NBC, and wanted to reuse the facility for the next ten years, enlisting the help of a manufacturer/systems integrator such as Sony could be beneficial. With that in mind, Sony and NBC entered into a close collaboration on a project to build the broadcast facility for the Sydney Olympics. The design is such that the basic building blocks will also be used for the four Olympics that follow. All five Olympic broadcasts will be done by NBC. In light of the accelerating rate of change in today's technology, building anything that can remain state of the art for a period of ten years is a considerable challenge in itself. Making it deployable cost-effectively adds another dimension to the challenge.

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Sony's Olympic RIBs: Racks in a box

Building block basics

After buying the rights to the next five Olympic broadcasts, NBC needed to find a way to do them with a very close eye on the bottom line. Through a series of win-win agreements (as well as a 10-year contract) with Sony Corporation whereby Sony would sell NBC some of the necessary equipment, lease the rest and provide system integration, the beginnings of an overall solution came together. The trick, it seemed, was to pre-build the system, ship it to the venue and do minimal assembly and integration on-site. For obvious reasons, it made the most sense to use standard shipping containers. Determining the best way to fill the containers was another matter. Talks were initiated with major shippers such as UPS and the U.S. military. If you think about it, the military's requirements are comparable — ship and deploy high-tech equipment reliably around the world in an efficient manner.

Ongoing integration work on several RIBs at Sony's integration facility in San Jose.

> The trick, it seemed, was to pre-build the system.

Several different building blocks are used to construct this repositionable facility. One building block is a set of standardized the equipment consoles built by TBC Consoles. These modular units are constructed from Formica-covered pressboard and can be quickly stacked into operator consoles of various lengths. For shipping, they slide into a set of stackable crates that are designed to collapse into compact units with minimal storage requirements. The next building block consists of a series of consoles and racks used to form a complete editing suite. The consoles are custom built and essentially self-contained. Although the current configuration contains mostly linear editing systems (19 out of 24), the design is such that it can easily handle nonlinear systems. The final, and most challenging building blocks are the RIBs. The RIBs consist of twenty equipment racks shock-mounted on a steel platform. This wheeled platform is built up from I-beams and includes forklift slots in both ends and the middle.

Considerable engineering and testing went into the RIB design. Early on, a test rig was constructed that included the platform, shock-mounted racks and 6000lbs of elevator weights (300lbs in each rack). G-force sensors were placed throughout the system, and it was loaded into a container. The container was then dropped from a height of one foot. After the drop, readings were taken, an adjustment or two was made, and the containerized unit was then shipped over land by truck and train and then ocean-shipped to Hawaii. More readings were taken and the system was evaluated based on real-world loading data. As it turns out, there were some significant G-forces encountered in the rail and truck shipments; however, neither exceeded the forces imposed by that one foot drop in the parking lot.

One of the sealed and shrink wrapped RIBs being loaded into a shipping container at Sony's San Jose facility.

RIB construction

As stated, considerable design went into the RIB assemblies. The fully-welded platforms include six heavy-duty casters as well as four inverted screw jacks (one in each corner) that

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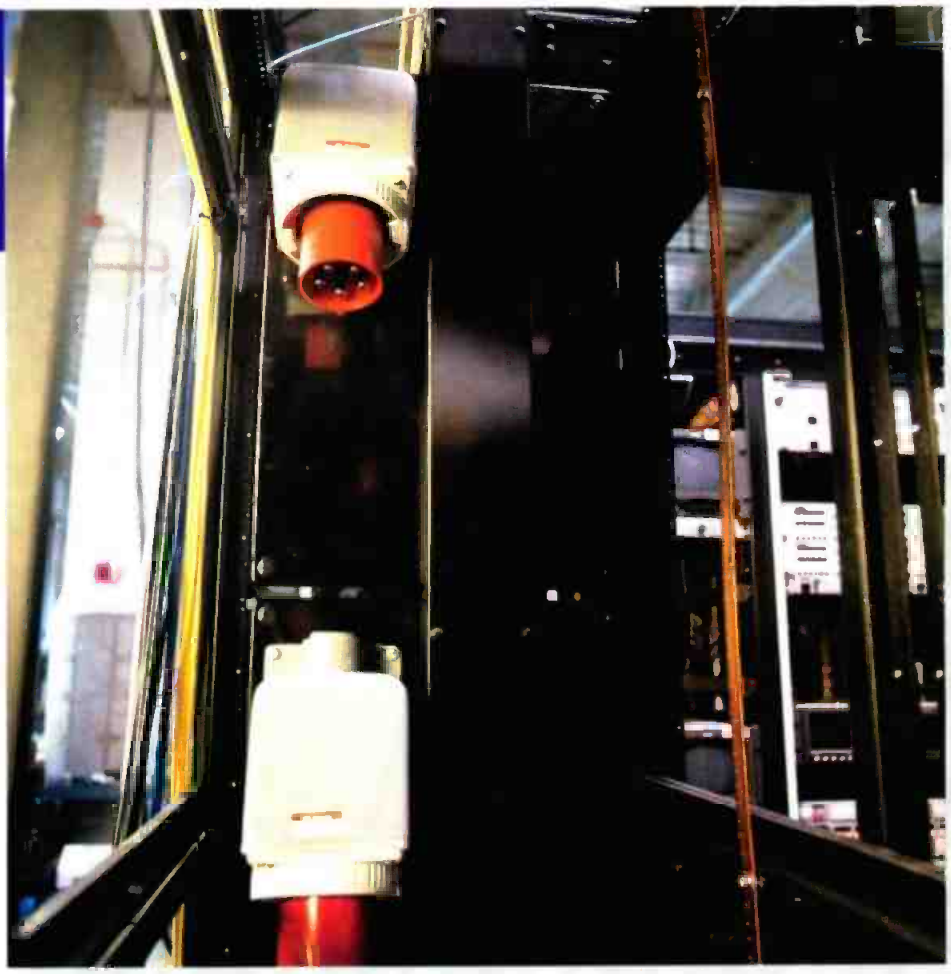
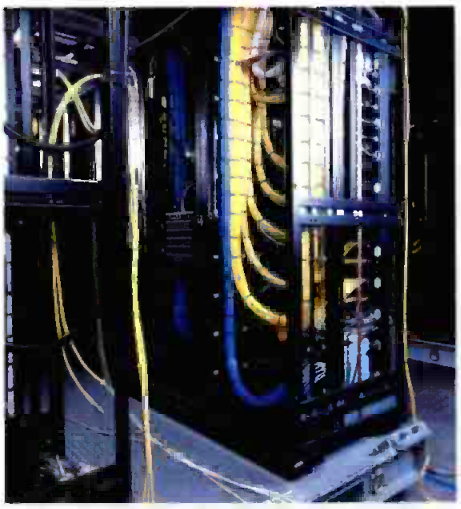
Sony's Olympic RIBs: Racks in a box



Power comes into each RIB through redundant distribution panels. Shown are the IEC connectors used for each panel.

can be used to hold the RIB in place once it reaches its final destination. There are two D-rings on each side of the platform in case they are needed, however, no use is currently planned. The top of the platform is a single piece of plate steel that forms the basis for mounting the rack assemblies and provides an impenetrable barrier when the racks are sealed for shipment. The final key point in the platform is found in the corners. The shipping container is basically a box with square posts in the corners. On the front of each platform are a pair of triangular wedges that engage the square container posts and center the platform within



Some of the wiring that goes into a completed RIB assembly can be seen. In the lower right is one of the wedges used to pin the back of the RIB in the shipping container. Also note that the racks sit slightly off the steel floor, held up by the cable shock-mounts.

the container. Similar wedges are mounted on the back of the platform. These back wedges can be driven outward with ½" machine screws, and then locked in place to mechanically pin the platform within the shipping container.

Each set of 10 racks is bolted together and then attached to the platform with shock absorbing mounts. These mounts consist of 4 pieces of steel cable set in small metal blocks that allow movement in all three directions. Placed approximately every 24 inches, they allow the racks to move, but only slightly—unless under load. A pair of floor-mounted snubbers limit movement fore and aft (See photo). To reduce, but not restrict movement, the two sets of racks are attached at the tops with hinged connections. On the outside, a rubber bumper along the upper length of the racks provides some shock relief if the rack tops come in contact with the container. Above the racks, cable trays are used to contain the wiring within the RIB as well as harness assemblies used to interconnect the RIBs.

Moving from the mechanical to the electrical basics, each RIB is equipped with redundant power systems. These systems are fed with 250V, five-pin IEC 309 style connectors. These 125A, three-phase connectors are common in Europe. Dual distribution boxes feed power to standard IEC connectors that are color coded. Use of the IEC connectors prevents someone from accidentally plugging a drill or heater into technical power. For the most part the power supplies used in the equipment can handle anything from 100- to 250VAC at either 50- or 60Hz. Copper strips are mounted in each rack for grounding. Further grounding steps can be taken on-site as necessary.

For signal cabling, lighter duty cables such as Belden 1855 were used within individual RIBs, while heavy-duty cabling such as Belden 1694 was used for all cabling used to interconnect the RIBs. All the cabling, interconnection panels and patch panels are HDTV ready, although the current equipment list contains mostly standard-definition equipment. To reduce deployment time, all cabling entering a RIB goes to an interconnection panel; that way, time isn't wasted

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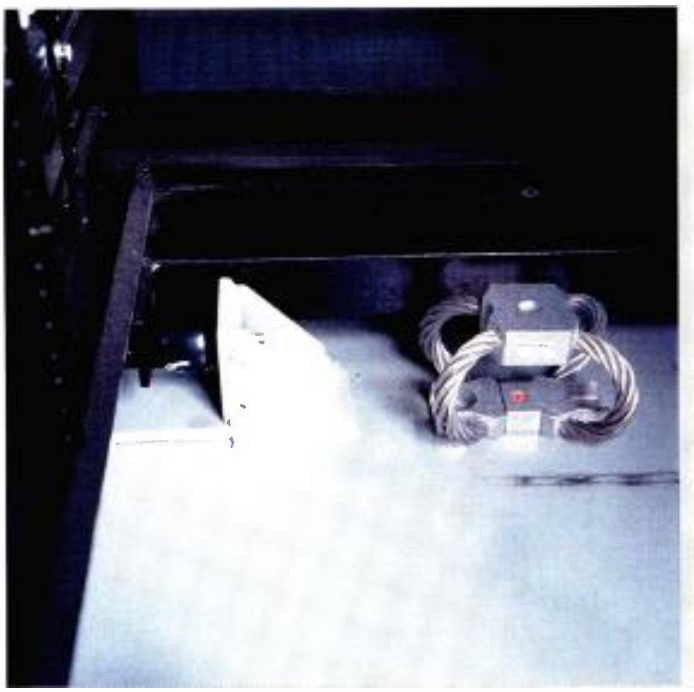

Close up view of one of the floor-mounted snubbers as well as one of the shock mounts which allow some flexibility while still restricting overall movement of the rack assemblies.

Close up of the rubber shock absorber on the tops of the racks. These are designed to soften the impact if the rack tops contact the sides of the container.

running cables from a harness into a variety of racks to multiple pieces of equipment. Cabling was neatly wrapped into place, and interconnection harnesses are stored on top of the RIB in cable troughs. High-tech (cardboard) separators were used anywhere the cabling might rub up against the racks during transit. As this is a relatively new science, there are still a few unknowns. As somewhat of a preliminary test, one RIB was shipped to Telex for installation of the intercom system, and by all accounts it fared well in the round-trip.

Although most of the equipment can be shipped fully installed in the racks, some items will be shipped separately. Large pieces of glass (monitors 14" and larger) as well as the VTRs will be installed on sight. All of the associated cabling has been tested and, if applicable, rack slides are in place so installation at the other end will be quick and easy. It is expected that 10- to 15 percent of the equipment will be rotated out of the RIBs for each Olympics. This includes equipment that is frequency sensitive (50Hz vs. 60Hz) as well as equipment upgrades that are expected as technology improves. As mentioned the system is HDTV ready, and if it is decided that the Olympics will be broadcast in HD, that can be accommodated quickly as there is sufficient excess rack capacity planned into the overall system.

In final preparation for shipment, the RIBs get a final inspection and are wrapped in foam and then shrink wrapped. Some bags of desiccant are thrown in and the unit is hermetically sealed into a reusable foil bag attached to the steel floor plate. Another layer of shrink-wrap and the RIB is ready to slide into the container for shipment to Sydney. Several security precautions have been taken to ensure the equipment makes it safely across the ocean. Recorders will keep track of the G-forces encountered as well as when they occur and sufficient redundancy has been built into the overall system so that if a container does not arrive on time, it can easily be patched around.

It is expected that 10- to 15 percent of the equipment will be rotated out of the RIBs for each Olympics.

Collaboration

As interesting and forward-thinking as the RIBs are, what may be more important is the ongoing close collaboration between Sony and NBC. Work on this project has been underway for nearly two years. During that time, project architects have discussed feature sets, workflow options and overall system requirements with NBC operations and management personnel. Many of their ideas have found their way into these systems. The majority of these new features are likely to become part of Sony's product line. Some of these features include things like customizable router settings and tighter production switcher/DVE integration. For the most part, through this project, every aspect of the production operation has been examined from the operations side, through the eyes of NBC employees and freelancers. That input has been integrated into the system design, and the designs of current and future Sony products. Ideally, this investment will pay off for Sony, NBC and the rest of the broadcast industry as these new products and features find their way into everyday operations and workflow. ■

Transmission & Distribution

STLs: The ignored system

BY DON MARKLEY

Let's face facts. The part of a television system that gets all of the glory is the studio. Populated by the talking heads, the studio has all of those exotic digital whiz-bangs and is the part of the station that gets the most attention. For those of us who don't normally think in ones and zeros, the RF system is still impressive and draws a lot of attention, especially when spending big bucks on transmitters and towers. The part of the overall system which is normally ignored is the lowly STL. Usually placed in the furthest and least significant rack, it is expected to be transparent to the signal and to operate continuously without problems. We need to remember that EVERYTHING goes through that little box. It is absolutely necessary to the overall system.

The advent of DTV has raised a whole new problem for TV broadcasters. The old systems simply are not capable of handling the DTV signal. That really doesn't matter a lot as it can still be used for several years to handle the NTSC signal in many systems. The two main problem areas are where a new system needs to be installed to handle the DTV by itself or where the entire operation is to be changed to a new site where both DTV and NTSC signals will be transmitted. In either of those cases, new frequency coordination studies are necessary and new path studies may be needed.

Where the DTV facility is to be located at the existing NTSC site, the frequency coordination problem can be significant. The 7 GHz. band is full in many of the major markets which either pushes one to the 12 GHz. band or calls for more efficient spectrum usage. Thankfully, the 25 MHz. bandwidth channels, which have been assigned for auxiliary television broadcast use, will handle both the DTV and the NTSC signals at the same time. Several manufacturers currently offer a wide range of units to accomplish this task. They mainly fall into two groups. Either the two signals are encoded into one data stream to be transmitted over a single broadband microwave system or the signals are handled on two essentially separate microwave systems that share the same channel. Both systems will meet most needs with no specific recommendation being offered here. Both systems have their advantages with the dual system offering the essentially a hot-standby when the NTSC system goes away. The NTSC channel can be converted to a second DTV channel at that time.

There is one difference that will be noted when doing path calculations. The power output on some systems is lower for DTV than NTSC. It's the old gain-bandwidth problem. When the bandwidth is expanded, the power will fall, reducing the fade margin unless larger antennas are used. Some systems show a slightly higher noise threshold for DTV as well. It's not really a problem – just something that has to be handled in the path analysis.

That leads to a topic which is often misunderstood – path reliability. For STL systems, a minimum design goal is a reliability of 99.999%. That is often referred to as "five-nines" and is a value which was long used for long-haul telephone systems. Disregard those who say that a lesser value is good enough. They are the ones who will have to answer to the suits when the picture goes away just as the swim-suit competition takes place or when the most interesting dress appears on the award show. Even "five-nines" means that you may lose the path for a second or two on rare

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occasions. However, the loss will usually be very brief and will also be very rare.

The calculation of the path reliability is usually done based on work done by W. T. Barnett and Arvids Vigants, both of Bell Telephone Laboratories. In the simplest form, the probability of path loss is given as:

$$t = a \times b \times 2.5 \times 10^{-6} \times f \times D^3 \times 10^{(-10/f)}$$

where:

t = time out of service as a fraction

a = 4 for very smooth terrain including over water, 1 for average terrain with some roughness, and 1/4 for mountainous, very rough or very dry

b = 1/2 for Gulf Coast or similar hot, humid areas, 1/4 for normal interior temperate or northern, and 1/8 for mountainous or very dry areas

f = frequency in GHz.

F = Fade margin to the minimum acceptable point in dB

Again, this gives the probability of path outage. The probability that the ath will not be out is the Reliability which is (1-P) x 100 in percent. Now hat you know how to calculate the reliability, forget all of the shade tree-mechanics who have cute little numbers that they think will be "enough". For most microwave systems, a fade margin of 40 dB will be a good first design goal to be adjusted after the reliability is calculated.

If there is any idea of doing path calculations, there is one book that is must for the engineer's bookshelf. "Engineering Considerations for Microwave Communications Systems" is printed by GTE Network Systems. This is a good, practical guide to system design and covers all of the calculations necessary. It is available from GTE Network Systems; GTE Network Systems Publications Manager; 400 North Wolf Road; Northlake, IL 60164. Your author apologizes for not knowing the price but his was purchased back when gasoline was under $0.50 a gallon. This is a paperback which is as necessary for TV engineers as Carl Smith's antenna book is to AM engineers. ■

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

Send questions and comments to: don_markley@Intertec.com

Fiber optic links for earth stations

BY HENOK TAFESE

During the past 12 years pioneering developers of fiber optic links for earth station applications have fought an uphill battle for acceptance. Using coax and waveguides to connect antennas to adjacent equipment rooms was "tried and true." New construction occurred at a steady pace, and innovation was perceived to be an unnecessary risk. Fiber optic cable use in telecommunications was still in its infancy, so prices were high. Few earth stations had enough antennas to warrant "exotic" solutions such as a linear fiberoptic link.

Today, however, there is a revolution overtaking the satellite communications industry. More and more system designers are recog-nizing that fiber optic interfacility links (IFLs) save time, save money

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and increase reliability. Simply put, fiber optic IFLs deliver higher performance for the following reasons.

The first is of course cost. Due to the surge in fiber optic use in terrestrial and undersea telecommunications, fiber optic cable is now less expensive than high grade coax. The link cost - the transmitter and receiver that converts the electrical signal to an optical one and back - has decreased by a factor of four for high volume, lower frequency applications at 70MHz and L-band. An often overlooked cost factor is installation. Fiber optic cable is compact and flexible enough to fit in tight spots, whereas coax and waveguide either fill up a conduit or require digging new trenches.

A second reason is the enormous flexibility that low loss fiber optic cable (<1dB/km) brings to the site surveyor. The rule with coax and waveguide that antennas have to be placed within 150m of the equipment room is due to their high loss characteristics. This presents at least two problems. First, what happens when antennas have completely surrounded an existing equipment room and you have to add more, and what do you do when you're building a new earth station and the perfect location for the antenna (on a hill or atop a building) is unsuitable for a nearby equipment room? The answer is to use a fiber optic link and put the antenna and equipment room where it makes sense, independent of distance between the two. Repeaterless fiber optics span 80 km at 70MHz, 60 km at L-band, 50 km at C-band, 25 km at X-band, and 20 km at Ku-band. This has a significant impact on cost.

A third reason favoring fiber links is performance, including reliability. Literally thousands of SATCOM earth station fiber optic links have been performing reliably for many years. ISO9001 certification of manufacturers ensures quality standards. Commercially available products range from those that meet the most demanding Intelsat "A" standards to units suitable for local CATV headends. Links are optimized for specific bands (IF, L, C, X, Ku), or cover widebands (0.1 to 18 GHz) for triband applications.

The fiber itself offers many performance advantages over coax. Since the core of fiber cable is non-conductive glass, it isolates electromagnetic interference such as lightening strikes from propagating into the equipment room, and can be run alongside power cables. It also eliminates ground loops and "hum" when cables are used between individually grounded buildings.

Bottom line? Fiber optic satellite transmission links are gaining broader acceptance with the industry now recognizing these products as a reliable, affordable coax replacement with a host of benefits for earth station operators - and the outlook is terrific for RF on fiber. ■

Henok Tafese is product line manager of satellite communications for Ortel Corp.

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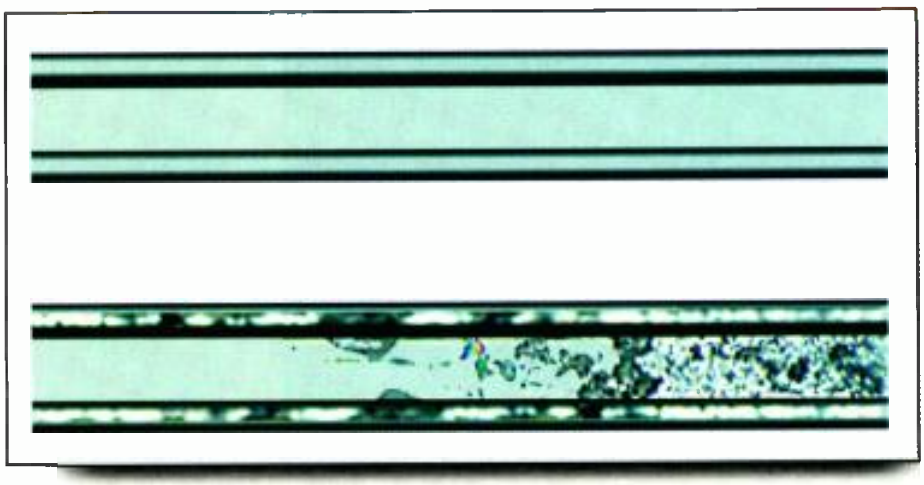
A tale of the tape

BY STEVE EPSTEIN, TECHNICAL EDITOR

Hard as it is to believe, videotape, in one form or another, has been around for nearly 50 years. Early versions were relatively simple oxide-based designs, however, today's videotapes are a sophisticated combination of materials designed for durability, as well as efficient recording and playback of analog and digital signals. With many open reel designs, the tape container consisted of little more than a hub and some flanges. Cassette shells, on the other hand, can include more than 100 different components. For example, the cassette door used on several formats is a clam shell system that protects not only the front of the tape, but the back as well. In addition, many of these door assemblies are made from materials designed to repel dust, offering yet another level of protection to the tape within.

Although there are a myriad of designs and formulations, videotape comes in three basic flavors, oxide, metal particle and metal evaporated. Each of these basic types has evolved over the years and several variations of each exist in today's range of recording formats. In addition to these basic types, there are differences in the quality of tapes. Videotapes manufactured for broadcast and professional use are quite different from those manufactured for consumer use. Typically, professional broadcast tapes are designed to have lower dropouts, run cleaner and have higher output than those meant for consumer use. Professional grade tapes are also designed to be more durable than consumer tapes. This added durability serves two purposes: First, tapes last longer under regular use, and second, tapes can be put away in archival storage with an increased likelihood that years from now, the information on the tapes will be fully retrievable.



Microscopic photos of a portion of a digital video tape head. The photo on top shows a clean head, while the bottom photo shows a good view of accumulated debris. Photo courtesy of Sony.

Care and feeding

Like most things mechanical, tapes and the machines they are used in will last longer if they receive periodic maintenance. How much maintenance varies—certainly you do not need to check the oil in your car at every stoplight. For the most part, cleaning a machine after every tape is also a bit of overkill, unless of course the tapes being used are from the '50s section of the archives and they are leaving themselves all over the machine. By the same token it is not necessary to keep the control room at cleanliness standards suitable for surgery or construction of silicon wafers. But, as they say, cleanliness is next to Godliness, and a reasonably clean environment will keep your tapes and tape machines in better shape.

Some simple guidelines include a daily cleaning of the control rooms as well as restricting or – better yet – prohibiting eating, drinking and smoking in the control room area. Machine transports should also be cleaned regularly, but how often will vary with use, tape quality (another reason for buying high quality tape) and the cleanliness of the control room area. Consider keeping a log of maintenance as well as problems such as head clogs to determine a reasonable cleaning and maintenance schedule for the machines in your facility. You might find that some machines are best cleaned on a daily basis whereas other machines only require weekly cleaning.

Along with a clean environment, a consistent environment will prolong the life of your tapes. Both temperature and humidity should be kept as constant as possible. Humidity should be around 50 percent and temperatures should be in a range where the operators are comfortable. Obviously, little can be done to control the outdoor environment where field tapes must be used. However, what can and should be done is to provide your tapes some acclimation time when they are moved from one environment to another. Many times, field gear remains in a controlled environment of some type for all but brief periods. For instance, the gear is typically in your facility overnight, then taken to a heated or air-conditioned news vehicle. It may only be outside for 30 minutes to do a shoot—during which time it can easily be subjected to both temperature and humidity extremes. In some cases, those brief periods of exposure can do more harm than

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simply leaving the equipment outdoors semi-permanently, say in a vehicle trunk. Of course, there are other security considerations.

Although tape is designed to operate in extreme outdoor conditions, there are limits. For example, on a remote news shoot, the tape and camcorder may adjust to the vehicle temperature of 80 degrees (comfortable enough for shirtsleeves) with very low humidity, then suddenly be taken outside to do a shoot in freezing rain. It is very likely that problems will develop under those circumstances, or when the camcorder is brought back into the news vehicle. Sensors, such as condensation sensors, within the machine may prevent a machine's use under these circumstances. These sensors are designed to prevent damage to the tape as well as the machine and should not be overridden. Because of the changes in the physical size of the tape due to contraction/expansion, is it possible to have tracking and playback problems when the tape is returned to a temperature-controlled environment. Providing sufficient acclimation time can reduce or eliminate many of these problems and lengthen the life of the videotape and the footage it contains.

Mix and match formats

Today's tape machines are more sophisticated than ever, to the point where many are capable of playing back several different recording formats on more than one type of tape formulation. To some extent, this is nothing new (it was done with U-matic and U-matic SP more than 13 years ago). But, what is new is the range of conditions these machines can operate under. Both mechanical and electrical adjustments are needed to play back these various formulations, and, for the most part, these changes are made transparently under microprocessor control. Surprisingly, there are few, if any, changes necessary on the part of the customer regarding these enhanced capabilities. Although some additional recorder cleaning might be needed in some cases due to hours of use per week and heat /humidity conditions; in a controlled environment, cleaning cycles beyond what the recorder manufacturers recommended is not required. Recorder heads and transport wear should also be monitored after use of a particular brand of tape for best compatibility.

What is more important with these machines is attention to these details. Regular cleaning needs to be done according to the manufacturer's recommendations, and this typically includes using recommended chemicals and applicators. Don't just rely on a cleaning cassette, as it only cleans the rotating heads. It does not clean the transport; that requires a manual cleaning by a knowledgeable technician or operator. Use only high-quality tape stock – do you put bargain basement oil in your car? Finally, read the manuals to ensure that your maintenance routines are covering all necessary items. If you take care of your tapes and tape machines, they are far more likely to perform when you need them.

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Store-and-forward technology

To use an Internet analogy, real-time video delivery resembles a chat room and store-and-forward technology is more like e-mail. In order to chat with someone, you must both be connected to the Internet at the same time and actively participate in your "conversation." With store-and-forward, you set up the transmission of your material when it's convenient for you and your remote location views it when it's convenient for them, just like sending an email message.

By choosing store-and-forward technology, television stations and production facilities can transmit material to remote locations whenever they choose with complete control of the quality. For approval video, lower-resolution images can be used. Broadcast-quality material can be transmitted for future use as full-resolution, full-motion video.

This is one of the major advantages of store-and-forward technology — the quality of the transmitted video is completely separate from the network bandwidth. Whether a traditional modem, DSL, cable modem or a high-speed data connection is used, the video will be identical at the receive point. It isn't even necessary for both parties to be connected at the same speed. A slower connection will increase the transfer time, but the end result will be the same.

Another advantage to using a store-and-forward system is that both sides are insulated from network problems. If a data packet doesn't get through correctly the first time, it can be sent again and this process is completely transparent to the user.

Every store-and-forward system uses a three-step process: encoding, transmitting, and decoding. In the encoding process, source material is converted to a compressed format (usually MPEG-2) and stored as a digital file on a local hard disk. Once that digital file exists, it is transmitted to another location using some type of network protocol. Different protocols offer different advantages, but whatever protocol is used, it must be able to properly handle large files. Finally, once the file is transmitted to the remote location, it must be properly stored locally in its digital format with some capability for playing it back at the proper time.

The quality of store-and-forward transmitted video is completely separate from the network bandwidth.

At the simplest level, home PC users can capture video onto their hard disks, transmit those videos as email attachments to anyone they choose, and the recipients can watch the video on their computer screens. For this process to work in a broadcast video environment, specialized equipment is usually required. Typically, this consists of recording and/or playback stations that include specialized software and are connected to an existing network.

The system software is important because it can address two critical issues that occur when adapting this technology for professional use. The first issue relates to the requirement of storing large video files. The receiving device not only must have sufficient space to store the clip to be sent. It also must be able to guarantee that over the transmission time period, that space will be reserved for that clip. The disk space can't be captured for another feed if that would result in an out-of-space condition for the first feed.

The second issue relates to compatibility. Nothing is more frustrating than receiving a file from another location and not being able to use it. Any store-and-forward system should be able to verify that the receiving site has the appropriate decoding software in place to view the video file being transmitted.

The encoding process

In a traditional video environment, source material is typically received from a variety of sources and then routed as analog or digital video through the facility. In a store-and-forward system, the encoding station acts like any other destination in the video routing system. In the simplest case, it accepts an analog NTSC or PAL signal from the router. In more complex systems, the input choices may multiply. Some systems even support both NTSC and PAL video formats with some method of translating between the two.

Once the input signal is available, the next step is to create the digital file, much like the recording on a VTR, but now tapeless. Different applications may require different quality video recording. As the quality increases, so does the size of the digital file and the amount of time it will take to transmit. Approval-quality video could be encoded at a rate of 1- to 2Mb/s, broadcast-quality video might require 8Mb/s, and production-quality could demand 8- to 50Mb/s. In all cases the encoding process occurs in real time.

Transmitting video

Once a video clip has been encoded and a file exists, the second step in the process is to transmit that file to the

desired location. Recipients are all assigned an address, much like e-mail. The sender can specify or attach the file or files, which contains the actual video. Support material including cover letters and other textual information are included to ensure that recipients have all the information needed.

The setup process assembles all this material and it is then sent, much like an e-mail or fax. The recipient machine is contacted and the file or files are transferred and stored for later use.

One relatively new development is the use of the IP protocol and IP addressing to move material between locations. This process is based on standard FTP transmission and allows any device with an IP address to transfer a digital video file to any other device with an IP address. In this way, intermediate storage devices can be used to hold (or archive) video clips. Ultimately, it may mean that any MPEG-2 compatible decoding device can receive and play files from any encoding station, as long as they both support the same video file format.

With IP addressing, the network used to move video from one location to another is essentially identical to that used for e-mail or Internet work. The ubiquitous nature of IP addressing and FTP means users can send and receive files from virtually anywhere in the world. Also, because many companies are already connected with full-time Internet connections, there are no additional connection costs associated with transmitting video clips. Think of it as sending a really big e-mail message.

Of course, nothing comes without some price. In the case of FTP and IP technology, that price is the unpredictability of the Internet itself. While the technology basically guarantees that the file will be delivered successfully (assuming sufficient local storage) there is no guarantee of when it will actually get there.

DURATION	PICTURE QUALITY	QUALITY DATA RATE (Mb/s)	TELECOM SERVICE	DELIVERY DATA RATE (Mb/s)	TOTAL TIME TO SEND hh:mm:ss
0:01:00 hh:mm:ss	Approval	1.5	ISDN 128kb/s	0.128	0:11:43
	Consumer	3.0		0.128	0:23:26
	Broadcast	8.0		0.128	1:02:30
	Approval	1.5	xDSL or Cable Modem	0.384	0:03:54
	Consumer	3.0		0.384	0:07:49
	Broadcast	8.0		0.384	0:20:50
	Approval	1.5	xDSL T1 Cable Modem	1.5	0:01:00
	Consumer	3.0		1.5	0:02:00
	Broadcast	8.0		1.5	0:05:20
	Approval	1.5	xDSL or Cable Modem	3.0	0:00:30
	Consumer	3.0		3.0	0:01:00
	Broadcast	8.0		3.0	0:02:40
	Approval	1.5	LAN 10Mb	8.0	0:00:11
	Consumer	3.0		8.0	0:00:23
	Broadcast	8.0		8.0	0:01:00

Table 2. Approximate time required to send one minute of video for some commonly available connections. Network traffic may cause total time to fluctuate.

The level of other activity on the Internet can affect the real transmission speed of files. As the amount of Internet traffic grows, the chances increase for dropped packets, requiring that the data be retransmitted. This will slow the transmission process. Also, even if every packet of data gets through the first time, the number of hops encountered affects the amount of time it will take to arrive. Even with these drawbacks, the benefits of using the Internet far outweigh the negatives on a daily basis.

While the technology guarantees that the file will be delivered, there is no guarantee of when it will actually get there.

Decoding the video

The final piece of the store-and-forward process is viewing the material on the receiving station. Just as the source unit encodes the video into a digital stream, the receiving station must decode that video and play it back as full-resolution, full-frame rate, full-screen video. This is typically handled by an external monitor or (in some systems) on a built-in viewing screen. Because further work on the video may be required, it's often necessary to be able to dump the video from the local digital storage onto production tools like VTRs and video servers. A store-and-forward system should be able to handle this by acting just like a traditional video source to the house routing system.

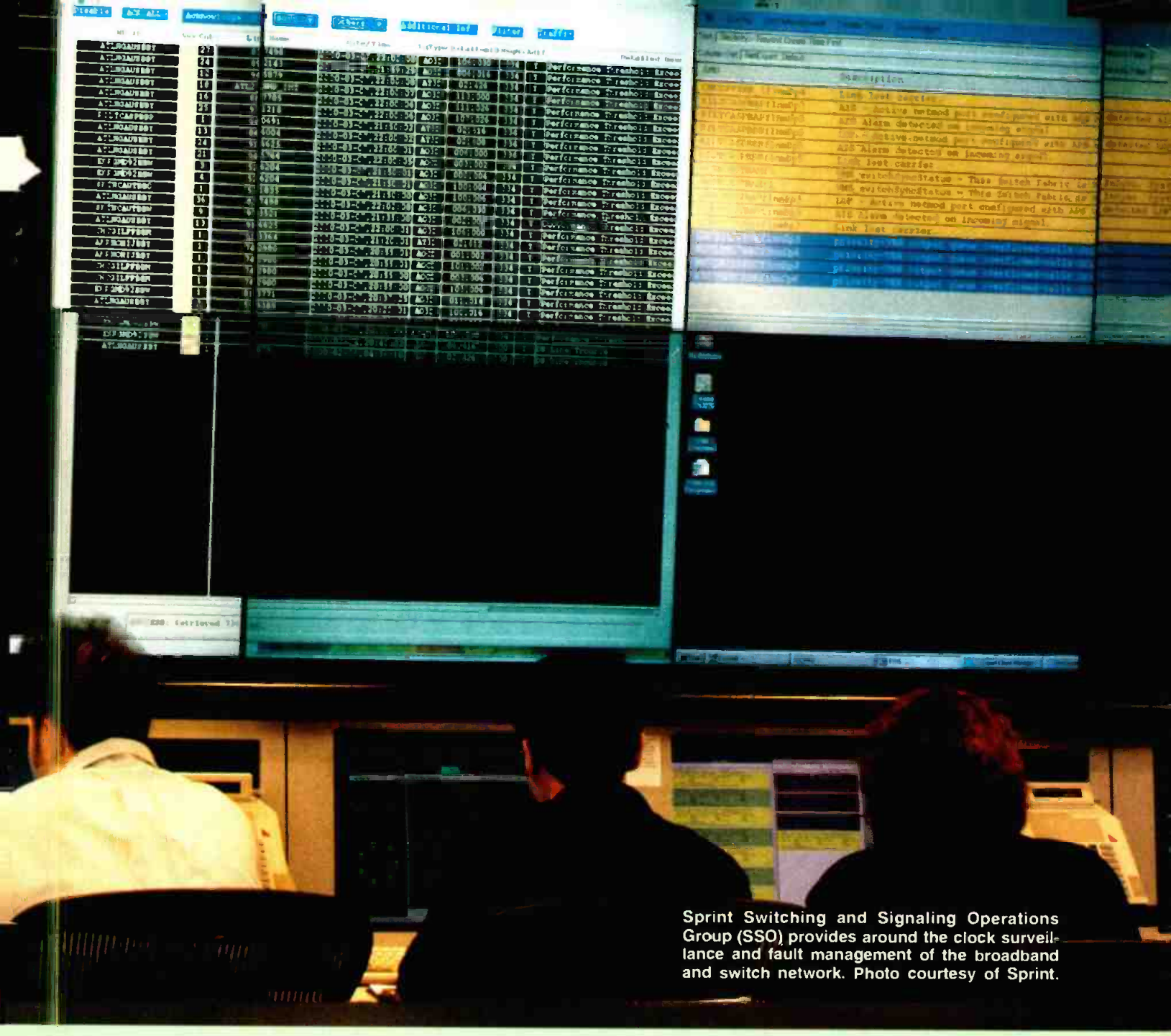
While the delivery of real-time video over high-speed networks is a wonderful concept, it can have significant shortcomings in practical use. Instead, the use of a store-and-forward technology, combined with IP and FTP interconnection can allow broadcasters and production houses to easily share broadcast quality material with lower costs, fewer hassles and more flexibility. ■

Shawn Carnahan is chief technology officer for Telestream, Nevada City, CA.

Understanding ATM

By Jim Boston

Broadcasters have developed a bag of tricks over the years for moving audio and video from one location to another. Initially, the process was quite simple; the phone companies ran long runs of coax. Every so often, the video on those lines was amplified and re-equalized to restore it to a semblance of what was originally sent. The baseband nature of the video through coax meant that the signal quickly degraded over distance. Microwave systems were soon employed. The long distance carrier (it was only AT&T in the beginning) would frequency multiplex both voice and television over the same path. This path was the best transport option for broadcasters for more than 30 years. In the mid-1960s, satellite transmission was experimented with on transoceanic relays with the advent of the Telstar satellite. In the late 1970s, satellite use made the super-station and the cable channel possible. By the mid-1980s, the networks distributed their content via satellite. Local stations used satellites for back-hauling news. When microwave and coax were the only tools available for transport, most local and long-haul carriers didn't court the broadcasters' business; thus broadcasters learned how to use other transmission methods to accomplish long-distance program delivery.



Sprint Switching and Signaling Operations Group (SSO) provides around the clock surveillance and fault management of the broadband and switch network. Photo courtesy of Sprint.

Telco tools

Although not interested in the video business through the 1980s, the telephony industry developed a large tool set to handle the emerging demand of moving data over long distances. With the large amounts of data carried by the Internet, the movement of data by the long-haul carriers is starting to rival the movement of voice. Because long-haul backbones are digital in nature, long distance voice traffic has been digital for years. This digital migration of voice traffic is making its way ever closer to the average home. Those homes and businesses with ISDN/xDSL already have a digital tentacle of that system. Now that the television industry is realizing that video and audio streams can be thought of as just another type of data, we can start to use the same data tools offered by the telephony people.

These tools come in three types: Frame Relay, IP, and ATM (asynchronous transfer mode). We will touch on Frame Relay and IP briefly here, but ATM is the main subject. These protocols use virtual paths, meaning a connectionless path. Instead of a physically switched and dedicated path between two locations, the data from one location is merged with other traffic headed the same direction via time multiplexing. Another common point of confusion is that IP (Internet Protocol) packets can be inserted as the data payload in ATM cells. Packets and cells are different names for specified chunks of data sent at a time. IP and Frame Relay call these chunks frames, whereas ATM calls them cells. These protocols emerged because long distance data traffic evolved from being mainly text-based to being graphics-based. Data traffic can come in bursts

Illuminet's Network Surveillance Control Center, Overland Park, KS. Control centers such as this monitor a network of public-switched telecommunications infrastructure, helping to ensure an even spread of traffic and the highest access speeds available. Photo courtesy Illuminet.

and many data users require some guarantee that the data will arrive at its destination in a timely manner. Some earlier protocols existed, namely X.25, which was developed when paths were still largely analog. Because of this, X.25 had error correction capabilities not needed with digital paths. X.25 was an asynchronous system, whereas the newer protocols for the digital networks are synchronous. Additionally, an error-correction scheme known as TCP (Transport Control Protocol) was developed which wrapped the user's data, which could then be wrapped a second time in IP.

Frame Relay uses paths called Permanent Virtual Circuits (PVC) to connect end users. Many other data sessions share different links of the path, but the data carrier provisions sets up the virtual paths to be there all the time, whether the user has data to send or not. If no data was sent, the time slots (or more exactly packets) devoted to that data customer would be empty. This simplified the Switched Virtual Circuit (SVC) used with X.25. A SVC can be thought of as a phone call for data. The virtual path is set up only when data needs to be sent. One trade-off is that some time is spent setting up the call. The advantage of Frame Relay is that its frame lengths are long, generally 128 octets (1 octet = 8 bits) and up. This means that for lower bit rate paths there is less overhead. The tradeoff is that data requiring fast access to the network has to wait longer for its turn. ATM has shorter cell lengths in part to solve this.

IP is much cheaper to implement than ATM. But it is good for carrying time-sensitive material only in uncongested networks. IP traffic outside the carrier's SONET backbone is routed via routers, which are cheaper than switches. Routers are generally software-driven devices, making the propagation delay through them longer than the hardware-oriented switches used for ATM. IP doesn't generally have any Quality of Service (QoS) guarantees which are available with ATM (although some IP router manufacturers are implementing them, but they increase the overhead). QoS has various levels, as we will see. These levels provide assurances of bit rates, propagation delay through the ATM cloud, and the amount of allowable jitter. ATM is good for moving video through congested networks where QoS levels along the path need to be tunneled out. Most of us now are aware that TCP (transport layer in the OSI stack) usually rides on top of IP (network layer). But often User Datagram Protocol (UDP) is used in place of TCP, as it requires no re-send of cells that are lost (something that TCP requires). The re-sending of lost cells and the wait to assemble the re-sent cells in the proper order greatly hampers the high bit rate/real-time nature of television bitstreams.

The telephony backbone

What actually comprises an ATM cloud? To use the ATM service of a backbone carrier, you need to gain access to the carrier. The access usually consists of using the Incumbent Local Exchange Carrier (ILEC), normally the local Baby Bell or a Competitive Local Exchange Carrier (CLEC) to provide connectivity from your facility to the ATM carriers Point of Presence (POP). Once your data is at the POP the ATM carrier charges a port charge. This is a subscription into the ATM cloud. One interesting thing about ATM tariffs is that you only pay for the amount of data inserted into the cloud, and not how far that data has to travel.

The access leg from your facility to the POP is often DS-3 (DS = Digital Service). DS-3 (often referred to as a M13 frame from a M13 multiplexer) when used for voice traffic, consists of seven DS-2 signals. Each DS-2 consists of four DS-1 (or T1 — which can carry 24 voice channels) signals. Hence a M13 multiplexer takes 28 DS-1s (the "1" part of M13) and muxes them into

one DS-3 (the "3 "part of M13). When DS-3 is to be used to transport ATM, the ATM data is encapsulated into a Physical Layer Convergence Protocol (PLCP) frame. The PLCP frame has twelve 53-byte ATM cells plus framing, and parity information. PLCP allows for 40.7Mb/s of ATM cell data to be mapped into the 44.21Mb/s DS-3 payload rate. DS-3 is what usually arrives at the POP. At the POP the DS-3 is mapped onto a synchronous optical network (SONET) ring. A SONET ring's capacity is measured in Optical Carrier (OC) rates. An OC-1 ring can carry a DS-3 data stream. Our PLCP frame is mapped into an STS-1 (Synchronous Transport Signal) frame. An STS-1 frame consists of data arranged in 90 columns with nine rows. This represents 810 octets of data. But the first three octets of each row, or 27 octets, are used for overhead. 8000 of these frames are sent per second, therefore each frame is 125 microseconds long. The 27 octets of overhead are used to point to where valid data starts in the frame, as the start of data does not always match the start of the STS frame (we will see why shortly). Also, control traffic and message traffic can be sent over the path using these overhead octets. The 783-byte payload can be used to carry ATM, or other types of traffic.

Originally DS-2 and above used Plesiochronous Digital Hierarchy (PDH). This means nearly synchronous, with multiple levels of multiplexing (DS-0 into DS-1, into DS-3). These are considered nearly synchronous because specific bits of information found in one frame may reside in a different location in the next frame. This is due to bit stuffing. As an example, PDH would be required if DS-1 channels from far-flung locations were being multiplexed into a DS-3 stream. The propagation time from the various DS-1 sources to the DS-3 multiplexer could vary as the weather changes, or other things slightly change along the path (sun rises and warms lines causing them to expand, lengthening the route). If the signal was taking a little longer than before to arrive, an extra bit would be added to make up for the delay. Therefore the size of the frame would vary. The converse would be true as the sun set, or went behind a cloud. DS-1 was always considered synchronous by telephone engineers because a particular bit for a particular channel is always found in the same place of a DS-1 frame. Telephone engineers have moved away from PDH and it's bit stuffing approach towards the use of pointers. This pointer is placed in the header of a frame, and it tells the receiver how far into the frame the data starts. Because of this, Synchronous Digital Hierarchy (SDH) is now used at all levels in new installations. Almost all SDH signals travel over fiber, except when undergoing switching (but that is starting to change).

One DS-3 bitstream is inserted into an STS-1 frame, which in turn is inserted into an OC-1 (Optical Carrier) stream. An OC-1 stream is 51.840Mb/s with about 8Mb/s overhead on top of the 44.21 DS-3 stream. OC-3 (155Mb/s) carries 3 DS-3 streams, or 84 DS-1 streams, or 2016 DS-0 (voice) streams. A concatenated mapping where all the bandwidth is given to a single user (no digital hierarchy at all) is possible, such as to ATM users (a lower case c indicates a concatenated frame, ex. STS-1c).

OC-12 carries 12 DS-3 streams (622Mb/s), OC-48 carries an STM-16 bit stream, which handles 48 DS-3 streams. OC-192 is currently the highest bitrate. OC-192 can carry 192 DS-3 streams.

SONET rings

On a SONET ring, you often find different kinds of traffic. Some carriers have voice, IP, and ATM traffic all traveling over the same ring. Although the different traffic can be thought of as separate virtual networks, they all travel over the same physical fiber ring in STS frames. The carrier provisions the ring so that part of the bandwidth (time) is devoted to each segment on the ring. In addition, some of the bandwidth will be devoted to express paths on the ring. If two nodes on opposite sides of a ring had a lot of traffic between them, a nonstop path between them would be setup. SONET works on a drop and add system. At each node, time slots that are programmed to be dropped from the SONET ring for local distribution are de-multiplexed out of the ring, and new traffic destined for long distance delivery is added. But at most nodes, some of the traffic does not undergo the drop-and-add process as it is intended for nodes farther along the ring. This is sort of a local and express

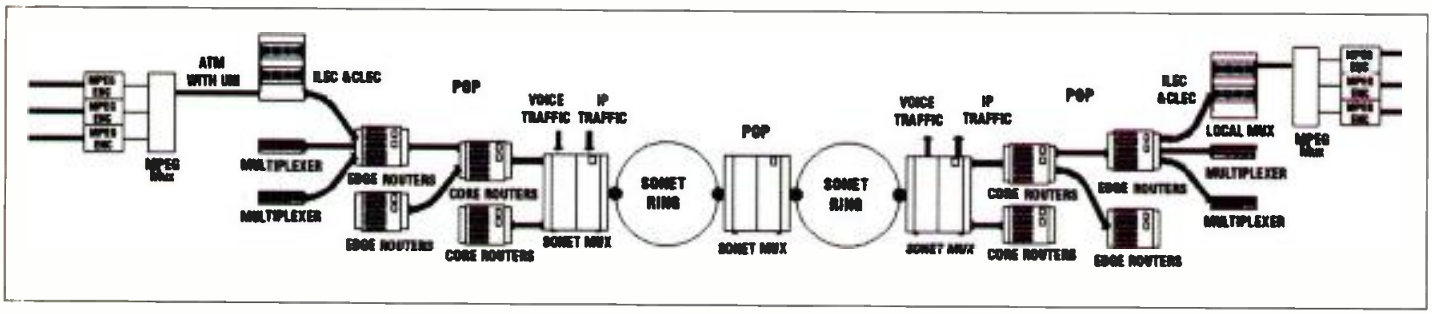


Figure 1. There are a variety of paths through the ATM cloud, but typically data will enter through an encoder, pass through some routers, through a POP and onto a SONET ring. It will then traverse one or more rings, be dropped into the POP nearest the destination and be routed on to its final destination.

train analogy. Some traffic only has to ride the ring for a couple of stops, while some have a long way to travel on the ring and it is inefficient to stop at each node.

Most traffic is destined for places not on the closest ring. The traffic must be handed off from ring to ring to complete its journey. Places where the rings are tangent to one another usually have a super POP. At these super POPs, traffic needing to transfer to a different ring is riding in a STS frame that is dropped off the ring. It is demultiplexed and routed if it is IP, or switched if it is ATM to a multiplexer that puts it back into a STS frame. It is then placed on the new ring. If the traffic is destined to ride additional rings, it probably will be placed into an express STS frame that will not undergo the add/drop process until it reaches the super POP tangent to the next ring to transfer to.

To reach its destination, most traffic will need to travel over multiple backbones owned by different entities. This means that the data must be handed off from one company's backbone to another. This is done at Network Access Points (NAP). NAPs are usually hosted by a telecom provider. Some handle all types of traffic, some just IP traffic. There are major NAPs in New York, Chicago, San Francisco, and Washington D.C. Although hosted by one backbone provider, many other companies can subscribe to a Service Interface (SI) at a particular NAP. The Chicago NAP, which is based on ATM and hosted by Ameritech, has 100 SI connections. These connections are to other telecom companies, Internet Service Providers (ISPs), universities, and government agencies. These entities hand off traffic to each other at these NAPs. Backbone providers and ISPs that exchange large amounts of traffic with one another often setup peering arrangements by running a path between one provider's backbone and another's backbone. NAPs and peering is what allows end-users using different access and backbone providers to communicate with one another.

When all the needed rings have been negotiated, the data is dropped at the closest POP to the destination. It then undergoes local switching/routing to arrive at the destination (See Figure 1).

AAL

ATM is intended to be used by different types of traffic, each with it's own set of requirements. Voice and video tend to produce constant bit rates, although video is usually at a much higher rate than audio. Data traffic is often bursty in nature. This means that although all bits are stuffed into ATM cells, these cells must be handled differently to satisfy the application. The OSI data-link layer is where the software code is specialized to handle the specific application. The data-link layer is what controls the hardware layer. The data (or video or voice) is put into ATM cells in the data-link layer, which is actually split in half. The lower half, known as the segmentation and re-assembly sub-layer, is where ATM cell generation takes place. The upper half, which is known as the convergence sub-layer breaks large blocks of data handed to it from the network layer above it into smaller (often 64kB) blocks and adds error detection and data recovery overhead. Some ATM is implemented without the upper intermediate step, instead relying on upper layer protocols (such as TCP) to handle error recovery. This process at the data-link layer is known as the ATM Adaptation Layer (AAL).

The movement of data by the long haul carriers is starting to rival the movement of voice.

AAL is broken out into five types. AAL-1 specifies Constant Bit Rates (CBR) for real-time traffic. This is often used for voice traffic and WAN applications. AAL-2 specifies Variable Bit Rates (VBR) for real time traffic. AAL-3 is VBR but intended for non-real-time data traffic. AAL-1 through AAL-3 are connection orientated. This is data transmission with a pre-arranged connection. AAL-4 is the same as AAL-3 except it is a connectionless transmission. AAL-4 is used for LAN Emulation (LANE). LANE is when ATM is used to connect remote LANs so that they appear as one contiguous LAN. AAL-5 does not use the convergence data-link sub-layer. This is known as Simple and Efficient Adaptation Layer (SEAL). SEAL has the advantage of using all 48 bytes in the payload section of the ATM cell. Other ATM AALs use four of those bytes for convergence sub-layer overhead. Like the MPEG characteristic of having higher profiles and levels able to handle lower types, AAL-5 devices facilitate all the lower AALs. AAL-5 is used for LANE also. Different AALs are used to guarantee various levels of QoS.

The tariffs for the various levels of QoS can vary greatly. VBR-NT (variable bit rate — non-real time) can cost about two-thirds of what VBR-RT (VBR — real time) costs. The same ratio exists for VBR-RT verses CBR. Therefore, CBR pricing can be two and a half times what VBR-NT costs. PVCs and SVCs are priced differently also. PVC pricing is based on level of QoS and the amount of bandwidth requested, while SVC is based on QoS and the amount of data delivered to the destination. The two different services are usually priced so that PVC is cheaper if used more than 100 hours a month, up to that point SVC is more economical. PVCs have to be provisioned by the carrier. The user can not change QoS levels and bandwidths on their own. With an SVC, the user can change both attributes.

Although access and port charges can run a few thousand dollars a

month for most users, the cost of sending standard-definition video (plus audio) isn't much more than a dollar and a half per minute in many cases. Besides the access and port charges, you need an ATM edge device. This can be an MPEG mux that talks ATM. Often the MPEG mux will go to another ATM mux downstream that is handling the merging of all ATM traffic within a facility, such as voice, and LANE activity. But if the MPEG mux is to directly generate ATM it must meet a number of standards:

ATM Cells

The simplest is to simply generate ATM cells. The 53 byte long packets have five octets (or 40 bits) of overhead in the form of a header. The header devotes the first four bits for flow control, although many ATM switches along a path combine these four bits with the next eight which are the Virtual Path Identifier (VPI). Each ATM switch encountered changes the VPI to manage handoff to the next switch. The VPI most likely will not be the same leaving the switch as it was when it arrived at the switch. A Virtual Path can carry more than one Virtual Channel. Separate services having the same source and destination, such as voice, LANE, video, audio, metadata, etc., would travel the same Virtual Path, but each would be separate Virtual Channels. Therefore the next 16 bits in the header are for the Virtual Channel Identifier (VCI). The VCI values also tend to change from switch to switch. The next three bits identify if the cell payload is user data or path setup and maintenance information. One bit is sent to indicate whether this cell has priority if congestion has mandated the dropping of cells. The final eight bits are for header error checking.

UNI

Next on the standards list is knowing how to negotiate an ATM cloud. The standard that encapsulates that is known as the User Network Interface (UNI). This standard was developed and is maintained by the ATM forum. A lot of it is based on various International Telecommunication Union (ITU) standards and recommendations. A common ITU recommendation often quoted in telecom circles is Q2931. A lot of Q2931 was incorporated into UNI version 3.1. The current UNI version is UNI 4.0. Q2931 specifies call setup and termination, VPI/VCI assignment, QoS requests, caller ID, error handling, and peak cell rate parameters. UNI communicates to the network the AAL level that is to be used. UNI also specifies that E164 addressing be used. E164 is essentially the addressing scheme we use when we manually dial a long distance phone number.

In summary, ATM technology has evolved to a state where it is another tool that broadcasters can add to the backhaul and program distribution tool set. Some SONET backbone providers have extremely wide fiber paths in terms of bandwidth. Some are literally terabytes wide. Even though the movement of program material is increasingly going to be non-real time in nature (such as FTP-type file transfers), real-time program movement can today be accomplished using ATM. ■

Jim Boston is the senior project engineer at Scripps-Howard, as well as author of a new McGraw-Hill book, The DTV Survival Guide. *The author would like to thank Qwest, especially Craig Brandetsas, Sylvia McKenna, and Richard Fintem, and Rich Csontos of Marconi/Fore Systems for their guidance.*

Common telco acronyms

AAL ATM	Adaptation Layer
ATM	Asynchronous Transfer Mode
CBR	Constant Bit Rate
CLEC	Competitive Local Exchange Carrier
DS-x	Digital Service
FTP	File Transfer Protocol
ILEC	Incumbent Local Exchange Carrier
IP	Internet Protocol
ISP	Internet Service Provider
LANE	LAN Emulation
NAP	Network Access Point
OC-x	Optical Carrier
PDH	Plesiochronous Digital Hierarchy
PLCP	Physical Layer Convergence Protocol
POP	Point Of Presence
PVC	Permanent Virtual Circuits
QoS	Quality of Service
SDH	Synchronous Digital Hierarchy
SEAL	Simple and Efficient Adapta tion Layer
SI	Service Interface
SONET	Synchronous Optical Network
STS-x	Synchronous Transport Signal
SVC	Switched Virtual Circuit
TCP	Transport Control Protocol
UDP	User Datagram Protocol
UNI	User Network Interface
VBR	Variable Bit Rate (NT-non real time)(RT-real time)
VCI	Virtual Channel Identifier
VPI	Virtual Path Identifier

Conversion Chart

The number of voice channels and how they fit into the various services offered.

1 DS-0 = 1 voice channel

1 DS-1 = 1 T-1 = 24 voice channels

1 DS-2 = 4 DS-1s = 96 voice channels

1 DS-3 = 7 DS-2s = 672 voice channels = 44.21Mb/s (payload)

OC-1 = 51.840Mb/s 1 DS-3 fits into an OC-1, 192 DS-3s fit into an OC-192 (10Gb/s)

Newstech: Weather graphics systems

Assessing the need

Perhaps your station's system has numerous graphic capabilities, but it's inefficient: if it takes a long time to render the animations, it takes a long time to create the graphics or put together the weather show. This can hurt a station in three ways:

- **Salary overhead is needlessly inflated.** The station is operating with more people, increasing salary costs.
- **Talent is wasted.** Station personnel must spend their time drawing the weather graphics and rendering the animations when they could be using their talents elsewhere to benefit the station in other ways.
- **Dynamic gap.** If you can't compete with breaking weather news, you lose ratings share because your system cannot get the data to air fast enough in rapidly changing severe weather.

While snazzy graphics and animations are important, the bottom line is: Stations present the weather because people want to know what the weather is now and what it will be. Although it should attract people's attention, for a weather segment to ultimately capture repeat viewer interest rather than be a gimmick, weather data must be clearly and concisely presented.

For example, viewers can see the graphic and determine whether there is rain to their north and if it's going to stay there or move to where they are. Rather than having something fancy and 3D that may attract attention, eventually they will turn to a station whose graphics give them clear answers rather than just the sizzle.

Give your system a good once-over.

One of the key elements of a strong weather graphics system is its capacity to clearly and concisely pass information to viewers in a severe weather situation. If its graphical elements are difficult to manipulate or take too much time to render, the information displayed might not be as timely or as useful as is necessary.

If it doesn't make the grade, it's definitely worth the time to do some shopping at this year's NAB. Your ratings may depend on it.

If stations fail to prepare, they might as well put a "for sale" sign in the window.

Weather system checklist

Beyond all the bells and whistles, there is a core list of elements a station should demand of its weather graphics system. The following list can be your guide through your station's selection/upgrade process.

There are several keys to selecting a system that will enable your staff to move past the basic elements of segment production. The system that is right for your station should be:

- **Easy to use:** Look for a system with an intuitive user interface that lets a user "point and click" and "drag and drop" to design weather maps. If a ten-minute demo can't highlight the system's benefits, it's too complicated.
- **Fast:** When severe weather hits your local area, your station's weather graphics system should be fast, with the ability to render animations and movies instantly, so you can break the story first. These days, your weathercaster should not have to spend hours creating a segment. Have the vendor put together a sample show to illustrate the system's speed.
- **Affordable:** A variety of quality weather graphics systems are available and they range greatly in price, anywhere from $20,000 to $150,000. Make sure the vendor will work within your station's budget and offer flexible payment plans.

Additionally, the system you choose should have:

- **A unique graphic look.** Do all weather shows in your market look alike? They don't have to. A unique graphics look, with proper branding, interesting video and 3D over-

The People.
The Technology.
The Company.

Your Partner in Digital Solutions.

TANDBERG Television believes that a lasting partnership with a customer is as important as the technology we provide. And for that partnership to grow, the people and technology involved must be open enough to fulfill the broadcast demands of today, yet flexible enough to meet the unknown requirements of tomorrow.

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www.tandbergtv.com

Circle (149) on Free Info Card

Newstech: Weather graphics systems

references. No system is without its bugs (especially in this quick-to-market industry) but does the vendor make an effort to correct the bugs and service your station appropriately?

• **Ample, ongoing user training.** When your station buys a weather graphics system, the weather vendor should provide four or five days of solid, on-site system's training for the station's weathercasters, graphic artists and engineers. Does the vendor offer user group sessions and/or beta testing of future upgrades and technology? Look for companies that work with their clients to continually provide training and customer feedback. After all, you're in this together.

Although today's weathercast must be graphically engaging, ultimately it is the strength of the information you provide that will garner repeat viewership. Look for a system that gives you the flash to grab an audience and the tools to hold it.

Streaming weather video checklist

Another aspect of a weather graphics system, one that can no longer be ignored or put off by forward thinking stations, is the ability to stream video over the Web. A large segment of your target is turning to the Web for quick updates of the present weather and the short-term forecasts. Consider your needs for the Web when evaluating your options for weather systems by asking the following questions:

• **In what format will the streaming media be delivered?** Real Media, Microsoft Windows Media and Quick Time Media — in that order. Streaming video should be available in all format delivery options. Make sure they have a concrete rollout plan for each format.

• **At what bit rates is the video encoded?** Does the vendor provide at least one stream for low-speed viewers and one high-speed solution (low speed referring to using just regular modems)? Both ends of the spectrum should be covered. You do not want to alienate any potential viewers.

• **What is the quality of the audio?** Don't take the audio for granted. When making your streaming decisions, make sure the video has high-quality audio. It does not matter how good the

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"The MT design allows us to get a full 96-input console in the space of a 48-input console and continues SSL's tradition of great sound. Engineers feel immediately familiar operating an SSL and total reset takes the pressure off when dealing with multiple acts, allowing us to fine tune every performance rather than just being grateful to get the next act on air. The MT is the ideal console for our type of business."

Richard 'Vance' Van Horn, President, Sheffield Audio-Video Productions.

Sheffield Audio-Video Productions, 13816 Sunnybrook Road, Phoenix, MD 21131 Phone: +1 (410) 628-1260

Axiom MT

Solid State Logic

International Headquarters

Begbroke, Oxford, OX5 1RU, England

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Fax: +44 (0)1865 842118

E-mail: sales@solid-state-logic.com

http://www.solid-state-logic.com

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Newstech: Weather graphics systems

Past, present and future trends in Weather Graphics

To keep up with the broadcast market's continuous need for bigger, better, faster and flashier, the competitive weather graphics industry must maintain a lightning-fast pace for new product development and innovation. Smart vendors guide their development based upon viewer preference surveys, by the reception of previously successful products, and from industry statistics.

Where we've been

Over the last few years, vendors geared their product innovations toward a demand for unique weather presentations packed with animated graphics and easy to understand timeline animations. Three dimensional graphics called fly-through animations, first brought to market by EarthWatch, Inc., let a viewer actually appear to fly in the sky over a particular mountain range or cityscape and view the rain, lightning, snow or clear skies depicting the weather across the country. (For those stations that want this fly-through capability, the technology is readily available on an equal basis from all the major players in the weather business). Although these graphics are still being used in today's weather shows, their use appears to be stepping back somewhat.

Another popular trend that has become an industry norm is the use of timeline animations to show viewers current and projected weather patterns. The graphics CNN created on AccuWeather's UltraGraphix ULTRAweather system, unveiled this concept. SGI O_2 systems were 'the rage' back then and stations scrambled to get the system's new technology capabilities to make weather presentations unique.

(Continued on p. 120)

picture is or how good it might look, if viewers cannot understand what is being said, they won't come back.

• **What is the update frequency of the weather products?** Because Internet users demand the most up-to-date forecasts, once a day updates will not be good enough to satisfy the weather needs of online users. How frequently will the vendor's products be updated? Some weather vendors do offer multiple updates; four times a day, even once an hour, are available.

• **What are the vendors capabilities to cover breaking news situations?** One of the most popular uses for streaming weather video is its ability to keep viewers informed of severe weather, like hurricanes, storms and tornadoes. Does the vendor have any experience providing this type of weathercast? How do they work with the station to provide the information?

• **How interactive is the streaming video product?** Interactivity is important. Don't settle for regurgitated television: look for a host of rich media and flat content to support the weather video. For example, if your site offers a weather video broadcast of Hurricane Floyd, does the vendor offer links to storm history or maps of the path?

• **Does the vendor have an e-commerce solution?** If a viewer is watching streaming weather video about Hurricane Floyd, does the vendor offer links to buy a book about it or a poster describing how a hurricane forms. Maximize the viewing experience.

• **How many ways can your station make money offering the streaming video?** Some e-commerce savvy weather vendors are offering streaming video with built in traditional banner ads, text tickers, sponsorship opportunities and co-branding partnerships which can provide new revenue 'streams' for a station.

A recent survey states that "the number one reason Internet users went to a local Internet site (a local television station or a newspaper) rather than going to a national site (like a Yahoo.com or an AOL.com) was for weather." The fact is those other sites do have local weather, your local weather, so your station has got to present the weather better than they

Several systems offer customized graphics. Station personnel can simply enter the appropriate information into the appropriate point-and-click template for use in on-air presentation.

Have you ever felt your MPEG-2 DVB system lacks flexibility?

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NAB update

Stop the presses! While we didn't stop the presses for this late-breaking issue, we have managed to assemble the latest in new product information for the NAB convention. You're holding the hottest info on more than 200 new products to be shown on this year's exhibit floor.

So, read on and you too will be up-to-date on the hottest new technology and products for NAB 2000. See you on the show floor!

robotic pedestal

Radamec RP2A:
features modified height functions, navigational improvements and adjustments to cable ergonomics; suitable for ENG and studio-style cameras and lenses; can support various teleprompters models.

877-RADAMEC; 732-246-0906; fax: 732-448-1184; www.radamec.com

Booth: L 2616 **Circle (251) on Free Info Card**

10-bit synchronizer

Pixel Instruments VS-5200:
features multiformat I/Os and built-in Heterodyne TBC; serial digital, composite, analog, component analog and Y/C selectable inputs and simultaneous outputs are standard, allowing users to transcode from one format to another; the DDO pulse output of the VS-5200 is used to control the audio delay of the AD-3000 for automatic lip sync correction with analog or AES/EBU digital audio; rapid delay tracking is made possible by the automatic pitch corrector in the AD-3000.

408-871-1975; fax: 408-871-1976; www.pixelinstruments.com

Booth: L 3529 **Circle (257) on Free Info Card**

Switchable camera

Ikegami HK-388/388W studio/HK-388/388PW portable NTSC:
offers 12-bit digital processing; converts the aspect ratio between 4:3 and 16:9 in the HK-388W and HK-388PW; component triax and fiber cable systems are available together with interface accessories for existing RGB triax; employs high-density HK-388 and HK-388P have 520,000 pixel 2/3-inch FIT CCS image sensors.

201-368-9171; fax: 201-569-1626; www.ikegami.com

Booth: L11831 **Circle (252) on Free Info Card**

RAID system

DataDirect Networks EV-5000 Fibre Channel Network RAID System:
a fast Fibre RAID System with over 190MB/s sustained throughput; a high-performance, scalable cross-platform, network data access storage solution for image-intensive, heavy-duty online media streaming, broadcast post production and special effects use.

800-322-4744; 818-700-7600; fax: 818-700-7601; www.datadirectnet.com

Booth: S 3427 **Circle (260) on Free Info Card**

Digital video and audio interfaces

Miranda Technology Imaging Series of digital video and audio interface:
includes a new set of modules designed for the conversion and processing of incoming video and audio feeds into a component digital facility; converters are designed to fit into the Miranda Symphonie 16-slot, 4RU or Quartet 4-slot 1RU modular frames and provide a complete feature set; modular design permits high density of up to four channels of video processing or two channels of video and audio processing per RU.

514-333-1772; fax: 514-333-9828; www.miranda.com

Booth: L 3330 **Circle (254) on Free Info Card**

Uncompressed quality, WinNT NLE

United Media On-Line Express 2.5:
real time video editing software operates in Windows NT; it provides Uncompressed Video Quality and is a professional finishing tool allowing complete creation of high-quality video and audio content; the software supports multi-format input and output in component, composite and YC video formats for real time editing and effects; the software is available as an upgrade for On-Line Express or as a new purchase.

714-777-4510; fax: 714-777-2434; www.unitedmediainc.com

Booth: L 9731 **Circle (255) on Free Info Card**

16:9 HD monitor

Panasonic AT-H3017W:
30-inch, 16:9 aspect ratio HD monitor with the ability to display 1080i, 720p, 480p and 480i images; delivers greater than 1000 TVL horizontal resolution because of a temperature-compensated shadow mask CRT with a 0.36mm dot pitch and SMPTE-C phosphors; features selectable color temperatures of 6500, 9300 and 3200degreesKelvin and multizone convergence and beam landing control with user presets.

800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast

Booth: L 8236 **Circle (264) on Free Info Card**

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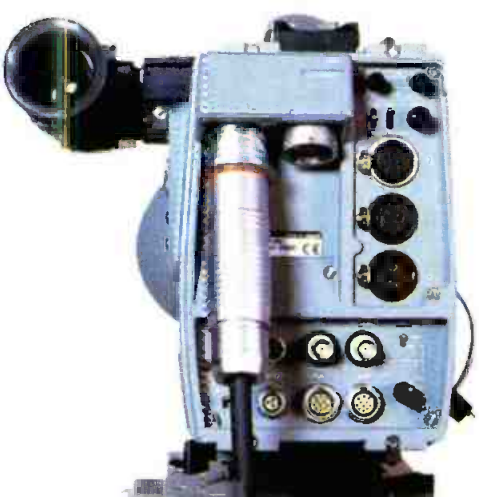

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Circle (156) on Free Info Card

Station automation system

Odetics AIRO:
integrates network feeds with local program origination and local spot insertion; scales to address a broad range of applications; automatically imports traffic schedules and appends them to current schedule; easily merges updated schedules.

714-774-2200; fax: 714-780-7594;
www.odetics.com/broadcast/

Booth: L 9341 Circle (271) on Free Info Card

Media management and distribution center

Sun Microsystems StorEdge Media Central Platform:
this comprehensive, scalable system allows broadcast, cable, satellite and entertainment companies to leverage their content across communications mediums ranging from high resolution television broadcasts to low-bandwidth, Internet-based and interactive media; it also provides live streaming of ongoing events, playout of pre-planned programming and storage of programming for reuse; for flexibility, it can be used to play-to-air over a terrestrial network or to a closed-circuit cable set-top environment; 415-969-1300; fax: 650-473-7101; www.sun.com

415-969-1300; fax: 650-473-7101; www.sun.com

Booth: M 8745 Circle (273) on Free Info Card

Data encoder

Norpak TES7 VANC Data encoder platform:
encodes, inserts, receives, bridges and multiplexes data in the VANC space of SMPET 292M TV signals; ideally suited to encoding closed captioning and ATVEF URLs for HDTV broadcasts.

613-592-4164; fax: 613-592-6560; www.norpak.ca

Booth: I 6815 Circle (265) on Free Info Card

Conditional access system

Canal + Technologies Mediaguard:
a digital conditional access system for subscriber and transactional pay-TV; supports several payment methods; scaleable to the operators' specific requirement and system architecture.

+33-1-71715715; fax: +33-1-71715578;
www.canalplus-technologies.com

Booth: S 5072 Circle (253) on Free Info Card

10-bit noise reducer

Leitch Lynx:
is adaptive field-based and offers recursive noise reduction, full proc-amp controls, frame synchronization, internal test generation and flexible I/O interfaces.

800-231-9673; 757-548-2300; fax: 757-548-4088;
www.leitch.com

Booth: L 9328 Circle (275) on Free Info Card

MPEG transport monitor

Tektronix MTM300:

a multi-stream remote monitoring tool for detecting errors in the MPEG-2 protocol in DVB and ATSC transport streams; user interface for immediate notification and an in-depth analysis mode are available; conforms to industry standard tests and physical interfaces; testing ETR290 helps identify synchronization, decoding and metadata problems; can simultaneously monitor up to eight transport streams.

800-426-2200; 503-627-7111; fax: 503-222-1542; www.tektronix.com

Booth: L 913 Circle (281) on Free Info Card

Troubleshooting instrument

LG Electronics StreamScope MT-10:

provides a cost-effective monitoring and troubleshooting solution for DTV broadcast Stations; able to monitor, measure, record and analyze vital parameters in a ATSC DTV broadcast stream; pays broadcast DTV video and audio, monitors 8VSB signal quality; monitors audio and video buffers usage; records and plays transport streams; analyzes contents of transport streams, including packet contents and PSIP table contents.

609-716-3505; fax: 609-716-3503; www.lgerca.com

Booth: Circle (278) on Free Info Card

Tally mapping and routing unit

Videoframe Tally Mapper:

tally mapping and routing unit has been enhanced to include TTL inputs; tallies can be remapped with a single button; a flexible solution for difficult tally control problems.

530-477-2000; fax: 530-477-7599; www.videoframesystems.com

Circle (276) on Free Info Card

Megapixel flat panel display

Sony PFM-510A1WU:

a 42-inch HD flat panel monitor with a 16:9 aspect ratio and 1024x1024 resolution; features a depth under six inches; offers 30 percent more brightness that the 5000A1WU at the same power consumption.

800-686-SONY; fax: 201-930-4752; www.sony.com/professional

Booth: L12107 Circle (277) on Free Info Card

Video scaler

Analog Way SMART CUT 2:

combines functions of an advanced video scaler with five video and two computer inputs; also provides switchable stereo audio on each of the seven inputs.

212-269-1902; fax: 212-269-1943; www.analogway.com

Booth: M10171 Circle (280) on Free Info Card

4:2:2 and 4:2:0 MPEG-2 IRD

Tiernan Communications TDR600:
1RU decoder; factory configurable for QPSK, QAM or OFDM with conditional access, over-the-air download, one stereo pair video, supports both SCPC and MCPC applications, ideal for contribution or monitoring production vehicle, ideal for OEM.

800-323-0252; 858-587-0252; fax: 858-587-0257;
www.tiernan.com

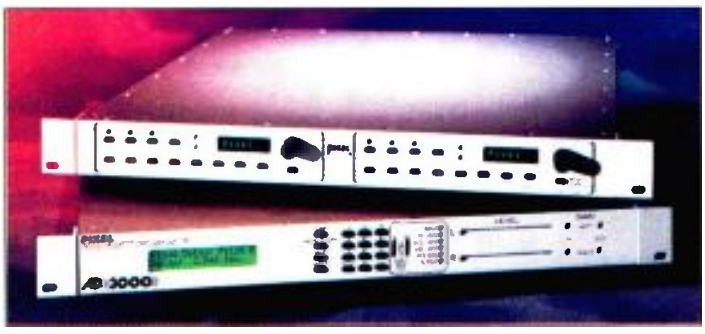
Booth: S 4162 Circle (261) on Free Info Card

Online logo inserter

Leitch LogoMax:
a broadcast quality "drag-and-drop" online logo inserter for post-production and television environments; can insert hundreds of SDI or HD logos with audio on the on-air signals.

800-231-9673; 757-548-2300; fax: 757-548-4088;
www.leitch.com

Booth: L 9328 Circle (274) on Free Info Card



Audio synchronizer

Pixel Instruments AD-3000
this audio synchronizer is intended for automatic lip sync correction (with the VS-5200, for example) and general purpose audio delay applications; built-in pitch corrector allows rapid delay change with minimum audible artifacts; includes standard stereo analog, AES/EBU digital (balanced) and SMPTE digital (unbalanced) I/Os.

408-871-1975; fax: 408-871-1976;
www.pixelinstruments.com

Booth: L 3529 Circle (258) on Free Info Card

HD fiber optic transmission link

Force Inc DTV Linx:
designed to transport a variety of datastreams and standards, including SMPTE 259M, 292M, 305M, 310M, CCIR 601, SONET and ATM.

800-732-5252; 540-382-0462; fax: 540-381-0392;
www.forceinc.com

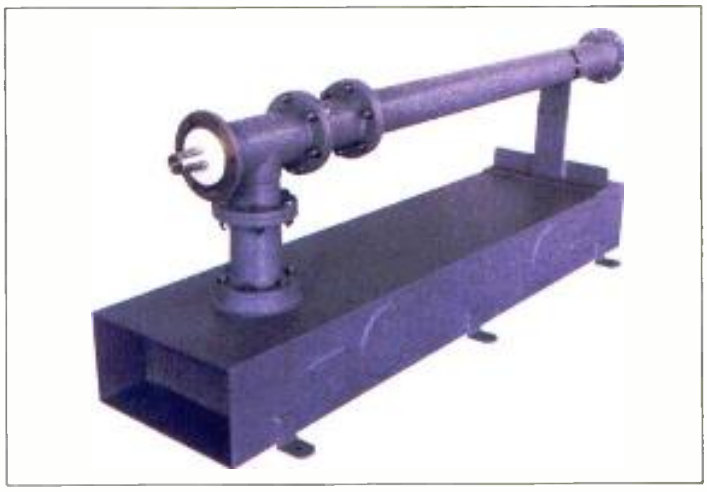
Booth: S 5357 Circle (259) on Free Info Card

Digital satellite news van

Frontline DSNG-350:
features excellent engineering, power and weight distribution; features fourth rack with exterior access for separate DSNG area and rack space for EFP equipment.

727-573-0400; fax: 727-571-3295;
www.frontlinecomm.com

Booth: L12386 Circle (262) on Free Info Card



UHF/VHF coupler

Micro Communications Duoband Combiner:
couples two signals into an existing transmission line; decouples two signals at the tower top with no interference between them; designed to allow the new DTV UHF signal to be combined with either an existing VHF or FM signal; can combine a LoV with UHF, HiV with UHF or FM with UHF signals.

800-545-0608; 603-624-4351; fax: 603-624-4822;
www.mcibroadcast.com

Booth: L10374 Circle (263) on Free Info Card

Video/SVGA flatpanel monitor

Ergo 2000 E2CKS5L:
features a maximum resolution of 1280x1024; offers composite and S-video inputs; VGA/SVGA/XGA compatible; optional touchscreen available.

800-635-9297; 714-992-0874; fax: 714-992-2131;
www.ergoind.com

Booth: I 5739 Circle (295) on Free Info Card

HD/SD telecine

Cintel Rascal:
based on the chassis and transport of URSA Gold; expands capabilities to multistandard film transfer operations, standard-definition and high-definition formats including 1080/24p.

805-294-2310; fax: 805-294-1019;
www.cinteltelecine.com

Booth: L 6344 Circle (293) on Free Info Card

Composite wfm/vect w/audio

Hamlet LCD Scope 400:
Features include four composite and audio input channels, waveform, vectorscope and audio bard graph, standard PAL and NTSC operation and gamut violation display and alarm.

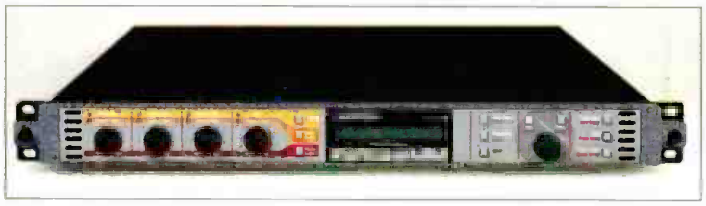
+44 0500 625 525; +44 1494 793 763; fax: +44 1494 791 283; www.hamlet.co.uk

Booth: L11855 Circle (297) on Free Info Card

HD camera cable

Telecast Fiber Systems HDTV Cobra:
Extends HD cameras with fiber and can support multiple digital cameras on one lightweight tactical fiber cable.

508-754-4858; fax: 508-752-1520;
www.telecast-fiber.com



Format converter

Leitch DFS-3005:
designed for hybrid conversion and synchronization applications; remote control panels network multiple units to central control location.

800-231-9673; 757-548-2300; fax: 757-548-4088;
www.leitch.com

Booth: L 9328 Circle (290) on Free Info Card

MPEG-2 transport stream server

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

650-903-4900; fax: 650-969-6388;
www.viewgraphics.com

Booth: S 4745 Circle (310) on Free Info Card

HD monitoring down converter

Astro Systems SC-2034:
features HD YPbPr input and NTSC output; three graticule overlay includes center marker, 4:3 safe zone and frame; include DC 12V input

818-244-1806; fax: 818-244-1878;
www.astro-systems.com

Booth: S 3877 Circle (289) on Free Info Card

PSIP manager

Harris PSIPplus/PSIP.com:
gathers, manages and disseminates PSIP data, including local system time, program guide and rating information, extended program descriptions and virtual channel information; offers easy-to-use local program editing capabilities; PSIP.com is a server that automatically downloads program guide information into the PSIPplus server daily.

800-622-0022; 513-459-3400; fax: 513-459-3890;
www.harris.com

Booth: L 6524 Circle (298) on Free Info Card

Digital audio sample rate converter

NVISION DA4050:
locks an asynchronous signal to local house reference; converts between different sample rates; offers two AES I/Os; 110- or 75Ω connectors.

800-719-1900; 530-265-1000; fax: 530-265-1010;
www.nvision1.com

Booth: L 543 Circle (283) on Free Info Card

4:3 and 16:9 front-lit test charts

DSC Labs CamAlign:
a series of test charts to optimize the performance of professional video cameras; patterns include standard crossed grayscales, vector colors, multibursts, flare tests and hyperbolics; available in 4:3 and combines 16:9/4:3 formats.

800-267-5227; 905-673-3211; fax: 905-673-0929;
www.dsclabs.com

Booth: L 9524 Circle (294) on Free Info Card

Desktop video system

Blossom Technologies Fury X2:
features dual 500MHz Xeon III processors; 1GB of 100MHz memory; five hours of high quality video storage, built-in 3 DVE effects and SDI; offers 350 real-time transitions and real-time linear keying, luma keying, chroma keying, serial digital I/O and 3 DVE with over 400 SD effects and dual monitor support.

305-266-2800; fax: 305-261-2544;
www.blossomvideo.com

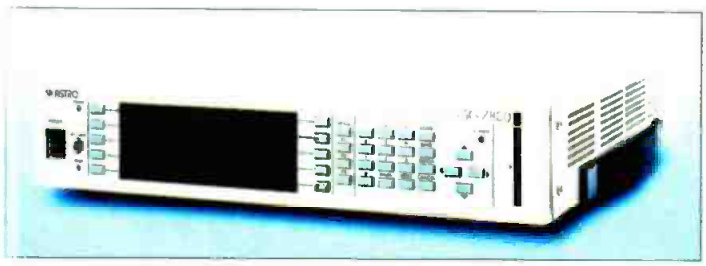
Booth: I 6539 Circle (279) on Free Info Car

Professional video networking system

PixStream VDS5000:
provides professional MPEG-2 video networking solutions; it allows multiple channels to be demodulated, descrambled, encoded, decoded, multiplexed and remultiplexed from variety of broadcast audio and video sources; the channels are then adapted to various telecommunications networks; it is designed for TV content redistribution and video courier applications and integrates seamlessly into terrestrial, satellite, cable and wireless infrastructures.

519-884-4196; fax: 519-884-9892;
www.pixstream.com

Booth: Circle (300) on Free Info Card



HD test signal generator

Astro Systems SG-7800:

a video signal generator for HDTV SDI; supports 1080i, 720p and 1080p24; provides functions including audio output, pattern edit, virtual motion and user BMP data availability.

818-244-1806; fax: 818-244-1878; www.astro-systems.com

Booth: S 3877 Circle (288) on Free Info Card

Live sports broadcasting system

Orad CyberSport:

a live sports broadcasting system featuring graphical capabilities and match analysis features such as insertion of virtual runners and record lines; real-time system uses microwave technologies to track and identify players and the ball in real time; instant animated graphics of the game highlights can be broadcast live over the Internet.

212-931-6723; fax: 212-931-6730; www.orad-ny.com

Booth: S 3132 Circle (282) on Free Info Card (285) on Free Info Card

Analog/digital transmitter

Rohde & Schwarz NH7000/NV7000:

a new generation of compact transmitters for analog and digital transmission; feautre liquid cooline and a special hardware concept.

+49-89-41292931; fax: +49-89-41291211; www.rsd.de

Booth: L 4758 Circle (304) on Free Info Card

Audio codecs

AEQ ACD-5001, MPAC-02

a dual multiformat audio codec for ISDN lines equipped with full-duplex intercom allowing a simple and independent communication with both audio channels, without external wiring and operations.

+34 91 686 13000; fax: +34 91 686 44 92; www.aeq.es

Booth: R 4066 Circle

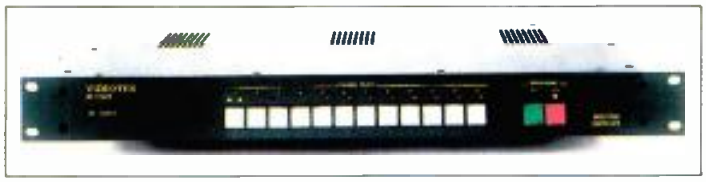
Diffusion effects

Tiffen Mfg Corp Black Diffusion/FX and Gold Diffusion/FX:

elimnates unwanted details in close-ups, especially facial close-ups; supress blemishes and wrinkles while maintaining a clear focused image.

800-645-2522; 516-273-2500; fax: 516-273-2557; www.tiffen.com

Booth: L11581 Circle (315) on Free Info Card



AES routing 12x1 and dual 12x1

Videotek RS-12AES:

flexible 12x1 and dual 12x1 digital audio routing switchers designed to operate as companions to any other Videotek RS-12 analog, digital or high-definition video router or separately as a stand-alone unit; also supports remote control from RS-232 or RS-422 devices with a variety of standard switcher protocols.

800-800-5719; 610-327-2292; fax: 610-327-9295; www.videotek.com

Booth: L12924 Circle (291) on Free Info Card

3D broadcast graphics & CG system

RT-SET Antero VS:

is a 3D on-air broadcast graphics and character generator package integrated with a full-blown virtual studio; it functions as a fully integrated system for single operator live-to-air production; this system's web-based real-time interface provides the user with maximum power and control and allows functions such as the fast change of virtual sets, realistic graphics, live-to-air facility, video inserts and clip effects; 877-955-2230; 212-463-9902; fax: 212-463-9931; www.rtset.com

877-955-2230; 212-463-9902; fax: 212-463-9931; www.rtset.com

Booth: S 6551 Circle (305) on Free Info Card

Newsroom nonlinear editing system

Panasonic NEWSbyte:

new version adds 40 new functions including the ability to digitize and display 16:9 aspect ratio footage, sequential file import with Alpha channel, import and export of user settings, networkable bins, EDL import/export and redigitizing, audio EQ and reverb and savable customized video modifications; newsBYTE system features a built-in DVCPRO 4x recorder player with disk transfers at 4x faster than normal speed.

800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast

Booth: L 8236 Circle (267) on Free Info Card

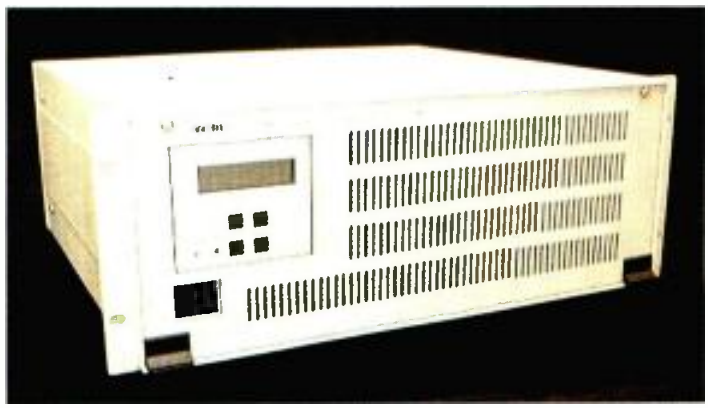
Audio network

Audio Processing Technology NXL384:

a cost-effective solution to audio communications across permanent digital networks; offers standard features such as auxillary data, alarm functions and integral back-up circuitry to assure the broadcast of program continuity.

+44 1232 371110; fax: +44(0)1232 371137; www.aptx.com

Booth: R 2390 Circle (268) on Free Info Card



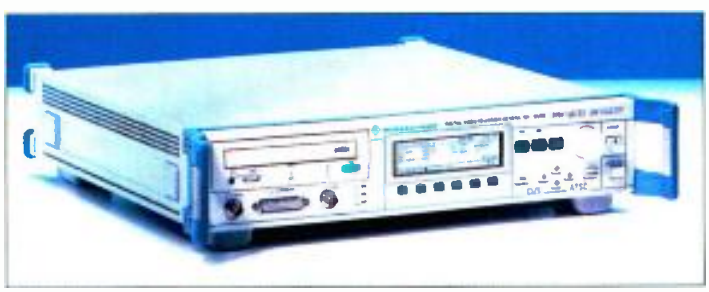
HD format converter

YEM HFC-292M:

handles every signal in conformity with SMPTE 292; automatically responds to vertical frequency of 60Hz and 59.94Hz; motion adaptable line scanning interpolation method increases vertical resolution of images.

310-544-9343; fax: 310-544-9363; www.yem.com

Booth: L 3117 Circle (270) on Free Info Card



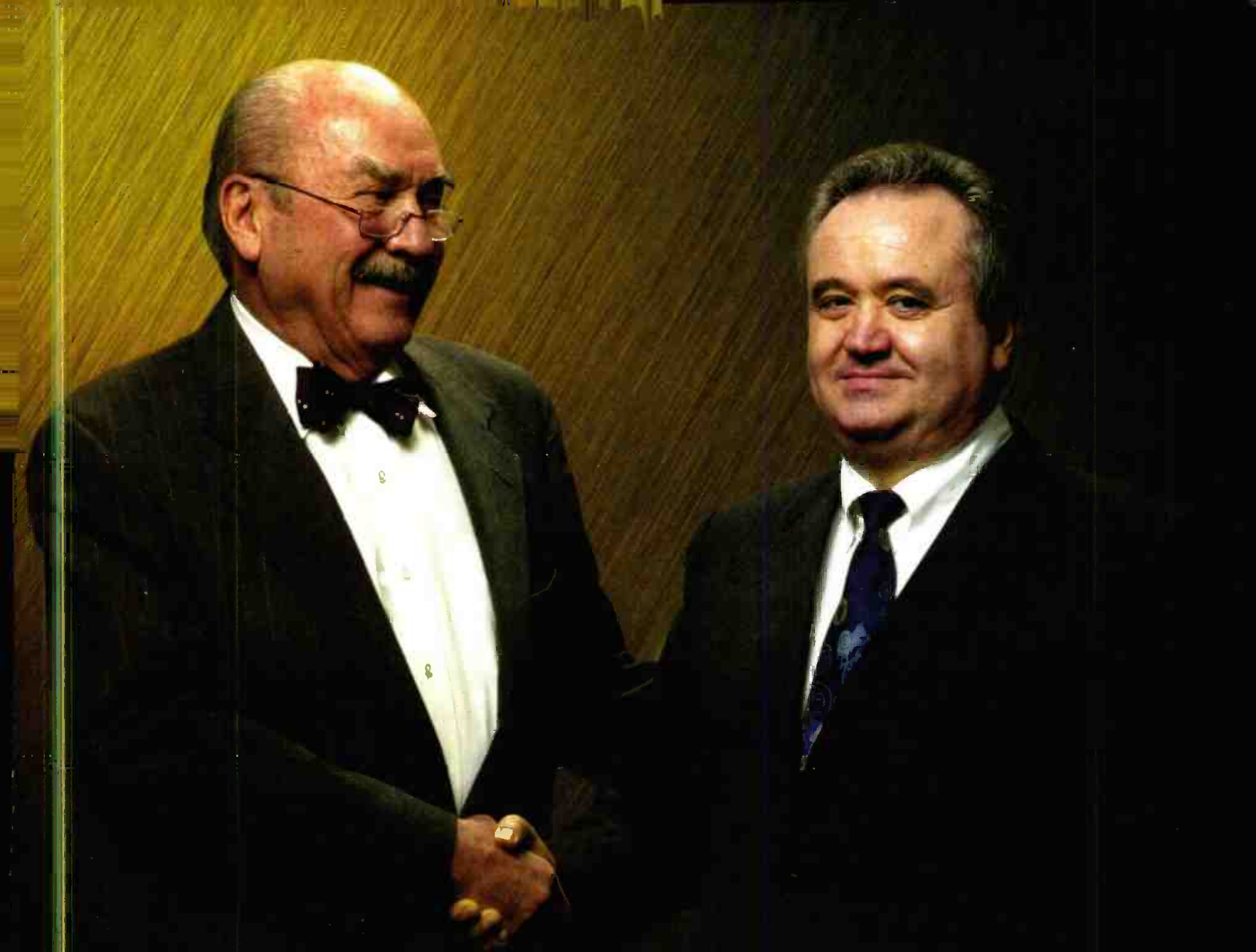
Dual audio embedder/de-embedder

Crystal Vision TANDEM

features two removable piggyback units on one card; can be configured to any two of four possible functions at once — embedding analog or digital audio into SDI or de-embedding analog or digital audio from SDI; can be a single embedder, a single de-embedder, a dual embedder, a dual de-embedder or a mixed embedder/de-embedder; the kit format means that the customer can build the exact product required and can reconfigure it in the field.

+44 1223 506 515; fax: +44 1223 506 514; www.crystalvis.com

Booth: L 9525 Circle (303) on Free Info Card



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801 524 9999 or www.utahscientific.com

See us at NAB Booth #L2027

Circle (152) on Free Info Card

MPEG-2 TS Analyzer

Astro Systems TS-7801:
this real time signal analyzer works with the MPEG-2 Transport Stream, providing fundamental analyzing functions such as TS bit rate analysis; PID analysis and PTS/DTS analysis; its input interface is ATSC/DVB ASI/SPI and a loop out equipped; this analyzer monitors the TS/PSI SI/PES/ES components of MPEG2 data streams, and errors are displayed in real time

818-244-1806; fax: 818-244-1878;
www.astro-systems.com

Booth: S 3877 Circle (320) on Free Info Card

Archive server

Pluto Technologies AirCHIVE:
solution that expands server media storage time much as does a data tape library system

303-402-9000; fax: 303-541-9043; www.plutotech.com

Booth: L 1516 Circle (329) on Free Info Card

2D production software

Cambridge Animation Systems Animo 3:
includes a 3D structure embedded within the current 2D toolset; acts as a harness for the Cas family of products and other software products; 2D/3D can be integrated via the Scene III plug-in.

+44 1223 578 100; fax: +44 1223 578 101;
www.cam-ani.co.uk

Booth: S4121 Circle (313) on Free Info Card

MPEG-2 real-time monitor

Rohde & Schwarz DVRM:
monitors either DVB or ATSC transport streams; errors are documented in detail and in different ways, alarm lines are freely configurable; reliability is provided by employing a non-PC-based platform.

+49-89-41292931; fax: +49-89-41291211; www.rsd.de

Booth: L 4758 Circle (314) on Free Info Card

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41BT Available with omni (EX-503H), uni-directional (EX-503UH) or SONY ECM-44H.

41HT Uni-directional handheld. Also available with AUDIX OM-3 capsule.

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Azden Home Page: www.azdencorp.com

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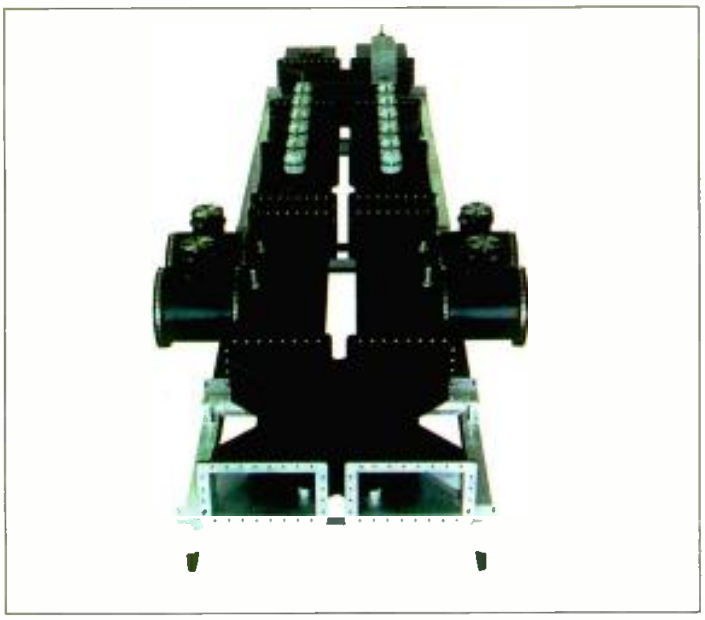
Circle (164) on Free Info Card



UHF channel combiner

Micro Communications High power N+1 channel combiner:
a high-power channel combiner for NTSC and DTV to work with allocation of DTV channel one above the NTSC channel; handles up to 240kW NTSC and 75kW DTV total power; serves as DTV mask filter; features thermally stable filter design — give constant load.

800-545-0608; 603-624-4351; fax: 603-624-4822; www.mcibroadcast.com

Booth: L10374 Circle (299) on Free Info Card

ENG/SNG vehicle

Harris Reporter TX2:
a combination ENG/SNG vehicle, equipped with both microwave and satellite communications system, offers unlimited coverage area and increased flexibility for small-, mid and large-sized markets.

800-622-0022; 513-459-3400; fax: 513-459-3890; www.harris.com

Booth: L 6524 Circle (322) on Free Info Card

RF test equipment

Z Technology DM-1000/2000:
provides RF channel coverage for both 8VSB and COFDM standards. Provides signal metrics including tap values, signal/noise and segment-error-rate; accessible from front panel or serial port.

503-614-9800; fax: 503-614-9898; www.ztechnology.com

Booth: L 2606 Circle (323) on Free Info Card

Audio processing system

TC Electronic System 6000:
targeted specifically towards music, film/post-production, broadcast and mastering applications in surround environments; its algorithms include the industry standard VSS reverb technology in a newly developed multichannel version called VSS-5.1; VSS-5.1 is a multi-source input to multichannel output space simulator that incorporates advanced positioning generators and five totally uncorrelated reverb diffused fields.

805-373-1828; fax: 805-379-2648; www.tcelectronic.com

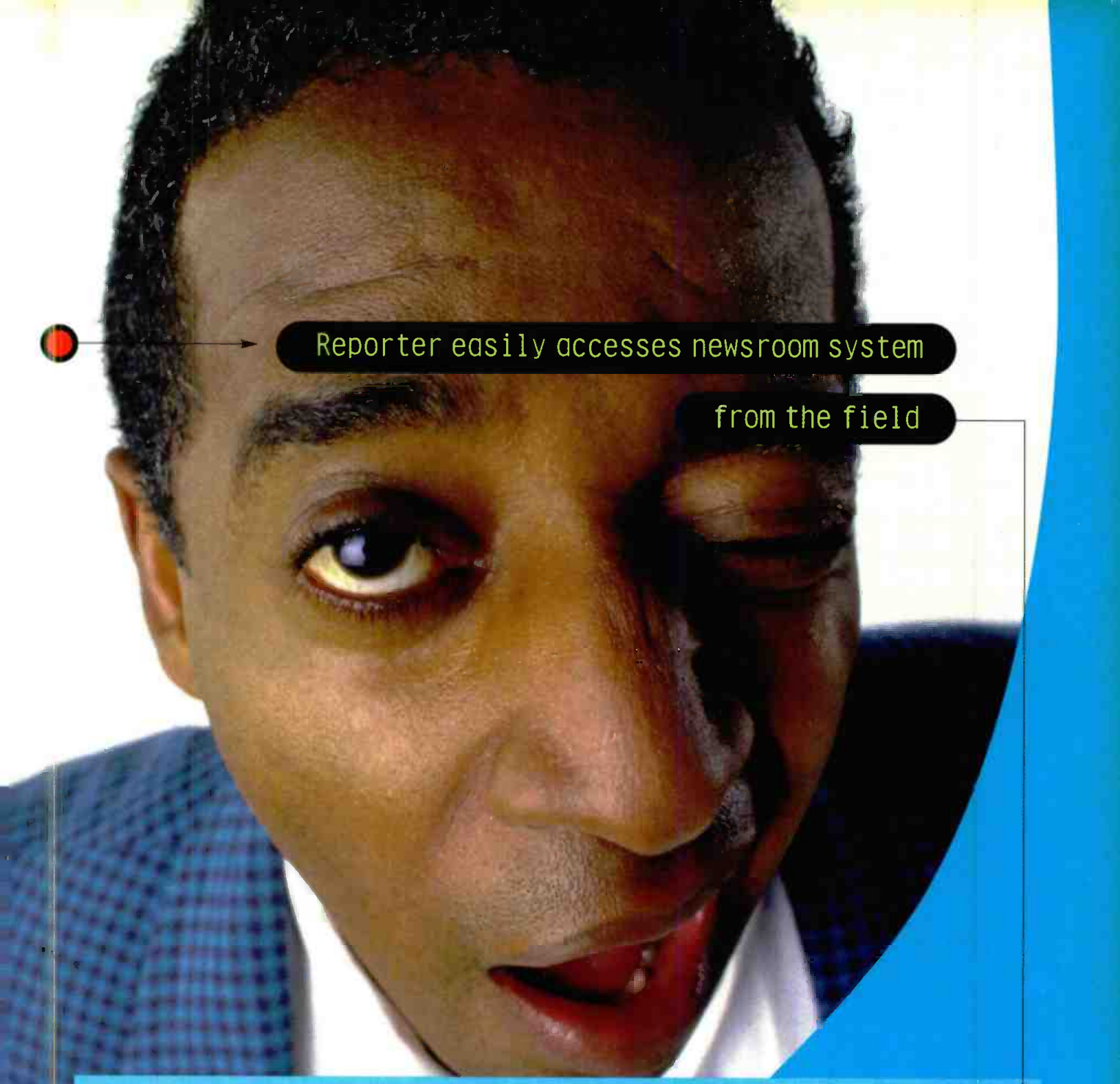
Booth: R 1059
Circle (307) on Free Info Card

Digital linear keyer

Crystal Vision LKEY211:
allows the fitting of six keyers into 1U; it is multi-functional and combines excellent additive and multiplicative keying quality due to 12-bit internal processing with additional operation modes; among these modes are self fill key, internal wipe, mask generation, mix and fade to black; the modes can be activated either manually or automatically.

+44 1223 506 515; fax: +44 1223 506 514; www.crystalvis.com

Booth: L 9525
Circle (311) on Free Info Card



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A·N·N SYSTEMS

Nonlinear editor accessory

United Media On-Line Express NLE Jog Shuttle Knob:
is an optional item for the online Express family of Realtime Nonlinear Editing Software; it offers direct control of various professional input devices for digitizing, allowing users to select edit in and edit out points of scenes and work in direct relationship with the timeline while editing.

714-777-4510; fax: 714-777-2434;
www.unitedmediainc.com

Booth: L 9731 Circle (339) on Free Info Card

Digital and analog transmitters

Technosystem UHF Band IV/V Solid State analog and digital TV transmitters:
for digital broadcasting, these transmitters are compliant with ITU DVB-T and ATSC DTV standards and feature automatic input bit-rate adaptation, front panel and remote controls, and serial and parallel inputs in single and multi-frequency networks versions; for analog broadcasting, they feature common amplification and all color standards, as well as a built-in precision offset circuit; maintenance is facilitated by easy tube replacement and cavity tuning; +39 06 225871; fax: +39 06 2282355; www.technosystem.it

+39 06 225871; fax: +39 06 2282355;
www.technosystem.it

Booth: L 2019
Circle (335) on Free Info Card

Real-time video editing software

United Media On-Line Express LE 2.5:
provides 550Kb per frame video quality and supports Matrox DigiSuite LE board (NTSC or PAL); it also allows for the complete creation of high-quality video and audio content, with multi-format input and output of component, composite and YC video formats for editing and effects in real time; it has new enhanced speed and performance, as well as enhanced scene trimming and playback; it is available as an upgrade to On-Line Express LE or as a new purchase.

714-777-4510;
fax: 714-777-2434;
www.unitedmediainc.com

Booth: L 9731
Circle (338) on Free Info Card

Camera crane

Egripment Javelin MKII Crane:
offers a steady shot up to 40-feet high; lightweight and easy to transport; designed for use with TV or film cameras in combination with remotely controlled camera heads.

818-787-6195;
fax: 818-787-6195;

Booth: L10686
Circle (333) on Free Info Card

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Utilizing Audio-Technica's proprietary DeltaBeam™ technology, the AT895 System manipulates the amplitude and phase of its 5-element array by acoustical, analog and digital means, providing off-axis cancellation of up to 80 dB. The system continuously adapts to a changing soundscape, and is especially effective at suppressing wind noise, rumble and other unwanted low-frequency information. So you get the audio you want, without all the clutter.

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Opticomm RGB-9100:
an amplitude modulated, LED or laser-based RGB or monochrome compatible video transmission system; designed for the extension of any high-resolution video signal such as CAD/CAM graphic workstation; units come with a built-in automatic gain control to maintain video output for each color; units transmit over three multi-mode fibers at 865nm and 1310nm or single mode fibers at 1310nm and 1550nm.

800-8-OPTICOMM; 858-450-0143; fax: 858-450-0155; www.opticomm.com

Booth: I 7424 Circle (266) on Free Info Card

Colorist control system

Pandora International Limited Pogle:
switches effortlessly for film, tape or data color correction; offers easily customized user interface; provides control of industry-standard telecine and associated devices; features fully integrated edit controller with support for common tape and disk drives.

+44 1474 561000; fax: +44 1474 566935; www.pogle.pandora-int.com

Booth: L 4458 Circle (327) on Free Info Card

Facility database

Crispin MediaBase 2000:
full facility database based on Microsoft's SQL server; complete with reports, searches and input screens; user access is available via Internet Explorer.

919-790-8813; fax: 919-845-7766; www.crispincorp.com

Booth: L 3507 Circle (345) on Free Info Card

D-1 output camera adapter

Hitachi CA-ZD1:
camera adapter that provides D1 output from any Z-3000W camera, a digital 4:3/16:9 switchable camera.

516-921-7200; fax: 516-496-3718; www.hdal.com

Booth: L 7507 Circle (341) on Free Info Card

Plug-in for DAW

Kind of Loud Technologies Real Verb 5.1:
a 5.1 surround panner plug-in for Digidesign's Pro Tools; uses sophisticated auralization technology to model physical spaces; can map reverberation spatially for surround mixing; allows users to independently place the direct path, early reflections and lat field reverberation in the sound field.

831-466-3737; fax: 831-466-3775; www.kindofloud.com

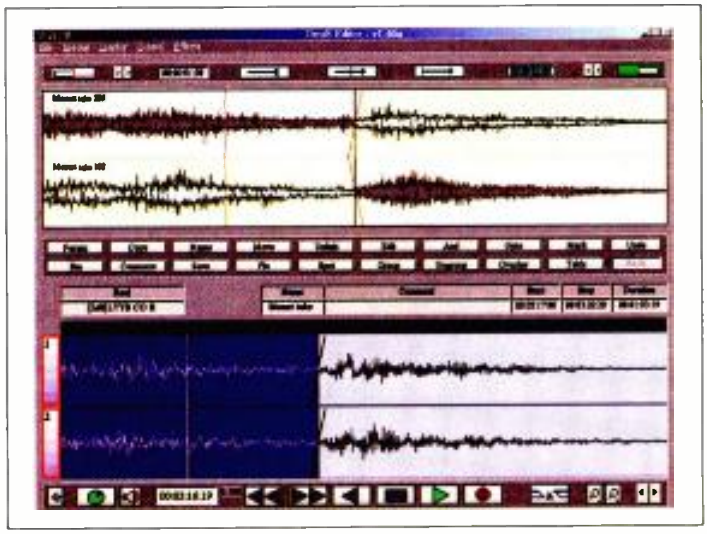
Booth: R4086 Circle (331) on Free Info Card

Audio connectors

ATI DMM100, DMM100-BAT Digital Match-Maker:
accepts serial digital NZR signals, including AES/EBU digital audio, from 110 Ohm balanced XLR input, a 75 Ohm BNC or RCA input or a TOSLINK optical fiber; it provides reshaped outputs to drive all simultaneously, with the inputs and outputs transformer-coupled and floating for maximum isolation and ground loop elimination.

800-959-0307; 215-443-0330; fax: 215-443-0394; www.atiguys.com

Booth: L 5211 Circle (332) on Free Info Card



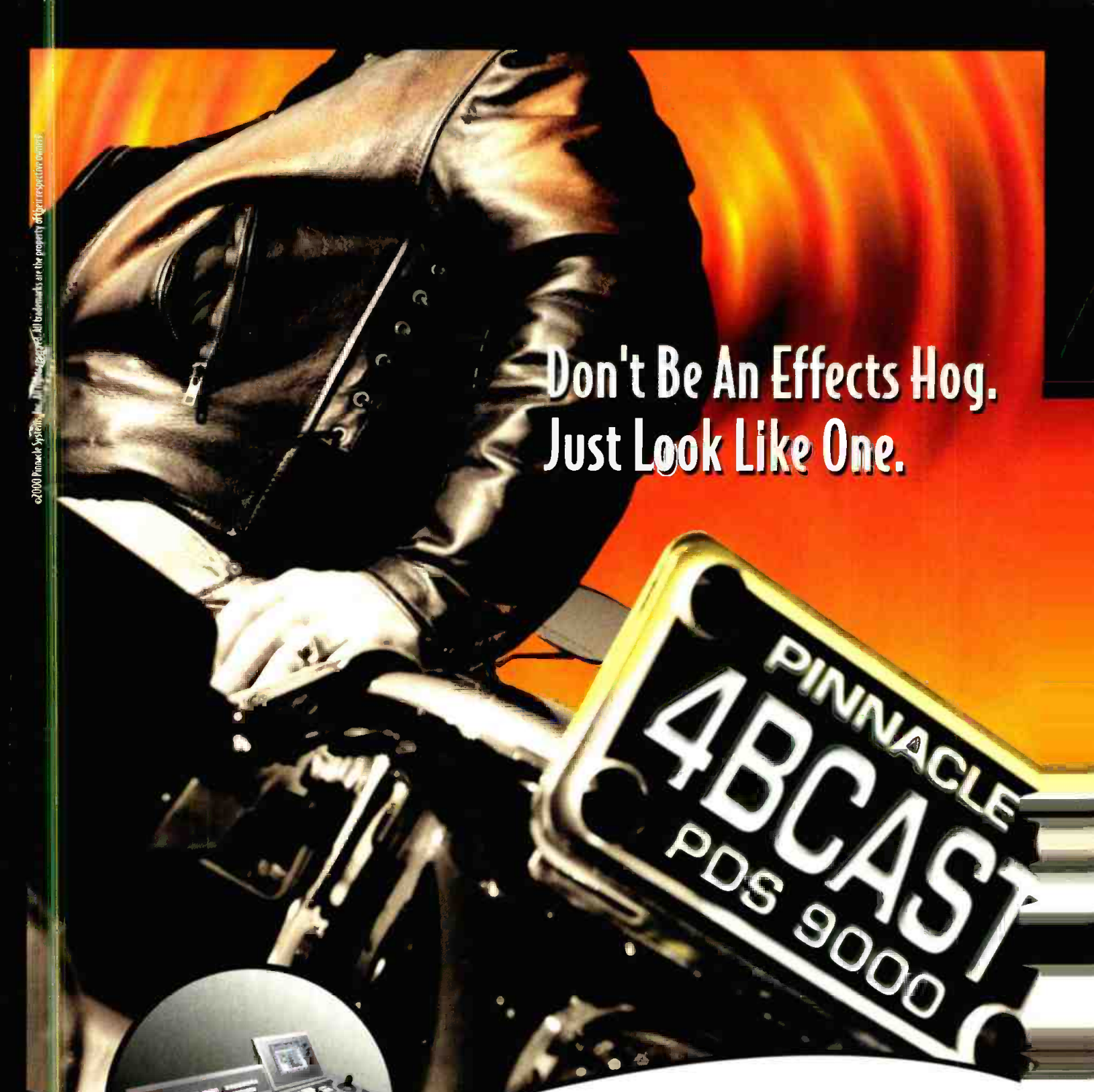
MPEG-2 interface converters and processors

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

413-569-0116; fax: 413-569-0679; thomcastcom.com

Booth: L 9609 Circle (309) on Free Info Card

Don't Be An Effects Hog. Just Look Like One.



PDS 9000 Production Switcher

- Big-station performance on a small-station budget
- 2.5 M/Es, each with three 3D DVEs
- Full RGB and YUV color correction on every key bus
- Up to 19 multi-page framestores
- Fully BroadNet compliant; can exchange files with Lightning, Deko and DVEXtreme
- Easy to use
- Fail-safe reliability

The PDS 9000. Full Color Correction. 2.5 M/Es. Nine 3D DVEs. Gives Broadcasters Vroom to Grow!

Born to be wild? Now there's a production switcher with the power to make lesser stations eat your dust. Never have so many effects been so easy to achieve. Designed to transition painlessly from an analog environment to a digital one, the PDS 9000 gives you nine full-function, 10-bit DVEs with full RGB and YUV color correction on every bus, with the flexibility to grow as you go. In fact, it sets a whole new standard for production switchers, at the lowest cost around. Think of it as a road-chewing Hog, on a Moped budget. Get up to speed fast. Visit our Web site or call 1-800-4PINNACLE.

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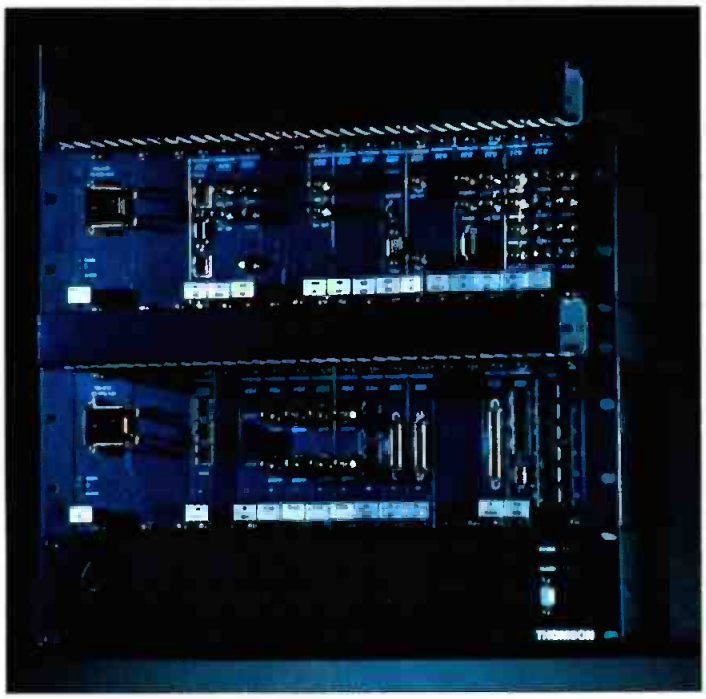

Telco contribution codec

Thomson Broadcast ACM 4200:
allows video trucking on the telecom network; offers broadcasters conveying video or audio signals over a network optimal rendered quality.

800-882-1824; 201-569-1650; fax: 201-569-1511; www.thomsonbroad.com

Booth: L 9609 Circle (369) on Free Info Card

Three CCD camera

Hitachi Three CCD color camera:
utilizes 2/3-inch 510,000 pixel CCD; 16:9/4:3 switchable; suited for use as graphics camera, in a pan/tilt system or as a tower camera; has a sensitivity of F1.4 at 0.5 lux and low vertical smear; features an automatic electronic shutter and a continuous wide range of lighting conditions by AES, Auto Iris and AGC; offers a horizontal resolution of 750 TVL; optional features include a remote filter disk and serial digital output.

516-921-7200; fax: 516-496-3718; www.hdal.com

Booth: L 7507 Circle (342) on Free Info Card

Serial digital video and AES Switcher

Multidyne DAS-1000
supports vertical interval switching of one video and up to two AES/EBU audio channels on a 10x1 matrix; includes one video and two audio breakaways; 350 meter cable equalized video inputs and two reclocked video outputs; supports 75-ohm single ended and 110-ohm balanced AES/EBU audio; supports 143-540Mb/s SMPTE 259M serial digital video and complies with SMPTE RP 168 vertical interval switching.

800-4TV-TEST; 516-671-7278; fax: 516-671-3362; www.multidyne.com

Booth: L 9144 Circle (393) on Free Info Card

Real motion images, not test patterns or flower pots.

Images that make television the ultimate
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those images expand to a whole new experience.

The benchmarks of success today – eyeballs glued to the images
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Circle (172) on Free Info Card

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MPEG-2 multiplexer

Thomson Broadcast Broadmux/XNA 4600:
offers enhanced input capabilities and new features, such as opportunistic data management and internal splicing capabilities between MPEG-2 streams; the internal broadmux splicer can be triggered through in-band commands; the XNA 4600 enhanced the multimedia capacities of the 4600 ATM network interfaces and addresses the needs for transmission of audio-visual services over ATM.

800-882-1824; 201-569-1650; fax: 201-569-1511;
www.thomsonbroad.com

Booth: L 9609 Circle (368) on Free Info

HD graphics camera

Hitachi DK-H3:
uses 1080i format, includes a 2.2-million pixel, 2/3 inch CCD chip and 1100 TVL horizontal resolution; offers DSP functions such as six-vector color correction, adjustable detail frequency and flesh-tone detail; built-in functions include color bar and three-wheel filter disc; can be controlled remotely through RC-Z2A port.

516-921-7200; fax: 516-496-3718; www.hdal.com

Booth: L 7507 Circle (340) on Free Info Card

Audio synchronizer

Pixel Instruments AD-3000:
this audio synchronizer is intended for automatic lip sync correction (with the VS-5200, for example) and general purpose audio delay applications; built-in pitch corrector allows rapid delay change with minimum audible artifacts; includes standard stereo analog, AES/EBU digital (balanced) and SMPTE digital (unbalanced) I/Os.

408-871-1975; fax: 408-871-1976;
www.pixelinstruments.com

Booth: L 3529 Circle (348) on Free Info Card

Studio camera

Angenieux 20x7.5HD:
camera lens for studio application; offers extended range and wide-angle capability with minimum ramping; provides distortion-free images with no chromatic aberration for optimal high definition and image clarity.

973-812-3858; fax: 973-812-3858;
www.angenieux.com

Booth: L11835 Circle (352) on Free Info Card

Master control automation

Crispin RapidPlayX 2000:
multi-channel playback/record control used for Master Control or News Control; runs on Windows NT; user screen is configurable; offers ability to link up to three channels of playout to a single channel.

919-790-8813; fax: 919-845-7766;
www.crispincorp.com

Booth: L 3507 Circle (343) on Free Info Card

Device controller

Crispin Crispin Device Server:
an NT-based PC for controlling serial and LAN controllable devices, such as Master Control switchers, routers, tape machines, video disk servers and character generators; communicates to Crispin applications over LAN via MOS.

919-790-8813; fax: 919-845-7766;
www.crispincorp.com

Booth: L 3507 Circle (344) on Free Info Card

Analog oscilloscopes

LeCroy LA302/LA303:
features three channels; LA302 measure 2Hz to 100MHz and LA303 operates up to 200Mhz; third channel provides three sensitivity levels for a wider range of measurements; both oscilloscopes feature a frequency response of 2mC/div, DC@50MHz and a sensitivity of 2mV/div; standard triggering includes TV system measurement base on NTSC and PAL SECAM; HD triggering is standard on LA303 and optional on LA302.

201-935-8486; fax: ; www.iwatsu.com

Booth: S 3315 Circle (367) on Free Info Card

HDTV stillstore

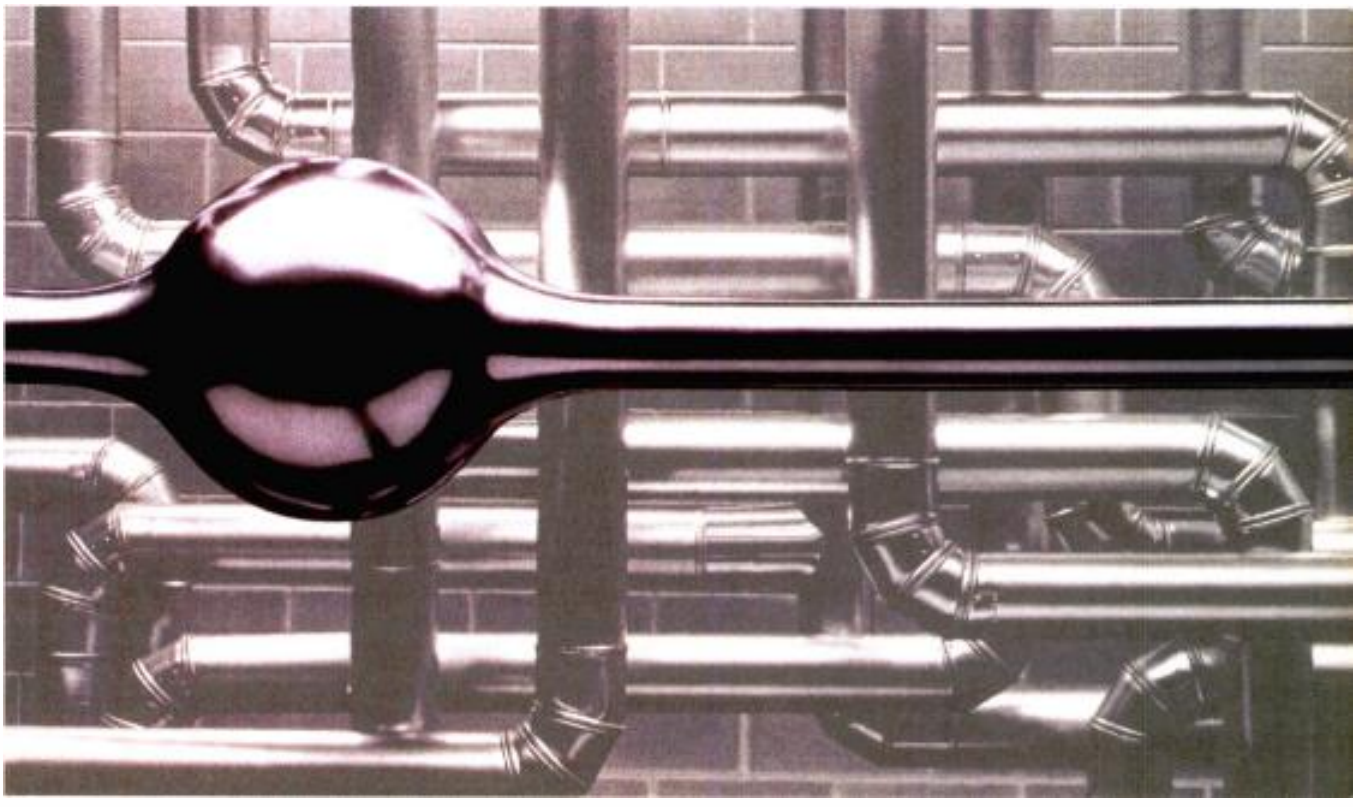
Avica Vecta HDTV stillstore:
this still/clip store supports all digital formats and allows simultaneous viewing of standard and high definition images; there is support avaible for the new 1080p/24sF image format, and up- and downconversions between all image formats; the stillstore may be used as a standalone or networked workstation.

800-706-0077; 818-846-0589; fax: 818-846-0175;
www.avicatech.com

Booth: S 2856 Circle (445) on Free Info Card

Visit us at NAB
Booth #L3132

DTV Transmission
So Much Content–So Little Bandwidth



Your allotted DTV bandwidth may look like a big pipe today, but—tomorrow promises greater opportunities for more services:

- High Definition Television
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- Streaming Video
- And more...

The DigiCipher® II ATSC compliant encoding system employs sophisticated compression and multiplexing technology to make the most of your bandwidth—while maintaining the highest quality pictures. And it's backed by the resources of an unparalleled technology innovator: General Instrument, now Motorola's Broadband Communications Sector. With nearly a decade of experience in helping customers deliver more digital content in less space, we have the track record and experience to act as your partner throughout the entire digital migration process. When choosing encoding systems for the long term remember...nobody delivers DTV better than Motorola.

Motorola's DigiCipher® II HD Encoder.

Contact us at 800-385-5843 for more information or visit us at www.motorola.com/broadband

MOTOROLA
Broadband Communications Sector

Circle (173) on Free Info Card

SAN-ready Fibre channel RAID system

DataDirect Networks EV-800:
for use in performance-critical and fault tolerant installations in broadcasting, post production and special effects; delivers high performance to digital content professionals; offers single unit storage capacities ranging from 45GB to 1.2TB; offers fault tolerance, redundant components and a solid migration path to a SAN environment.

800-322-4744; 818-700-7600; fax: 818-700-7601;
www.datadirectnet.com

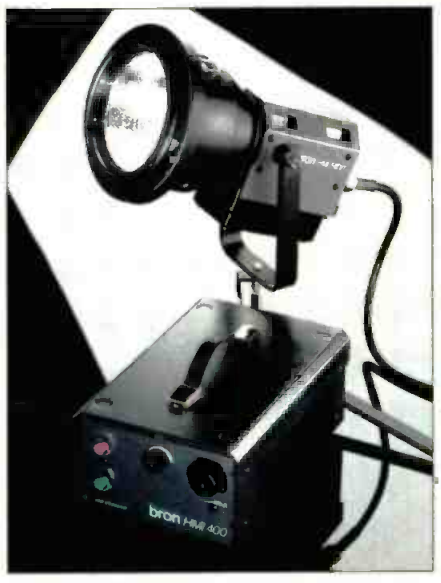
Booth: S 3427 Circle (474) on Free Info Card

Graphics platform

Pinnacle TARGA 3100:
provides impeccable quality including true uncompressed video as well as MPEG-2 and DV video processing; supports RGB A format for effects processing and compatibility with video and key provided by animation and compositing applications; new HUB3 100 megapixel per second video processor has a memory centric architecture that enables multilayer editing and compositing in real-time with sub-pixel DVEs, RGB chroma keying and advanced RGB color correction operating simultaneously on multiple layers of video.

650-526-1600; fax: 650-526-1601;
www.pinnaclesys.com

Booth: L 9457
Circle (360) on Free Info Card



HMI lighting system

ProSource/BMI Bron HMI400 light:
400W open-faced lamphead has focusing ratio of 5:1 and is fitted with a highly efficient, hot re-strike-type HMI/MSR bulb; electronic AC ballast is stabilized and allows flicker-free recording regardless of frame restore or shutter speed.

203-335-2000; fax: 203-335-3005;

Booth: L11878
Circle (302) on Free Info Card

Linux-based MPEG encoder

Zapex Technologies LX-3000:
a Linux-based MPEG-2 encoding board with video and Dolby digital audio for digital broadcast, cable and video on demand an satellite applications.

650-930-1300; fax: 650-930-1399;
www.zapex.net

Booth: M7962
Circle (374) on Free Info Card

DTV.
Time waits for no man... neither does the FCC.

With so many decisions to make in the fast approaching conversion to DTV, you need to begin the process early. By starting now, you assure your station a seamless transition with custom-engineered choices. Our design engineers are ready to create the Antenna System that works specifically for your unique situation.
Let's get started!

1-800-341-9678 • email: dcsales@dielectric.com • www.dielectric.com
Dielectric Communications • 22 Tower Road • Raymond, Maine 04071

START


Preliminary Design
1-2 weeks


Customer Confirmation
1-2 weeks


Final Engineering Design
2-8 weeks


Manufacturing
2-10 weeks


Assembly
1-3 weeks


Final Test
1-2 weeks


Transportation
1-2 weeks


Installation
1-4 weeks

ON THE AIR
May 1, 2002

Note: In the first two years of the digital television changeover, 115 stations went on air with DTV. In the next three years, the remaining 1,485 must be on air.

See us at NAB Booth# L8205

Dielectric
COMMUNICATIONS
Engineering Excellence Since 1942

1959: Baltimore, Maryland. First triple antenna candelabra built.

1999: Nine new Dielectric antennas top this historic tower.

Start the process now. Call 800·341·9678.

Logo generator

Video Data Systems LogoStar:
offers a simple and cost-effective means of keying over incoming video, storing and scheduling logos on screen; stores bitmap images and is ideal for on-air slides, channel identification, or auto display of emergency messages; features 32-key levels per logo, downstream keyer or upstream sources and preview output plus on-air output with enable control.

800-858-5850; 516-231-4400; fax: 516-231-4405;
www.videodatasys.com

Booth: I 6142 Circle (256) on Free Info Card

HD production switcher

Philips HD35:
designed for high-end live and post production; a format-selectable 1.5Gb/s switcher that features up to four M/E banks and 90 inputs; designed for configuration flexibility, network and performance.

800-962-4287; 818-729-7700; fax: 818-729-7710;
www.broadcast.philips.com

Booth: L 6910 Circle (379) on Free Info Card

Film and video restoration system

Snell & Wilcox Archangel:
provides fast and effective detection of impairments and estimation of quality; provides one-pass automatic restoration and user intervention of critical material.

+44 1730 821 188; fax: +44 1730 821 199;
www.snellwilcox.com

Booth: L11039 Circle (376) on Free Info Card

Widescreen display processor

Snell & Wilcox ARC 225:
new addition to ARC range; a cost-effective aspect ratio converter unit for playout centers within terrestrial and digital broadcasting environments.

+44 1730 821 188; fax: +44 1730 821 199;
www.snellwilcox.com

Booth: L11039 Circle (377) on Free Info Card

WAN routing switcher

Philips NetCaptain:
extends functionality of Jupiter and Vulcan routing control switchers to support Web-based applications and centralized control over WANs; provides control and monitoring for companies that offers video transport services; provides software to manage, control and view broadcast content from remote locations.

800-962-4287; 818-729-7700; fax: 818-729-7710;
www.broadcast.philips.com

Booth: L 6910 Circle (380) on Free Info Card

MPEG-encoded video routing switcher

Videotek RS-12MPEG:
switches MPEG-2 encoded serial digital signals with data rates from 19.4Mb/s to 360Mb/s; also compatible with DVB-ASI signals and uses the same control protocol as any RS-12 series router; features 12 looping data inputs, dual data outputs and serial communications control standard.

800-800-5719; 610-327-2292; fax: 610-327-9295;
www.videotek.com

Booth: L12924 Circle (391) on Free Info Card

Digital audio metering system

Wohler Dolby Digital AC-3 level metering system:
a compact 1RU metering unit with an internal Dolby Digital decoder and six 106 segment tri-color, high-resolution LED level meters.

888-5 WOHLER; 650-589-5676; fax: 650-589-1355;
www.wohler.com

Booth: L 6761 Circle (362) on Free Info Card

Matte box

ProSource/ BMI Shade FX:
features two independently rotating filter compartments; also incorporates a fixed matte within its hoods and lightweight carbon fiber filter frames; can be used with all broadcast and industrial internal focus lenses in both 4:3 and 16:9 down to 5.0mm. Optional rail adapter and universal lightweight support are available for external focus lenses.

203-335-2000; fax: 203-335-3005;

Booth: L11878 Circle (269) on Free Info Card

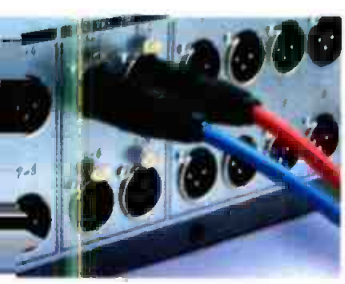
TCR8 MASTER RECORDER

MEET THE BEST DIGITAL AUDIO MULTITRACK MASTER RECORDER MADE.

360 Systems designed the TCR8 with one goal in mind: To deliver a Master Recorder that faithfully captures the results of your work.

The Difference is in the Details

To provide the level of sonic accuracy that critical projects demand, you have to sweat the details. TCR's design specifies gold XLR connectors, metal film resistors, no capacitors in the audio path, and a patented low-noise circuit to suppress RF, hum and cable noise. Put all of this on shielded PC boards with double-regulated power, and the result is a 24-bit audio recorder of unprecedented quality.



Defining the Master Recorder

The TCR8 Master Recorder includes the tools you'll need for professional work— solid synchronization, the right connectors, and a feature-set focused on commercial audio production.

Today's high-resolution audio formats need a new generation of recorders that deliver on the promise of 24-bit audio. By actual measurement, the TCR8 Master Recorder far exceeds the specs of competitive machines, and actually approaches the limit of today's art.

Today's "24/7" studio makes very real demands on audio equipment. Which is why 360 Systems designs for reliability, just as we design for audio quality. But then, we also have 30 years experience building equipment for round-the-clock professionals.

From original recording to final mixdown, the new TCR8 Master Recorder delivers performance without compromise. Should you expect anything less?

Superior Audio Quality

- Measurable improvement of 20-dB in SNR and dynamic range over conventional designs
- Bit-for-bit™ reproduction of 24-bit PCM, Dolby®-E and AC-3 recordings
- Record across all tracks, at any sample rate
- Workstation file interchange with SD-II and WAV files
- Complete Cut-Copy-Insert-Erase editing features
- The best digital scrub editing on the market
- Time offsets, track slip, varispeed and audio delays
- Up to 24-hours of recording time in a single file

Standard Equipment

- DVD-RAM drive for 10 hours of 24-bit audio on low-cost disks
- Internal 9GB SCSI hard disk (up to 50 GB available)
- 250 MB Zip® drive
- A complete set of XLRs for analog and AES/EBU
- Rear panel SCSI port for external drives
- Large display for full length file names
- Multi-machine sync provides up to 64 tracks
- Flex-Format™ drive bay for removable media, such as DVD-RAM (standard), Magneto Optical or removable hard disks
- Complete SMPTE time code features:
  - > Support for all frame rates
  - > VTR emulation with P2 control
  - > Reads LTC or VITC
  - > Hard lock to Digital Betacam® for tight sync during scrub-edits
  - > Reference to Video, AES, Word Clock, or LTC
- **$5,995 complete**

There is a difference. Click on www.360systems.com for a 20-dB improvement in *your* next project.

360 Systems®

The pros know the difference.

Visit us at NAB Booth #R3163

Circle (178) on Free Info Card

5321 Sterling Center Drive, Westlake Village CA 91361
Tel (818) 991-0360 Fax (818) 991-1360 E-mail: sales@360systems.com

Zoom and focus control

ProSource/BMI ZiF100:

ergonomic design and 24-bit DSP electronics allow zoom/iris and zoom/focus control with one hand; standard functions such as VTR start/stop, return video, zoom/focus direction and speed adjustment are built into the controller.

203-335-2000; fax: 203-335-3005;

Booth: L11878 Circle (301) on Free Info Card

Serial digital video distribution amplifier

Burst Electronics DVA-2:

is three products in one: a reclocking serial digital video distribution amplifier with 2 outputs; a serial digital to analog composite converter, and an error code analyzer allowing one to observe the quality of digital video in order to correct problems.

505-898-1455; fax: 505-898-0159; www.burstelectronics.com

Booth: L 9975 Circle (359) on Free Info Card

HD digital disk recorder

Accom WSD/HD Digital Disk Recorder:

incorporates significant advances in storage and disk control technology; designed for electronic film, graphics/effects and editing application in a network, multi-user, multiformat environment; can record/play SD/601 digital as well as HD formats, including 24p, on a clip-by-clip basis; provides flexibility for work at any resolution.

650-328-3818; fax: 650-327-2511; www.accom.com

Booth: S 4909 Circle (364) on Free Info Card

HD downconverter

Snell & Wilcox HD 9000D:

a production tool designed to enable HDTV program makers to originate and archive material in HDTV while simultaneously delivering studio quality masters for immediate distribution.

+44 1730 821 188; fax: +44 1730 821 199; www.snellwilcox.com

Booth: L11039 Circle (378) on Free Info Card

60kW IOT

Litton Electron Devices L4482:

features peak sync output (vision only) 64kW; common mode peak sync output power of 44kW visual/4.4 kW; and peak output power digital operation of 85kW.

800-861-1UHF; 570-326-3561; fax: 570-326-2903; www.littonedd.com

Booth: T 2238, L 5927 Circle (426) on Free Info Card

Solid-state DTV transmitter

ITELCO WV Series:

a liquid-cooled solid state transmitter; features an exclusive Itelco developed 8VSB exciter/modulator and patented liquid cold solid-state amplifier modules; available for power levels between 800W rms and 40kW rms.

303-464-8000; fax: 303-464-8770; www.itelco-usa.com

Booth: L 3243 Circle (361) on Free Info Card

Third generation IRD

Tadiran Scopus Codico IRD 2600:

offers enhanced capabilities at head-end site; based on new advanced chipset and included Dolby AC-3 support, simultaneous decoding and Program IDs, ATM DS-3 interface and advanced VBI over SDI; offers a modular structure and a variety of interfaces for various applications.

858-618-1600; fax: 858-618-1615; www.scopususa.com

Booth: M10135 Circle (363) on Free Info Card

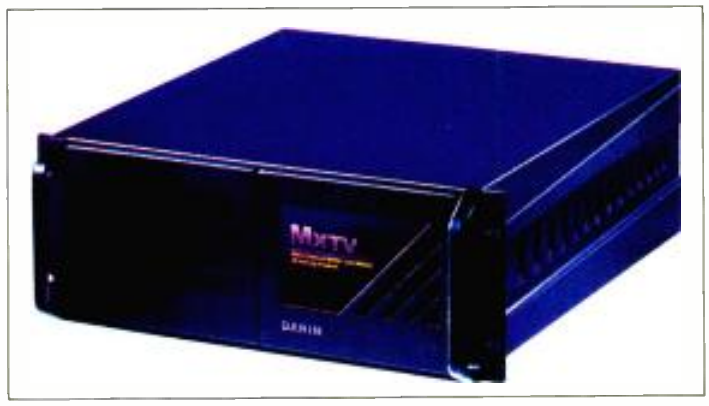
Asset management system browser

Grass Valley Group ContentShare Explorer 1.0:

browser-like application for networked media asset management; leverages Internet-based technologies of ContentShare platform for media access provides multiple views and dynamic discovery of assets; metadata display and modification tools.

800-998-3588; 800-547-8949; fax: 503-627-7275; www.grassvalleygroup.com

Booth: L11018 Circle (366) on Free Info Card



MPEG-1/MPEG-2 streaming server

Darim Vision MxTV:

this integrated MPEG-1/MPEG-2 streaming server transmits up to 4 live channels and supports scheduled broadcasts for pre-recorded files and on-demand requests for remote sites; it can also be used to create full-screen/full-motion video conferencing.

888-GET-MPEG; 213-637-1700; fax: 213-637-1705;

Booth: M10167 Circle (488) on Free Info Card

ultimatte 9

The new Ultimatte 9 and Ultimatte 400 are part of the third generation of Ultimatte's all digital compositing devices. They feature the Emmy and Oscar winning technology that has gained Ultimatte Corp. a reputation for the best blue- and green-screen compositing in the world. Both are fully linear matting systems, producing totally realistic composites even when the foreground contains smoke, shadows, soft edges, and other translucent and transparent qualities.

PROGRAMMABLE REMOTE CONTROLS
Both the Ultimatte 9 and the Ultimatte 400 feature advanced remote controls which can control up to 4 Ultimatte main units. "On Air" tally lights, reduced menu layers and programmable menus give you easy access and control.

ULTIMATTE 400
The new, low cost all-digital compositing hardware featuring matte controls, foreground & background colorizing controls, internal windowing controls, programmable remote, and non-volatile memory.

Specifically designed for virtual studio applications, the Ultimatte 9 offers features that produce a polished virtual production where visual improvements can be seen on the screen while bottom line production costs are reduced.

DEPTH OF FIELD with BACKGROUND DE-FOCUS
Automatic background defocusing that requires no software programming or physical hookup to the camera or computer.

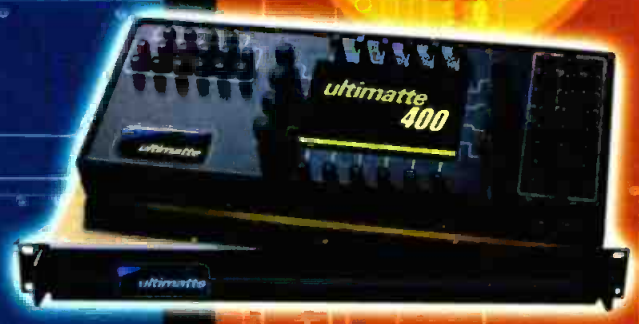
AMBIANCE and COLOR CONFORMANCE
Analyzes the background and automatically adjusts the foreground color in real-time.

EDGE CONTROL with AdvantEdge
Produces a flawless edge and can be used alone or in conjunction with sub-pixel matte sizing and positioning controls.

OVER-EXPOSURE CONTROL
Corrects problems with over exposed blue screens with no loss in detail.

EIGHT INPUT ROUTER
Configurable so that any of the inputs can be used for Foreground, Background or Matte signals, providing enhanced versatility.

ultimatte 400



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Chatsworth, CA 91311
USA
Ph: +1.818.993.8007
Fax: +1.818.993.3762

E-Mail:
sales@ultimatte.com

Ultimatte Europe
Zijdstraat 72
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The Netherlands
Ph: +31.297.380.935
Fax: +31.297.380.939

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www.ultimatte.com

See us at NAB Booth #L 9774

Circle (181) on Free Info Card

Computer chassis/server

Crystal Group CS600:

a 2U high by 19" rackmount computer chassis; features a six-slot ISA/PCI PICMG 2.0 compliant passive backplane with a butterfly backplane design; powered by wither 100- or 150W AC/DC; unit can accommodate three 3.5 hard drive bays and two cooling fans.

800-378-1636; fax: 319-393-2338; www.crystalpc.com

Booth: M 9831 Circle (334) on Free Info Card

Character generator

Peak Broadcast Systems USA Pilot Ticker:

this character generator is based on Everest real-time graphic software and is available for the SGI NT, O2 and Onyx platforms; it is used in combination with Pilot's database; the software reads electronically delivered financial data for instant display in formats including multiple crawls and non-moving graphic displays.

212-453-4893; fax: 212-453-4884; www.pilot.no

Booth: S 6569 Circle (354) on Free Info Card

Hard disk recording option

Solid State Logic MixTrack:

completely integrated for the Axiom-MT digital multi-track console; it functions under direct Ethernet control from the console to eliminate delays in response that occur when console and recorder operate under different software regimes.

212-315-1111; fax: 212-315-0251;
www.solid-state-logic.com

Booth: R 2074 Circle (405) on Free Info Card

Telecine upgrade

Cintel URSA CALLISTO:

is a simple upgrade package for users of Cintel's URSA Gold/Diamond telecines; it provides those systems with HD capability; employs Cintel's C-Reality technology.

805-294-2310; fax: 805-294-1019;
www.cinteltelecine.com

Booth: L 6344 Circle (406) on Free Info Card

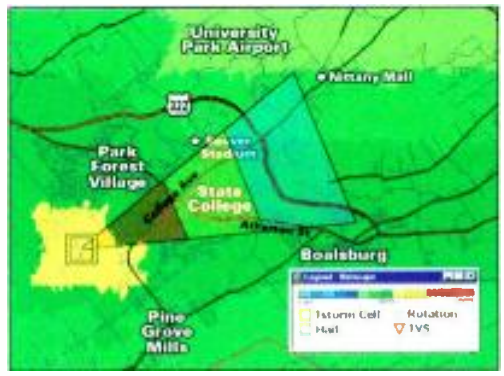
3D virtual set system

Evans & Sutherland Mindset Virtual Studio System:

this virtual set system is Windows NT-based and adds increased functionality for easier use and the co-development of a weather interface with AccuWeather.

801-588-1661; fax: 801-588-4511;
www.es.com

Booth: S 4862 Circle (408) on Free Info Card



Radar and weather system

AccuWeather FirstWarn Neighborhood Nexrad:

new features include ability to set color schemes, echo levels and animate selected echo level; users can also animate projected severe weather movement; control the StormPath analyzer box and display an accurate display of radar data at street level.

800-566-6606; 814-237-0309;
fax: 814-235-8609;
www.accuweather.com

Booth: L11576 Circle (272) on Free Info Card

3 Solutions for HDTV STL

available **NOW!**

from the LEADER in video broadcast MICROWAVE

Dual Stream

Dual Digital

DS3 System

Nucomm's family of HDTV STL systems offers 3 high performance options for making your transition to digital as easy and economical as possible – and they're available now. The Dual Stream (Dual Carrier), Dual Digital, HD Only (19.39 Mbs) and DS3 systems feature an ***open architecture platform*** providing you with years of flexibility.

These 3 systems are based on Nucomm's field-proven "Digalog" group of truly digital-ready microwave transmitters and receivers. Other features include:

- Modular design for easy configuration changes.
- Multi-format modulators: QPSK, 8PSK and 16QAM with forward error correction and adaptive equalization.
- Full factory integration and testing.
- System and path analysis available.

For complete information on Nucomm's family of HDTV STL systems contact us today.

Tel: (908) 852-3700
Fax: (908) 813-0399
www.nucomm.com

Nucomm

MICROWAVE SOLUTIONS FOR THE DIGITAL AGE

Circle (183) on Free Info Card

See us at NAB, Booth #L5451

HDTV virtual set

RT-SET Larus HD:
this new virtual set provides a fully integrated and comprehensive real-time, 3D solution at every stage of TV and video program productions; it also offers an unlimited number of cameras (including dissolve) and unrestrained camera movements, and has added capabilities for high definition broadcasts.

877-955-2230; 212-463-9902; fax: 212-463-9931; www.rtset.com

Booth: S 6551 Circle (409) on Free Info Card

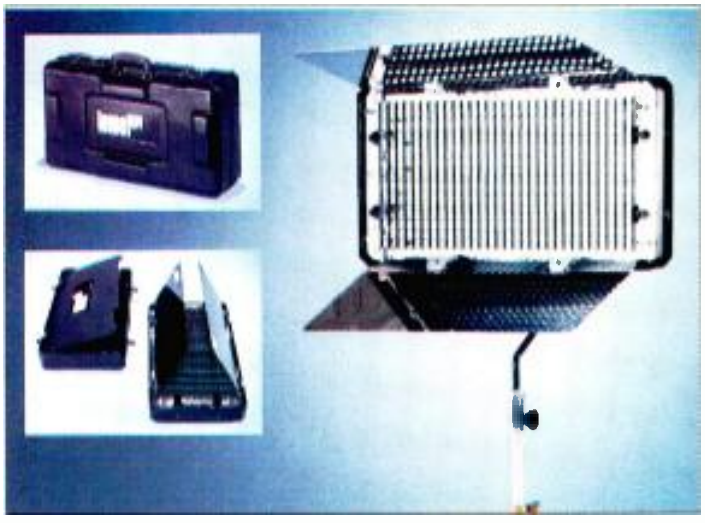
NTSC or PAL production switchers

Sony DFS-700/ 700P DME:

provides full bandwidth component 4:2:2:4/8-bit digital processing; standard SDI capability ensures signals from digital sources are input and output with digital purity; digital processing makes the DFS-700/700P ideal for use with VTR or DDR formats ranging from DVCAM, to Betacam SX and Digital Betacam formats or with the MAV-55 VDR.

800-686-SONY; fax: 201-930-4752; www.sony.com/professional

Booth: L12107 Circle (371) on Free Info Card



Fluorescent lights

Lowel-Light Caselite:
two models, the Caselite 2 and Caselite 4, are equipped with two and four 55W tubes; capable of 120/230V operation and can use Daylight (5400) or Tungsten (3000) corrected T-55 tubes.

800-334-3426; 718-921-0600; fax: 718-921-0303; www.lowel.com

Booth: L 9744 Circle (337) on Free Info Card

Expandable digital router

Fortel DTV INTEGRITY
features 1.5 Gbit crosspoints to handle HD data rates and SDI input and output cards which provide 8 channels per card; a 4-channel card with dual outputs per channel is also available.

800-530-5542; 404-885-9555; fax: 404-885-1501; www.forteldtv.com

Booth: Circle (484) on Free Info Card

control solution

Miranda Technology Kaleido-QC
combines same great features as original Kaleido display system with new web-based device management and control software; used to replace suites of dedicated control panels and monitoring equipment with single computer workstations, or a rack-mounted, touch-screen display.

514-333-1772; fax: 514-333-9828; www.miranda.com

Booth: L 3330 Circle (394) on Free Info Card

Automated weather system

WSI Corporation SkyAlert
an automated, lightning-fast system for generating broadcast quality streaming severe weather graphics and alerts; combine up to the second updates from the NOAA Weather Wire with informative severe-weather graphics and icons, and station branding and tag lines.

; fax: 978-670-5100;

Booth: L10971 Circle (395) on Free Info Card

Severe weather tracking system

WSI Corporation SkyTracker:
lets stations integrate their custom look with their severe weather coverage; results in a seamless transition between storm tracking coverage and the rest of the weather broadcast.

fax: 978-670-5100;

Booth: L10971 Circle (396) on Free Info Card

Virtual monitor wall processor

Miranda Technology Kaleido:
now supports audio signal inputs and incorporates peak level meters for real-time audio-signal tracking; the processor can display up to 16 analog, digital or computer signals on a single projection, plasma or computer display.

514-333-1772; fax: 514-333-9828; www.miranda.com

Booth: L 3330 Circle (397) on Free Info Card

VTR/DDR/slow motion controller

DNF Controls DMAT Sports Controller:
this controller based upon DNF's new ST400 controller, interfaces with multichannel video servers; it enables continuous record and simultaneous playback of sports action; 818-252-0198; www.dnfcontrols.com

818-252-0198; fax: 818-252-0199; www.dnfcontrols.com

Booth: L 8683 Circle (398) on Free Info Card

16:9, 32-inch video monitor

Sony BVM-D32E1WU:
a 16:9 32-inch flat monitor for use in critical evaluation; features 16:9 Trinitron CRT; supports 480i, 720p and 1080i inputs directly and displays each at its native frequency and resolution; conforms to ITU 709, ITU 601 and SMPTE 240M; features four option slots that allow use of input decoder and expansion boards for a variety of input configurations; offers digital uniformity correction, digital landing correction, digital convergence and automatic presets for white balance and brightness.

800-686-5ONY; fax: 201-930-4752; www.sony.com/professional

Booth: L12107 Circle (373) on Free Info Card

Studio camera tracker

InterSense ISO-9000:
offers seamless transitions between CG and real elements; provides an accurate Six Degree of freedom tracker over large areas for use in virtual environments; inertial tracking is augmented with an acoustic range measurement system for absolute position locking and inertial drift correction.

888-359-8478; 781-270-0090; fax: 781-229-8995; www.isense.com

Booth: M10368 Circle (414) on Free Info Card

Scan converter

Visual Matrix Corporation RTC2:
available with an HDTV digital video output option; features zoom and smooth pan/scan capability for camera-like movements; separate horizontal and vertical filters provide an extra level of control for the elimination of flicker, alias and Moire patterns.

818-84304831; fax: 818-843-6544; www.visual-matrix.com

Booth: L7513 Circle (418) on Free Info Card

Non-linear editing system

Amazon/Interactive Effects Piranha Edit:
a high-end online nonlinear editing solution with full support fo both |D1 and HD1080i uncompressed viceo; can conform standard CMX EDLfiles and features full digital AES and ADAT audio support; includes full transition, DVE, character generator and complete compositing capabilities.

714-247-1200; fax: 714-573-9424; www.ifx.com

Booth: S2952 Circle (419) on Free Info Card

ENG microwave link

Adaptive Broadband MRC CodeRunner 2.7: extends CodeRunner family to the 7GHz band; offers option of incorporating dual-band operation (2- and 7GHz) with a single van transmitter.

978-671-5700; fax: 978-671-5903; www.adaptivebroadband.com

Booth: L 7521 Circle (411) on Free Info Card

High Definition Professional Receiver

Tandberg Television evolution 5000 PMRX5800: this receiver focuses on the professional user; it supports all prevalent HD formats and has a wide range of interfacing options.

949-725-2500; fax: 949-725-2545; www.tandbergtv.com

Booth: S 4168 Circle (415) on Free Info Card

Asset management system

SGI Media Commerce: enable broadcasters and production facilities to both enhance their effieciency today and create a competitive advantage.

650-960-1980; fax: 650-933-0819; www.sgi.com/go/broadband

Booth: S4131 Circle (416) on Free Info Card

SNG truck

Frontline News Truck: nine rack KU Band SNG EFP; built on a Freightliner Argosy chassis; truck is setup for dual path analog and digital SNG along with complete EFP capabilities.

727-573-0400; fax: 727-571-3295; www.frontlinecomm.com

Booth: L12386 Circle (455) on Free Info Card

Console control system

Studer D950 Digital Mixing System: supports the new Central Assign Section which allows the functionality of a complete Studer D950 console channel to be display and overated from a single console location, operational sections are provided for EQ, filters, dynamics, panning, input, output, delay, insert, aux sends, fader and channel selection

510-297-2711; fax: 510-297-2785; www.studer.ch

Booth: R 4073 Circle (460) on Free Info Card

TWT amplifier

MCL MT3200: a medium power TWT amplifier for C-babd or Ku-band application upt to 400W; incorporates five standard, field replaceable subassemblies including the Simplified Logic Interface Module; RF assembly, Prime Power Converter and HV Power supply; offers single communications port for either RS232 or RS422/485 serial bus interface.

630-759-9500; fax: 630-759-5018; www.mcl.com

Booth: T 2028 Circle (461) on Free Info Card

Klyston high power amplifier

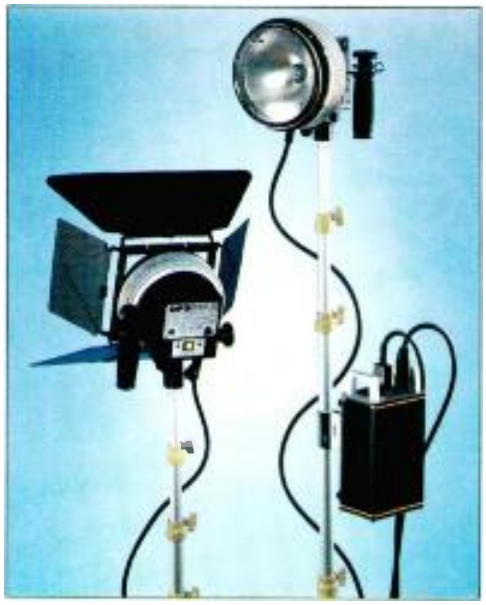
MCL MK9500: a klystron high-power amplifier for C, Ku or Ku-DBS band applications; operating power levels extend from 3300W in C band to 2,400W in Ku-DBS band; features superior phase noise performance, serial interfaces, high-speed klystron tuning option and a complete redundant system in a standard height cabinet.

630-759-9500; fax: 630-759-5018; www.mcl.com

Booth: T 2028 Circle (462) on Free Info Card

HMI/MSR lighting fixtures

Lowel-Light DP Daylight System:
a family of three HMI/MSR fixtures (200-, 400- and 575W), designed to meet requirements of TV and film industries; flicker-free triple output ballast can be used to power wither a 200, 400, or 575w fixture automatically with input voltages from 90-260V.



800-334-3426; 718-921-0600;
fax: 718-921-0303;
www.lowel.com

Booth: L9744
Circle (336) on Free Info Card

Facial animation

FAMOUS Technologies FAMOUSfaces:
a standalone 3D facial and motion capture software package at supports 3D animation programs such as 3D Studio Max, Light Wave 3D, Maya and Softimage; features open motion capture channels to support motion capture sources such as Motion Analysis, Phoenix, Vicon and Xist.

415-835-9445; fax: ; www.famoustech.com

Booth: S5553 Circle (370) on Free Info Card

Editing control unit w/HD switcher

Sony BVE-700:
designed for HD production; two jog/shuttle dials provide fast operation of VTR/DDR control; optional plug-in HF video switcher provide cost-effective method of performing A/B roll effects; control is also provided for SD switcher and audio mixers; supports 1080/24p and 1080 60i/50i.

800-686-SONY; fax: 201-930-4752; www.sony.com/professional

Booth: L12107 Circle (372) on Free Info Card

Decoder/synchronizer

Fortel DTV DEC-312S
decodes and synchronizes composite analog video (NTSC or PAL selectable) and generates 4 SDI outputs; its 12-bit A/D conversion and prcessing result in exceptional transparency and improved signal-to-noise; the DEC-312S features an adaptive frame, field and 3 line comb filtering, producing accurate YC separation without undesirable artifacts; used in conjunction with an INTEGRITY serial digital router, the DEC-312S provides a composite analog input channel.

800-530-5542; 404-885-9555; fax: 404-885-1501; www.forteldtv.com

Booth: L1806 Circle (483) on Free Info Card

Uncompressed NLE system

Darim Vision Forward:
this newly integrated desktop digital video system provides real time title and logos, linear/non-linear audio and video editing, color keying, Alpha Channel, zooming and other special effects.

888-GET-MPEG; 213-637-1700; fax: 213-637-1705;

Booth: M10167 Circle (487) on Free Info Card

Effects plug-ins

DigiEffects Delirium/46+ plug-ins for AfterEffects:
this set of plug-ins for Adobe After Effects includes over forty-six separate creative tools for working with video and motion graphics; they can be used to create generate spectacular particle-based fire and smoke, or natural phenomena such as snow storms with flakes that fall naturally on a logo; Delirium also includes a collection of production tools to create simple or sophisticated gradients, lighting effects or retinal-blooms.

415-841-9901; fax: 415-841-1207;
www.digieffects.com

Booth: S 3305 Circle (489) on Free Info Card

HD analog monitoring down-converter

AJA Video HD10M:
a miniature, stand-alone HD analog monitoring downconverter; accepts 1080i, 180p24 or 720p YPrPb or RGB analog inputs; outputs SD analog RGB, YPrPb or NTSC/PAL composite or Y/C; can be powered by 5-24V for portable applications.

800-251-4224; 530-274-2048; fax: 530-274-9442;
www.aja.com

Booth: L 3314 Circle (382) on Free Info Card

DTV translator

NEC America Multichannel DTV translator:
uses single common broadband amplifier for several DTV channel, translator utilizes microprocessor controlled active feedback to provide an efficient, stable linear translator in an ultra-compact enclosure.

888-383-4DTV; 972-751-7246; fax: 972-751-7245;
www.necbroadcast.com

Booth: L 2037 Circle (384) on Free Info Card

Guyed towers

LeBLANC Broadcast SuperTowers:
2049 foot guyed towers capable of supporting 60 tons of top-mounted antenna equipment; have 75 foot candelabras;

905-844-1242; fax: 905-844-8837;
www.leblanc-group.com

Booth: L12355 Circle (401) on Free Info Card

UHF solid-state transmitters

LARCAN Digital Transmitters:
these transmitters are UHF solid-state and IOT, containing up to 75 kw avg. power and VHF solid-state up to 6 kw avg. power; they transmit digital radio for DAB, and Eureka 147 radio for L-BAND and BAND III; 905-564-9222; 905-564-9244; larcan.com

905-564-9222; fax: 905-564-9244; larcan.com

Booth: Circle (403) on Free Info Card

30-inch video monitor

Panasonic AT-3017W:

a 30-inch 16:9 wide aspect ratio, master-grade HD monitor with capability to display 1080i, 720p, 480p and 480i images; delivers horizontal resolution of greater than 1000 lines due to a temperature compensate shadow mask.

800-528-8601; 323-436-3500; fax: 323-436-3660;
www.panasonic.com/broadcast

Booth: L 8236 Circle (388) on Free Info Card

Camera robotics

Telemetrics Triax and Coax camera control systems:
incorporate a separate IFB channel and universal mounting provisions for non-docking and hip pack configurations, external microphone selection switches and improved styling.

800-424-9626; 201-848-9818; fax: 201-848-9819;
www.telemetricsinc.com

Booth: L11852 Circle (392) on Free Info Card

HD multiplexer

Motorola Broadband (formerly GI) Multichannel High Definition Statistical Multiplexer:
applies Motorola statistical multiplexing technology to four HD channels that will occupy 38.8Mb/s bandwidth pipe.

888-800-8346; 858-455-1500; fax: 858-404-2443;
www.gi.com

Booth: L 3123 Circle (399) on Free Info Card

Rohde & Schwartz digital transmitters

Acrodyne Industries Solid State Transmitters:
are integrated with an 8VSB/ATSC modulator and output mask filter as well as analog systems with an NTSC modulator; UHF models range up to 15kW average DTV power and 40kW analog power; VHF models to 20kW peak visual can be configured to DTV.

800-523-2596; 215-542-7000;
fax: 215-540-5837;
www.acrodyne.com

Booth: L 9372 Circle (385) on Free Info Card

Mobile intercom system

Telex Communications RTS Model KP-32 Keypanel:
a 2RU unit with 32 lever keys (30 intercom talk/ listen assignment; one call waiting respond/clear; one headset/microphone switching); features DSP and binaural headset operation with left/right signal assignment; 90mm depth idea for mobile uses; fluorescent display increases visibility in all lighting.

800-392-3497; 612-884-4051; fax: 612-884-0043; www.telex.com

Booth: L 9366 Circle (386) on Free Info Card

Laptop editing system

Panasonic AJ-LT95:
a DVCPRO50 4:2:2 laptop editing system; video production capabilities include 525/625 and DVCPRO/DVCPRO50 switchability, 4:2:2 component video quality; 16:9 widescreen monitors and four digital audio channels; weighs less than 26 pounds; includes two 4:2:2 DVCPRO50 VTRs, an editing controller, two 16:9 seven-inch LCD monitors and two speakers in a rugged aluminum case.

800-528-8601; 323-436-3500; fax: 323-436-3660;
www.panasonic.com/broadcast

Booth: L 8236 Circle (387) on Free Info Card

Coax video cable

Belden Brilliance Plenum Rated High Definition Coax:
RG11 HD coaxial cable features 14 AWG solid copper conductor, gas-injected foam, FEP dielectric, a foil/braid shield and Flammarrest jacket.

800-BELDEN1; 765-983-5200; fax: 765-983-5294; www.belden.com

Booth: L 8478 Circle (435) on Free Info Card

HD coax cable

Belden Brilliance Riser Rated High Definition Coax:
RG7 HD coaxial cable features a 16AWG solid copper conductor, gas-injected foam high-density polyethylene dielectric for superior crush resistance, a foil/braid shield and PVC jacket.

800-BELDEN1; 765-983-5200; fax: 765-983-5294; www.belden.com

Booth: L 8478 Circle (436) on Free Info Card

Graphics billboard system

Video Data Systems videoGIZMO:
features a single-region display that allows quick and easy Window-based editing; a versatile and independent crawl feature that can overlay pages with message and sophisticated page transitions.

800-858-5850; 516-231-4400; fax: 516-231-4405;
www.videodatasys.com

Booth: I 6142 Circle (493) on Free Info Card

Radio/TV broadcast facilities

Lodestar Towers Inc Turnkey Broadcast Facilities:
these facilities provide radio and TV broadcast turnkey solutions for design, supply, installation and commissioning; they also provide solutions for maintenance and site management.

561-748-9300; fax: 561-748-8555;

Booth: Circle (404) on Free Info Card

Hum eliminator

Allen Avionics HEC-2000-V:
designed to eliminate hum in video applications caused by long cable runs or ground loops; stops all 50Hz and 60Hz hum; features 1/4" thick guard rails to protect BNC connectors.

516-248-8080; fax: 516-747-6724;
www.allenavionics.com

Booth: L12410 Circle (421) on Free Info Card

Dual audio embedder/de-embedder

Crystal Vision TANDEM:
features two removable piggyback units on one card; can be configured to any two of four possible functions at once — embedding analog or digital audio into SDI or de-embedding analog or digital audio from SDI; can be a single embedder, a single de-embedder, a dual embedder, a dual de-embedder or a mixed embedder/de-embedder; the kit format means that the customer can build the exact product required and can reconfigure it in the field.

+44 1223 506 515; fax: +44 1223 506 514;
www.crystalvis.com

Booth: L 9525 Circle (452) on Free Info Card

HD camera system

Band Pro Film/Video High Definition Electronic Cinematography system:
features the Sony HDW-F900 24P HDCAM, Abakus eyepiece extender, Angeniux 11.5x5.3 HD cine-style lens, Chrosziel 6.6x6.6 Swing-away Mattebox system, and Genio Remote Focus/Iris control.

888-BANDPRO; 818-841-9655; fax: 818-841-7649;
www.bandpro.com

Booth: L11871 Circle (422) on Free Info Card

Fiber optic link

Force Inc Model 2953:
provides fiber optic transport of SMPTE 292M digital video at 1.48Gb/s; includes adaptive coax cable compensation and is compliant with pathological code tests; links are available either at 1310nm or 1550nm and signal transport distance is up to 100km.

800-732-5252; 540-382-0462; fax: 540-381-0392;
www.forceinc.com

Booth: S 5357 Circle (453) on Free Info Card

Upconverter

COMM-TEC UP 1280:
features three-field interpolations and internal time base correction; output can be set to a DLP or LCD projectors panel, from 800x600 up to 1280x1024; features six inputs for video and four stereo audio inputs.

49-7161-3000-490; fax: 49-7161-3000-400;

Booth: Circle (423) on Free Info Card

HD signal receiver

Harris NETplus:
receives HD signals distributed over fiber or satellite networks; supports a wide variety of inputs and formats.

800-622-0022; 513-459-3400; fax: 513-459-3890;
www.harris.com

Booth: L 6524 Circle (321) on Free Info Card

Polarizing filters

Tiffen Mfg Corp UltraPol filters:
eliminates the maximum amount of reflected glare from water, glass and other non-metallic surfaces.

800-645-2522; 516-273-2500; fax: 516-273-2557;
www.tiffen.com

Booth: L11581 Circle (496) on Free Info Card

Motion picture film cleaning system

RTI Lipsner-Smith CF-8200:
provides safe, cost-effective cleaning results at up to double the speed of traditional film cleaners; includes a dual refrigerated vapor recovery system, stainless steel plumbing, new air management and higher output ultrasonics.

800-323-7520; 847-677-3000; fax: 847-677-1311; www.rtico.com

Booth: L 7845 Circle (425) on Free Info Card

MPEG-2 compression plug-in

Darim Vision DVMPEG Plus:
s a software solution for capturing and compressing AVI to MPEG-1 or MPEG-2, as a plug-in driver, easily creating MPEG files during rendering without intermediate AVI; the software enables users to compress, edit and playback high-quality video and audio.

388-GET-MPEG; 213-637-1700; fax: 213-637-1705;

Booth: M10167 Circle (486) on Free Info Card

Monitoring mixing console

Audio Toys Paragon II:
live sound production analog mixing console; up to 20 stereo output mixes, four-band parametric EQs on inputs, three-band stereo EQs on stereo outputs and returns.

800-642-8063; 410-381-7879; fax: 410-381-5025; www.audiotoys.com

Booth: R 3496 Circle (427) on Free Info Card

XLR cable connection system

Neutrik NC3FEZY-P and NC3MEZY-B Easycoin:
offers easy and rapid assembly with self-adjusting cable strain-relief; accepts a wide range of cable diameters and gold-plated, self-cleaning tuning fork contacts extend its lifetime.

732-901-9488; fax: 732-901-9608; www.neutrikusa.com

Booth: L12139 Circle (428) on Free Info Card

3-chip DLP projector

Christie Digital Systems Vista X3:
based on three chip DLP technology; results in better uniformity and video with no instances of image retention; designed for large-venue and fixed installation applications.

800-265-2171; 519-744-7111; fax: 519-749-3136; www.christie.com

Booth: M 8035 Circle (492) on Free Info Card

Video indexing software

Virage VideoLogger 4.0:
newest version of software for indexing video in real-time; critical first step for any video production, distribution and Internet publishing strategy.

650-573-3210; fax: 650-573-3211; www.virage.com

Booth: M 8751 Circle (429) on Free Info Card

Internet video platform

Virage Video Search Server 2.0:

a complete Internet video publishing and management platform; accesible via standard web browsers, this server-based application provides a powerful search engine, template-based web page customization and sophisticated annotation and administration capabilites.

650-573-3210; fax: 650-573-3211; www.virage.com

Booth: M 8751 Circle (430) on Free Info Card

D1 to analog converter

Intelvideo SDI-100:

a 10-bit acquantizing accuracy system with 12-bit internal processing; ideal for professional application where SDI signal needs to be converted to any 525-line 60Hz analog format; features front-panel adjustable luminance and chrominance levels and high-frequency compensation.

203-348-9229; fax: 203-348-9266; www.intelvideo.com

Booth: S 4118 Circle (465) on Free Info Card

Nonlinear editing system

Fast Multimedia FAST601 DV:

this IEEE1394 I/O card features a new InTime Processor and allows FAST601 users to input DV footage directly from DV cameras; it works with all FAST601 systems and will allow Batch Capture and Print to Tape.

800-249-FAST; 425-354-2002; fax: 425-354-2005; www.fastmultimedia.com

Booth: S 4150 Circle (432) on Free Info Card

Multiformat video measurement set

Hamlet ADEPT:

a multiformat capable video "on screen" measuring set; provides Sdi, Firewire, analog component, composite, S-video and multistandard 525/625 measurement and monitoring capability, including line select, bow tie and gamut indication.

+44 0500 625 525; +44 1494 793 763; fax: +44 1494 791 283; www.hamlet.co.uk

Booth: L12636 Circle (433) on Free Info Card

Image editor

Sonic Foundry Viscosity:

fuses process of image editing and animation into one application; offers integrated multiframe editing, animation effects, web optimization and real-time playback.

608-256-3133; fax: 608-256-7300; www.sonicfoundry.com

Booth: S 5157 Circle (476) on Free Info Card

AES/EBU audio cable

Belden Brilliance 8-pair AES/EBU audio snake cable:

26 AWG cable designed for use with digital audio console equipment; fits easily into standard 25-pin D-sub connectors without stripping the outer jacket.

800-BELDEN1; 765-983-5200; fax: 765-983-5294; www.belden.com

Booth: L 8478 Circle (434) on Free Info Card

Skirt generator

Sierra Video Systems Skirt Generator:

inserts two 4:3 images into a single 16:9 frame; presents two images on the screen simultaneously; skirt section can display text, graphics or live video without interfering with the main picture.

530-478-1000; fax: 530-478-1105; www.sierravideo.com

Booth: L 4654 Circle (437) on Free Info Card

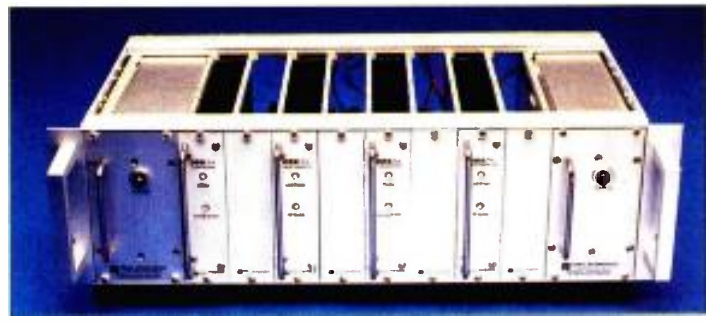
Unattended networked monitoring system

Videotek SpyderWeb:

designed to communicate audio, video and timecode alarm information from the VTM-300 series and VTM-400HD monitor; alarms may be stored, logged directly to a printer or exported as text for future reference.

800-800-5719; 610-327-2292; fax: 610-327-9295; www.videotek.com

Booth: L12924 Circle (438) on Free Info Card



Satelite link

Force Inc DBSLinx:

L-Band link now available in rack-mounted version; rack can hold 10 2990 units and one power supply or eight 2990 units and dual redundant power suppli8es; 2990 will transport over single mode fiber RF signals from 950-220MHz in one octave passband; for antenna remoting, headend relocation, L-band distribution for MDUs and PCS networks.

800-732-5252; 540-382-0462; fax: 540-381-0392; www.forceinc.com

Booth: S 5357 Circle (454) on Free Info Card

Camera fluid head

Miller Fluid Heads DS 80:

a 150mm fluid head that carries up to 80lb payloads.

973-857-8300; fax: 973-857-8188; www.miller.com.au

Booth: L 9748 Circle (413) on Free Info Card

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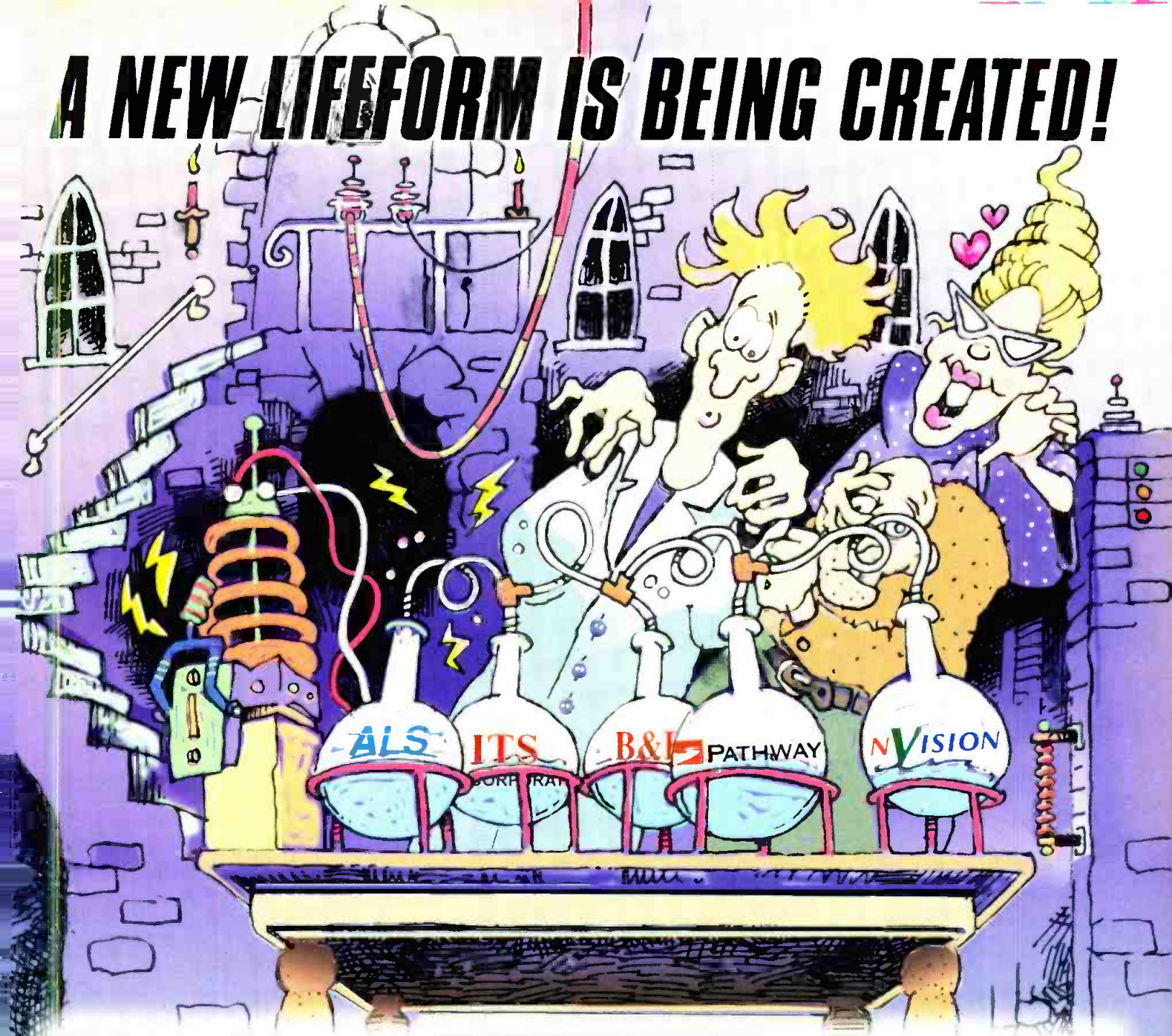

CHECK OUT OUR NAB BOOTH L543 TO SEE WHAT WE'VE COOKED UP FOR YOU!

In recent years, technical innovation has provided the television industry with the ability to recreate itself. Digital systems deliver a higher level of product quality and new services to the audience. However, the implementation of these new technologies requires an end-to-end understanding of system architecture, in order to ensure reliable integration. We call it DTV Science.

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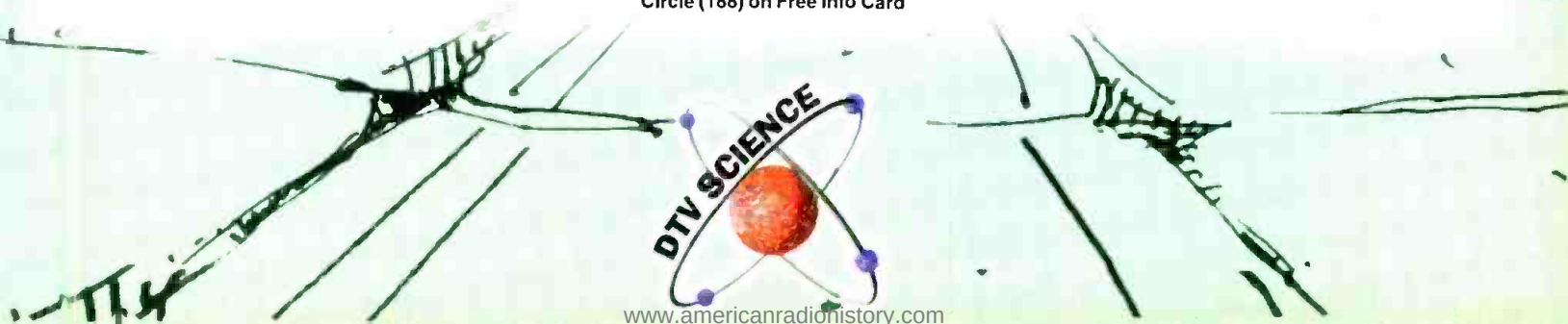

Video server

Storage Concepts Fibre Space-2000:
this video server can provide 700 GB of storage in a single chassis at 170 MB/second; it is successful with high bandwidth, high I/O applications such as HDTV, broadcast video storage and server applications; 800-525-9217; 949-852-8511; fax: 949-852-8930; www.storageconcepts.com

800-525-9217; 949-852-8511; fax: 949-852-8930; www.storageconcepts.com

Booth: S 3259 Circle (439) on Free Info Card

Fiber optic multiplexer

Video Products Group VGP DWDM:
this applique system multiplexes up to eight 140Mbps, 155Mpbs, 270Mbps or 622Mbps signals onto a single optical fiber at ITU-grid wavelengths; 888-375-2855; 805-383-5500; fax: 805-383-5519; www.vpginc.com

888-375-2855; 805-383-5500; fax: 805-383-5519; www.vpginc.com

Booth: S 3574 Circle (440) on Free Info Card

MPEG TS Splicer

Astro Systems CX-5505A:
replaces programs in multiprogrammed TS signal and switches between two TS signals; features two TS input channels and one program output supports non-seamless and near-seamless splicing.

818-244-1806; fax: 818-244-1878; www.astro-systems.com

Booth: S 3877 Circle (450) on Free Info Card

Speakers

Miller & Kreisel MPS-1610P:
is an internally Bi-Amplified Main Monitor; it is designed to be used with a subwoofer and bass management to provide full-range monitoring for all channels; 310-204-2854; fax: 310-202-8782; www.mkprofessional.com

310-204-2854; fax: 310-202-8782; www.mkprofessional.com

Booth: S 4175 Circle (441) on Free Info Card

Compression/MPEG test equipment

Xyratex MM-1000:
this MPEG monitor provides continuous, cost-effective monitoring of MPEG transport streams; 949-476-1016; fax: 949-476-1916; www.xyratex.com

949-476-1016; fax: 949-476-1916; www.xyratex.com

Booth: S 4178 Circle (442) on Free Info Card

Removable drive video server

Fast Forward Video Omega Deck:
this video server has a removable hard drive option; it can be controlled via a Windows TM-based PC platform; the custom application software is compatible with Windows 95, 98 and NT-based computer systems; 949-852-8404; fax: 949-852-1226; www.ffv.com

949-852-8404; fax: 949-852-1226; www.ffv.com

Booth: L 4954 Circle (443) on Free Info Card

SDI noise reducer

Intelvideo SDI-10:
takes serial digital video inputs, separates video components and processes each component, with 12-bit accuracy, to reduce random noise by more than 9dBs; also adds up to 6dBs of high frequency boost to the luminance signal, video components are reserialized into the SDI format.

203-348-9229; fax: 203-348-9266; www.intelvideo.com

Booth: S 4118 Circle (463) on Free Info Card

Word clock DA

NVISION DA4023:
for the 4000 series frame; eight outputs for word clock distribution; one word clock input with loop-through; 75-ohm connector interface.

800-719-1900; 530-265-1000; fax: 530-265-1010; www.nvision1.com

Booth: L 543 Circle (318) on Free Info Card

Compression/MPEG test equipment

Logic Innovations MM-1000:
this MPEG monitor provides continuous, cost-effective monitoring of MPEG transport streams; 949-476-1016; fax: 949-476-1916; www.xyratex.com

888-34-LOGIC; 619-455-7200; fax: 619-455-7273; www.logici.com

Booth: T 2240 Circle (446) on Free Info Card

Digital and analog component/composite WFM

ProTeleVision Technologies PT 5664:
provides alignment and monitoring in component and composite video environments; features analog displays for serial digital component, analog component and analog composite signals for studion, OB vans, production and post-production houses.

+45 3288 5911; fax: +45 4343 2390; ww.ptv.dk

Booth: L 7133 Circle (447) on Free Info Card

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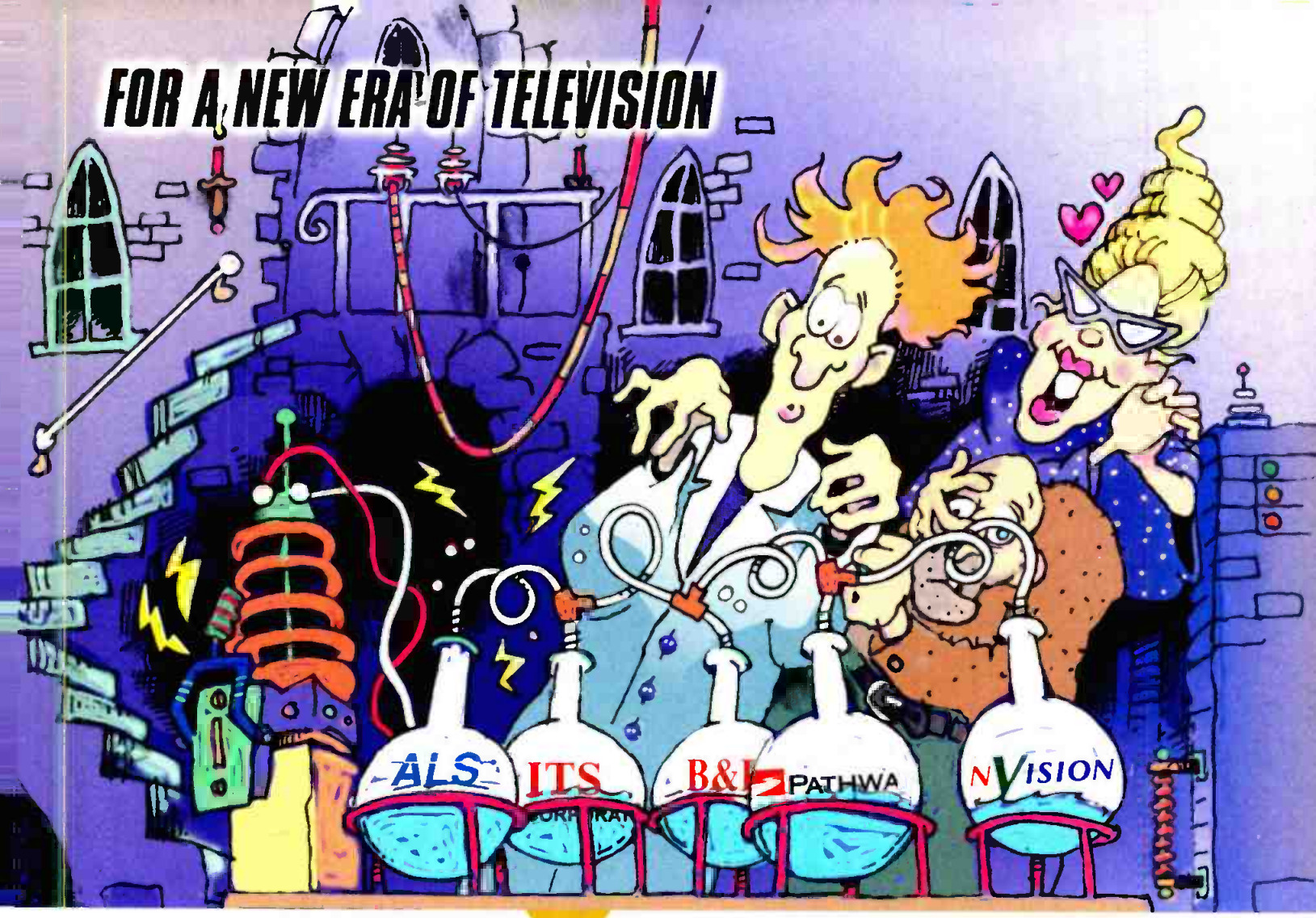

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ADC has scoured the broadcast industry to find leading technologists who understand the science of digital television systems. The result—formation of an elite group made up of ADC patching & connectivity, ITS transmitters, ALS transport systems, Pathway ATM transports, and NVISION routing and processing products. All brought together to share knowledge and innovation. We call it DTV Science.

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ADC

Applied Technology

The digital benefits of solid state transmitters

BY DAN DICKEY

In ten years, there will be no such thing as a tube-type television transmitter. The solid state transmitters on the air today will still be broadcasting after tube transmitters are long gone. That is a bold prediction from a 54-year-old company that built its reputation on vacuum tube equipment.

Continental Electronics Corp. (CEC) has developed its entire line of digital television transmitters around solid state technology that is designed and optimized for digital applications. Meanwhile, older tube technology is essentially being retrofitted and reinvented to fill a need it never was intended to meet. Solid state equipment offers a clear upgrade path, a high level of reliability, and virtually maintenance-free operation. These are the characteristics that are essential in this emerging age of digital terrestrial television.

Continental Electronic's 714D solid state digital transmitter.

A quick, clear upgrade path

With the emerging viewer demand for digital broadcasting, most stations don't yet require the same power for their DTV operations that is required for NTSC-TV. However as the number of viewers increases so will the need to increase power levels. With that reality in mind, the benefits of CEC's solid state transmitter technology can be seen even before it is delivered to the site.

As the number of viewers increases so will the need to increase power levels.

Solid state technology offers a clear upgrade path with minimal initial investment. Stations can begin their digital broadcasting with the exact power they need to meet FCC and community demands, then increase power when necessary.

This is possible because the solid state transmitters are built from identical power amplifier components. CEC's SpectraStar line of scalable, solid state DTV transmitters is based on common power units that are added as power requirements increase. This flexibility also will permit broadcasters to remain current with evolving digital standards.

Digital by design

As digital television evolves, so does the technology. CEC chose to be a solid state-only company because tube equipment cannot keep pace with the digital evolution. The evolution of solid state, on the other hand, is driving new innovations designed specifically for digital applications.

The laterally diffused metal oxide semiconductor (LDMOS) is one example of such advancements. Besides being less costly to fabricate, LDMOS chip sets were designed specifically for broadband communications applications, from wireless telecommunications to commercial broadcasting.

With broadband operation in mind, LDMOS chips are more rugged and will withstand greater load mismatch abuse. In high-power applications, LDMOS chips deliver a higher gain than equivalent bipolar devices, approximately 12- to 15dB, and they offer a greatly improved level of linearity. All this adds up to a rugged and reliable foundation for DTV transmitter products.

That is exactly where CEC began with the SpectraStar product line. The result is a RF amplifier designed around 250W LDMOS power blocks, bringing with it the inherent benefits of LDMOS -- high efficiency, excellent linearity and improved reliability due to lower junction temperatures in a reduced component population. The built-in re-

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more and more video professionals rely on Trinity's powerful paint, animation and compositing system, Panamation. Its fully object-oriented graphics engine gives you a comprehensive set of tools for complete control of the creative process. Paint with smooth air brushes in 3D perspective and multiple layers. Use adjustable light sources to cast soft-edge shadows while drawing. Quickly create stencils and mattes with a variety of brushes and keyers. And that's just the beginning.

Of course, video production requires more than just a great paint system, and that's why Trinity includes a powerful real-time CG and lightning-fast still store.

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dundancies made possible by the LDMOS design mean CEC's solid state transmitters are inherently fully redundant, eliminating the need for a backup transmitter.

CEC's solid state design eliminates all tunable components within the amplifier. Tube transmitters generally have tunable input circuits and output circuits. Setting these adjustments requires an experienced engineer and a significant investment in test equipment.

There are significant technical advantages in digital applications for wideband input circuits afforded by solid state as opposed to tube amplifiers. CEC's amplifier modules are field programmed to the correct frequency for near plug-and-play simplicity.

Solid state transmitter systems bring the plug-and-play concept in focus with the elimination of complicated RF switching systems that are used on many multiple tube amplifiers. Because a solid state transmitter is made up of multiple power modules, the failure of a single module does not lower the output power significantly. In a two-tube transmitter, the failure of a single component can reduce the power by a 4:1 ratio unless a complicated RF switching system is installed. These RF switches are expensive and mechanical in nature and can fail, leaving a station in no better shape.

Solid state transmitters eliminate the need for a crowbar device, offering a major advantage over most IOT transmitters.

When a problem in a solid state transmitter does crop up, it is generally easier to troubleshoot than tube transmitters because each module can be equipped with a diagnostic system. The control unit can display all operating parameters on every module. A broadcasting engineer can easily locate system failures without special test equipment. When the problem is pinpointed, the "hot swappable" modules enable the transmitter to be serviced while still on the air.

Solid state transmitters eliminate the need for a crowbar device, offering a major advantage over most IOT transmitters. A crowbar can cause serious power line fluctuations when it is engaged. As more and more broadcast facilities become digital this can be a concern. Solid state transmitters are powered by the same type of power supplies used by sophisticated, high-end mainframe computer systems, and do not create significant disturbances to the power line.

Virtually maintenance-free

Most IOT transmitters are water-

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cooled while CEC's solid state designs are air cooled. Many climates are not well suited for water-cooled equipment; particularly the northern states where in the winter, water systems are prone to a multitude of problems. Even in warmer climates, extreme temperature changes from cold to hot during the year can fatigue water couplings and create nuisance leaks. A small air leak in an air-cooled transmitter is not a problem. However, a small water leak can be a big problem.

Completely air-cooled transmitters provide other benefits as well. The high installation and maintenance costs of liquid cooling systems used in IOT and Klystron-based designs are unnecessary, reducing initial and long-term investments in the overall system.

Power supply voltages used in solid state transmitters are about 500 to 1000 times lower than tube transmitters. Since high-voltage circuits tend to collect dust more quickly, a tube transmitter generally requires special cleaning. When dust does collect on a high-voltage component, it can cause a damaging high-voltage arc-over, which can knock the station off the air.

Solid state technology, with its obvious benefits, is cost competitive with older tube equipment up to 40kW.

Today, solid state technology, with its obvious benefits, is cost competitive with older tube equipment up to 40kW. The initial solid state transmitter purchase outlay is now near the level of tubes while total life cycle costs are much lower. That's a substantial bargain considering solid state equipment is easier and quicker to manage, from installation and training to maintenance and upgrades.

Wines get better with age, not tube technology. Everyone is working to remove tubes from the digital chain, from DTV transmitter manufacturers to DTV receiver manufacturers. Why should your station's transmitter be caught in the middle as the only tube in the digital television broadcast chain?

For more information on Continental Electronics Corporation's solid state television transmitters, circle (553) on the Free Info Card.

Daniel L. Dickey is vice president of engineering for Continental Electronics Corporation.

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Applied Technology

Ampex DST Video Server Archival Storage

BY JOHN HENNESSY

With television playout applications quickly transitioning to video server-based systems, the requirement to store hundreds to thousands of hours of file-based digitized video program content looms as a new and challenging task for broadcast technical staffs.

Retaining ingested video as JPEG or MPEG video data files helps accrue cost savings benefits as well as operational efficiencies for television news and master control operations. For material that must be retained for future use, storing video in its data form requires far less media than archiving the content at its original bandwidth on videotape. Acceptable broadcast MPEG levels provide a storage capacity advantage of up to 20 times greater than videotape. Moving these files from server to server or server to archive via computer networks allows for video material to reach its destination several times faster than real time.

Leveraging 50 years of magnetic recording expertise, Ampex once again is playing a key role in providing video storage solutions for the broadcast industry. Utilizing the same robust 19mm transport designed for the D-2 composite digital video format, Ampex's DST archival storage products provide unmatched performance in terms of access speed to files, storage capacity per cartridge and robust long-term interchange.

Emerging video server archive applications are in essence providing an extension to video servers' integrated disk-based storage. A good example is at KRMA (Denver/PBS), where they are integrating an Ampex DST 812 12.8TB video server archive system. Content flows in and out of the archive based on the playlist requirements of the automation software controlling the facility. Since changes to the playlist may require immediate response from the archive, the system must be designed to react quickly. DST systems differ considerably from the average data tape drive used in the enterprise storage market. DST drives are true archive devices. They are designed to have tapes quickly loaded and unloaded on a constant basis. They search for data a magnitude faster than any other tape storage system, while their data transfer speeds far exceed linear tape storage devices and their long-term interchange and archival properties are second to none.

Although data tape drives operate differently than videotape recorders, Ampex DST drives draw on the unique technologies pioneered for their videotape recorders to provide strong performance in the data archive world. Air-lubricated tape guides coupled with a low-friction direct drive capstan (no pinch roller) minimize file access time by moving tape at 1600MB/s. To put this in perspective, other high-performance pinch roller-based helical scan data tape drives search for data in the 300- to 400MB/s range. The air system keeps the tape path clean and also provides for gentle tape handling by presenting a cushion between the tape guideposts and the back coat of the tape.

Since requests for program and commercial spot material are made on a random basis, most archive retrievals involve a new tape mount. Due to design limitations, most data drives load and unload tape at a single point, requiring excessive rewind before a tape can be removed. To enhance access time to the next video data file, DST tape drive architecture includes system zones. A system zone is an area on tape reserved for loading and unloading of the tape cartridge. Created when formatting a tape, multiple system zones make DST drives appear as virtual disks within the video server storage environment.

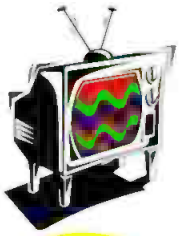
There are a number of items that influence the overall access time to a data file, including robotics movement, the time to search down a tape to locate a file, the time to physically load a tape and prepare for read/write operations, and the time it takes to unload a cartridge after the read or write function. For applications that include long-for-

HOURS OF VIDEO CONTENT							
Compression rate	100GB cartidge	300GB cartridge	660GB cartridge	DST 414 4.8TB	DST 714 7.6TB	DST 714 11.6TB	DST 814 25.6TB
48Mb/s	4.6	13.8	30.4	212	352	534	1178
36Mb/s	6.2	18.6	40.6	284	468	720	1588
20Mb/s	11.2	33.4	73.4	534	844	1288	2844
15Mb/s	14.8	44.4	97.8	684	1126	1716	3788
12Mb/s	1836	55.4	122.2	856	1408	2156	4762
10Mb/s	22.2	66.6	146.6	1066.6	1688.8	2577.6	5688.8
8Mb/s	27.6	83.2	183.2	1333.2	2111.0	3222.2	7111

Table 1. DST video data file storage capacities in hours.

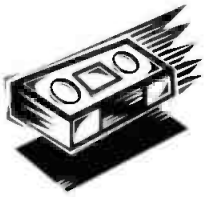
1936

First Television Broadcast



1954

First Color Broadcast

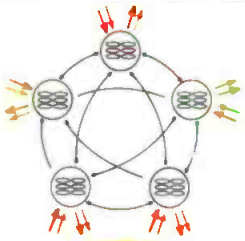


1956

Video Tape Introduced

1962

First Satellite Transmission



1998

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mat video programming, the read or write time is significantly enhanced by archiving video as a file, particularly with DST data drives that sustain data transfer at 160Mb/s. A DST drive can retrieve from archive an hour-long video encoded at 15Mb/s in less than six minutes or over 10 times faster than from the original videotape.

Another major benefit of archiving video libraries as data files is the storage density achieved, especially on helically scanned DST tape cartridges. Today, a large 330GB DST cartridge stores approximately 50 hours of 15Mb/s MPEG video. At NAB 2000, Ampex will introduce its next generation quad-density DST tape drive providing uncompressed storage of 660GB on a single cartridge, the equivalent of nearly 100 hours of 15Mb/s MPEG files (See Table 1).

Ampex once again is playing a key role in providing video storage solutions.

In addition to its storage advantages, DST tape cartridges also provide unique formatting options. While the system zones noted above enhance access time, the ability to partition tapes allows users to replace material within a DST tape similar to a video insert edit. By contrast, most other data tape drives write files sequentially down tape, appending file after file until full. If a file is written over in the middle of a full data tape, all the data is lost past that point. Partitioning a DST tape essentially creates a number of small tapes within one cartridge. For example, to store three-minute music videos encoded at 15Mb/s, the tape would be formatted with 340MB size partitions, thereby allowing one music video to be stored per partition. To replace the video, the existing file can simply be written over since all other music videos are protected within their own partitions. To reclaim space on a data tape that does not support partitioning, however, the entire contents of the tape must be transferred to a disk array, the files to be deleted must be removed and then the files needed must be written back to tape.

All the functionality mentioned above is meaningless unless it's incorporated into a robust tape transport that will ensure long-term archive and interchange. At the heart of the DST tape drive is its 19mm tape transport. Initially designed for Ampex's D-2 composite digital tape format, today's product has been refined and enhanced to meet the needs of demanding data archive applications. The new quad-density version is the fourth-generation DST drive. Field proven transport mechanics combined with three levels of Reed Solomon error correction create a high-performance storage solution to protect television facilities' critical video assets. The archive life of any individual tape is only as good as the error correction and long-term stability of the data tape drive. ■

For more information on Ampex's DST archival storage products, circle (552) on the Free Info Card.

John Hennessy is director of video and broadcast marketing for Ampex Data Systems, Redwood City, CA.

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Applied Technology

Logic Innovations' MM-1000 MPEG monitor

BY RICHARD BAUARSCHI

As we approach the new millennium, broadcasters, satellite service, cable and telco providers are making significant strides in the transition to true digital data delivery. The move to digital production and delivery creates new challenges in asset distribution and management, creating a need for appropriate monitoring, test and control.

Monitoring whys and wheres

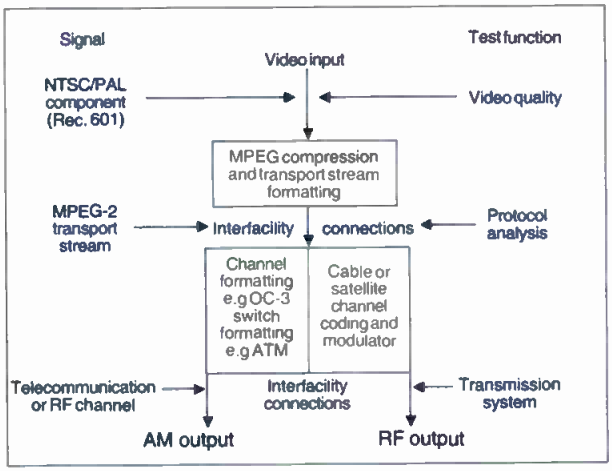
The DVB ETR290 specification outlines recommended "health check" tests for the syntax and consistency of data contained within the transport stream. Most of these tests, either continuous or periodic, are performed on the header information within the packets and are available on streams that have conditional access applied. The tests are prioritized into three categories: (1) those necessary for decodability, (2) continuous or periodic monitoring, and (3) application dependent monitoring. Unfortunately, while these tests are valid for testing the health of the transport stream, they aren't necessarily a definitive answer to monitoring, as in the case of using statistical multiplexing techniques for broadcast, cable or DBS. In this scenario, remultiplexers are used to insert local program feeds and other content, or simply to change the SI (System Information) data to reflect transmission over a cable network rather than through a terrestrial network.

Errors may be introduced to a signal when it traverses multiple hops as it is being transmitted. This can occur in microwave, fiber optic and satellite links. The result is the potential insertion of new coding, which necessitates content monitoring at the input and output of each multiplexer.

At this point, monitoring will evolve from looking at basic synchronization issues on the transport stream level to monitoring detailed Program Specific Information (PSI). Specifically, broadcasters, cable operators and satellite providers will require more sophisticated and flexible monitoring tools.

Field monitoring and analysis

The next generation MPEG-2 monitoring and analysis systems must be both cost-effective and flexible while retaining an open architecture to match the operational needs of a growing network. They must also be scalable since the number of streams to be monitored may change.



Functional MPEG-2 testing layers

Furthermore, the system should be network-oriented as most facility architectures will migrate to a combination of local area network (LAN)/metropolitan area network (MAN) or wide area network WAN/global area network (GAN) infrastructures. Therefore, the need for monitoring systems to communicate locally or remotely will become critical. Each monitoring point should be remotely configurable and viewable from any computer platform, with any number of users capable of interfacing with a single or multiple monitoring points.

Logic Innovations' MPEG monitoring system

Logic Innovations has developed an MPEG monitoring system that follows this new paradigm. The MM-1000 MPEG monitoring system is a cost-effective, scalable network-attached MPEG-2 analysis system aimed at meeting the rapidly changing needs of MPEG-2 compliance testing within the broadcast, cable, DBS and video-based markets. It is the first scalable network-attached test system that permits remote operation and unobtrusive, continuous 24/7 monitoring of DVB or ATSC transport streams at multiple points in the signal chain.

Among its many benefits is the capability to isolate faults in real time rather than dragging a single very expensive tester from one location to another to perform sequential fault isolation.

As the facility's requirements grow, the system's scalable architecture permits users to add to the number of monitoring points without interrupting the existing network or user interface.

The standard MPEG monitor interfaces are: asynchronous serial Interface (ASI) with payloads up to 52Mb/s; synchronous parallel interface (SPI) with the same payload; and synchronous serial interface (SSI) at the rates defined in SMPTE 310M.

Remote operation

The MPEG monitor seamlessly blends computer networking technology with powerful test and monitoring functionality. The network connection, via its network-attached interface, employs a

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Java user application interface. This unique feature permits platform independence for the clients and affords unprecedented versatility by allowing monitoring of DVB or ATSC transport streams emanating from multiple points from a single location.

By using Java rather than HTML pages and a Web server, the user with a single application can be in communication with multiple MPEG monitors simultaneously, viewing a Java application that has been automatically downloaded from the MPEG monitor.

Network personnel can now look from remote locations at the test equipment that the individual station is using to monitor its own operation. Moreover, to avoid congesting the network, the MPEG monitor sends out a 50 byte "heart beat" packet at regular intervals containing all the pertinent information on the unit's address and device-under-test's health. Each heart beat can be monitored by a single client or thousands of clients without increasing the need for network bandwidth. Because of its low bandwidth requirement, hundreds if not thousands of units can be monitored at any given time.

Functionality

In operation, stream monitor and error-checking functions start with the basic ETR 290 stream syntax checking. With its user-definable interface, ETR 290 error checking can be set to indicate whether certain variants are or are not permitted or if certain items are to be checked at all. The MPEG monitor also includes pre-defined setups for MPEG-2 DVB and ATSC installations. Error logging and notification based on ETR 290 parameters and other parameters specific to ATSC and DVB are standard with the system.

Through a digital PLL program clock reference, the MPEG monitor can emulate the decoder buffers for a particular program, allowing for real-time buffer fullness checks. Time stamp delay checks can also be accommodated for monitoring timing misalignment between video and audio.

The MPEG monitor also performs Stream Query. Stream Query allows users to find out what's in a stream and how the stream is put together. With Stream Query, the user can view the structure of the transport stream (PID/program assignments) and the contents of tables (in either raw hex or fully field-decoded form), and the bandwidth consumed by various elements of the stream. This capability includes MPEG-2 and its DVB and ATSC variants and the tables specific to each of these formats.

The MPEG monitor also offers the option of capturing transport stream segments when an error has occurred — giving way to "at-a-glance" remote system monitoring, rapid fault isolation and off-line analysis for troubleshooting and preventive maintenance.

As the industry moves toward a new era in digital, it's reassuring to know that equipment such as an MPEG monitor will allow facilities to ensure signal integrity. ■

For more information on Logic Innovations' MM-1000 MPEG monitor, circle (554) on the Free Info Card.

Richard Bauarschi is director of product management for Logic Innovations, Irvine, CA.

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Audio consoles for broadcast

BY JOHN A. LUFF

Those of us, like myself, who entered this business through the lens and not the speaker have to work especially hard to understand the needs of the aural part of our medium. We need to remember that television is a two part medium. It has been said that television without audio could be surveillance, while radio without pictures could be opera. The changes in audio technology in the last 50 years have been every bit as stunning as they have been in the visual part of the medium, many of which parallel changes in video technology, and often have preceded those movement of visual media.

Digital audio has been with us for a long time now. Compressed audio is ubiquitously available in consumer products. Thousands of radio stations have made their signals openly available on the Internet, and MP3 products allow playback of digital audio without moving parts in pocket players. Sophisticated audio processing tools, which began with analog reverb chambers, are now readily available to the designer in DSP-based products.

Broadcasters need to carefully analyze their audio needs before stepping into the showroom to buy the next console. The products range from well under $500, to well over $500,000. Unlike video production for television broadcasting, audio may well have solid reasons for remaining analog for some time into the future. Today video switchers for analog signals would cost as much, or more, than digital products. Digital audio consoles for the same broadcast production facility are arguably still more expensive to implement in a system than their analog counterparts. The difference starts right at the microphone. Mics are inherently analog. Converting each microphone signal to digital takes

Company	Model	Analog or digital	Bit processing: internal and I/O	Time Delay Compensation	Max./Min. # Of Inputs	Surround-sound panning compatibility	Automation avail.	Free Info #
AMS Neve	Libra Live Series II	Digital	64 bit internal; 24 bits I/O	Yes	192/24	Yes	Yes	550
Arrakis	REV-12P	Digital	18 bit	No	24/12	No	Yes	551
	REV-12/18/24C	Digital	18 bit	No	48/18	No	Yes	552
Audioarts Engineering	D-700	Digital	32 bits internal; 24-bits I/O	No	32/1	No	Yes	553
Audio Technologies	BC6DSL	Analog	NA	NA	6	NA	NA	554
	BC12DSL	Analog	NA	NA	12	NA	NA	554
Audio Toys Inc.	Paragon II	Analog	NA	No	92/64	No	Yes	556
	Mini Paragon	Analog	NA	No	48/40	No	Yes	557
Harrison by GLW	Series Twelve	Both	40 bit internal; 24-bit I/O	Yes	576/24	Yes	Yes	558
	TV 5.1	Analog	NA	NA	60/12	Yes	No	559
Logitek	Numix	Digital	24 I/O	No	64/4	Available as option	Yes	561
Sennheiser	Innova-Son Sensory Grand Live Console	Digital	24 bits Internal; 20 bit I/O	Yes	72/48	No	Yes	562
Solid State Logic	Aysis Air	Digital	32 internal; 24 I/O	Yes	96/8	Yes	Yes	563
	Axiom-MT	Digital	32 Internal; 24 I/O	Yes	96/24	Yes	Yes	564
Soundcraft	B400/B800	Analog	NA	No	56/56	Yes	No	565
Soundtracs	DPCII	Digital	32 internal; 24 I/O	Yes	96/8	Yes	Yes	566
	DS3	Digital	32 internal; 24 I/O	Yes	96/8	Yes	Yes	567
Tascam	TM-D4000	Digital	24-bits internal; 24-bits I/O	Yes	36/36	Yes	Yes	568
Wheatstone	TV-1000	Analog	NA	No	Four Inputs per input mondule/ no fixed number of input modules	Yes	Yes	569
Yamaha	PM1D	Digital	32 internal	Yes	192/48	Yes	Yes	570
	M2500	Analog	NA	No	56/24	No	No	571

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CBS Audio Engineer Mary Cody at the AMS Neve Libra Live broadcast production console within CBS's control room #43 in its New York headquarters. Broadcasters should carefully consider their audio needs before purchasing an analog or digital console. Photo courtesy of AMS Neve.

extra circuitry, though the cost of doing that has dropped tremendously. Here are some things to look for when making the root decision about buying an analog or digital console.

- Are you able to use mostly digital sources, like CD players, digital VTRs and servers, digital audio from satellite feeds, digital "carts" and cut players, phone interfaces?
- Do you use digital audio effects processing devices like reverbs, compressor limiters, gates, duckers, filter sets and noise reduction?
- Can you replace audio peripherals at the same time as replacing the audio console?
- Would the output of the console be feeding analog or digital devices before broadcast (master control switcher and STL, VTRs and servers)? Digital VTRs without digital inputs do not count as digital in this context. Some VTRs in use in news production can be equipped with AES as an option, but are not normally equipped that way at the factory.
- Is the console to be used for live, or post production or both? What about simply audio production and multitrack recording?
- If you plan post-production use, does the edit system provide control and with what protocol?
- Is there any economic benefit to improved quality beyond that you already produce? This is very hard to prove.
- Will you be feeding a surround sound signal, or DTV transmitter in stereo?

If you think I loaded the dice to suggest you remain in analog audio you are wrong. There are plenty of very inexpensive, and quite capable and reliable, digital audio consoles that can work with both analog and digital inputs and outputs. Monday Night Football for HDTV was mixed on two consoles last year that cost a total of $15,000, but yielded digital and analog I/O, surround sound mixing, moving faders, internal audio delays, effects, and more. But the broadcast specific production may require other features not common in such powerful, though somewhat niche products. They did not have mix minus capability for feeding back to talent earphones for instance. In the case of MNF, the internal delay functions solved a number of problems that would otherwise have required outboard delay lines for an analog only console solution.

Surround sound mixing presents special challenges for audio consoles. Panning the image around in six speakers is hard enough, but a live production with elements that come in as surround will present a special technical challenge. All six tracks must not be modified in time (which is affected directly by EQ settings), or relative level. What happens to one track needs to happen to each one. Not many analog consoles will provide the necessary handles to make that work. Many digital consoles are set up to handle this easily. Remember that few currently available VTRs have six channels for recording, though multiplexing equipment to increase the number of channels is readily available. Also check the VTR to see if it can record AES "as a data stream."

Once you have listed the features you must have, carefully consider things like line inputs. Some inexpensive consoles still use unbalanced audio inputs for line and insert points, and often non-standard levels as well. You can buy a lot of console for a little money and end up spending a fortune to make it work right in your system. Flashing lights and moving faders do not mean much if the quality of your signal will be worse after conversion. If you need to mix a newscast ask about mix minus. Having a mix minus available for each input may seem like an extravagance, but it wouldn't be if you asked the journalist! For digital consoles you should ask just how long it takes to boot after a power failure, and how software is updated.

If the primary application is for post production consider special purpose consoles designed for editing environments. They include things like preview functions that mainline consoles will not have. But beware of the manufacturer that says he has a "serial edit interface", but does not specify the protocol(s) that are supported.

Lastly, if the installation is a new console in an existing system plan ahead. It will be much easier if you can prepare the existing plant for the new gear. Prefabricating the cabling to the new interface (which could well not be XLR connectors in many large consoles) will save loads of time. If you are implementing digital audio for the first time consider doing it on coax. Most equipment can accept BNC I/O now, and those devices that do not can be interfaced through baluns that adapt the 110Ω twisted pair to 75Ω unbalanced connections. ■

John Luff is president of Synergistic Technologies Inc. in Canonsburg, PA.

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BusinessWire

Business highlights from broadcast and production

BY LAURA COLLINS, EDITORIAL ASSISTANT

Belden's electronic division installed over 4,000,000 feet of cable in the new Staples Center in Los Angeles. The majority of the cable connected the TV control rooms and routed digital audio/video signals within the 1 million-square-foot stadium.

The division also brought their high-performance networking cabling to Panduit's termination, management and identification products to produce the end-to-end system, Integrity Structured Cabling Solution.

ABC-affiliate WSIL-TV3 converted from 3/4" tape-based systems to a computer-based digital news production solution by Vibrint. The system includes applications for feed capture, nonlinear editing and playback.

Acrodyne recently added Rohde & Schwarz broadband solid state UHF and VHF digital television transmitters to the low, medium and high transmitters they already supply.

Communications Engineering designed, engineered and built WETA Washington, D.C.'s new digital TV and radio broadcast plant in Arlington, VA.

ECHOlab has changed its name to e-StudioLIVE to reflect its recent expansion into Internet broadcasting systems.

EMCEE announced that it will acquire Advanced Broadcast Systems in order to offer broadcasters low- to high-power digital transmitters.

Avid and Ultimatte reached an agreement to integrate Ultimatte's real time keyer technology into Avid's Symphony finishing system. This integration will allow Symphony users real time control over keying situations, especially blue-screen/green-screen compositing.

East Side Audio recently purchased a DPC-II digital console from Soundtracs. The 32-bit, 48-fader console will be used in East Side Audio's newly renovated Studio E.

CNN Interactive announced that it will use Virage Interactive video infrastructure on its site, allpolitics.com. The service will enable users to search for televised speeches by presidential candidates by subject and keyword.

California production company Digi-Dog Studios installed Otari's Elite+ digitally controlled analog console to increase the studio's capabilities.

Otari also sold five of their Radar II hard disk recorders to Right Track Recording of New York.

Dielectric Communications constructed a new tower and transmitter for WWWB-TV's move to Louisville, as well as designing their antenna. The new transmitter is the most powerful of its kind in America and will boost the station's power to 5Mw.

Chyron will work with Microsoft to develop video graphics systems for Microsoft's TV platform, which enables content developers to offer consumers a new TV experience.

ScreenShot

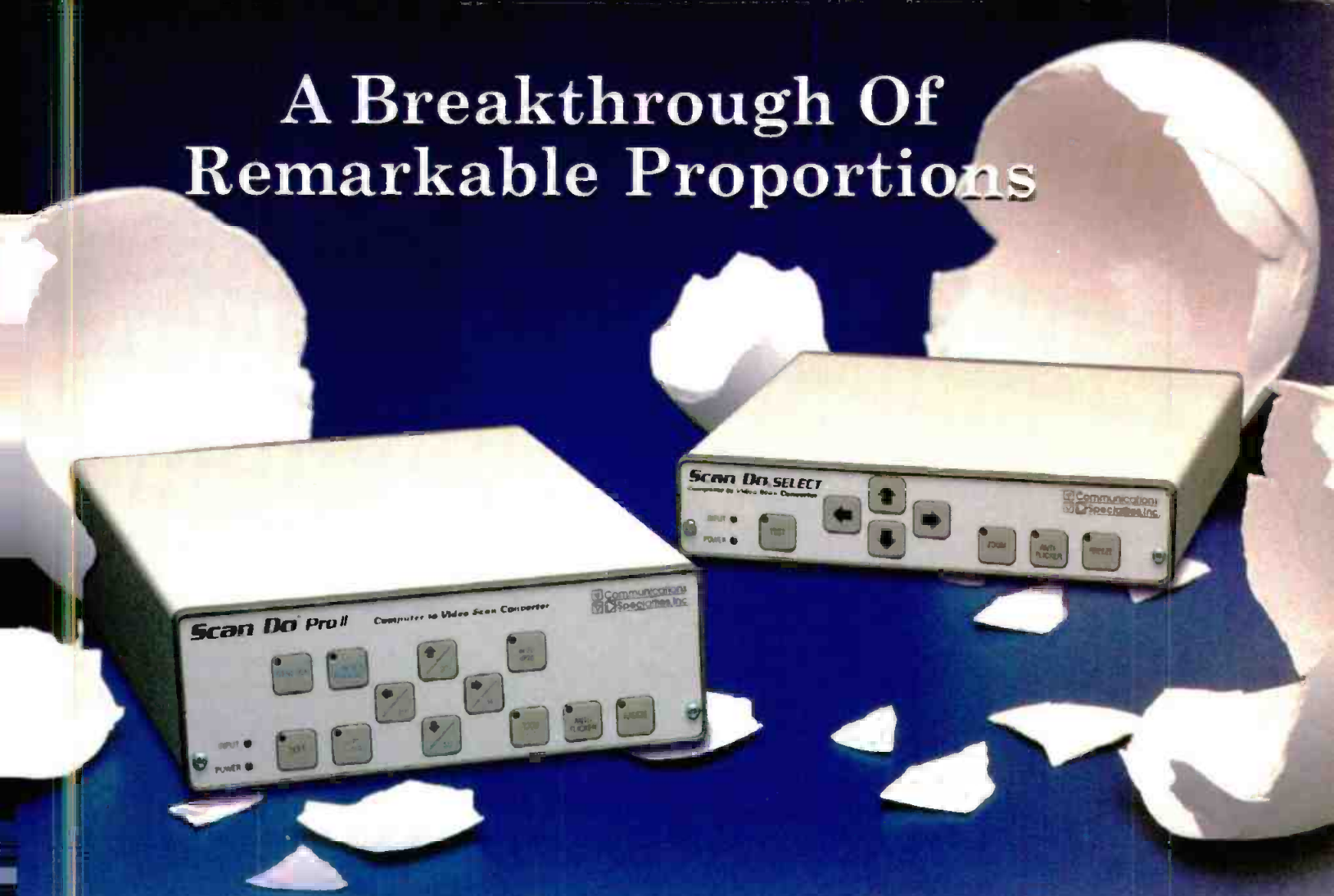
Raycom Sports with Orad's IMadGINE covers college tournaments

Raycom Sports used Orad's IMadGINE virtual advertising systems for the Food Lion MVP Classic college tournament hosted by North Carolina in Charlotte, N.C., and the BB&T Classic tournament hosted by George Washington University and the University of Maryland at the MCI Center in Washington, D.C.

Advertisers' logos in both events were inserted into the keys at each end of the court using IMadGINE. The logos appeared as if they were painted onto the wood courts and were changed at half time. More frequent changes were avoided so viewers would not be distracted during the event.

IMadGINE allows for targeted advertising during live TV broadcasts by electronically replacing the peripheral boards in a sports stadium or inserting synthesized messages in empty places in the arena, facing obstacles such as diverse weather conditions and players blocking the physical space used for the insertion.

A Breakthrough Of Remarkable Proportions



Our Next Generation Scan Do Scan Converters Raise The Industry Standard. Again.

With the redesigned Scan Do® Pro II and new Scan Do Select, we've hatched two scan converters that offer egg-ceptional performance at an unbeatable price. Both maintain all the great user amenities and rugged dependability you've come to love, plus have these great features:

- True multi-scanning with support for resolutions to 1280 x 1024 (at 60Hz). So they'll work with virtually any computer.
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- An internal, universal power supply which eliminates the need for an external "brick."
- Advanced, three-line flicker reduction for the crispest, most stable images.
- RS-232 remote control for easy system integration and expansion.

Scan Do Select is the perfect presentation tool for boardrooms, meetings, training and videoconferencing applications. Scan Do Pro II has additional capabilities. Designed for top video and broadcast professionals, it features:

- Studio timeable genlock
- Component output (YUV and RGB formats)
- Switchable vertical filter
- Optional serial digital output (SDI)

Of course, both Scan Do Pro II and Scan Do Select are the epitome of user friendliness. They're simple to install, can be rackmounted and have easy-to-use, front-panel controls. Add a very reassuring three-year warranty on parts and labor, plus a great price, and you'll be scrambling to try one for yourself. For more information, including a printed or CD version of our catalog, contact us today.

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Harris Corporation sold its TV antenna business to Dielectric Communications. The sale will enable Harris to focus on its core transmitter business and allow Dielectric to expand its antenna business.

National Mobile Television in Seattle ordered a 60-channel C2 analog mixing console from Calrec for installation in its Remote Vehicle Unit A9. The C2 will replace the Harrison TV - 3 currently in use.

Post production houses POP Film, POP Amination, Digital Magic and Riot are joining forces to form a Los Angeles-based, resource-rich media production center under the name R!OT. The full-service production and post production studio will offer telecine, editing, compositing, 3D animation, duplication, distribution and support services to clients from the advertising, music video, feature film, and entertainment and interactive television industries.

R!OT will operate as part of the Four Media Company division of the Encore Group, whose president is Larry Chernoff.

People

Advanced Television Technology Center announced new officers for their board of directors. Edward Calleca, senior vice president of technology and operations for PBS, replaced Howard Miller as chairman. Philip Livingston, vice president and strategic technical liaison for Panasonic Broadcast and Digital Systems Company, replaced Dr. Robert Hopkins as vice chairman.


Dorrough

NAB recently announced the following winners of its 2000 Engineering Achievement Awards: Michael Dorrough in radio engineering and Max Berry in television engineering. Dorrough is the founder of Dorrough Electronics. Berry was vice president of broadcast engineering for Capital Cities/ABC until his retirement in 1989.

Steven Muni was appointed channel manager for Leitch's United States sales operation.

The Advanced Authoring Format Task Force recently incorporated as AAF Association. Industry veteran and *Broadcast Engineering* writer Brad Gilmer was appointed executive director of the new association. Other AAF board members include David Dale of Avid, Andrew Oliphant of the BBC, Gordon Castle of CNN, Ian Gordon of Discreet, Gavin Schutz of 4MC, Alain Legault of Matrox, Tom McMahon of Microsoft, Laurin Herr of Pinnacle, Jon Pannaman of Quantel, Peter Dare of Sony, Clyde Smith of Turner Entertainment Networks and Steve Long of the US National Imaging and Mapping Agency.

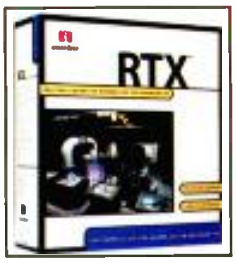

Campbell

Guy Campbell was elected president and a director of Andrew Corporation.

Avid recently announced the following appointments: Rob Kobrin as the vice president of worldwide product marketing and Mike Rockwell as chief technology officer.


Schwartz

Paul Schwartz was appointed to the position of marketing communications coordinator for Otari Corporation. ■



Inscriber RTX creates on-air timing for 2000 Winter Goodwill Games

Turner Broadcasting used Inscriber RTX for their broadcasts of the 2000 Winter Goodwill Games in Lake Placid. The RTX automation system by Inscriber was used to create on-air timing applications including running clocks, differentials, time to beat and split times. These applications appeared in events ranging from snowboard Super-G, bobsled and luge to downhill races, one of which was featured prominently in the first night's broadcast.

Softimage DS produces promos for Winter X Games

White Iron Digital used Softimage DS by Softimage to produce the 2000 Winter X Games in Mount Snow, Vt., for ESPN. The post house was used to produce promos and bumpers for the 1999 Summer X Games in San Francisco and was chosen again for use in the Winter X Games because of its ability to meet tight deadlines, and because of the features it provided, including streaming capture, new compositing tools and editing enhancements. In the Winter X Games, it was used to create 30-second "personality pods" and two features, as well as high-impact bumpers.

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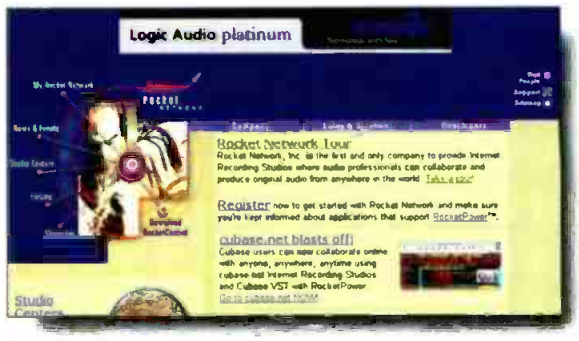

www.rocketnetwork.com

Rocket Network, Inc. is the first and only company to provide Internet Recording Studios where audio professionals can meet online to collaborate and produce original audio from anywhere in the world. The Company'srevolutionary network provides a cost-effective and convenient complement to traditional studios by reducing production expenses and increasing creative options for professional-quality audio in TV, film, radio, music and Websites.

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.commscope.com

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

www.digibid.com

Upgrading equipment? Need to remarket the replaced equipment? Digibid provides a ready online marketplace of equipment buyers. Our online auction format makes it easy to sell your equipment.

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.

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HyTRON 50 Battery

Weighing a mere 3 1oz (880 grams) and packing 50 Watt-hours of energy - enough to operate a typical ENG camcorder for two hours the HyTRON 50 is the most advanced lightweight battery in the industry

- Made possible by recent advancements in a cell technology originally designed for the mobile computing industry, it incorporates nickel metal hydride cells that provide the highest energy density of any rechargeable cylindrical cell available. High performance is further assured through the integration of Anton/Bauer InterActive digital technology
- Equipped with an on-board "fuel computer" which monitors energy input and output as well as critical operating characteristics and conditions. This data is communicated to the InterActive charger to ensure safety and optimize reliability
- In addition, remaining battery capacity information is available by means of an LCD display on each battery and in the view-finder of the most popular broadcast & professional camcorders.
- Special low voltage limiter prevents potentially damaging overdischarge

Specifications: 14.4 V, 50 WH (Watt Hours)
5-3/4" x 3-1/2" x 2-1/4" 1.9 lbs (88kg)
Typical runtime: 2 hours @ 25 Watts 3 hours @ 17 Watts

QUAD 2702/2401

Four-Position Power/Chargers

The lightest and slimmest full featured four position chargers ever they can fast charge four Gold Mount batteries and can be expanded to charge up to eight. They also offer power from any AC main, in a package the size of a notebook computer and weighing a mere four lbs! The 40 watt 2401 can charge ProPacs in two hours and TrimPacs in one. Add the Diagnostic/ Discharge module and the QUAD 2401 becomes an all purpose power and test system. The 70 watt QUAD 2702 has the module and is the ultimate professional power system

STEADICAM VIDEO SK

Steadicam Video SK2

Incorporating the same design principles as its larger Oscar and Emmy winning Steadicam cousins, the Video SK 2 is designed for cameras weighing from 9-19 lbs. Far more compact and less complex, the complete SK2 system -sled, stabilizer arm and vest- weighs a mere 21 lbs and fits neatly into the trunk of a car.

Balancing is easier than ever and a single battery operates both camera and Steadicam. In fact, the SK2 is the only Steadicam simple enough to be operated without workshop training. A comprehensive instructional video will have you up and running in hours. But make no mistake: the lightweight Video SK2 performs like a true heavyweight.

Shoot on the move effortlessly, without cranes, booms or dollies. The sled-mounted monitor offers a crystal-clear picture, so your eyes are no longer glued to your camera's eyepiece. And with the weight spread comfortably over your torso you can shoot on the run, climbing stairs or even from a moving vehicle. With one smooth tracking shot capture what used to require five or six setups. An optional low-mode bracket can further enhance your creativity. Whether you shoot commercials, industrials or documentaries, the SK2 lets you offer more flexibility that ever before. If you can imagine a shot, you can shoot it more efficiently, more economically and more creatively than with any other other equipment

GLIDECAM

V-16 AND V-20

Camera Stabilization Systems

The V-16 and V-20 allow you to walk, run, go up and down stairs, shoot from moving vehicles and travel over uneven terrain without any camera instability or shake. The V-16 stabilizes cameras weighing from 10 to 20 pounds and the V-20 from 15 to 26 pounds. They are both perfect for shooting the type of ultra-smooth tracking shots that take your audience's and client's breath away, instantly adding high production value to every scene. Whether you are shooting commercials, industrials, documentaries, music videos, news, or full length motion pictures, the Glidecam "V" series will take you where few others have traveled.

QUICK DIAL 74

sachtler

Tripods and Fluid Heads

DV Systems—Digital Support for Every Budget

Today's compact digital cameras require light, fast and highly versatile camera support systems. Starting from the DV2 all the way up to the DV12, Sachtler has a solution tailored for just about every conceivable digital camera package available today. All feature Sachtler's patented counterbalance system and Touch and Go wedge plates. And all except the DV2 feature sliding camera platform to ease in the balancing of your camera.

DV2 System

- The smallest head of the Sachtler's line.
- Sachtler Touch and Go quick release with automatic camera lock and safety lever/drop protection
- One step of dynamic counterbalance
- Frictionless leak proof fluid damping with one levels of drag
- Vibrationless vertical /horizontal brakes
- Built in bubble for horizontal leveling
- Single Stage 75mm tripod DA 75 Long
- Lightweight floor spreader SP 75

This system (0210) consists of:
Fluid Head (DV-2) Long Tripod (DA 75), floor spreader (SP 75)

DV4 System

- Sliding balance plate
- Touch and Go quick release with automatic camera lock and safety lever/drop protection
- One step of dynamic counterbalance
- Frictionless leak proof fluid damping with one levels of drag
- Vibrationless vertical /horizontal brakes
- Built in bubble for horizontal leveling
- Single stage 75mm long tripod DA 75
- Lightweight floor spreader SP 75

DV4 System (0410) consists of:
Fluid Head (DV-4), Long Tripod (DA 75), floor spreader (SP 75)

DV4XD System

Same as the DV4 PLUS —

- Five step of dynamic counterbalance
- Five step of vertical and horizontal drag

DV4XD System (0610) consists of:
Fluid Head (DV-6), Long Tripod (DA 75), floor spreader (SP 75)

DV8 System

Same as DV6 PLUS — • Greater load capacity

DV8 System (0810) consists of:
Fluid Head (DV-8), Long Tripod (DA 75), floor spreader (SP 75)

DV12

Same as DV8 PLUS — • Greater Load Capacity • Fits 100mm tripods

QTV

15" and 17" On Camera Prompters

The 15" and 17" On Camera prompter is the industry standard and designed for use with any camera, for any application. The high contrast, high resolution monitor created by QTV, is the result of state of the art components and design. The monitor permits a much greater degree of tilt because of its cutaway feature. Its VPS Eyeline feature superimposes copy over the camera lens, enabling the reader to maintain maximum eye-to-eye contact. It's easy and comfortable to read. QTV's On Camera prompter will make sure the talent has clear access to the prompter. The 17" model has a viewing area of 123 sq. inches, 39% more than the 15" model. The 15" On Camera prompter is also available in a free standing pedestal model, which can be utilized both in the studio and in remote situations.

MVP-12

The MVP-12 incorporates QTV's latest design technology for studio and EFP prompting. The MVP-12 features the most advanced circuitry for a prompter of this size. Fully self-contained, it offers high brightness and high resolution that ensures unmatched ease of readability for the speaker. The MVP-12 is powered by AC or DC current utilizing the Sony type NP-1 or Anton Bauer 13-14 volt batteries, allowing on-location as well as studio prompting. It weighs only 19 lbs including the quick release roller plate for fast mounting and balancing. Below the lens mounting is utilized resulting ideal counter balancing for ease of operation.

MVP-9 Mini Videoprompter

The MVP-9 mini videoprompter is designed for use with smaller cameras and small spaces. The same level of performance is achieved as the larger CRT based units but in a smaller configuration that is powered by AC or DC current (as above). Created for the new generation of smaller, lighter cameras, the MVP-9 weighs only 17 1/2lbs and both the monitor and camera mount set up quickly and easily. As with the other units the VPS Eyeline feature assures maximum eye contact with lens while easily reading the script. It packs up very tightly, making it easy to take anywhere.

SONY

PVW-2600/PVW-2650/PVW-2800

Betacam SP Pro Series

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

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

PVW-2650 Only

- Dynamic Tracking (DT) playback from -1 to +3 times normal speed

PVW-2800 Only

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

800 SERIES UHF WIRELESS MICROPHONE SYSTEMS

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

PROFESSIONAL VIDEO TAPES

QUICK DIAL 71

fuji

Professional Grade VHS

PG-30	2.39	PG-60	2.39	PG-120	2.

Broadcast Grade VHS Box

BGR-30	3.29	BGR-60	3.99	BGR-120	4.

H471S S-VHS Double Coated

ST-30	5.69	ST-60	7.49	ST-120	7.

M221 Hi 8 Double Coated

Metal Particles		Metal Evaporated	
P630HMP	4.99	E630HME	7.
P660HMP	6.29	E660HME	10.
P6120HMP	8.29	E6120HME	13.

M321SP Metal Betacam (Box)

05S	11.99	10S	12.49	20S	12.
30S	14.99	60L	24.95	90L	39.

DP121 DVC PRO

12M (Med.	7.49	23M	8.79	33M	10.
63M		19.99	64L (Lg.)		22.
94L		30.99	123L		39.

maxell

Hi8 Metal Particle (XRM)

P6-120 XRM					6.

Broadcast Quality Hi8 Metal Particle

P6-30 HM BQ		5.39	P6-60 HM BQ		6.
P6-120 HM BQ					7.

P/A PLUS VHS

T-30 Plus	1.69	T-60 Plus	1.99	T-90 Plus	2.
T-120 Plus		2.19	T-160 Plus		2.

HGX-PLUS VHS (Box)

HGXT-60 Plus		2.69	HGXT-120 Plus		2.
HGXT-160 Plus					3.

BQ Broadcast Quality VHS (Box)

T-30 BQ	3.89	T-60 BQ	3.99	T-120 BQ	5.

BQ Professional S-VHS (In Box)

ST-31 BQ		6.79	ST-62 BQ		6.
ST-126 BQ		7.45	ST-182 BQ		13.

Betacam SP

B30MSP	13.49	B60MLSP	19.99	B90MLSP	29.

Panasonic

Mini DV Tape

AY-DVM-30		6.49	AY-DVM-30 (10 Pack)	ea.	5.
AY-DVM-60		7.99	AY-DVM-60 (10 Pack)	ea.	7.
AY-DVM80		12.99	AY-DVM120		20.

DVCPRO

AJ-P12M (Medium)		6.99	AJ-P24M		9.
AJ-P33M		11.19	AJ-P66M		19.
AJ-P66L (Large)		20.99	AJ-P94L		29.
AJ-P126L					38.

SONY

Hi-8 Professional Metal Video Cassettes

P6-30 HMPX		4.59	P6-30 HMEX		7.
P6-60 HMPX		6.49	P6-60 HMEX		10.
P6-120HMPX		8.49	P6-120HMEX		14.

PR Series Professional Grade VHS

T-30PR	2.39	T-60PR	2.59	T-120PR	2.

PM Series Premier Grade Professional VHS

T-60PM					3.

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

T-30BA	3.59	T-60BA	3.99	T-120BA	4.

MQ Master Quality S-VHS (In Box)

MQST-30	7.49	MQST-60	7.79	MQST-120	7.

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

KCS-10 BRS (mini)		8.69	KCS-20 BRS (mini)		8.
KCA-10 BRS		8.19	KCA-20 BRS		8.
KCA-30 BRS		9.60	KCA-60 BRS		13.

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

KCS-10 XBR (mini)		8.79	KCS-20 XBR (mini)		10.
KCA-10 XBR		9.29	KCA-20 XBR		10.
KCA-30 XBR		11.99	KCA-60 XBR		15.

KSP 3/4" U-matic SP Broadcast (In Box)

KSP-S10 (mini)		9.59	KSP-S20 (mini)		11.
KSP-10		10.09	KSP-20		11.
KSP-30		12.99	KSP-60		16.

BCT Metal Betacam SP Broadcast Master (In Box)

BCT-5M (small)		12.29	BCT-10M (small)		13.
BCT-20M (small)		13.29	BCT-30M (small)		13.
BCT-30M (small) (50 Pack)				ea.	13.
BCT-30ML		18.99	BCT-60ML		21.
BCT-90ML					27.

Mini DV Tape

DVM-30EXM w/Chip		12.99	DVM-60EXM w/Chip		17.
DVM-30EX (No Chip)		11.99	DVM-60EX (No Chip)		13.
DVM-30PR (No Chip)		7.99	DVM-60PR (No Chip)		9.

Full Size DV Tape with Memory Chip

DV-120MEM		24.99	DV-180MEM		26.

PDV Series Professional DVCAM Tape

PDVM-12ME (Mini)		15.25	PDVM-22ME (Mini)		16.
PDVM-32ME (Mini)		16.99	PDVM-40ME (Mini)		15.
PDV-94ME (Standard)		33.49	PDV-124ME (Standard)		37.
PDV-184ME (Standard)		44.95	PDVN-64N		24.
PDVN-124N		31.95	PDVN-184N		39.

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FUJINON ENG LENSES

hile ENG camera technology evolves ster and faster, delivering ever high- performance in ever small bod- s, it has been increasingly dif- cult for lens manufacturers to prove quality while keeping ze and weight to a minimum ntil recently. With Aspheric chnology (A12) Fujinon has suc- eeded in manufacturing superior quality nses that are both smaller and lighter than lenses of con- entional spherical design. From the widest angle to the ghest telephoto, Fujinon's broadcast hand-held style lenses ffer unparalleled features and performance. In fact, they are advanced and so optically superb they will reshape your inking about how well a lens can perform.

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

A15X8EVM Standard Zoom Lens

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

A20X8EVM Standard /Telephoto Zoom Lens

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

CHYRON PC-CODI & PC Scribe

Text and Graphics Generator and Video Titling Software

C-CODI incorporates a broadcast quality encoder and a wide bandwidth ear key- for the highest quality, realtime video character generation id graphics display. A video graphics software engine running under /indows 95/NT, PC Scribe offers a new approach and cost effective olution for composing titles and graphics that is ideal for video produc- on and display applications. Combined, then a total solution for real- me character generation with the quality you expect from Chyron.

PC-CODI Hardware:

Fully-and slased displays • Display and non-display buffers
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User def ble intercharacter spacing (squeeze & expand)
Multiple roll/crawl speeds • Automatic character kerning
User def ble tab/template fields
Shaded b kgrounds of variable sizes and transparency
Software controlled video timing

- User definable read effects playback: wipes, pushes, fades
- NTSC or PAL sync generator with genlock
- Board addressability for multi-channel applications
- Auto display sequencing • Local message/page memory
- Preview output with safe-title/cursor/menu overlay
- Composite and S-video input with auto-genlock select

PC-Scribe Software:

Number of fonts is virtually unlimited. Also supports most Internatio al language character sets. Fonts load instantly and the le el of anti-aliasing applied is selectable.
Adjust a w de range of character attributes. Wide choice of composi n tools.
Character words, rows and fields can color flash
Character olls, crawls and reveal modes. Speed is selec- table and can be auto timed with pauses. Messages can be manually dvanced or put into sequences along with page transitions

- Multiple preview windows can be displayed simultaneously.
- Transitions effects include: cut, fade, push, wipe, reveal, peel, zoom, matrix, wipe, spiral, split, weave and jitter.
- Import elements to build graphics. This includes OLE objects, iNFiNiT! RGBA and TGA with alpha channel. Scribe also imports and exports TIFF, JPEG, PCX, TGA, BMP, GIF, CLP, ASCII, IMG, SGI, PICT and EPS formats.

PC-CODI and PC-Scribe Bundle 2995.00

TRUEVISION/Avid

Professional Video Production Workstation

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

TARGA 1000 Features:

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

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

MCXpress Features:

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

TARGA 1000/MCXpress Turnkey Systems:

- 300-watt 6-Bay full tower ATX chassis
- Pentium ATX motherboard with 512K cache
- Pentium II- 450 MHz Processor
- Matrox Millenium II AGP 4MB WRAM display card
- 128MB 10ns 168-Pin (DIMM) S-DRAM
- IBM 10GB IDE System Drive
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- Adaptec AHA-2940U2W Ultra Wide SCSI-3 controller card
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KNOX VIDEO

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

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

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

LEADER

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

5860C WAVEFORM MONITOR

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

5850C VECTORSCOPE

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

5100 4-Channel Component / Composite WAVEFORM

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

5100D Digital Waveform/Vectorscope

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

5870 Waveform/Vectorscope w/SCH and Line Select

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

5872A Combination Waveform/Vectorscope

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

5864A Waveform Monitor

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

5854 Vectorscope

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

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

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One additional color is available at $95^{00} per insertion. Color is determined by publisher at time of imposition.

Broadcast Engineering will reproduce business cards in a special advertising section of professional services for the broadcast industry. Cost is $165^{00} per insertion, black and white reproduction only.

Blind Box ads (replies sent to Broadcast Engineering for forwarding) are an additional $45^{00}. Reader Service Numbers are available for $55^{00} per insertion, or free with 4-inch or larger ads. In addition, company will be listed in the Advertisers' Index.

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Classifieds Help Wanted

STUDIO MAINTENANCE ENGINEER: Must be able to perform the following duties: install and maintain studio transmission equipment including video switchers, audio consoles, DVE, CG, SS, cameras, and robotics. Familiarity with automation systems and master control environment. Should possess a general computer/networking background. Must be able to work on a rotating shift schedule. Candidates should have an engineering degree or equivalent technical training. SBE/FCC certification a plus. If you want to be a part of the exciting transition to HDTV in the most exciting city in the world, please send your resume and cover letter to: Kurt Hanson, Chief Engineer, WABC-TV, 7 Lincoln Square, New York, NY 10023. No telephone calls or faxes please. We are an equal opportunity employer.

BROADCAST MAINTENANCE ENGINEER (Vacation Relief)—Excellent opportunity for an experienced Broadcast Engineer at the ABC O&O in New York. Responsibilities include the installation/maintenance of studio and transmission equipment, including video switchers, routers, VTR, audio consoles, SS, cameras and DVE. Must be able to do component level repair, work well under pressure and with little supervision. Must possess knowledge of analog / digital systems, and a minimum of three years broadcast television experience. Candidates should have an engineering degree or equivalent technical training. SBE/FCC certification a plus. Please send resume only to: Kurt Hanson, WABC-TV, 7 Lincoln Square, New York, NY 10023. No telephone calls or faxes please. We are an equal opportunity employer.

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Principal Engineer, Broadcast Systems (201946-BU)

We are looking for an engineer to provide team leadership to a group of engineers responsible for a state-of-the-art broadcast automation system at our new broadcast center. Will be responsible for schedules, task management and performance as we all work with vendors and broadcast center customers on-site to resolve on-air issues. We are looking for individuals with 15 years software and systems development and 5 years of team leadership/management experience. Must have background in performing system level and software application design, implementation, testing and various computer platforms including UNIX and Windows.

Sr. Staff, Broadcast Systems (201947-BU)

We are looking for an individual to perform end-to-end development and implementation of a state-of-the-art monitoring system for a new broadcast facility. Responsible for the design, development, testing and implementation activities. 10 years of software and systems development experience, a background in performing system level and software application design for operating systems including UNIX and Windows, and a BS in Computer Science or EE are desired.

Sr. Staff Engineer, Broadcast Systems (201948-BU)

We are looking for an individual to participate in the implementation of changes to existing broadcast automation systems, participate in the planning, selection, design and implementation of a new broadcast automation system. 10 years of software development experience in performing software application design for various operating systems including HP-UX, QNX and Windows NT are desired. Applicants should have a BS in Computer Science or EE and a Master's is preferred.

Staff Engineer 2 (201945-BU)

You will perform end-to-end development and implementation of the monitoring system for our broadcast facility. Responsible for development, testing and implementation activities. 5-7 years of software and systems development experience and a background performing system level and software application design, implementation and testing for various platforms and operating systems including UNIX and Windows and 'C' language.

Staff Engineer 1 (201944-BU)

Will perform development and implementation of our error monitoring system for our broadcast facility. Responsible for development, testing and implementation activities. 0 -3 years of software development experience in performing software application development using various platforms and operating systems including UNIX, Windows and 'C' language is desired. Candidates should possess a BSCS or BSEE and a Master's in Computer Science is preferred.

DIRECTV offers its employees an excellent benefit package including a choice of medical and dental plans, optical coverage, life and disability insurance, a 401k plan, retirement, generous vacation and holiday allowances and education reimbursement. Please send your resume, **indicating appropriate job code**, to our corporate headquarters located at: **DIRECTV, Inc., Employment, P.O. Box 915, El Segundo, CA 90245** or email (text format only; no attachments) to **resume@directv.com**. For more information about DIRECTV, please visit our website at: **www.directv.com**. DIRECTV is proud to be an equal opportunity/affirmative action employer. We strongly support workforce diversity.

DIRECTV.

DIRECTOR OF ENGINEERING: CBS O&O in San Francisco is looking for an experienced Director of Engineering. Person should have strong credentials in personnel and budget management. Emphasis is on experience in broadcast engineering, digital, MIS, and Internet. Good project planning and communications skills a must. Fax resume to: (415) 765-8796. EOE

KNVA-TV seeks highly motivated Master-Control Operator to fill overnight position. Some experience in Television is preferred, computer experience is a must. Applications will be accepted until March 24, 2000. Send your current resume to 908 West MLK, Austin, Texas. 78701. E.O.E. no phone calls please.

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Classifieds Help Wanted

Manager of Newsroom Technology Job Advertisement

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The Mid-level Engineering candidate should have the following: a good background in television engineering, and engineering management skills with a working knowledge of AutoCAD. A E.E. or P. Eng., would be a plus.

Candidates must possess excellent problem solving abilities, be able to accept responsibility, work in a team environment and have a working knowledge of Office 97. Successful applicants will be mature, organized, able and willing to travel for several weeks at a time.

Please send resume to:
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Email: sam.gouveia@immad.com

AT&T Broadband Job Opening Broadcast Technician needed at multi-channel TV facilities in Littleton, CO. Duties include installation and repair of all types of broadcast video and audio equipment. Minimum qualifications include 3+ years of broadcast video, audio equipment repair and operations experience. The preferred candidate will also possess an SBE and/or Associates Degree in electronics and experience in maintenance and repair of analog and digital video and audio equipment including: multiple format video tape recorders, video file servers, On-Air Automation Systems, routing switchers, and master control switchers. Other duties, weekend and shift work as required. A drug and background check will be required for successful applicants. Non-smoking environment. EOE.
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DIRECTOR OF ENGINEERING: WVPT-TV, an award-winning PBS station located in the beautiful Shenandoah Valley, seeks a Director of Engineering. The ideal candidate will manage all aspects of the Engineering and Operations departments. Capital planning, familiarity with budgets, and strong supervisory skills required. Will oversee WVPT's DTV conversion, maintenance, and technical operations. Requires excellent communications skills, prior management experience, working knowledge of analog and digital transmitters, microwave, studio, master control equipment, linear/nonlinear production systems, MAC, PC, UNIX, computer networking systems. Prefer FCC General Class license or Senior Engineer SBE certification. Plant in very good condition; capital needs have been addressed annually as we begin our migration to DTV. Reply to Executive Secretary, WVPT, 298 Port Republic Road, Harrisonburg, VA 22801. EOE/AA

Classifieds Help Wanted

ASST. DIRECTOR OF ENGINEERING

ABC7 Los Angeles is looking for an experienced technical manager who will assist the Director of Engineering in overseeing the day-to-day technical operations of the station. Qualified candidates should have significant experience in broadcast engineering including maintenance, in-house and remote operations and design, capital planning and implementation, knowledge of physical plant systems, technical construction, and a strong familiarity with applicable laws, regulations and standards.

Interested applicants must possess excellent verbal and written communication skills and should have prior experience working with collective bargaining units. Knowledge of and familiarity with networking systems, PC/MAC platforms and operations systems, AutoCad and Excel a must. Minimum of 5 years major market television experience in engineering management or supervision required. College degree preferred.

Please send resume to: **ABC7 Los Angeles, Attn: Kimberly Castillo, Dept. ADE/BE, 4151 Prospect Avenue, Los Angeles, CA 90027**. No phone calls please.
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abc 7
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CHIEF ENGINEER: WHUT-TV, WASHINGTON DC Howard University is currently seeking a CHIEF ENGINEER to provide guidance and management of the Engineering Department of WHUT; oversees the maintenance of all broadcast and closed circuit equipment. Identifies technical equipment. Identifies technical malfunctions and trouble shooting technical equipment. Diagnosis equipment problems and assigning and inspection repair and maintenance work. Interested applicants should submit a cover letter and two resumes, re: Job Number: J-46-199-D-99, to: Howard University Department of Employment, 400 Bryant Street, NW, Washington, DC 20059. Please see the full posting for this position, including position requirements, on our website **www.howard.edu.** Howard University is an EOE/AA Employer.

DIRECTOR OF ENGINEERING: The State of Wisconsin Educational Communications Board, the licensee of five public television and 18 public radio stations, has an immediate opening for a Director of Engineering/Chief Engineer. This position is responsible for the planning, development, and ongoing management of statewide delivery engineering for the Wisconsin Public Radio and Television networks. The Director of Engineering has overall responsibility for coordinating the work of 44 Engineering/Operations professionals in the Engineering Division. Successful applicants will have education, training, credentials and experience demonstrating the capacity to provide leadership to a strong engineering team. The individual will be responsible for planning and implementing the digital transition for the state radio and television networks, including replacement of head end facilities and the broadcast network interconnect. A successful candidate will have 7+ years of experience in complex project management, broadcast technology and supervision of staff. Must be thoroughly familiar with digital broadcast technology and transmission systems, from Master Control through antenna. Attractive and competitive salary commensurate with qualifications and experience. Excellent benefit package. Headquarters location: Madison, WI. Send detailed resume and salary history in confidence to: Personnel - Director of Engineering Search, The Wisconsin Public Broadcasting Center, 3319 West Beltline Highway, Madison, WI 53713. Include a letter describing how your experience will contribute to the Wisconsin state radio and television network conversion to digital broadcasting. Candidate consideration begins immediately and position remains open until filled. AN EQUAL OPPORTUNITY EMPLOYER

VICE PRESIDENT, ENGINEERING & OPERATIONS: KDVR Fox 31 has an exciting opportunity for an experienced, senior-level, engineering manager. The station is currently constructing a new, state-of-the-art facility in preparation for a FOX-style news launch (check it out at www.kdvr.com), and we're seeking the right person to oversee the technical and operational departments. Job duties include: responsibility for all engineering and technical aspects of KDVR's facilities; managing all technical operations for news, including start-up; overseeing all maintenance and operational functions encompassing all areas of engineering; planning, coordinating and implementing capital projects, including budgets, timelines and organization; acting as liaison between engineering and all departments, including news, for on-going, daily operations, major events and special projects. REQUIREMENTS: 5 years experience as a chief engineer in a medium to large market as a proven project manager, staff developer, and administrator of television engineering operations required; several years management level experience in a news environment required; excellent managerial, organizational, interpersonal and communication skills required; strong knowledge of FCC rules and regulations required; knowledge of computer and transmission systems required; SBE certification strongly desired. No phone calls, please. Qualified candidates should send or fax resumes with salary requirements to KDVR Fox 31, Attn: Human Resources/VPE, 501 Wazee St., Denver, CO 80204. FAX (303) 357-3953 EOE

Classifieds Help Wanted

ENGINEERS

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

Jim Brown
Assistant Vice President of Engineering Services
Turner Broadcasting System, Inc.
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THE WORLD'S NEWS LEADER

BROADCAST MAINTENANCE TECHNICIAN

The Freedom Forum/Newseum an international journalism foundation located in Arlington, VA is looking for a broadcast maintenance technician to work in a high-tech museum environment. The ideal candidate should have at least three years of experience within a broadcast television operations environment, strong computer skills, exposure to large screen video projection systems and good bench technical skills. Primary role will be to support the Newseum's technical and broadcasts areas, plus add support to our computer systems department. Good interpersonal skills are a must in this shop oriented work environment. The work schedule is planned to include some evening and weekend hours. Candidate should be able to lift 50 pounds. Please send letter of interest and resume to:

Nate Ruffin, VP/Human Resources
The Freedom Forum
1101 Wilson Boulevard
Arlington, VA 22209

MEDIA GENERAL BROADCAST GROUP www.mgbg.com WJTV-TV: Executive Producer to oversee daily news assignment operations; plan special events and projects; supervise daily output assignments; and share responsibility for editorial control of story content with News Director. Education equivalent of BS degree in Journalism, Communications, or related field. Five years management experience in a TV newsroom. Knowledge of journalistic standards as they relate to on-air presentation of news. EOE M/F Drug Screen. Send resume to HR Dept. 1820 TV Road, Jackson, MS 39204-4148

MAINTENANCE TECHNICIAN: The successful applicant will have completed a program of electronics training at a recognized institute of Technology paired with a minimum of five years of television broadcast experience. RF experience would be a plus. Send resume to Haralds Rudzroga, Maintenance Supervisor, ONtv Limited, P.O. Box 2230 Station 'A', Hamilton, Ontario, Canada L8N 3A6, or fax to 905-527-5022 or Email: hrudzrog@ontv.wic.ca

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INTERNATIONAL
Richard Woolley
Tony Chapman
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EOM

Drag and click commercials

BY PAUL MCGOLDRICK

The experts tell us that more and more people are surfing the Web while they watch TV, a significant trend for the future of video content — and an argument for interactivity, at least in the realm of commercials. So far the experiments are mild (like the ability to download a page to order flowers on EchoStar). But it may be that we are at last entering an era when interactivity might become real.

The marketers have given a name to these users: *telewebbers*. They are people who e-mail or surf while watching their favorite programs. Obviously, having a mouse in your hand while an advertisement is running on a nearby receiver could be closely connected acts, and the industry is already predicting commerce revenues of as much as $10 billion within five years. Whether these Internet connectors and display devices are different products or a combined appliance will be extremely important to the developing industry.

Despite our living in an age when change is rapid, there is still an amazing amount of inertia in most of us – inertia that is probably mostly habit. But there are large groups of users that can be addressed – or targeted, if you are cynical – to change those habits. The 22 million AOL subscribers, for example, are certainly not going to be allowed to ignore the content provided by Time Warner on AOL TV. For AOL, of course, the intent is to make sure that content is viewed on the PC, while others would rather that a set-top box connected to a conventional display be the controlling access.

Bigger pipes are getting closer

More and more of us are reaching the first Nirvana level of Mb/s-something connections to the Internet backbone. With those connections, the possibilities for requested video into our homes becomes more realistic. That has not been ignored by other groups of potential providers, and newly extant technologies suddenly become important. One interesting device is the Streamaster from Motorola.

Streamaster is now a couple of years old, but having changes made in software rather than silicon has allowed the product to grow with the opportunities. This maturity means that the communications processing module can now control ATM protocols, ADSL, VDSL, hybrid fiber optic coaxial (HFC) with DOCSIS (digital cable), satellite and terrestrial. Motorola's notions were that Streamaster could cover full DVD home theater, video-on-demand, Web browsing and online gaming. A partnership was clearly needed and Motorola obtained an infrastructure gain with its acquisition last year of General Instruments. Apart from being the largest supplier of cable TV equipment products, GI also had a stake in Next Level Communications, which is developing the infrastructure technology for getting all manner of signals over DSL. Next Level's Residential Gateway 2000 – a set-top box to harness the DSL applications – may well be competition for Motorola's Streamaster, but there is also a great opportunity for the companies to cooperate in a single solution.

That seems less likely now that Motorola has recently teamed with Canadian iMagicTV to deploy that company's DTV manager software with Streamaster to access broadband delivery services. While the federal government has been poorly inclined to accept that the Internet is a suitable distribution facility for broadcast TV, it is very clear that the U.S. telecommunication companies regard DSL as a golden opportunity to provide a plausible alternative to cable. Most are looking at plans to deliver broadcast TV with the opportunity to add interactive TV and Internet. Of course, the copper will still be usable for dial-tone services.

This may be one reason why a lot of these companies are reluctant to roll out DSL services before they can offer a total package to the customer. If the user has high-speed Internet access available before the local company can provide services, then there will be newcomers out there who will offer their own video/service packages earlier. Hollywood and the U.S. courts may have bloodied the upstart icraveTV, but there are a lot of creative entrepreneurs who see the Internet as the world's first level playing field: It doesn't matter who you are, your domain registration price is the same.

In rural areas, such as where I live, we have had to be a great deal more creative to get high-speed services. Although our local telephone supplier — whose franchise has already expired — equipped its new digital exchange with DSL equipment, it has continuously refused to provide services. This is certainly not novel in the country. Out of necessity, our community has done an end-run around the supplier such that a major cooperative of different public utilities has built a backbone that stretches for 150 miles. At the time you read this, every business and every home in our community can have DSL at an attractive price. I'm ready for it; I don't think I'm ready for interactive TV to be directed at me, but then I've got habits too. ■

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

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

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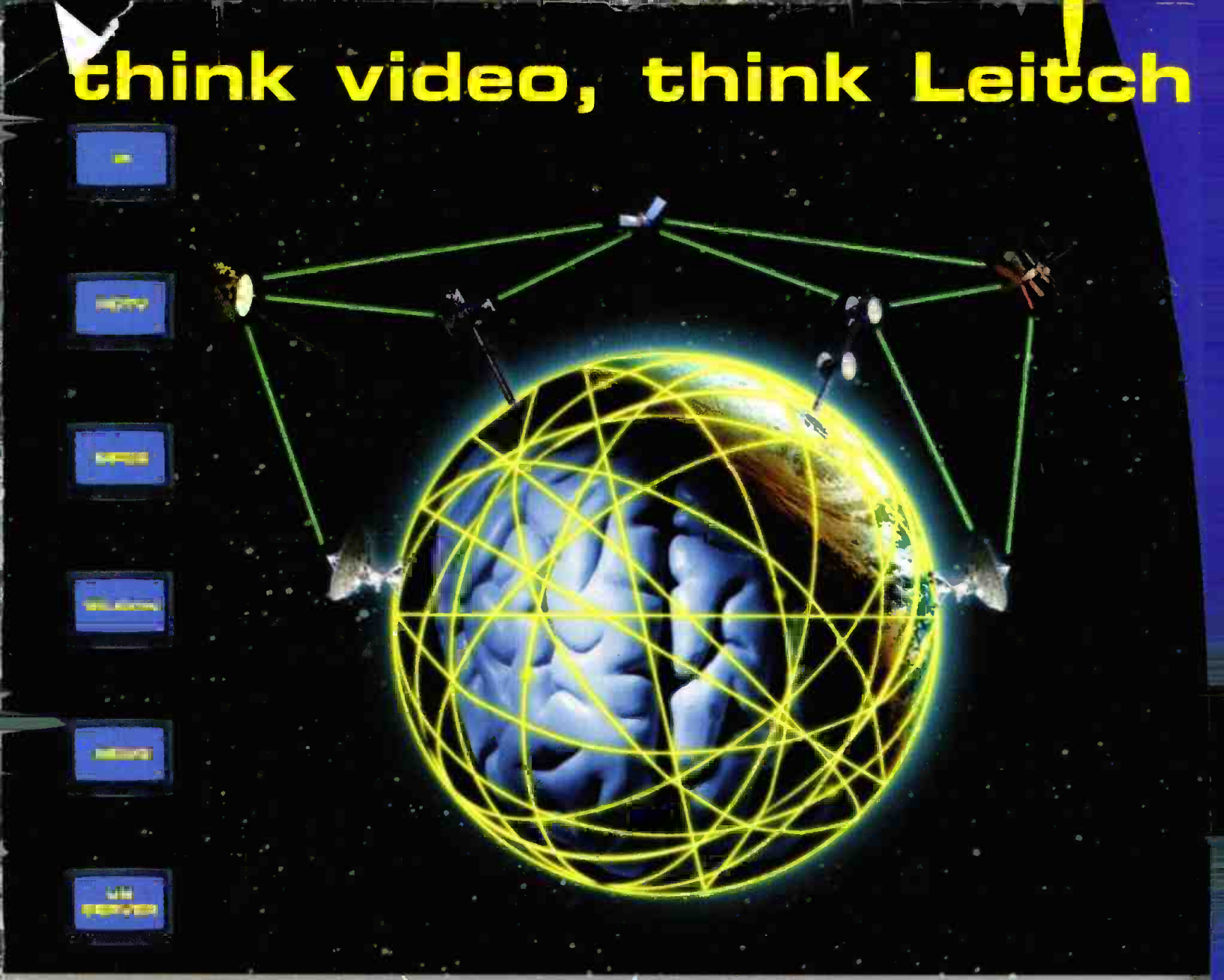

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Leitch dominates the digital newsroom with its NEWSFlash™ non-linear editor built into the VR video servers allowing each editor simultaneous access to all media. By combining edit stations with acquisition and playback channels, we build an integrated all-digital system to meet your time critical needs with streamlined newsroom workflow.

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