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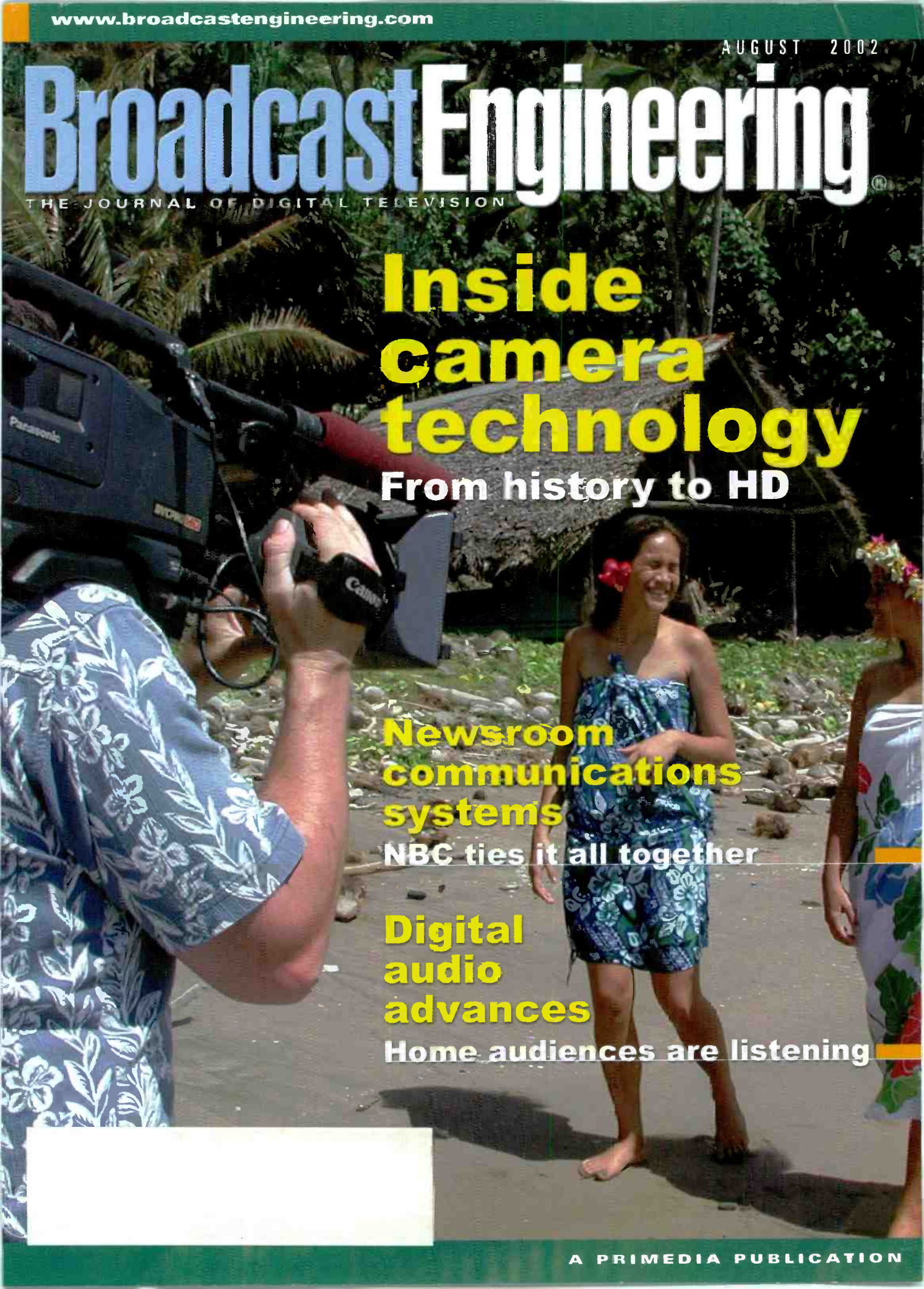
AUGUST 2002

Broadcast Engineering

THE JOURNAL OF DIGITAL TELEVISION



Inside camera technology

From history to HD

Newsroom communications systems

NBC ties it all together

Digital audio advances

Home audiences are listening

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CASE STUDY

KWCH-TV Wichita, Kansas

Company Name:
KWCH-TV

Headquarters:
Wichita, Kansas

Number of Stations:
KBSD-TV, Dodge City
KBSH-TV, Hays
KBSI, Goodland
Local Cable Channel

Critical Needs:
Multi-channel operation
CentralCasting configuration
Total automation
Flexibility of control to support live broadcasts

Don Vest, Chief Engineer

Five years ago, Don Vest, Chief Engineer at KWCH-TV in Wichita, Kansas knew facility improvements had to be made. The station needed a flexible automation solution that combined the power of disk-based media storage systems with the reliability of tape-based technologies. As a result, the station chose Odetics Broadcast to help transform its broadcast operations from its single channel, mostly manual master control to a fully modernized, multi-channel automated broadcast facility. "We chose Odetics because they demonstrated a better understanding of how a television station is programmed and operates," says Vest. With Odetics' AIRO™ Automation System, KWCH has been able to extend its capabilities from controlling one station to three others in the Western Kansas area.

Since 1996, KWCH has taken advantage of the scalability and adaptability offered by the AIRO system to meet the station's increasing channel requirements without adding complexity or additional staff. The latest upgrade included integrating the addition of a new AIRO system with their existing AIRO system. "Odetics delivered the capability to merge the media database in the two systems so it would operate as one – this has made a big difference in our capabilities," adds Vest. "This gave us an eleven channel system – eight channels in the new system using MPEG-2, and three channels in the previous system using JPEG."

With AIRO, KWCH is also able to control four stations from one central location and with one operator, all running a different playlist. "This has had a great impact on decreasing the switching errors and improving the technical quality of the commercial spots. Thanks to AIRO, discrepancies reported by the Western Kansas stations have decreased from two pages a day to maybe a single entry" explains Vest.

The AIRO system also gives Vest the flexibility he likes. "We can break away from the combined control, bring in extra operators and run each individual station as a standalone, or even combinations of stand-alone and combined control. And we can do all this while at the same time running a totally separate channel on cable that is virtually unattended."

Where is Vest looking now? "Expansion, expansion, expansion. I'm ready to work with Odetics to continue to expand the AIRO to program our DTV channel."

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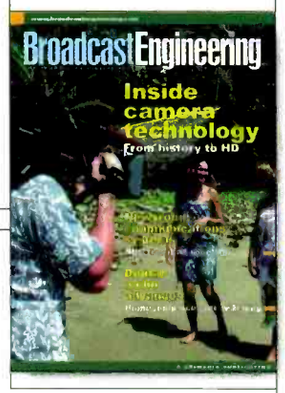

BEYOND THE HEADLINES

DIGITAL HANDBOOK

ON THE COVER: Chuck Henry Productions utilizes Panasonic's AK-HD20A 1080i high-definition camcorder to acquire the Los Angeles-based TV program "Travel Cafe" in HD. The popular travel/food series has shot episodes at exotic locations including French Polynesia, New Zealand, Hong Kong and Hawaii. Photo courtesy of Panasonic.

(continued on page 8)

Studio

Field

1080i

720p

480i

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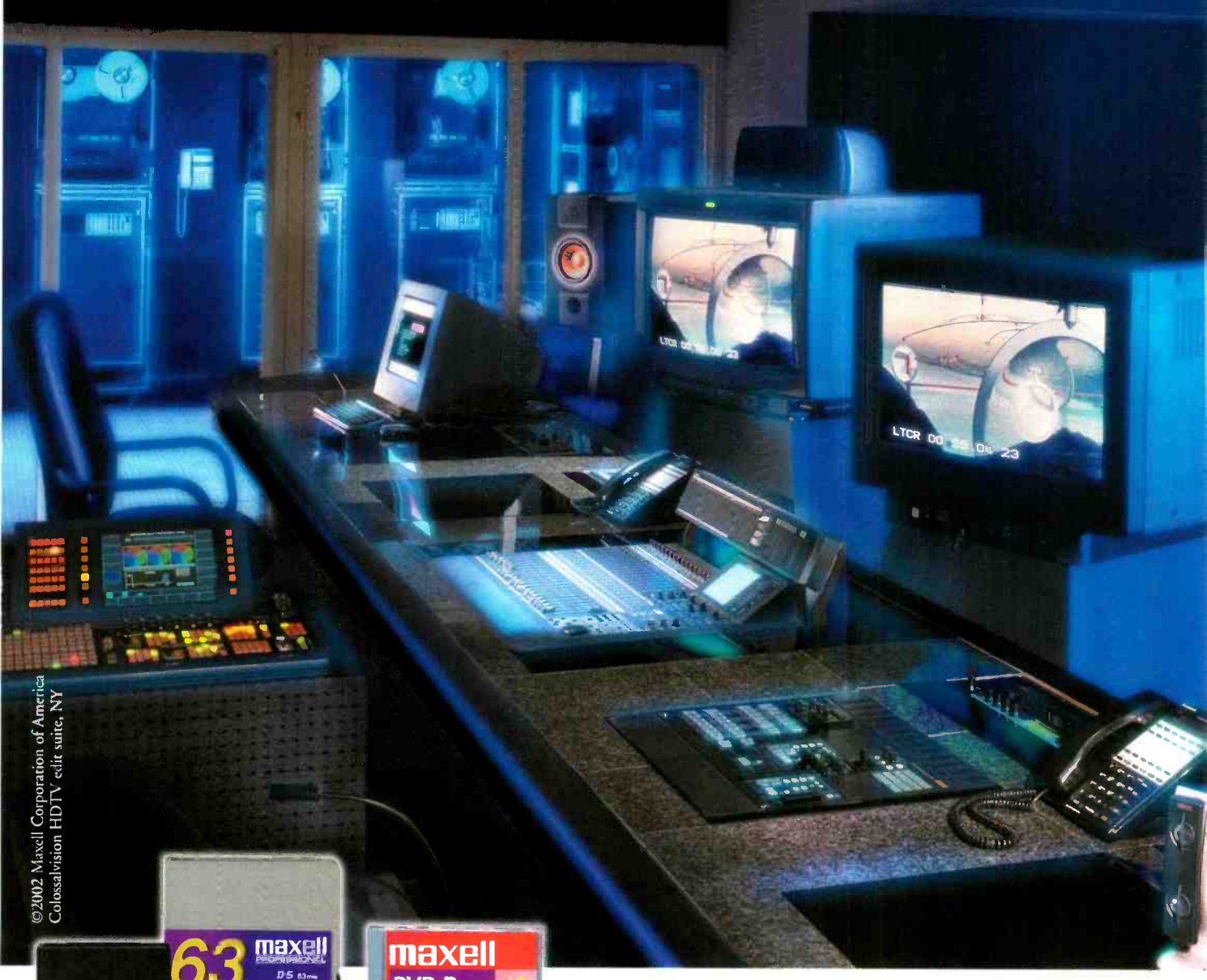
HDTV in 10 years - 20 years ago

A *Broadcast Engineering* interview in June 1982 reported that this industry leader predicted that HDTV would see early adoption by the [broadcast] industry and acceptance by the public within five years, and certainly not more than 10 years. Who is this acknowledged industry leader and where did he work when he made these statements? Correct entries will be eligible for a drawing of the new *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-August" in the subject field and send it to bdick@primediabusiness.com. Correct answers received by Sept. 17, 2002, are eligible to win.

What company creates advanced media for the new and emerging technologies?



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Colossalvision HDTV edit suite, NY

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Hollywood will control your TV

Remember the opening segment in the series *The Outer Limits*? As the show opened, the announcer said in an ominous voice "We control the horizontal, we control the vertical." Meanwhile, the screen breaks up horizontally and then vertically. As a kid I thought that was true. Well, it looks like Hollywood is about to make that happen for real.

Last April I warned readers about a proposal to restrict the viewing and storage of electronic content. Now, thanks to Hollywood, the Consumer Electronics

Manufacturers Association (CEMA) and their puppets in Congress – the movie moguls are about to increase that control over a whole lot more than your TV set. They'll control every media device, from your TV set to your PVR, VCR, computer, cell phone and anything else that might touch their precious material. The most significant consumer ripoff ever is being hidden under the banner of copyright legislation. After all, according to the movie and record companies, every American is nothing more than an evil pirate.

The latest infringement on your freedom is Ernest Hollings' Hollywood-driven bill called the Consumer Broadband and Digital Television Promotion Act (CBDTPA). This mouthful of anticonsumer legislation will prevent almost anyone from copying almost any material to anything.

Separate from the bill is the control over HDTV. This would be handled by a new interface called DVI. Hollywood wants this device on every display, recorder, receiver, you name it. Hollywood's goal is to be sure that they can control what material you can see or record.

In addition to Hollywood's goal of controlling what and when you watch or listen to anything, there's one more little itsy bitsy problem with their solution. The "solution" would make every HDTV product out there obsolete. Overnight about three million HDTV sets are going to become very expensive doorstops.

If your current HDTV set doesn't have a DVI connector (and it doesn't), you will never be able to display an HD image on it. There is no backward compatibility. No grace period to upgrade to a new TV set would be allowed. Some of you may still be making payments on your HDTV set long after it becomes that doorstop I mentioned. You (and I) my friend, are screwed.

Want to guess who's going to be blamed for this consumer ripoff? It sure won't be Congress! It's you, my fellow TV engineer and manager. Viewers are going to blame TV stations because one day their HDTV set worked and the next day it didn't. Viewers won't understand DVI, CBDTPA or QRZ. It's simply the TV station's fault, and boy are they gonna be mad!

If you want more information on the proposed legislation and how it may affect you and your station, check out the site www.eff.org. This is the Electronic Freedom Foundation. Watch the Tinsel Town video. While the video clip is cute, its message is frightening.

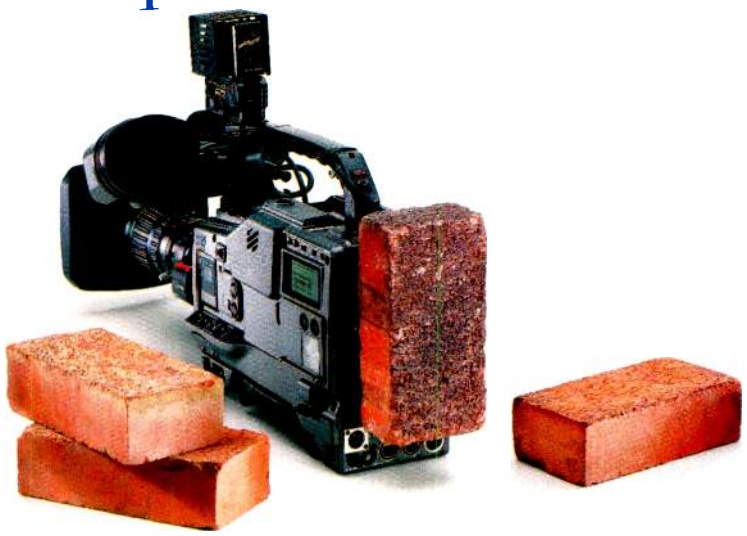
You can also easily send your Washington representatives a letter from this Web site. I urge you to write your congressional representative now — before Hollywood copy-protects that too.

Brad Dick

editorial director

Send comments to: • direct: editor@primediabusiness.com • web site: www.broadcastengineering.com

There are those who say their batteries outperform these...



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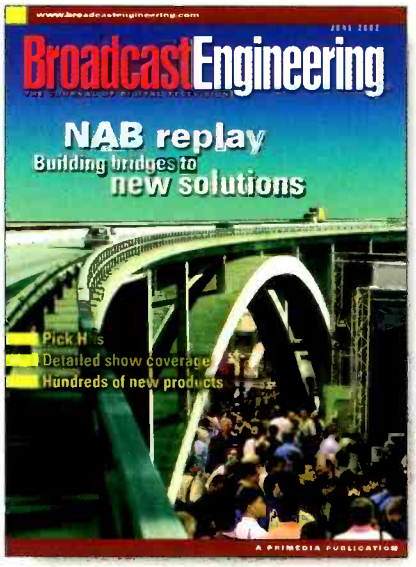

Deliver it not...

Dear Paul McGoldrick:

Your analysis [in the June column] was very clear. Free over-the-air broadcasting requires a viable, robust delivery system that viewers can rely on to receive the digital signals. Reliance on the good graces of competing services like cable and satellite only speeds up the eventual demise of free over-the-air TV services.

The one point that you seemed to avoid is the glaring reality that the present fumbling attempts to make 8-VSB work by reducing the data rates to gain robustness will eliminate HDTV as a delivered service. The current secret efforts of NAB and MSTV are equivalent to rearranging the deck chairs on the Titanic after it has hit the iceberg.

Wishful thinking by the NAB and MSTV technical leadership that yet another miracle will save 8-VSB and DTV is wasting time and money. You clearly noted that the European system did work as an over-the-air service. The imposed power level restrictions may have made it difficult to receive, but COFDM modulation proved its worth in the UK.

Isn't it about time we stand back and evaluate the current efforts to make increasingly complex receivers in the vain hope that we will somehow stumble on a solution to the 8-VSB multipath limitation when COFDM is now the default worldwide standard. Who or what are we protecting? Is it egos, personal reputations or patient rights? We certainly are not protecting the American TV viewer.

NAT OSTROFF
VICE PRESIDENT-NEW TECHNOLOGY
SINCLAIR BROADCAST GROUP

Peak performance

Dear Michael Robin:

As usual, an excellent and informative article! I work primarily as a freelance NLE, and the concept of VU vs. PPM [discussed in your April article] brings up a question about average/peak audio levels and reference signal.

With a VU meter it is simple to set tone to 0 VU and average audio to 0 VU. However, with a PPM, setting tone at 0 displays an "average" level on a PPM at +6 (since peaks are now factored in). Therefore, should I set my level for tone and not worry about riding at +6 (on a PPM) for my audio, or should I first lay down tone at 0 and then set my "average material" audio at 0 on a PPM, giving me an average at -6 VU on a VU meter?

It seems with the latter that I am giving myself 20dB headroom for digital end users, but the former is more correct for the analog world. I want my product to be consistent with standards (if any exist)!

STEWART SMOOT
MOTOS-VISION

Michael Robin responds:

The concepts of VU and PPM are based on irreconcilable approaches to audio signal level monitoring. The problem gets even more complicated when both types of instruments are used side by side. So, make a choice and stick to it!

It is interesting to note that digital audio equipment manufacturers allow for a headroom of 20dB between the alignment level and the absolute peak level of 0dBFS. This is done to enable the users of VU meters to avoid digital clipping while still maintaining a respectable SNR. This is possible due to the tremendous digital equipment dynamic range of 120dB when using 20 bits per sample. Problems occur with analog background personnel, who will complain that the "loudness" of an audio signal with a 20dB headroom is generally lower than when you reduce the headroom to 6 to 10dB as is customary with analog equipment and VU metering. The latter is necessary with analog equipment due to its poor SNR. I personally would prefer operating with a PPM and a 20dB headroom and, of course, digital equipment. As for standards, it is interesting to note that to the best of my knowledge there are none.

REGARDS,
MICHAEL ROBIN

The importance of being direct

I am a land surveryor and have been asked to certify to the antennae direction (azimuth) on a newly constructed tower as part of the FCC permitting process. What accuracies are required (i.e. plus or minus two degrees)? Is there a standard statement or certification that addresses this issue?

JAMES M. OVERFELT, RLS
BARGE WAGGONER SUMNER & CANNON
NASHVILLE, TN

Editor responds:

TV antennas can be quite directional, depending on frequency, design and mounting configuration. In the case of a top-mount omnidirectional antenna, there really isn't an azimuth as such; radiation is pretty equal in all directions.

A side-mounted antenna on a high channel would certainly be directional, in part because of the effect the tower has on the antenna's pattern.

Antennas are typically modeled at the factory on either full scale or fractional scale models of towers, and patterns are plotted for the customer. Using a chart and the actual mounting configuration, you would be able to project the pattern out to the horizon.


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Surround and conquer:
Digital audio technology

BY CRAIG BIRKMAIER

The ability to represent information using the binary code of ones and zeros was well established before the development of modern computers. But the practical use of these binary codes did not begin to transform the world until the invention of the transistor, followed by the rapid evolution of solid-state processing devices. The microprocessor led to a rapid succession of transitions affecting all forms of media – print, still imaging, audio, and now video and motion pictures.

Equally important, the digitization of traditional analog media has enabled the development of new forms of media that combine all of these building blocks in new and innovative ways. That we now go to the Internet to search for news or the MP3 of a pop music hit is testament to the speed with which the digital transition has swept around the world. Audio – with the exception of radio broadcasting – has been at the forefront of this transition. Audio's move to digital is all but complete, having begun with the introduction of the audio CD in 1983, followed by the "desktop audio" revolution in the late '80s and the Internet audio revolution, fueled by MP3 audio compression.

The popularity of the DVD is having a tremendous impact on sales of home theater components.

Digital audio technology

Today, surround sound audio systems are an integral part of the home theater experience. Consumers are expecting more of their home theater systems as digital technology offers better picture quality and better audio. According to a new CEA report, home theater is driving component audio system design. Digital 5.1 channel surround sound, either Dolby Digital or DTS, is a standard feature in receivers priced as low as $199. In 1999, the first preamp/processors compatible with 6.1 channel DVD soundtracks appeared. In 2000, the first 6.1 channel-compatible A/V receivers appeared.

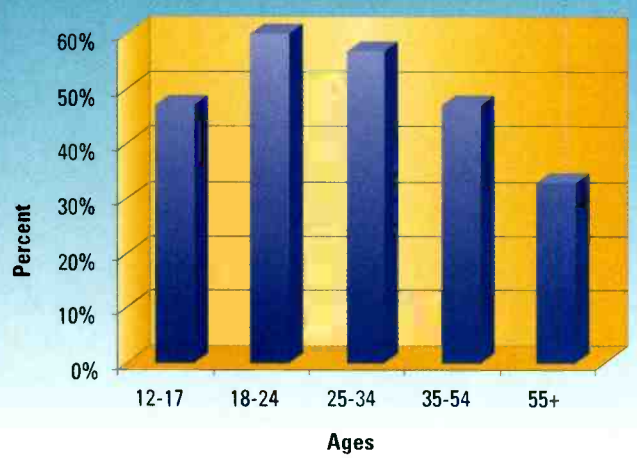
DVD is the key to delivery of 5.1 channel sound and higher quality images for Digital TV monitors equipped with analog component video inputs. The popularity of the DVD is having a tremendous impact on sales of home theater components, according to the latest sales figures released by NPDTechworld (see Figure 1). Sales of home theater systems with DVD increased 230 percent in 2001 vs. 2000, and more than 987 percent during the first five months of 2002 when compared with the same period in 2001.

Dolby Labs reports that they have licensed more than 17 million 5.1 channel Dolby Digital decoders for use in home receivers and decoders, and just over one-half million 5.1 channel Dolby Digital decoders for DBS set-top boxes and integrated Digital TV receivers. These numbers are dwarfed by the number of DVD players (64 million) and DVD-ROM drives (103 million) that include Dolby Digital decoders

FRAME GRAB A look at the issues driving today's technology

Consumers becoming aware of satellite services

More subscriptions may result



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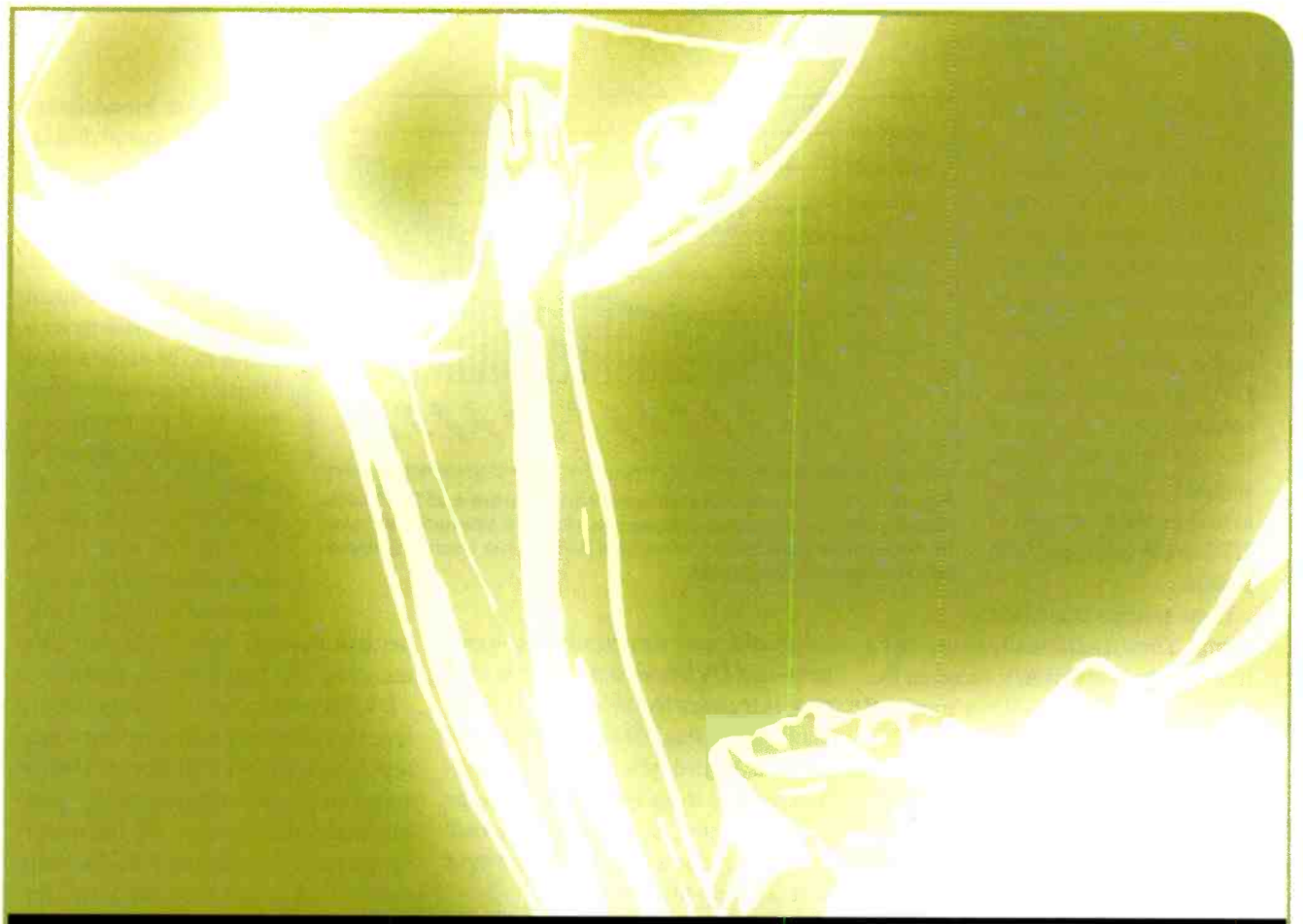

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(numbers current as of July 6, 2002).

Factory-level sales of Home Theater in a Box (HTiB) systems grew 124 percent in 2001 to $794 million, almost 60 percent of the size of the component-audio market. In 2001, DVD-equipped models accounted for 52 percent of the 2.3 million HTiBs shipped by manufacturers to dealers and 62 percent of HTiB dollar volume of $794 million.

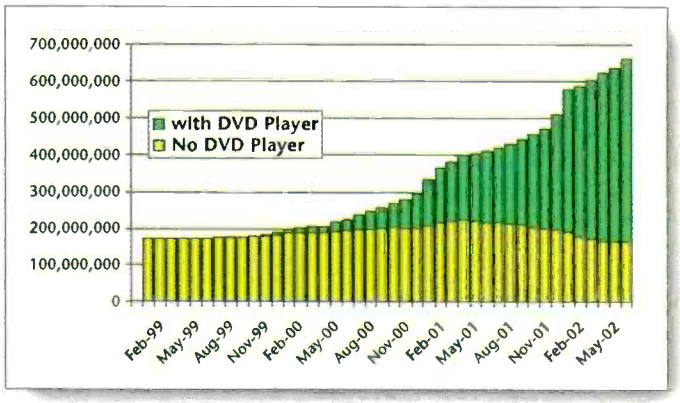

Figure 1. The marriage of surround sound audio and DVD technologies in home theater systems has led to a dramatic increase in consumer purchases over the past three years. Source: NPDTechworld, May 2002.

These systems take many forms. They traditionally consist of a full-size component A/V receiver, five satellite speakers, usually a powered subwoofer and sometimes a component-size DVD/video player. Another type integrates the receiver and DVD player into a single standard-size component. A third type moves all amplification and most electronics into the enclosure that houses the powered subwoofer, allowing for a main unit that takes up little space.

Web Links

Digital America 2002, the U.S. Consumer Electronics Industry Today
www.ce.org/publications/books_references/digital_america/default.asp
Dolby Product Guide: Equipping for Surround Sound
www.dolby.com/dtv/DTVaudioAdHome/pa.br.01121.ProProducts.pdf

Audio and television

Radio, television and motion pictures are at the tail end of the digital transition – partly because video is among the most demanding applications with respect to processing requirements and distribution bandwidth.

Television broadcasters could learn a great deal by studying audio's transition to digital, and just how important audio is to their transition to digital.

DVD and surround sound audio systems are a major factor in the sale of Digital TV monitors, a.k.a. HDTV. The CEA reports that 1.4 million Digital TV products were sold in 2001 and that sales are increasing this year. Given the numbers for DVD systems and HTiBs, it's a safe bet that most of these big-screen TVs are going into home theater systems.

DVD is setting consumer expectation levels for what they expect to hear when watching an HDTV program. Unfortunately, broadcasters apparently have not heard the message. Of the major broadcast networks, only ABC has been producing programming with 5.1 channel audio.

Most broadcast facilities are not equipped to handle 5.1 channel sound, and many digital video recorders cannot accommodate six digital audio tracks. To help broadcasters, Dolby Labs has created a family of products that allow 5.1 channel sound to be car-

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ried via an existing two-channel digital distribution infrastructure.

Dolby E enables up to eight audio channels plus accompanying metadata to be passed via regular routers and satellite links, and stored on video servers and digital videotape recorders. The Dolby E output bit stream looks like two-channel AES/EBU digital audio, enabling distribution of multichannel audio via either a single AES3 pair or by recording it on two audio tracks of digital videotape.

Changing business models

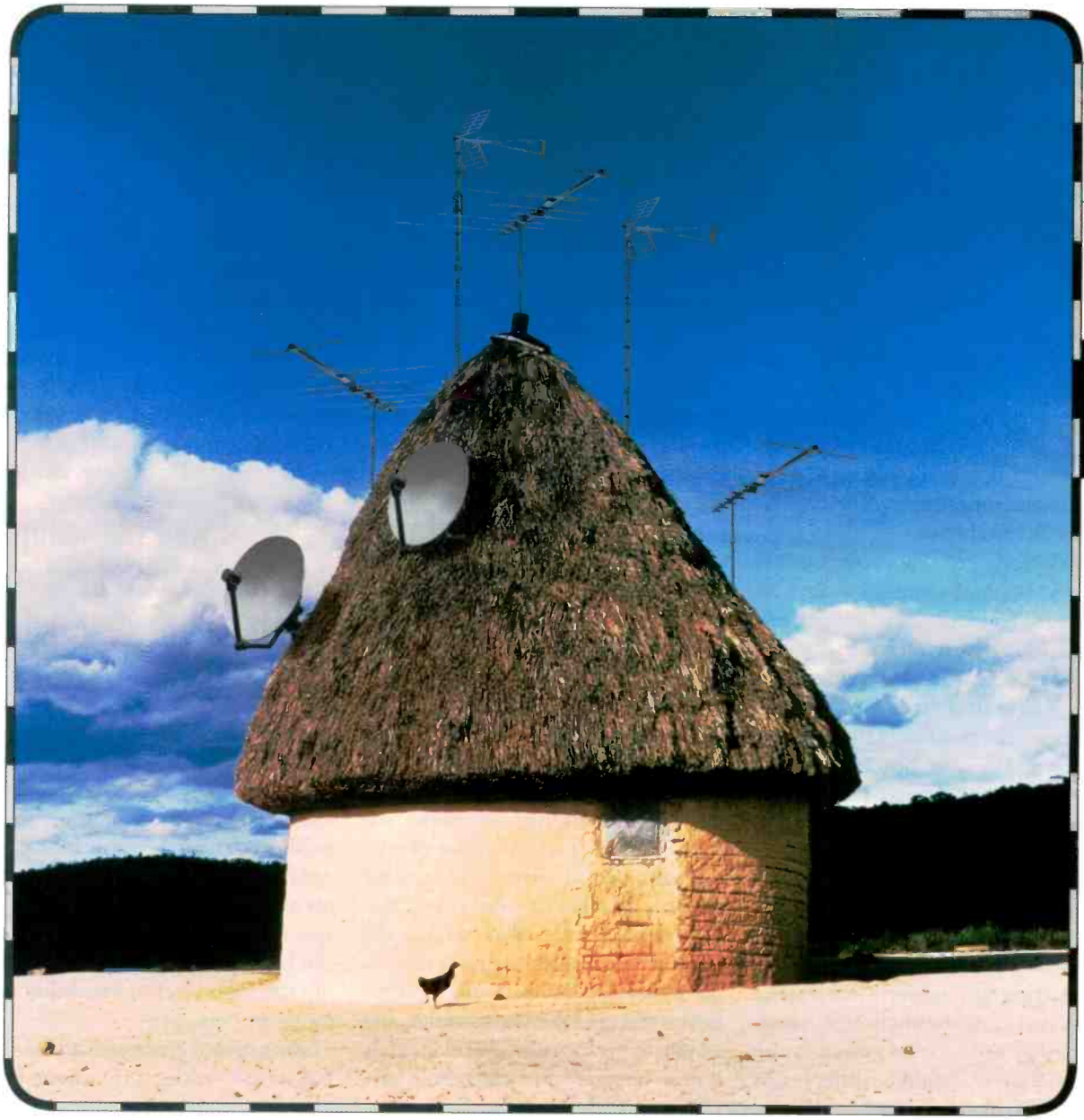
Digital technology is shifting control to the consumer. Consumers want control over the consumption of information and entertainment in their homes. They don't want to be told to sit down at 8 p.m. Tuesday to watch a TV show. The personal video recorder threatens to change forever the way television content is consumed.

Some broadcasters and content production organizations view digital products like the PVR as a major threat, in much the same way that Hollywood viewed the VCR as a threat in the early '80s. But those who learn how to use these technologies to their advantage are likely to be the survivors, maybe even the beneficiaries, of the new business models being shaped by digital. Unfortunately, to date, broadcasters have treated the DTV transition as a burden rather than the opportunity it represents to regain a competitive advantage in an increasingly crowded marketplace. BE

The CEA reports that home theater is a major factor in the development of component audio systems. This elaborate system in St. Louis features an Onkyo 7.1 surround receiver and PSB speakers. Photo by Michael Marxer.

Craig Birkmaier is a technology consultant at Pcube Labs, and hosts and moderates the Open DTV Forum.

These days MPEG-2 technology is everywhere. Fortunately, so are we.



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seeking comments on spectrum issues

BY HARRY C. MARTIN

The Commission's Spectrum Policy Task Force, created earlier this year, is seeking comments on a wide range of topics relating to the Commission's current spectrum use and allocation policies. Five subject areas have been identified by the task force as most important to the development of a comprehensive spectrum management policy. They are discussed in turn below.

Market-oriented allocations. The task force is emphasizing market-oriented allocation and assignment policies, and is seeking comment on how best to design and implement such policies. Such efforts have thus far focused on two potential techniques: (1) permitting flexible uses by incumbent licensees; and (2) auctioning "overlay" licenses and white space spectrum, e.g., geographic licensing of MDS licenses.

Also in this area, the task force is requesting comments on whether there are alternate methods for allocating spectrum. They are also interested in identifying any underutilized spectrum that could be auctioned. Moreover, they are seeking comment on whether there should be different allocation policies for those radio services in the more congested bands, to afford greater protection for those radio services.

Finally in the allocation area, the task force is seeking suggestions to facilitate experimentation and innovation, along with the proper treatment of unlicensed devices.

Interference protection. The task force has also focused on the level of interference protection that should be afforded to spectrum users. Currently, the Commission distinguishes "interference" from "harmful interference" by accepting a certain level of the former, and limiting the latter. They are seeking comment on whether this structure makes practical and useful distinctions, and whether changes are warranted.

In addition, the task force raises the possibility of establishing receiver standards that would protect only those receivers that meet the new standards, and would permit a greater level of interference to be received on older receivers.

They are also interested in comments addressing the possibility that licensees be accorded the opportunity to negotiate interference rights among themselves, or use arbitration or mediation as a means to resolve interference disputes.

Spectrum efficiency. The task force is interested in determining how to make more efficient use of the spectrum. It is soliciting suggestions for new rules or policies that might encourage spectral efficiency, and seeking comment on whether any rules presently in effect are inhibiting the efficient use of spectrum.

In addition, the task force is seeking to measure the relative efficiencies among the various radio services, and is attempting to identify an appropriate benchmark for such a comparison. They are interested in developing methods to provide incentives for promoting spectral efficiency, including fees or receiver standards that would require more efficient systems.

The FCC task force has identified five subject areas as most important to the development of a comprehensive spectrum management policy.

Sharing of public safety frequencies. The task force is seeking comment on spectrum issues relating to public safety communications. Accordingly, they are looking for comments on whether there are any spectrum-sharing techniques that can be implemented without reducing the high level of reliability currently in existence.

International communications. The task force is seeking comment on international spectrum agreements. In particular, they are interested in examining the effect of U.S. international agreements on domestic allocation and allotment policy, especially with respect to satellite and international communication services and what steps can be taken to improve these activities. BE

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

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

Dateline

No biennial ownership reports are due in 2002. The FCC has not required the filing of annual employment reports since 2000, although such reports may be required again under the new EEO rules that the FCC is considering.

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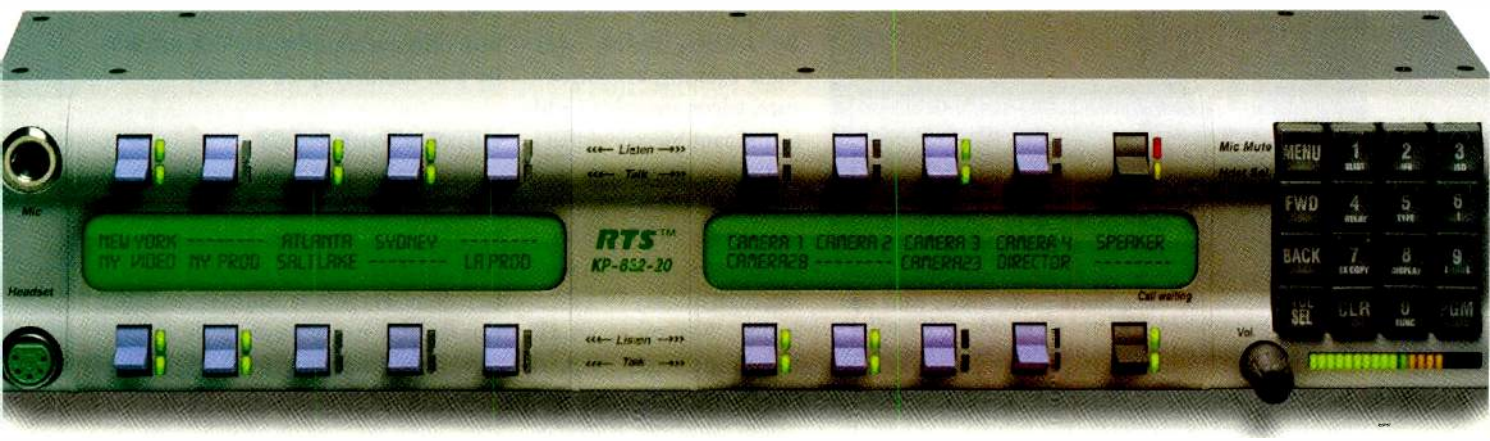

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BEYOND THE HEADLINES

Television
from the telephone

BY REED MAJORS

For the first time in history, telcos are beginning to lose telephone business. People are now buying cellular phones as an alternative to secondary and tertiary lines in the home, and the popularity of the Internet is forcing down the potential revenues from long distance. In fact, traditional "plain old telephone service" (POTS) is the loss leader of the telecommunications industry. In addition to the influences of wireless and the Internet, cable companies are encroaching on telco territory, offering bundled voice, video and data over their networks. Telecommunications providers must offer value-added services or lose their market share to cable.

Studies have shown that subscribers are likely to opt for bundled communications, entertainment and information solutions from a single, trusted source – their telecommunications provider. IP-based solutions can help telcos and broadband service providers compete effectively with incumbent cable and satellite network operators, as well as accelerate the return on their network investments.

Companies like Minerva Networks can simplify the transition for telephone companies that opt to offer broadcast and video services by offering IP headend solutions along with full-service integration.

More than ever, telephone companies need to offer broadcast and video services to their subscriber base, not only to keep their existing customers, but also to stay competitive, gain new customers and increase revenue. Telcos are developing business plans that include services like live television and video-on-demand (VOD) because incremental data service and telephony alone cannot generate enough cash-flow to justify an xDSL network investment.

Telephone companies need to offer broadcast and video services to their subscriber base to stay competitive.

Is your network up to the challenge?

Like any business, the phone companies want to maximize their cash flow to a facility costs ratio, and they're already deploying DSL for data and voice. Video revenue is the single largest source of potential revenue over these networks, and video over asynchronous DSL (ADSL) technology is readily available. By adding video over their existing infrastructure, telcos are able to add significant billable dollars to their bottom line.

Existing telco networks are up to the technical challenges of transporting high quality IP-based video. For most small telephone companies in the United States and telcos in Europe, upgrade requirements are minimal. These service providers have already built their copper plants in such a way that video deployment is only an issue of installing DSL access multiplexers (DSLAM) and other core network gear, with no need to upgrade the outside plant wiring.

IP or native ATM?

Most telcos use ATM as a transport protocol from their backbone to the DSLAM, with IP as the routing protocol. As an architecture, ATM is not a very elegant solution, with the inherent necessity of virtual circuits and the administrative overhead it requires to run. As a result, many companies are turning to IP routing technologies. They are ubiquitous, inexpensive and provide a much more elegant routing mechanism, along with an equivalent quality of service (QoS) for video on the network.

For those companies who have already implemented it in the backbone, ATM is a sufficient transport protocol for video over IP. Either way, IP television is an inherently carrier-class solution offering round-the-clock reliability and uninterrupted service.

What about HFC?

Although cable can offer some of these services today, they are expensive to implement using the solutions currently available. Hybrid fiber coax (HFC) is neither scalable nor flexible in terms of easily changing or adding new services, which forces the provider to maintain more than one type of network, and restricts the network provider to proprietary technology.

The open standards of IP, the growth of the technology, and the increase in the number of vendors offering solutions will drive down the cost of implementation and increase the capability of IP television solutions for everyone. Cable companies today must make use of an inconsistent hybrid of equipment, vendors and proprietary implementations to gain Internet access over IP and video over QAM. To the benefit of telcos with robust xDSL networks, IP offers one open platform for the delivery of all services.

The benefits of IP

Every user on an IP network can watch a different VOD movie concurrently. In the IP world, telcos have the flexibility to offer subscription VOD (sVOD), pay-per-view (PPV) and near VOD (nVOD) services based on changes in customer demand. Being able to quickly adapt to this demand means that a telco can easily implement and sell whatever services the customer wants to buy – and the available online self-provisioning can eliminate a costly truck roll.

For live channels, IP television offers the same quality and an easily customizable electronic program guide (EPG) providing the operator more flexibility in terms of enhancing the user experience with things like branding, interactivity and advertising.

As a result of the open standards-based architecture of IP set-top boxes, telcos are again dealing with added flexibility to deliver enhanced interactivity such as games, video mail, caller ID, t-commerce and other high-margin offerings.

Telcos can also offer personal video recording (PVR) more cost-effectively than their cable counterparts. A hard drive is not required in the subscriber's STB because PVR is handled at the headend. Unless STB storage becomes more reliable and much less expensive in the coming years, PVR will continue to be accomplished more profitably in the network.

By 2008, 46 million homes will watch television delivered through the telephone line.

For a telco, making the decision to get into the video business is one not to be taken lightly. However, the barriers are far outnumbered by the compelling reasons to move. Strategy Analytics reports that 46 million homes will watch television delivered through the telephone line by 2008, representing more than 11 percent of worldwide digital television services, up from less than one percent today. The reasons for this growth are far-reaching. IP network architecture is flexible and open standards-based. The widespread availability and compatibility of IP-based hardware makes it easy to integrate. Healthy competition almost guarantees the reduction in customer premise equipment and other costs over time. When weighing these and other facts, it becomes difficult to ignore the vast revenue opportunity represented by offering video services over xDSL.

By maximizing the opportunity to bundle services including VOD, PVR, telephony, broadband Internet and e-mail over their existing xDSL networks, telcos will be well positioned for the long-term battle with cable, satellite and alternative service providers. BE

Reed Majors is the vice president of marketing and business development for Minerva Networks.

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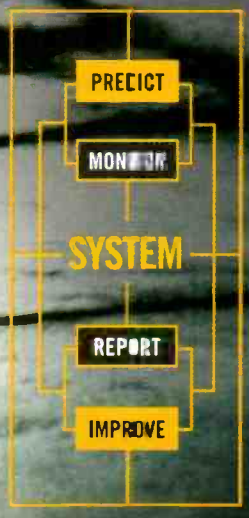

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Inside color bars

BY MICHAEL ROBIN

In last month's column, we introduced color-bar signals and took a look inside matrixed color-bar signals. This month concludes the two-part series on color bars with a look inside encoded color-bar signals.

Encoded composite color-bar signals

The NTSC and PAL encoding processes use identical matrixing coefficients to obtain the luminance (E'_Y) and color-difference (E'_{B-Y} or E'_U and E'_{R-Y} or E'_V) signals. NTSC 100 percent luminance has a value of 714.3 mV (100 IRE) and 7.5 percent black-level pedestal (setup), while PAL has 700 mV and no setup. The E'_Y signal is given by the expression:

$$E'_Y = 0.587\,E'_G + 0.114\,E'_B + 0.299\,E'_R$$

The amplitudes of the color-difference signals are reduced by specific scaling factors to avoid overmodulating land-based AM video transmitters using negative modulation. The scaled color-difference signals are given by the following expressions:

In the 21st century, color-bar signals are not used for operations; they are used for maintenance activities.

$E'_{B-Y} = 0.493\,(E'_B - E'_Y)$, also known as E'_U in PAL

$E'_{R-Y} = 0.877\,(E'_R - E'_Y)$, also known as E'_V in PAL

The NTSC and PAL encoding processes are similar. In the process, each of the two scaled color-difference signals amplitude modulates a dedicated subcarrier. The two dedicated subcarriers are equal in frequency but quadrature in phase, and are subsequently suppressed. The NTSC encoding process uses two 3.579MHz subcarriers and results in a half-line-offset interleaved chrominance/luminance spectrum. The PAL encoding process uses two 4.43MHz subcarriers. The V subcarrier phase alternates line by line, resulting in a more complex quarter-line-offset interleaved chrominance/luminance spectrum.

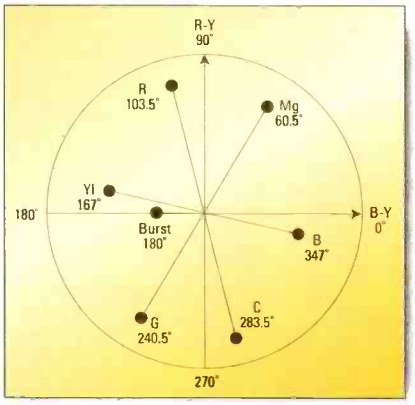

Figure 1.The NTSC color-bar signal displayed on a vectorscope

The NTSC and PAL vectorscope displays feature vector amplitude and phase reference graticules, selectable for 100 percent or 75 percent color bars. They allow you to adjust the vector phase and amplitude of the encoder under test within accepted tolerances.

Figure 1 shows a vectorscope display of an NTSC color-bar signal. Note the presence of the color-burst signal. This

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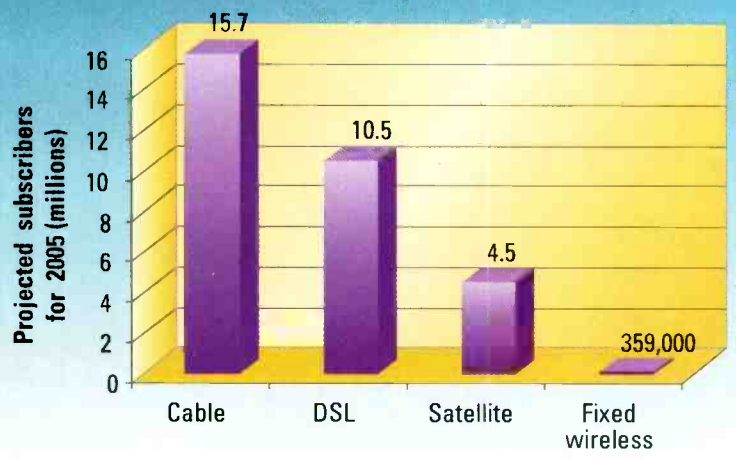

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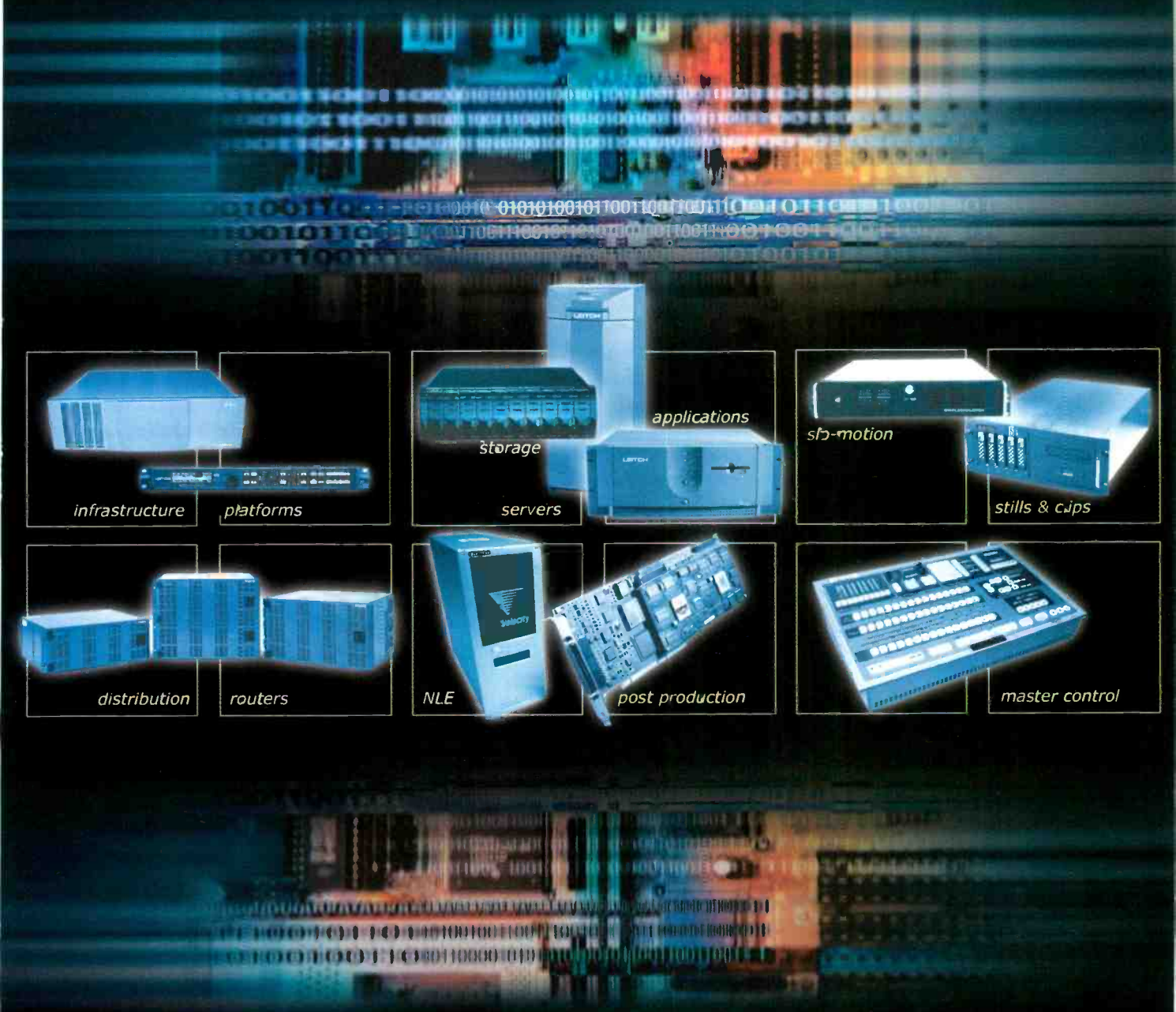

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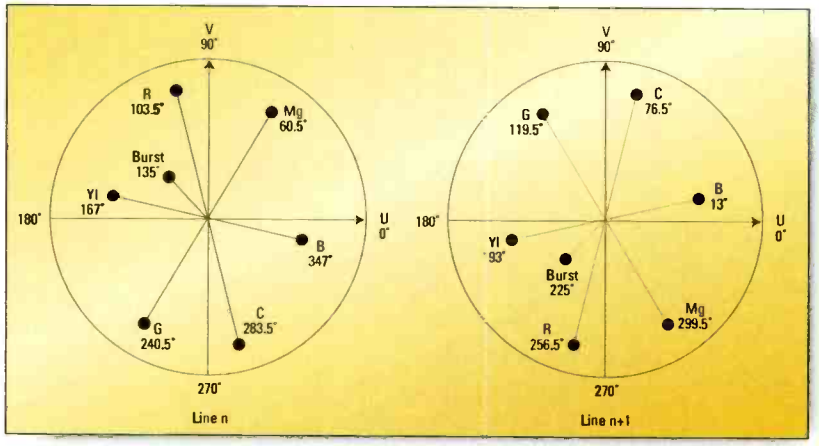

Figure 2. PAL color-bar vectorscope display showing line-sequential alternating phase change

display of the six reference color signals and the burst signal is obtained by decoding the NTSC signal and feeding the decoded color-difference signals to the horizontal and vertical amplifier or the vectorscope. Figure 2 shows a vectorscope display of a PAL color-bar signal. Two line-sequential displays of line "n" and line "n+1" show the alternating phase process of PAL. Usually, the two displays are superimposed.

Figure 3 shows the relationship between 100 percent and 75 percent PAL and NTSC color-bar signals and AM modulation percentage of land-based transmitters. From the 100 percent PAL and NTSC color-bar signals on the left side of the figure, you can see that the yellow and cyan colors would overmodulate the carrier. However, 75 percent color bars, with either 100 percent or 75 percent white level, would not overmodulate the transmitter. It is important to note that saturated yellow and cyan colors don't occur in nature, so camera-generated signals will not overmodulate. But high-amplitude synthetic signals, such as those generated by a character generator, would create problems. The right side of Figure 3 shows reduced-amplitude color bars with 100 percent white as well as 75 percent white (indicated by the dotted line). Note that the NTSC signal has a black-level pedestal (setup) and the amplitudes are expressed in IRE units. The PAL signal has no setup and the amplitudes are expressed in mV. In both standards, the lowest permissible carrier modulation by the white level is 12.5 percent. The

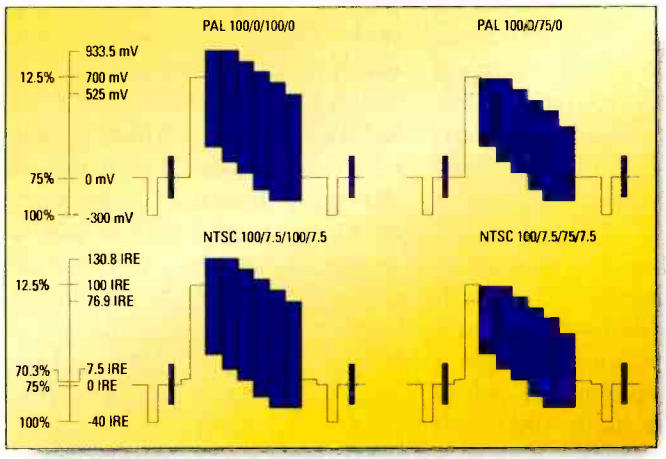

Figure 3. This oscilloscope display shows original and scaled-down color-bar signals as a percentage of AM modulation.

only exception is the UK, where the lowest permitted level is 20 percent, allowing for the transmission of 95 percent color bars, identified as 100/0/100/25. (So much for uniformity.)

The United States, Canada and some other NTSC countries use a general-purpose color-bar signal that is seldom encountered elsewhere. Its most usual variety is known as EIA Standard RS-189-A. A seven-segment 75/7.5/75/7.5 color-bar display occupies the upper 75 percent of the picture. The lower 25 percent contains, from left to right, a -I bar, a 100 percent white bar, a +Q bar and a black bar. The top part of Figure 4 illustrates this arrangement. Some variations include an additional two bars, one slightly whiter than black and the other slightly blacker than black, inside the black bar area. These signals are an adaptation of a monitor's black-level alignment signal, known as picture line-up generator (PLUGE). While the PLUGE is helpful for adjusting color monitors, the -I and +Q components are a heritage of the early NTSC encoding practices and, in today's age, serve no useful purpose. The center part of Figure 4 shows the waveform that creates the upper 75 percent of the display, and the bottom part of the figure shows the waveform that creates the lower 25 percent of the display. Figure 5 shows the vectorscope display of this EIA RS-189-A color-bar signal, which is similar to a simple NTSC vector display with the addition of the -I and +Q vectors.

Are color bars fading away?

In analog composite or component television, a color-bar signal is used as a leader to a recorded tape. This allows the VTR playback operator to

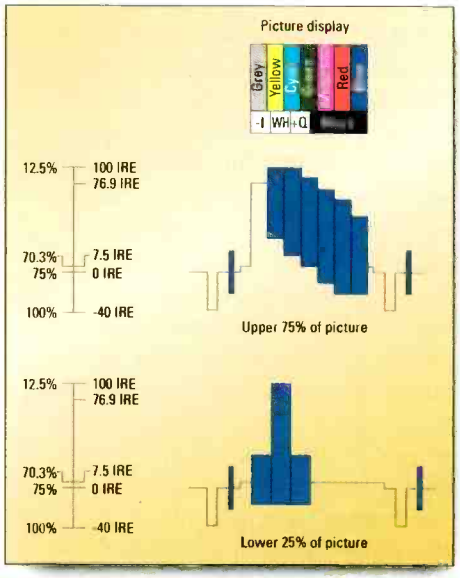

Figure 4. RS-189-A NTSC color bars

optimize the signal characteristics before the program material begins. In an analog camera, you can use the color-bar signal to verify and optimize the encoder. In early, unstable receivers, the color-bar signal was used to adjust contrast, saturation and hue. Current receivers are very stable and don't require such adjustments. So, the question arises: Why do we need to transmit a color-bar signal anyway? In a digital studio, you really don't need to use a color-bar signal unless you want to verify the performance of an ADC or a DAC. Otherwise, you don't need it in daily operations. And, since modern receivers are stable, they don't need a color-bar signal. Contemporary television transmissions, with very few exceptions, run 24 hours a day, seven days a week. So even if you wanted to transmit color bars, you would have difficulty finding a time slot in which to do so. In the 21st century, color-bar signals are not used for operations. Instead, they are used for maintenance activities such as verifying the performance of a piece of equipment, the performance of a telco network or, perhaps once a month, the performance of an analog NTSC transmitter.

One area where color-bar signals, and the expert knowledge of how to use them, will be required is in a multiformat SDTV and HDTV teleproduction operational environment. In the near future, 4:3-format SDTV signals will be upconverted to 16:9-format HDTV signals, and vice versa. The situation is complicated by the fact that the matrixing coefficients are quite different in the two worlds: Digital SDTV signals are governed by ITU-R BT.601, and HDTV signals are governed by ITU-R BT.709. The SMPTE and ITU are currently developing a color-bar signal concept that will allow signal characteristics common to both formats and specific to each, located in a 4:3 area, to be translated into the alternate format. Additional HDTV-specific content will be located in the remaining 16:9 space. So a new generation of color-bar signals will be used in an entirely different working environment. Stay tuned. BE

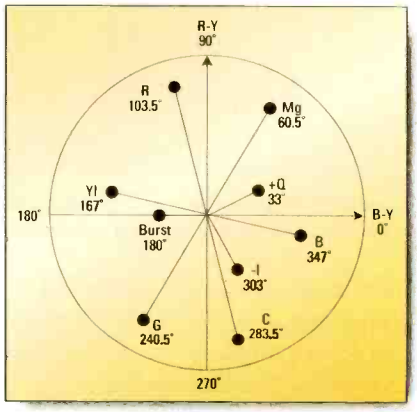

Figure 5. Vectorscope display of RS-189-A color-bar signal

Michael Robin, former engineer with the Canadian Broadcasting Corp.'s 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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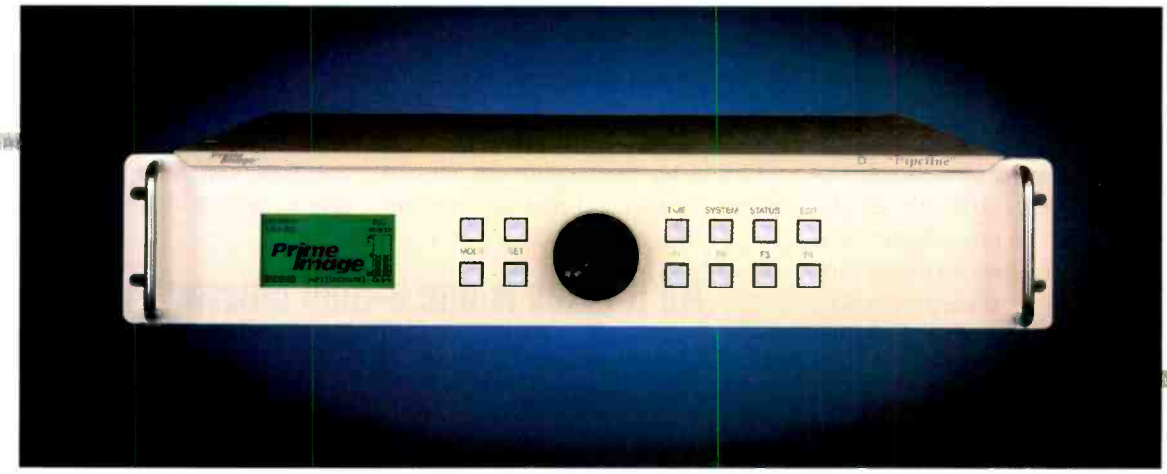

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Security

BY BRAD GILMER

Given that computer networks have found their way into the core operations of television facilities, what specific steps can we take to keep our networks secure while still taking advantage of the benefits of networking? First and foremost, do not connect critical computers, such as on-air automation systems, directly to the Internet. In fact, do not connect these systems to other networks inside your own building. If you need to download files from the Internet, do it on a separate computer and then transfer the files (after antivirus scanning) to your on-air network. Also, do not allow e-mail to run on critical systems. E-mail viruses are commonplace now. All it takes is one e-mail message with a viral attachment to take down your entire system.

Why is it important to avoid connections to the Internet? Because that is where most threats come from these days. There are thousands of computers out on the Internet running robot programs, sometimes called 'bots'. These programs probe computers at random, looking for security holes and collecting information such as IP address, NETBIOS computer name and operating system information. At best, these probes steal cycles away from time-critical applications such as automation. At worst, these probes allow someone to collect information about the vulnerabilities of your system.

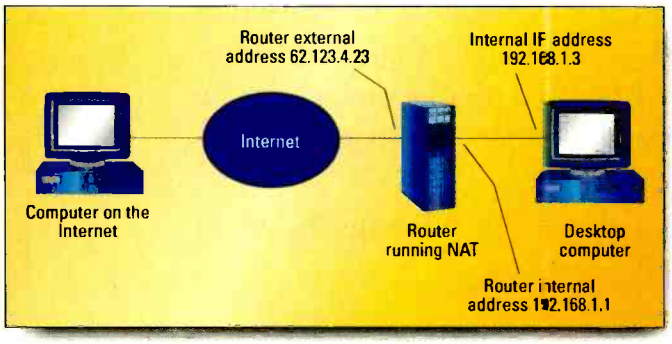

Figure 1. Network address translation hides the true IP address of a computer inside the firewall.

Protect against viruses

Viruses are fairly common. For this reason, you should provide antivirus protection for *every* computer on your network, and it goes without saying that you should update the virus definition files frequently. Virus definition files contain information that allows the antivirus software to identify and neutralize viruses. Antivirus software vendors update their definitions all the time. Having the latest definitions is critical to computer security.

In the old days, viruses were usually spread through contaminated floppy disks. Now that network file transfers have largely replaced floppies, virus programmers have changed their strategy. Most viruses are spread through e-mail attachments. This is why e-mail should not be allowed on critical systems.

What about computers that are critical but that must run e-mail (newsroom systems for example)? Be sure to use antivirus software that quarantines your messages until they have been scanned for viruses. If you are working in a newsroom environment, you probably have a stand-alone mail server. Install a virus scanner on your e-mail server to scan all incoming e-mail. This allows you to provide e-mail protection from a central location and avoids the hassle of updating virus definitions at every desktop.

All it takes is one e-mail message with a viral attachment to take down your entire system.

Do not open attachments from people you do not know. The attachments may contain viral scripts. Be very careful in opening attachments from people you *do* know. Remember that the virus may have mailed itself to you. Some virus programs infiltrate e-mail programs, and propagate by sending a message to everyone in the user's address book. Finally, do not open executable attachments unless you know they are clean. Executable attachments are programs that run on the computer. These may be identified by their extension — .exe, .com, .asp, etc. There are many other extensions that are executable, so be wary.

Firewalls

Many facilities today have full-time Internet connections. More than likely, this connection runs through a router at the demarcation point between the Internet service provider and your equipment. Be sure that the router is set properly to provide network address translation (NAT) and port address translation (PAT). NAT conceals the IP addresses of internal machines from the Internet, making it much more difficult to locate and attack a

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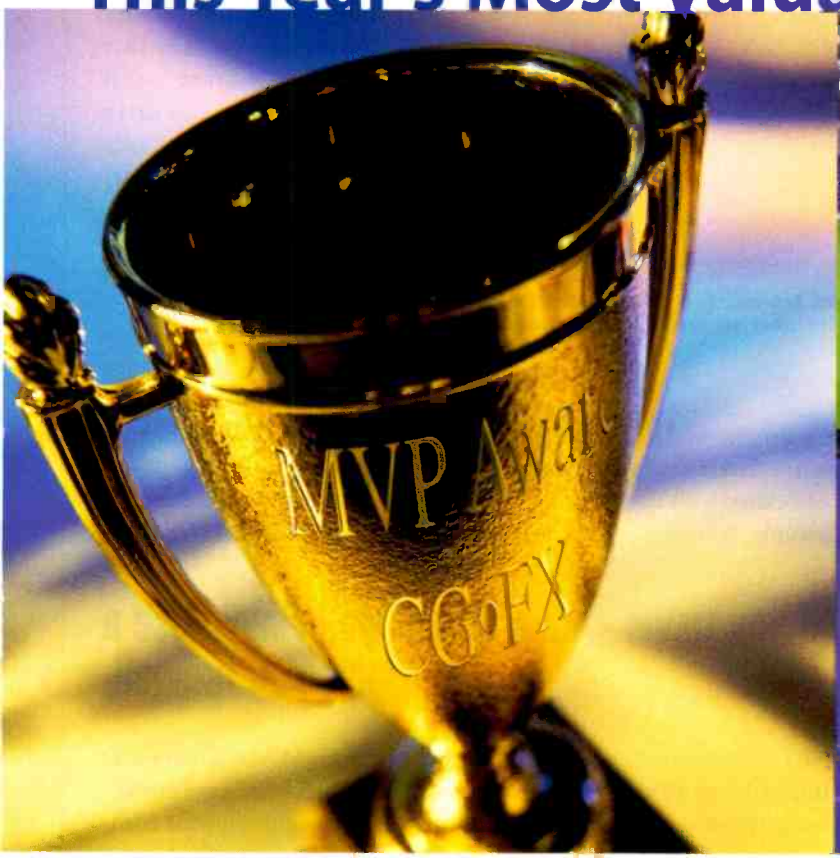

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particular machine. With NAT enabled, any message sent to the Internet is modified so that it appears that the message originated from the router. In Figure 1, any messages coming from the internal desktop PC with an IP address of 192.168.1.3 will be modified so that the PC on the Internet sees them as originating from the firewall with an IP address of 62.123.4.23. A query from the PC on the Internet sent to 192.168.1.3 will likely return an error. This is important because the router keeps the PC on the Internet from connecting directly with the desktop PC. It also makes it more difficult to break into an internal PC or server because the person attempting to break into the device must first guess its IP address.

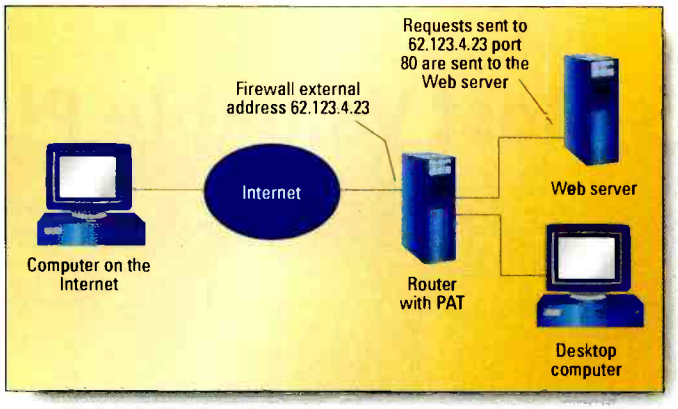

Figure 2. Port address translation allows you to forward requests for a specific port to another machine on your internal network.

Another way routers limit access is to allow communication only to authorized ports. The Internet functions by using well-known port addresses. For example, when you point your Web browser at a particular URL, the browser will automatically attempt to connect to port 80 unless you tell it otherwise. Web servers are designed to listen to requests incoming on port 80. If a network administrator wants to block incoming Web access, he or she can program the router to reject all communications with port 80 inside the firewall. For a complete list of port numbers, go to www.iana.org/assignments/port-numbers.

If the firewall is configured to drop requests to the port without responding, a computer making a request on that port will receive absolutely no response. Computers on the outside of the firewall cannot determine whether a computer associated with that port exists. For example, you may decide to block all NETBIOS requests coming from the Internet, just in case someone on your internal network leaves their computer open on these ports.

Installing a personal firewall provides protection from people trying to get access to your computer. This alert shows that someone is trying to access your computer using NETBIOS. Figure courtesy of Zone Labs. Copyright 2002 Zone Labs. All rights reserved.

You may want to configure the router to perform Port Address Translation (PAT) to conceal the address of a Web server behind your firewall. Using PAT, you can configure the router so that any requests that come in on port 80 are automatically forwarded to a separate Web server. Doing this allows you to run a Web server without exposing it directly to the Internet.

How can you be sure that your router is providing NAT, hiding ports and performing PAT? From a computer on the inside network, point your browser to Steve Gibson's Web site, www.grc.com, and go to the "Shields Up" section. Steve has done a great service to the Internet community by providing a free site that probes routers and firewalls for security holes. This probe is totally non-destructive; its only function is to report back to you any security holes it finds. If you do find that various ports are open, or that Steve can determine your NETBIOS computer name, you may want to contact your ISP to have them tighten up security on your router.

Security is not only a desktop or server issue. If you travel with a laptop, you should use a personal firewall. Personal firewalls are protective programs that run on your computer, blocking unauthorized communications. When you first install firewall software, you may be surprised at the number of messages you get. It is important to know that not all of these messages are caused by intruders trying to break into your computer. Many of them are caused by software packages interacting over the Internet in completely benign ways. In any case, when you see the warnings, you may feel better knowing that you are running a firewall.

If you travel with a laptop, you should use a personal firewall.

Software updates and backups

One thing you can do to improve the security of your systems is to check for software updates frequently. Almost all software vendors work very hard to block any known security holes. When they do, they frequently make updated programs available to customers free of charge. One such company is Microsoft. Point a browser to

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windowsupdate.microsoft.com and Microsoft will check your system and then suggest a list of updates you may want. Most of these updates tend to relate to security. Many other vendors provide update service as well.

One of the least expensive security solutions is to backup your system regularly. There is no way to make your computer absolutely bulletproof. It is likely that sooner or later you will have a computer problem related to security. When you do, you may be very glad that you have a full backup on hand.

Finally, while the threats from e-mail viruses and break-ins over the Internet are real, it is good to keep things in perspective. As engineers, the methods you employ to tighten security may have an adverse impact on the people who operate the facility on a daily basis. Remember to balance your response with any inconvenience the cure may cause. BE

Remember to balance security measures with any inconvenience the cure may cause.

Security checklist

1. Do not connect critical computers to the Internet, either through full-time connection or dial-up.
2. Provide antivirus protection on EVERY computer.
3. Update antivirus software regularly.
4. Update other software packages regularly.
5. Use a router to hide your computer.
6. Use a personal firewall on laptops to block intruders.
7. Make backups.

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

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

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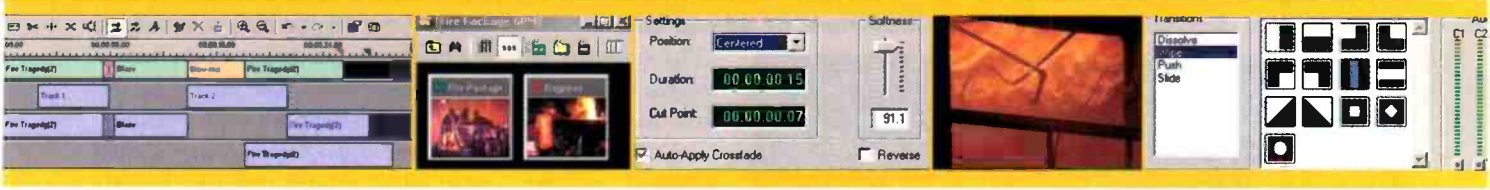

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DVD production:
Planning the facility

BY BENNETT LILES

Production and post facilities everywhere are adding DVD production suites to update and expand their service offerings. While among vendors there is a race to the bottom in terms of flooding the market with low-cost DVD recorders and authoring applications, this article focuses on the more robust and hardware-driven systems currently joining traditional broadcast machinery in the racks at video production firms. This is to differentiate between consumer DVD recording and professional DVD production.

Any video production or post plant looking to add a DVD premastering operation must first strive to get a clear picture concerning the needs of their anticipated clientele. DVD creation has many more flavors than traditional video production, and facility planners must carefully anticipate both the volume of work and the exact DVD formats to be offered.

This photo shows an integrated DVD workstation at the DVD Foundry. Workstation elements include an NTSC monitor, Sony and Panasonic DVD players, and sound-absorbing material on the wall. Atop the large monitor is a DV camera.

Will the clients want to do feature-length movies, DVD copies of existing television broadcasts, interactive DVD titles with complex navigation cues and moving menus, or karaoke disks and music videos? Will the audio require encoding in MPEG-2, Dolby Digital or PCM? Will the facility need to be set up for recording and monitoring in 5.1 surround? How many simultaneous audio tracks will be supported?

Any video production or post plant looking to add a DVD premastering operation must first get a clear picture of the needs of their anticipated clientele.

Network or stand-alone?

The question of volume will be the first fork in the road. The answer will decide whether to build a few individual workstations with integrated functions or to go with a distributed network model where each workstation is dedicated to specialized performance in one area of the DVD production chain. The workstations in the distributed network model will be connected for shared storage on a high-speed network using shared RAID arrays. The heavy storage requirements of DVD premastering have begun a migration to storage area networks (SANs), which consist of workstations using shared, independent and largely proprietary storage devices. Segments of a SAN can reach up to 10km. If heavy volume is anticipated, the distributed network model is the way to go.

In the network model, specialization can be made to varying degrees, but most of these systems involve a video encoding station where racks of peripherals may include Beta SP and miniDV, but Digital Beta will likely be the most popular original tape format with broadcasters. The encoding station may also require a black-burst-to-word-sync converter. Encoders should be capable of both constant bit rate (CBR) and for longer titles, variable bit rate (VBR) encoding.

The next specialized workstation may be in the audio encoding area. A DA-88 or ADAT modular digital multitrack machine could go here, along with audio CD players and burners, DAT machines and MP3 players. The environment should have the same acoustic properties as the traditional sound editing suite, including 5.1 surround monitoring.

The artist's workstation is used to create functional and aesthetic properties for complex graphics and menus in interactive DVD projects. The graphics workstation should also include the capability to print out intricate presentation and storyboarding displays to

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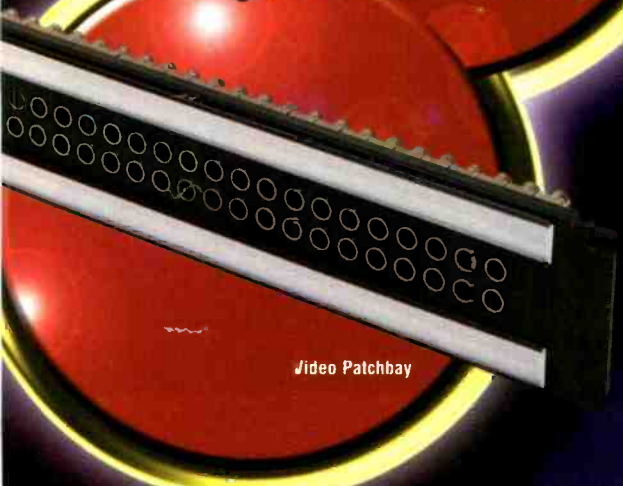

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maintain close communication with clients. The importance of this client communication climbs exponentially from video to DVD plans. With the interlocking structure of some DVD projects, single revisions may tend to cascade into many more. Subtitling will require massive file storage and access capability in addition to that required for graphics displays.

The authoring workstation is the platform that puts it all together. This workstation needs to have playback ability from remote storage arrays and enough processing power to do complex rendering in real or near real-time. The authoring workstation will access the encoding station's files for audio and video content and the graphics station's files for navigation menus, subtitles and other displays. It will also output the finished project directly to a routing system or digital patch bay to feed the digital linear tape (DLT).

All of the peripheral equipment should be router-connected to reduce downtime from machine failures. If you expect to be producing more than 20 or 30 titles a year, the network model, with its distributed workflow architecture, will be needed.

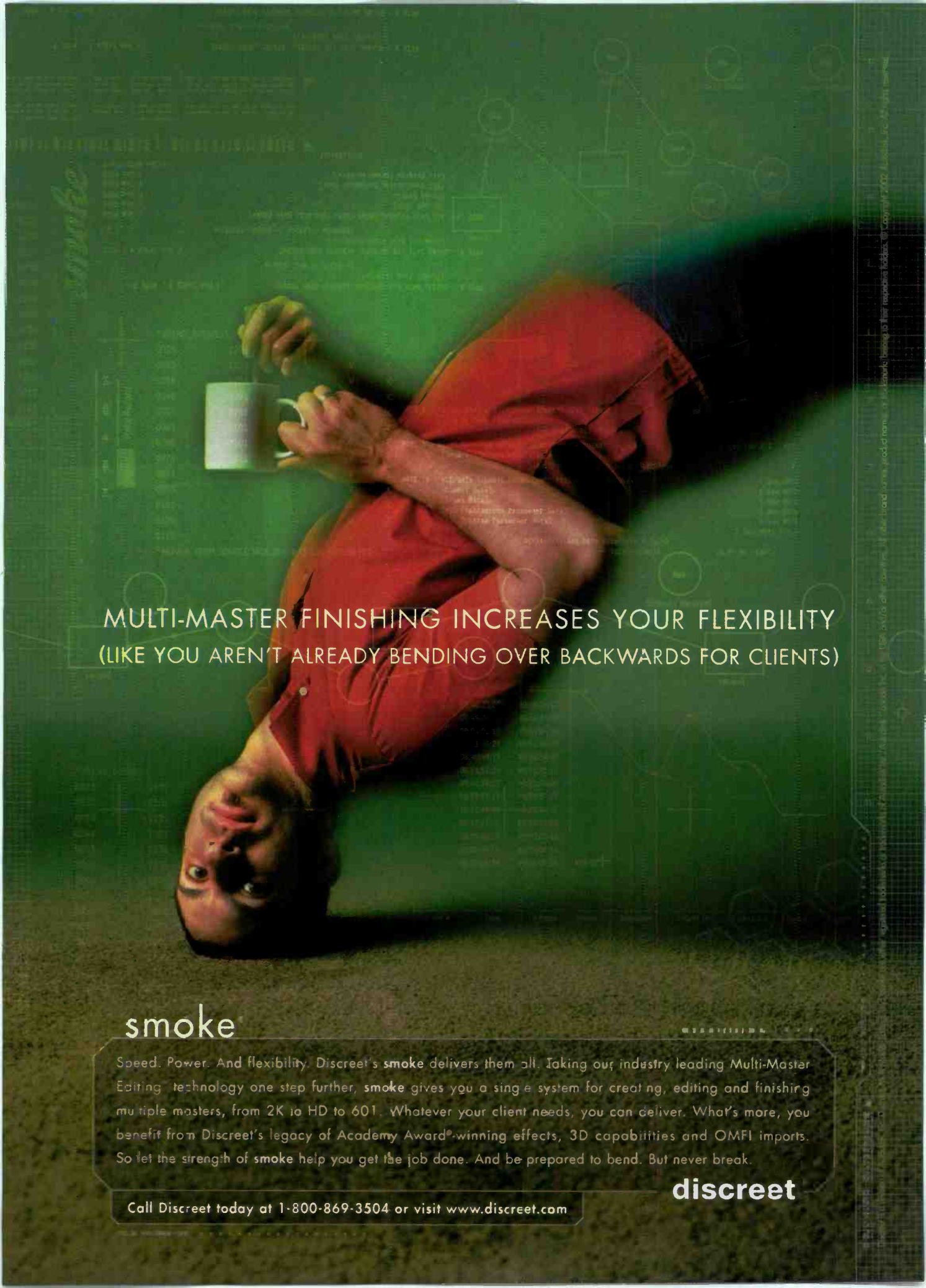
The process of DVD proofing, known as monkey testing, subjects the original disk to every known player format and viewer preference.

Proofing

DVD proofing has become such an involved process that new businesses have evolved that do nothing but take prototype DVDs and play them in a wide, in-house assembly of different consumer players. The process, known as monkey testing, subjects the original disk to every known player format and viewer preference. The proofing house then submits a detailed report to the premastering firm noting every problem with the most serious listed first and the more insignificant glitches noted in descending priority.

Regardless of whether the network or stand-alone model is used, careful planning, continuous client communication and frequent proofing are essential tasks in the DVD production facility, and the plant must be so designed and equipped. BE

Bennett Liles is a writer and TV production engineer in the Atlanta area.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The master control room at Media Most's origination facility in New York monitors incoming and outgoing feeds and controls servers for outgoing feeds. Photos courtesy A.F. Associates. Photos by Melissa Lowver, marketing manager of A.F. Associates.

Media Most's new facility

for Russian-speaking viewers

BY STEVEN SABIN

Media Most International, a subsidiary of Overseas Media, owns the only privately held Russian-language information and television service. It is independent of the Russian government and currently reaches approximately 4.5 million international viewers. Media Most (which in Russian means "media bridge") has also entered the film production business, and does advertising and Internet-based information projects. Through its affiliates, it holds worldwide rights to the largest Russian and Soviet movie library,

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consisting of more than 2500 titles. Film production companies affiliated with the group are among the largest producers of TV serials and movies in Europe, and by far the largest in Russia. Its affiliate, Teleatelier, provides professional television design, special computer effects and graphics. The group's other significant ventures include Ostrov, a publishing house that publishes a business and politics weekly magazine and runs a radio station.

In early 2001, amid international outcry, Russian government authorities took over NTV (Media Most's television interests in Russia) and liquidated TV-6. NTV and TV-6 were both privately owned Russian television stations with news organizations that were free from government influence.

To continue its quest for Russian free speech, Media Most immediately established a facility in a teleport in Cologne, Germany. It then set out to build an independent origination facility in the United States. It chose New York City, with its sizable Russian-speaking population, for its base of operations.

From its rented facilities in New York, Media Most produced one Russian-language channel for cable and satellite distribution. It was able to sustain affiliations with Russian program and news producers, and received long-form entertainment programming and news clips from Russia. It also received a large number of programs from western producers that were voiced over in Russian.

Media Most's central equipment room currently houses 32 racks of equipment, with space for 36.

A growing concern

The company sought to expand its services to include live international newscasts, movie channels and, eventually, original programs, as well as to increase viewership. To achieve these goals, it approached A.F. Associates (AFA), a firm that designs and builds broadcast facilities, in the fall of 2001. It also planned to move to a more permanent location in lower Manhattan and upgrade its infrastructure from analog to digital. To help with this aspect, Media Most contacted an architectural firm named Group 3, which had experience with technical projects.

One of the key technical decisions that needed to be made up front was whether to go with a 625 or 525 plant. Its existing library consisted of approximately 5000 hours of PAL programming on analog tape. Incoming feeds would consist of four NTSC and four PAL feeds, and outgoing would be a mix of PAL and NTSC, depending on the target region. Factors like timecode incompatibility, costs and space precluded consideration of a dual-standard infrastructure for this fast-track project (four months from contract to air).

A technical committee comprised of members of all three companies evaluated the lower Manhattan location to determine the square footage required to support the new multichannel origination facility. AFA worked closely with Group 3 in the technical space planning of the two floors that would ultimately house two studios, studio control, edit rooms, central equipment, master control/NOC, ingest and a dub area.

As with most clients in particularly budget-conscious times, Media Most was looking for the most cost-effective yet technologically advanced equipment possible. It knew it wanted a facility that was digital, server-based and automation supported, and it would not compromise on any major equipment decisions.

AFA designed and built the new facility, with 525-601 video and embedded audio as the in-house standard. The decision was made to go with a 525-601 plant in part because of the automation. To secure local support it was deemed best to go with an American automation company, and only a few have PAL versions. Controlling related costs further limited the available choices. NTSC equipment was more readily available. Video quality was still high, even after double conversion (from PAL to NTSC and back to PAL). These considerations, along with time constraints, ultimately drove the decision.

Creative engineering (especially in the areas of the servers, routing and distribution), along with straightforward integration and coordination with vendors, helped ease the staff's learning curve on the major pieces of equipment — servers, automation and electronic graphics.

To continue its quest for Russian free speech, Media Most set out to build an independent origination facility in the United States.

Hardware and software

Following an evaluation and recommendation by AFA, Media Most chose a proven Grass Valley Group (GVG) solution that includes Profile XP servers, a 128x128 Concerto router with an Encore control system, Vibrint FeedClip and NewsEdit. Fibre Channel provides file transfers faster than real time between devices. The GVG solution minimized development time and avoided interoperability issues. The router was

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a key cost-saving factor because it would also function as the on-air switcher. It was also chosen for its reliability and flexibility.

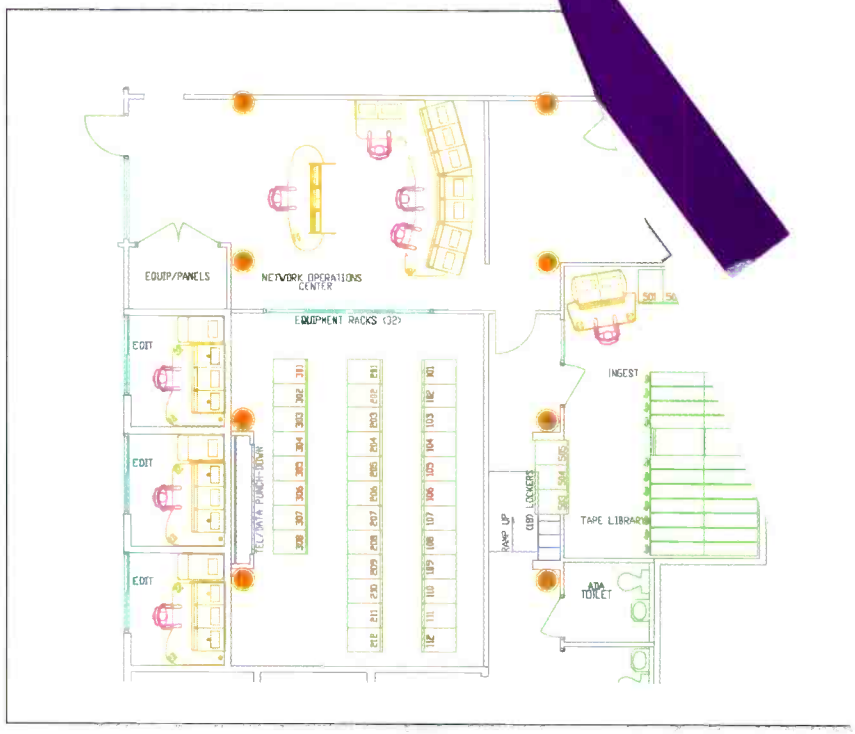
GVG NetCentral software was incorporated to provide Simple Network Management Protocol (SNMP)-based remote monitoring and diagnosis for the GVG equipment, with a feature set that includes Internet access schedule-based notification and predictive-failure analysis.

Snell & Wilcox standard converters convert the incoming NTSC and PAL feeds to SDI as they receive them, and a GVG ingest server records them. The ingest server can back up the on-air cache via the Concerto router. Digital broadcast-quality news clips from Moscow are fed into the facility via IP using the Telestream ClipExpress, supporting four live newscasts per day. News clips are also received from the Associated Press and CBS News via fiber through AFA's sister company, Waterfront Communications.

Leitch 12x1 switchers fed from source distribution amplifiers serve as backups in the event of a catastrophic failure in any of the primary signal paths. A Chyron Duet LE system feeds Russian (Cyrillic) text to the Ross downstream keyers for each program channel. There is a Leitch logo generator for bugs and a Leitch Prom Slide for stills.

All conversion and terminal equipment came from Snell & Wilcox. The Kudos Plus CVR550 standards converter has SDI input capability and the Kudos CVR45D has SDI output capability. The RollCall infrastructure management system provides status monitoring and control of the Snell & Wilcox equipment, and can be easily and rapidly accessed from many points. Remote access, as provided by GVG and Snell & Wilcox, allows operation with fewer staff members.

The master control room/NOC monitors incoming and outgoing feeds and controls servers for outgoing feeds. The dub area converts legacy PAL material to 525 SDI, which is then ingested into GVG's Profile XP servers. The ingest area, with four ingest positions and one quality control station, uses DVCPRO25 as the ingest format. On-air playout is controlled by a Florical automation system. The Florical system also controls the servers, router and Leitch logo generator.



The floorplan of Media Most's Manhattan facility attests to its efficient use of space and attention to ergonomics.

Project team

Media Most International:
Sergey Shestakov, executive vice president, U.S. Project
Julius Feinstein, director, Broadcast Operations and Engineering
Group 3:
James Shaughnessy
A.F. Associates:
Steven Sabin, senior project manager
Dave Liptak, design engineer
David Wasserman, project leader

Equipment list

Chyron Duet LE CG
Florical automation
GVG Profile XP servers
GVG Concerto router
GVG Encore system controller
GVG FeedClip
GVG NewsEdit
GVG NetCentral monitoring system
Leitch XPR-12x1S routing switchers
Leitch LGI-6801 logo generator
Leitch VES-6801 Prom Slide
Snell & Wilcox CVR-550 and CVR45D standards converters
Snell & Wilcox signal distribution equipment
Snell & Wilcox RollCall monitoring system
Tektronix test and pulse equipment
Telestream ClipExpress
Videotek VTM quality control

One of the key technical decisions Media Most needed to make up front was whether to go with a 625 or 525 plant.

Future plans

Media Most's programming department compiles its program schedules

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in a spreadsheet format using the Russian language and fonts. For accuracy, Media Most has a software engineer developing a program to cross-check program schedules with its Russian-language program database. The software engineer is also developing a more complex program to transliterate the Russian spreadsheet into English by sound. From there, the software converts the phonetic English text program log into an ASCII file for import into the Florical system.

Media Most's ingest stations use Florical's MediaTimer and MediaFiler.

Media Most is programming driven, and some of its future goals may be doing live, regional cut-ins for breaking news, as well as doing the Russian voiceover work in the New York facility. The company broadcasts domestically produced commercials featuring Russian-oriented businesses, and it hopes to expand its ad base to include Russian-language commercials for corporations as well.

The facility is a classic example of a successful collaboration between the clientele, systems integrator, architect and general contractor. This collaboration allowed the company to meet its budget and successfully launch from its new facility in June of 2002. Media Most currently produces eight channels of programming (five original content and three pass-through) to Russian-speaking people in various countries and major universities worldwide. BE

Creative engineering helped ease the staff's learning curve on the major pieces of equipment.

Steven Sabin, a certified broadcast network technologist, is a senior project manager for A.F. Associates.

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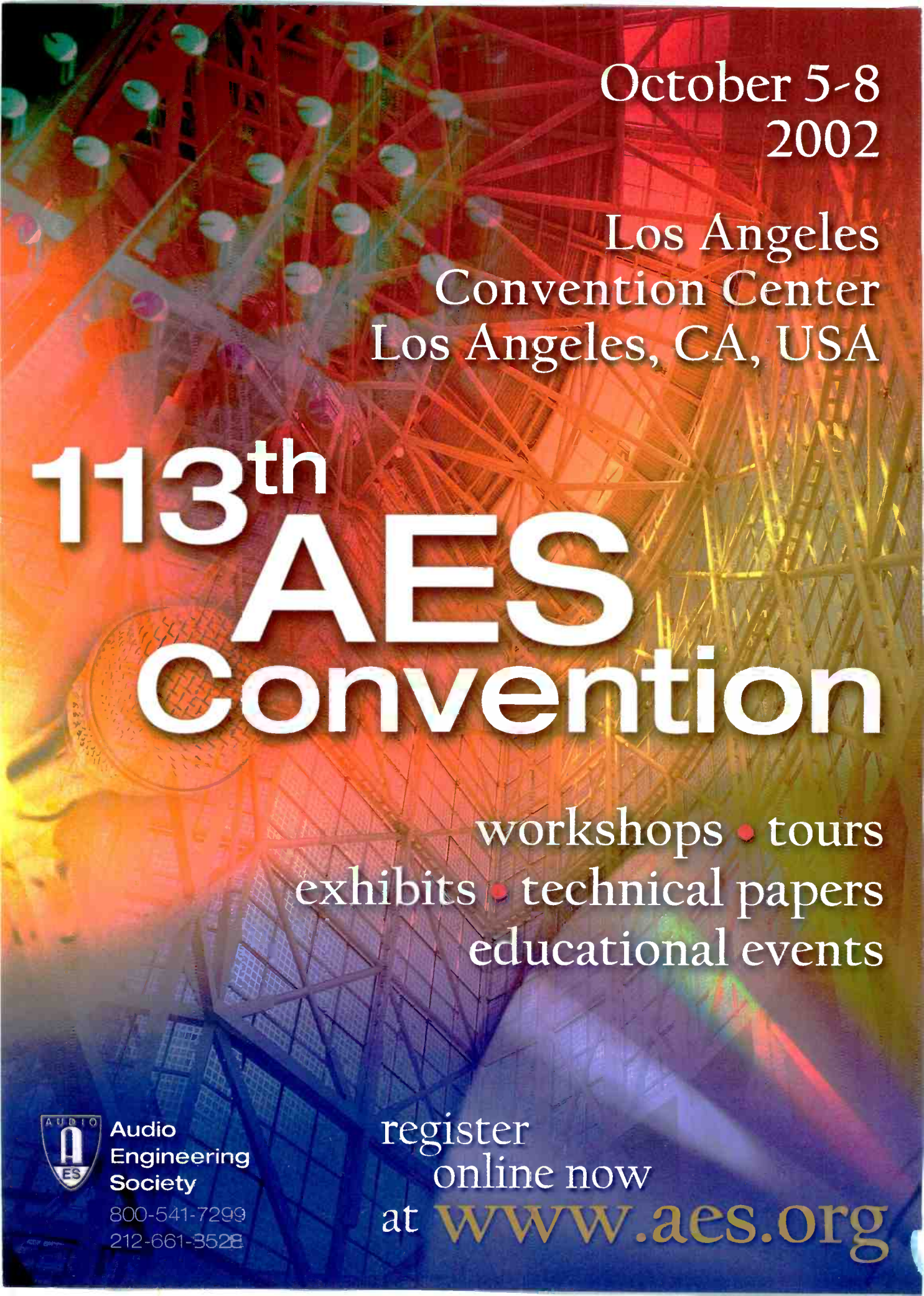
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TEMPE, AZ: As the world's only mobile unit capable of simultaneous HD and 601 signal production, the new HD601 hybrid from Core Digital is setting a new standard in truck versatility. To ensure that only the most advanced images are broadcast from HD601, Core Digital specified the camera representing the next generation in digital processing, the Ikegami HDK-790E/79E.

"Our philosophy is always to look into the future and try and be there first," says Larry Meyers, Chairman of the Board of Core Digital/SWTV. "Our new HD601 truck is the solution that offers the best quality possible in both HD and SD, with minimum impact on the still-prevailing SD format. We felt that the Ikegami HDK-790E/79E was superior to all other cameras, in regards not only to picture quality, but the technical functions and ability to handle both HD and SD."

Core Digital is equipping HD601 with eleven of the fully digital HDK-790E/79E cameras from Ikegami, featuring 2.2 million pixel 2/3-inch FIT CCDs, 12bit A/D conversion; 38-bit internal digital processing circuits, and multi-standard simultaneous broadcasting. A newly developed TFC/TFH-790 Fiber to Triax Converter "Mongoose" System can transmit high-quality pictures from the camera head without signal degradation, up to 3,300 ft. using standard 1/2-inch triax cable. Equipped with the Ikegami SE-79D System Expander, SWTV's camera can be converted from full studio application to full portability in one minute.

"The flexibility of the new Ikegami System Expander is probably the best I've ever seen," Meyers says. "In entertainment we use a lot of hand-helds, while in sports we need hard cameras. With the Ikegami HDK-790E/79E, we can go back and forth very easily."

Larry Meyers, Chairman of the Board of Core Digital/SWTV with Ikegami's HDK-790E/79E.

With over 100 Ikegami cameras already in house at Core Digital and SWTV, Meyers already knows the high level of service that he can expect. "Ikegami's customer service and support

Continued on Page 7

Jefferson Pilot Sports Adds Eight Ikegami HK-388W Cameras.

Full Digital Camera Upgrade For Mobile Production Unit 4.

CHARLOTTE, NC: Jefferson Pilot Sports, a leader in entertainment and sports production in the Southeast, has upgraded their flagship Unit 4 truck with the addition of eight new Ikegami HK-388W cameras. The purchase of the industry-leading switchable SDTV studio HK-388W and portable HK-388PW cameras extends a JP Sports commitment to Ikegami excellence that has continued uninterrupted for three decades.

The new Ikegami cameras will be key in helping JP Sports to provide superior coverage of the popular ACC and SEC athletic conferences, and stand out in the highly competitive mobile production market. "There's no better quality camera than Ikegami to compete with," says Powell Kidd, VP and Technical Manager of Jefferson-Pilot Communications. "I don't know what else I could buy that could give me an edge like Ikegami does."

A combination of the Ikegami 388W's instant 4:3/16:9 switchability and newly developed 640,000 pixel 2/3-inch FIT CCDs gives JP Sports a powerful, flexible way to capture any event. Additionally, a 10MHz ultra-wideband component triax system delivers high-resolution pictures, even at long cable lengths. The extensive use of digital circuits in the Ikegami 388W consistently achieves top image quality in an easy to use system.

The purchase was made through Technical Video Systems in Winston-Salem, NC. "JP Sports commitment to quality is well-known, and this is their third round of Ikegami cameras," notes Jim Holladay, President of TVS. "Their new Ikegami 388Ws and 388PWs make their SD format Unit 4 the very best it can be."

"There's no better quality camera than Ikegami to compete with. I don't know what else I could buy that could give me an edge like Ikegami does."

-Powell Kidd, VP and Technical Manager of Jefferson Pilot Communications.

Working through a fast-paced schedule, JP Sports has also come to rely on Ikegami durability and support. "We take Ikegami cameras out of the box and they go right to work," Kidd says. "In addition, I've always had very good service from Ikegami."

Outfitted with their new set of high performance Ikegami 388W cameras, JP Sports looks forward to meeting the tough standards of their customers. "All of our clients require extremely high picture quality, and Ikegami looks better than anyone else," says Powell Kidd. "With it's switchability, high resolution and superior imagery, the Ikegami 388W was clearly the right choice for JP Sports."

From left to right: Powell Kidd, Charles Moye and Mark Riley, with Ikegami's HK-388W Camera at Jefferson Pilot Sports Mobile Production Unit 4.

Ikegami Expands Selection Of Advanced Technology.

Breakthrough Cameras, Monitors, Switchers And Accessories Keep Ikegami In The Lead.

MAYWOOD, NJ: Ikegami has redefined broadcast technology once again with the introduction of several highly advanced new systems for digital television production. The debut of the Ikegami TDP-370H HDTV Portable Switcher, HDK-79E(IT) camera, HDL-20 ultra-compact 2-chip color camera, HL-60W camera, and HTLM-600D 6" HDTV LCD monitor are just a few of the latest additions to the industry-leading Ikegami line of digital television products.

"We are showing the largest, most highly developed line of digital HD and SD products in Ikegami history this year," says Alan Keil, VP and Director of Engineering for Ikegami. "Our deep experience in the broadcast market has allowed us to make our latest cameras, switchers, monitors and accessories the leading choice throughout the industry."

TDP-370H HDTV Portable Switcher

The TDP-370H is a compact design with features that significantly raise the bar for HD field production performance. With two ME buses and multi-standard operation in 1080i, 1080/24p, 720p, and 1035i, the TDP-370H is the most flexible HD switcher yet from Ikegami. Optional chroma key and DVE also significantly increase the possibilities. With two built-in keyers and up to 16 inputs and 6 output buses available in a compact and self-contained 4RU unit, the Ikegami TDP-370H makes advanced HD production in trucks and small studios a reality.

HL-60W

HDK-79E

HDK-79E(IT)

Ikegami's flagship line of HDK cameras is more accessible than ever with the addition of the HDK-79E(IT) 2/3" 2,200,000 pixel CCD portable camera for HDTV . Ikegami's newly developed IT (Interline Transfer) chip delivers a very high level of performance at a lower cost than Ikegami FIT-equipped cameras. Designed from the ground up for DTV, the HDK-79E(IT) can provide simultaneous HDTV and SDTV signals, and includes such features as six-axis + two-axis color corrector, enhanced digital DTL, and Super KNEE.

HDL-20

Following in the footsteps of the popular HDL-10 ultra-compact HD CCD camera, Ikegami has doubled the performance with the introduction of the HDL-20 2-chip camera. Featuring two 2/3", 2,200,000 pixel CCD image sensors, achieving unparalleled performance in a small-body design, the full-digital HDL-20 offers significant performance gains with only a small size increase. For microscope applications, specialized videography, sports coverage, factory automation, surveillance and a wide variety of POV uses, the HDL-20 offers the ultimate in color fidelity, digital stability and ease of operation for specialized situations.

HTLM-600D

Ikegami's reputation as a world leader in video monitors continues to grow with the HTLM-600D 6" HDTV LCD monitor. This multi-standard 16:9 monitor accepts digital inputs, and works in 1080/60i and 1080/24p(sF). Ideal for use in the field in conjunction with a camcorder, the HTLM-600D gives producers the opportunity to make highly accurate judgments on image quality.

HL-60W

This lower-cost, switchable 16:9/4:3 camera features a 520,000 pixel AIT CCD and uses Ikegami's latest ASIC with 0.18 micron design, featuring 38-bit internal processing, 65 dB signal-to-noise ratio and 750 TVL resolution. This camera can be integrated with the high end triax systems from Ikegami, and has optional servo filter wheel control.

HDTV Cameras

HDK-790E
High Definition Studio/Field CCD Camera System
- Full Digital Processing with Next Generation ASICs
- 12 bit A/D Conversion
- Both HDTV and SDTV Output Signals
- 1080i and 480i Interlace Output Standard, Progressive (480p/720p) Output Available as an Option.
- Component Serial Digital Transmission with Optical Fiber Cable

HDK-720 & HDK-720P
High Definition Studio/Field CCD Camera System
- Full Digital Processing with New Generation ASICs.
- 12 bit A/D Conversion
- FIT 2/3" native 720p CCD X 3
- 720p, 480p, and 480i Output (including option)
- Component Serial Digital Transmission with Optical Fiber Cable

TFH-790 & TFC-790
Fiber/Triax Converter System
- Enables use of triax for HDTV camera cable
- Maximum transmission distance: 1,000 m (3,300 ft) using 1/2-inch diameter triax cable
- Power for converters supplied from the CCU-790

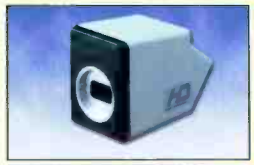
HDL-V90
One-piece DVCPRO HD Camera/Recorder
- Recording Format: 1/4" DVCPRO HD
- Employs Next Generation ASICs
- 12bit A/D Conversion
- DSP Camera and Digital Recorder
- Skin, Slim and Diagonal Detail
- HD SDI Output from Camera Head

HDK-79NA
Extended Optics HD Camera
- Optical Block Separate from the camera head
- Employs three 2/3" 2.2 million pixel CCDs
- Full Digital Processing with 12-bit A/D
- Fiber Camera Cable extension to CCU-790 (option)

HDK-79E
High Definition Portable CCD Camera System
- Companion to the HDK-790E Studio/Field Camera or Stand-alone Unit
- Full Digital Processing with New Generation ASICs
- 12 bit A/D Conversion
- Both HDTV and SDTV Output Signals
- 1080i and 480i Interlace Output Standard, Progressive (480p/720p) Output Available as an Option

SE-79D
System Expander
- Enables use of 7" VF and full studio lenses with HDK-79E
- VF DTL and VF Box Generator Control
- Utility Outlet for Prompter
- Very easy to remove and install portable camera

HDL-40
Compact One-Piece Type High Definition Camera
- Full Digital Processing with next generation ASIC
- Compact, lightweight One-Piece type camera
- HD SDI output
- Various Digital Function such as Wideband DTL



HDL-20
Ultra Compact High Definition Camera
- Full Digital Processing with HD SDI Output
- Employs two 2/3" 2.2 million pixel CCDs
- Lightweight cable connection to compact digital CCU
- C-mount Lens interface

HDL-10
Ultra Compact High Definition Camera
- Light-weight Multicore Cable Connection to Digital CCU
- Remote Control Available with RM-11 (Option)
- Employs C Mount Lenses
- Superb Color Reproduction
- Ultra Compact Camera and Compact CCU

SDTV Cameras

HK-388 & HK-388W
Ultra-wideband Studio/Field Digital CCD Camera System
- Ultra-wideband Component Triax System (10MHz) with Base Station
- Employs New Generation ASIC for Ultra-high Density CCDs
- Analog and Serial Digital Component Outputs
- Skin, Slim and Diagonal Detail
- 2 types of 4:3 Fixed Version (HK-388, HK-388H)
- 16:9/4:3 Switchable Version (HK-388W)

HK-387W & HK-387PW
Ultra-wideband Studio/Field Digital CCD Camera System
- Ultra-wideband Component Triax System (10MHz) with Base Station
- Employs New Generation ASIC for Ultra-high Density CCDs
- Analog and Serial Digital Component Outputs
- Skin, Slim and Diagonal Detail
- 16:9/4:3 Switchable / Both Studio (HK-387W) and Portable Companion (HK-387PW) Versions Available

HL-45A & HL-45AW
3 CCD Broadcast Quality Portable Digital Camera
- 12 bit A/D conversion
- Operating Status Stored in a Memory card (SmartMedia)
- Docks with Popular On-board Recorders
- Connects with New Triax System (TA/BS/OCP-45)
- SDI (D1) Output and Q-TV Available with BS-45 (Option)
- 4:3 Fixed Version (HL-45A)
- 16:9/4:3 Switchable Version (HL-45AW)

HL-V79W & HL-V75W
One-piece DVCPRO Camera/Recorder
- Employs New Generation ASIC
- Recording Format: 1/4" DVCPRO50 (4:2:2)
- DSP Camera and Digital Recorder
- Skin, Slim and Diagonal Detail
- 16:9/4:3 Switchable

HL-59WNA
Digital Portable Camera
- Optical Block Separates from Camera Body
- New Generation ASIC Reduces Power Consumption
- Skin, Slim and Diagonal Detail
- Extended Range CVSS (Continuously Variable-Speed Shutter)
- 520,000 pixel 2/3" 16:9 IT CCDs/Switchable to 4:3

HK-388P & HK-388PW
Ultra-wideband Digital Portable CCD Camera System
- Ultra-wideband Component Triax System (10MHz) with Base Station
- Companion to the HK-388/388W Studio/Field Camera or Stand-alone Unit
- Employs New Generation ASIC for Ultra-High Density CCDs
- 2 Types of 4:3 Fixed Version (HK388P, HK-388PH)
- 16:9/4:3 Switchable Version (HK-388PW)

HL-60W
Top-end full Digital Processing Portable Camera
- Full Digital Processing with next generation ASIC
- 12 bit A/D conversion
- Employs newly developed 2/3" AIT CCDs
- Connects with various extension systems
- 16:9/4:3 Switchable

HC-400 & HC-400W
3 CCD Professional Digital Camera
- Employs New Generation ASIC
- Skin, Soft and Diagonal Detail
- Docks with Popular On-board Recorders
- Optional Remote Control and Multicore Cable Camera Control Unit
- 4:3 Fixed Version (HC-400)
- 16:9/4:3 Switchable Version (HC-400W)

HL-DV7W & HL-DV5
One-piece DVCAM Camera/Recorder
- Recording Format: 1/4" DVCAM
- DSP Camera and Digital Recorder
- Equipped with DV (i.LINK) Terminal
- Max. Recording Time: 184minutes (with L cassette)
- 16:9/4:3 Switchable Version (HL-DV7W)
- 4:3 Fixed Version (HL-DV5)

SKC-410 & HC-250
3 CCD Compact Multi Purpose Cameras
- Broadcast Quality Digital Processing Circuits
- Compact One-piece type cameras
- 2/3" CCD version is SKC-410
- 1/2" CCD version is HC-250

Switchers/Converters

TDP-370H
Portable Digital Switcher
- Compact one-piece design (4U height, can be rack mounted)
- 16-input, 2 M/E, 6-output
- Multi standard: 1080i/60i, 1080/24p, 720/60p
- Built-in DVE and Chroma Keyer available (option)

HVC-555
Broadcast Up-Converter
- Converts SDTV (NTSC) into HDTV
- Compact Design with Low Power Consumption
- Built-in Digital Enhancement
- 1080i or 1035i Outputs Standard

HVC-680
Broadcast Down-Converter
- Converts HDTV into NTSC
- Compact Design with Low Power Consumption
- Built-in Digital Enhancement
- 1080i or 1035i Input and 480i Output

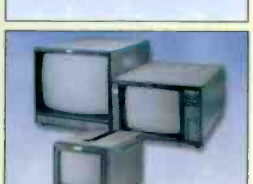
HVC-65
Compact Down-Converter
- Converts HDTV Signals into SDTV
- HD SDI Signal Input
- D1 or D2 Signal Output

HDTV & SDTV Monitors

HTM 50 Series
HDTV/SDTV Multi Format Color Monitors
- 20", 15" & 10" Models
- 900 TVL (HTM-2050R), 750 TVL (HTM-1550R/1550CS), 500 TVL (HTM-1050R) H. Resolution (at HDTV)
- BFS (Beam Feed-back System) and 3 Line Comb Filter
- HD/SD Analog (RGB/Y, P_B, P_R) Input Standard, HD/SD SDI Input Available as an Option

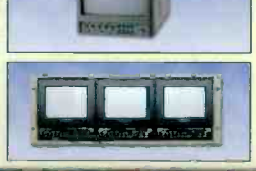
HTM 1700R
HDTV/SDTV Multi-Format Color Monitor
- 19" rack mountable
- NTSC/PAL, HDTV/SDTV multi-format compatibility
- Selectable 4:3/16:9 aspect ratio
- 800 TVL horizontal resolution
- Natural Flat-Screen
- BFS (Beam Feed-back System)

TM 80/90 Series
High Quality Broadcast Color Monitors
- 20" & 14" Models
- 900 TVL (TM20-90RH), 700 TVL (TM14/20-80RH)
- BFS (Beam Feed-back System) and 3 Line Comb Filter
- SD SDI (D1 or D2/D3) Input as an Option
- Plug-in Modular Construction for Optional Modules
- A Variety of Remote Control Facilities Available (Option)
- 10bit Digital Controlled



TM 17 Series
High Performance Color Monitors
- 20", 14" & 10" Models
- 600 TVL (TM14/20-17RA), 450 TVL (TM10-17RA)
- BFS (Beam Feed-back System) and Comb Filter
- SD SDI (D1 or D2/D3) Input as a Option
- NTSC/PAL Automatic Mode Selection
- Screen Aspect Ratio of 4:3 or 16:9 Switchable

TM9-1 & TM9-ID
9" Broadcast Color Video Monitor
- 300 TVL H. Resolution
- NTSC/PAL Compatible
- 16:9/4:3 Aspect Ratio
- AC/DC Operation



TM6-1BRM3
Triple Rackmounted 6" Color Monitor
- 200 TVL H. Resolution
- Dual Video Input
- AC/DC Powering

HPM-9050
9-inch HDTV Monochrome Monitor
- HPM-9050 is provided with an SDI input
- 16:9/4:3 scan function
- 19-inch rack mountable
- Switching power supply circuitry provides a wider range of power supply voltages
- Back porch clamping assures consistent stability for the video black level

HTLM-600D
6" HDTV LCD Portable Monitor
- 750 TVL H. Resolution
- Light-weight (1.75kgs) and Outstanding mobility
- 19" Rackmountable
- Various signal formats are acceptable directly 1080i/60i, 1080/59.94i, 1080/50i, 1080/24PsF
- HD SDI Input available
- 9 (Nine) Areas Markers can be displayed

V-R82P
Dual 7.9" LCD Monitor
- Rackmountable unit with two 7.9" active matrix LCD panels
- 1440 x 234 pixels with a brightness of 300 candle luminance
- Dual inputs with loop through capability, and auto recognition for NTSC or PAL
- Independent 3 color tally system is provided for each panel
- Choose from more than 30 different types of LCD monitors available at www.ikegami.com

PM9050 & PM1430A /2
9" Monochrome Monitor (PM9050)
- 800TVL H. Resolution
- 19" Rackmountable
- 4:3/16:9 Mode Selection
- D1 Input Available (Option)

14" Monochrome Monitor (PM1430A/2)
- 800TVL H. Resolution
- 19" Rackmountable
- 4:3/16:9 Mode Selection

PM-K5 & PM-K9
Cost Effective 5" Monochrome Monitor (PM-K5)
- 700 TVL H. Resolution
- Triple Rackmountable

Cost Effective 9" Monochrome Monitor (PM-K9)
- 700 TVL H. Resolution
- Dual Rackmountable

PM40
Quadruple Rackmounted 4" Monochrome Monitor
- 500 TVL H. Resolution
- 19" Rackmountable

Editcam Technology

DNS-21W & DNS-201W
Editcam 2 One-piece Disk Camera Recorder
- No More Digitizing into Avid Non-Linear Editing Systems
- Digital Disk Recording Format - Ikegami/Avid
- Employs New, Compact Removable Hard Disk (FieldPak2) as Recording Media
- External Video Input & Video Playback from Camera/Recorder

DNR-20
Dockable Disk Recorder
- No more Digitizing into Avid Non-linear Editing Systems
- Two interface connections available; 79pin (HL-59/60)and 50pin (HL-45A/HC-400)
- Supports several compressions including AVR, JFIF, DV or IMX

DNE-11
Portable Non-linear Disk Recorder with Editing
- Compact Non-linear Editing Machine
- High Picture Quality Online Recording Mode (AVR-75/70BH) and Long Time Recording Mode (AVR-3S/4S/6S) Switchable

Ikegami DNS-201W Editcam Goes Outdoors.

Outdoor Adventure Series Producer Captures "Best Video Of My Career."

MAYWOOD, NJ: As the producer/host of the largest syndicated outdoor-adventure TV series in the nation, "The Outdoorsman With Buck McNeely," I find myself in some exotic and remote corners of the globe, shooting under some of the most demanding conditions.

Whether I'm on a one-day fishing trip in my home state of Missouri or on a two-week safari in the African bush, the choice of gear I depend on is critical.

The camera section of the Ikegami DNS-201 Editcam utilizes three 520,000 pixel IT CCDs. The camera can be quickly switched to shoot in either 4:3 or 16:9 aspect ratios through the viewfinder menu. For low-light shooting, the DNS-201W offers a variety of gain settings that range between –3 dB to +48 dB. The DNS-201 takes advantage of virtually all the same digital signal processing that is found throughout Ikegami's HL line of cameras.

The Editcam records on a drive called a FieldPak. It represents the camcorders recorder section that fits in a shirt pocket and weighs about eight ounces.

Ikegami offers FieldPaks in two capacities: 20 GB and 40 GB. At DV25 quality, these translate into 1.5- and 3-hour record times, respectively. The DNS-201 can record in one of seven compression levels. They include AVR-70BH, AVR-75, DV25, DV50, JFIF 3:1 and JFIF 10:1.

When working with an Avid system, the thumbnails that represent the clips appear within seconds after the FieldPak is mounted to the system. In most cases, you edit directly from the portable drive with no transfer or digitizing.

DNS-201W

Apart from the door mechanism where the hard drive slides into the camcorder, the unit has no other moving parts. That's a big upside to this technology — there is no worry about heads clogging or belts breaking in places where the nearest service shop is a plane ride away.

"With the Ikegami Editcam, I shot the best video of my career."

-Buck McNeely

Making the transition to tapeless acquisition does require a small shift in thinking, but the process of getting images is really no different than any other camcorder.

In theory, if we ever had a recorder problem, we would just pop in another FieldPak. There's not even a dew light on this camera and we had it working in humidity levels that would knot up videotape.

The Ikegami Editcam has a unique feature: a special type of record mode called "Retro Loop." This feature actually lets us capture events AFTER they happened. In this mode, the camera writes a "buffer" of time to the disk that's constantly updated. We left the buffer set to 30 seconds.

The Editcam can sit in this mode for hours, waiting for a fish to strike. When the fish takes the bait, we hit the record button and can begin recording 30 seconds prior to that point!

In terms of overall quality and usability, the Ikegami DNS-201 has the features and capabilities of any modern, professional three-CCD camcorder. The difference between the Editcam and a traditional videotape camcorder lies with the Editcam's hard disk recording. With the Ikegami Editcam, I shot the best video of my career.

Buck McNeely is founder of Outdoorsman International and the producer/host of "The Outdoorsman" TV series. It airs on more than 200 TV stations nationwide in syndication and is in its 17th year of production. Buck can be reached at twolf@ldd.net.

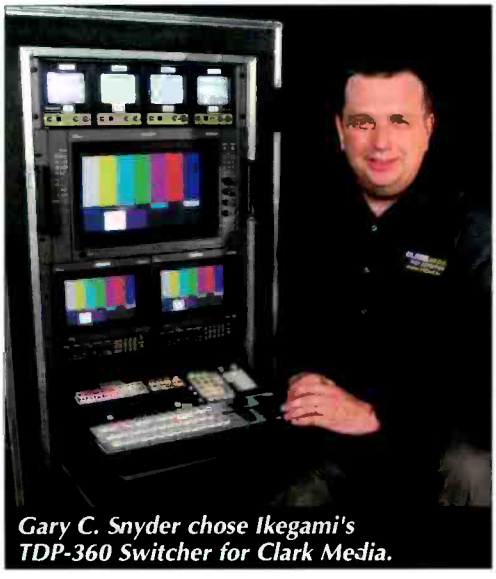
Ikegami TDP-360 Digital Portable Switcher At Clark Media.

From Cameras, To Monitors, And Now Switchers, Ikegami Puts More Into Every Product.

BETHLEHEM, PA: Clark Media, located in Bethlehem, PA, has been providing high technology equipment and services to producers, corporate and broadcast clients since 1985. We have a reputation for having the newest and best production equipment available. Our industry is very competitive and our advantage is that we provide equipment solutions and engineering services that help our clients solve their unique requirements

Our Ikegami TDP-360 switcher is used in a custom built HiDef fly-pack that uses six Ikegami HDK-79D HDTV cameras for the on-location production of HD programming. Our major requirement was to find a switcher that was extremely compact and could hold up to the rigors of location production. We liked the one piece construction of the TDP-360, which is a unique advantage of this product. There are many small production switchers made for regular video, but the other HD switchers were very large and bulky. Most of our productions are in the field, and although we have custom cases for everything, the equipment we choose must be extremely solid and reliable.

We knew immediately that the TDP-360 would be great for our location department. We own over thirty Ikegami SDTV cameras in our rental facility, and we have come to depend on the outstanding picture quality of the Ikegami cameras. Our experience with other Ikegami products made us very confident of the design and construction of the TDP-360 switcher. We have used the switcher on many shoots and it's bulletproof: compact, reliable, and very easy to operate.



Gary C. Snyder chose Ikegami's TDP-360 Switcher for Clark Media.

Everyone knows that the quality of Ikegami gear is outstanding. Ikegami has been very responsive to our suggestions over the last few years -- our salesperson had previously worked in the rental industry in New York and really understands our business.

As far as service, Ikegami has been the easiest company to work with. Our switcher has performed perfectly and has not needed any service, but we know that if we have an emergency they'll do everything to get us back on the air. I've already driven a camera to them and they had a technician waiting; this type of support is extremely valuable, especially with HiDef gear.

What makes this job fun is that we get to play with the newest toys -- and we're really excited to see what Ikegami has up their sleeve next!

By Gary C. Snyder, President/Engineer of Clark Media

Core Digital Selects Ikegami...

Continued from Page 1

is just fantastic," says Meyers. "We get loaner equipment when we need it, and a quick turnaround on repairs. Their tremendous engineering support for live shows, such as when we covered the Academy Awards for KABC, ensures that their cameras always look great."

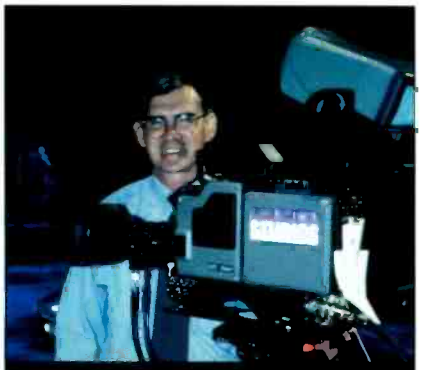
As Core Digital drives the future of mobile production with HD601, it helps to have Ikegami on board. "You have to have a known quantity like Ikegami," Larry Meyers concludes. "When you're developing a new concept like HD601, you need the support of every last manufacturer. Ikegami gives us everything we need to break new ground."

Ikegami Combines Great Technology With Industry-Leading Service And Support.

Long Known As The Technology Leader, Ikegami Is Also Number One In Customer Service And Support.

MAYWOOD, NJ: Ikegami, long known as the leading manufacturer of cameras and monitors, has earned a reputation for technological excellence that is rivaled only by their exceptional customer support. It's no secret that many camera, monitor and now switcher buyers, choose Ikegami not only for state of the art technology, but for service that's second to none.

The Ikegami customer support commitment has made a big difference to The Image Group, NYC, which uses 27 Ikegami



Doug Joseph, VP of Engineering for Lifetime Television, with an Ikegami HL-59 camera.

cameras to shoot the action throughout nine highly active studios. "I consider Ikegami to be excellent when it comes to customer service," says John T. Chow, Director of Engineering for The Image Group. "Ikegami is much more personable, because they're not a huge company like a lot of the others. Their cameras are extremely reliable, but if I'm in a jam, they'll deliver what I need immediately. Ikegami is specialized, they've been able to service me very well, and that's why I think they're a leader in the camera business."

Lifetime Television depends upon Ikegami monitors for their critical monitoring of Post Production, Studio and On Air feeds. In addition, Lifetime Studios uses Ikegami cameras exclusively in all of their studios in Astoria, NY. "We're in the industry for the long run, and we need vendors like Ikegami that will support us year in and out for many decades" says Doug Joseph, VP of Engineering for Lifetime Television. "I refer to Ikegami as a 'silent partner' because they're always there when you need them, supporting us in a very friendly and efficient way."

For mobile production companies such as F&F Productions in St. Petersburg, FL, great customer service provides an essential lifeline. "Ikegami's field support has always been very good, and that's one of the reasons we've stayed with them," says Bill McKechney, General Manager at F&F Productions. "Remote trucks don't sit still, so you're often confronted with problems you don't have in the studio -- when we lose a board it's very difficult to troubleshoot. If that should happen, we're always able to call Ikegami and get a board exchanged immediately, so we can keep working."

"We're in the industry for the long run, and we need vendors like Ikegami that will support us year in and out for many decades."

-Doug Joseph, VP of Engineering for Lifetime Television

When it comes to doing a complete job for customers like the full service media company Lyon Video in Columbus, OH, Ikegami has got everything covered. "When Lyon Video looks at customer service we evaluate three things," says Bob Lyon, President of Lyon Video. "First is the information provided prior to the sale, next is giving us exactly what we bought, and third is maintenance, repair and service in the field or over the phone. Ikegami is the best at all three."

For More Information on Ikegami's Products,
Contact Your Regional Sales Office or the Ikegami Dealer Nearest You.

Ikegami®

Ikegami Electronics (U.S.A.), Inc. 37 Brook Avenue, Maywood, NJ 07607 East Coast: (201) 368-9171
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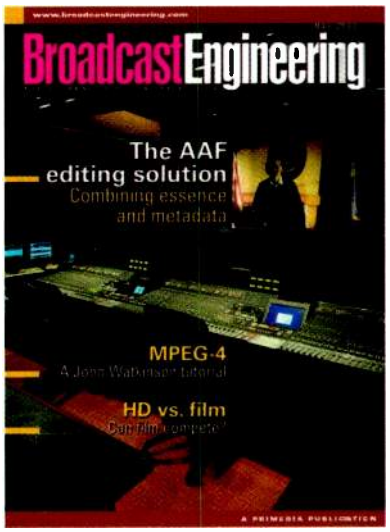

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Just what is my signal strength?

BY DON MARKLEY

It seems that everyone wants to know what the received signal strength is for their station. The manager and sales department want a nice neat map of coverage to use in their sales pitches. They also want population and household numbers to convince clients just how they can reach buyers economically. The FCC wants coverage contours or areas to make sure that the station is meeting their requirements. Some non-viewers want the signal strength so they can bypass over-the-air reception and use their satellite service. The engineering department is concerned about whether the antenna is doing what they want, and the owner simply wants a map they can feel warm and fuzzy about.

The problem is deciding just how to determine the signal strength either at a particular point or over the total service area. Making that determination is difficult at best, whether one uses calculation schemes or measurements. It is always an education for an engineer when taking a field strength meter out for the first time. It is amazing, especially at UHF, to see the variation in the signal strength when the test antenna is moved even a few feet. That is why the Commission has defined a method to be used in measuring field strengths. It involves moving the antenna over a distance while recording the measured values, then determining the mean of those values to come up with a reasonable final value (See Section 73.686).

It is always an education for an engineer when taking a field strength meter out for the first time.

To be at all meaningful, field measurements must use a calibrated field intensity meter together with a calibrated antenna system. The antenna system would normally consist of a dipole and a connecting cable that has been checked for attenuation across the band. To do the measurements the dipole needs to be extended to the proper length for the frequency involved and raised to the proper height. Then the indicated field strengths must be adjusted by a correction factor that should have accompanied the meter and antenna system from the factory. When the meter is recalibrated periodically, such calibration should be done with the antenna and cable to be used for measurements. If this sounds like a lot of trouble, it is. Measurements must be done right if they are to be more useful than walking around with a portable TV set and a coat hanger antenna.

The gist of the measurement problem is that it is best done by someone with the proper experience and equipment. There are several firms that provide such service. These firms have vans equipped with the extendable antennas, meters, recording equipment and the support electronics needed. Unless an individual station contemplates doing a lot of measurements for some reason, the use of a measurement service is probably a good investment.

However, measurements are not the norm for determining coverage for a TV station. In fact, the Commission has narrowly defined those times when they will even consider measurements. The usual method is by calculations using one of several propagation models. The most common method in the past used the published FCC charts known as the F(50,50) and F(50,10) curves. There are three sets of those curves to be used for low-band VHF, high-band VHF and UHF frequencies. The curves are based on a statistical analysis of thousands of

FRAME GRAB

A look at the consumer side of DTV

Kids put surfing first

If they could only have one medium, many would pick Internet

	Children 8-17	Boys 8-17	Girls 8-17
Internet	33%	38%	28%
Television	26%	34%	17%
Telephone	21%	12%	31%
Radio	15%	12%	17%
Magazine	4%	2%	2%
Newspaper	1%	1%	1%

SOURCE: Knowledge Networks/Statistical Research www.statisticalresearch.com

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field strength measurements done in the fifties. Roughly, the curves were intended to allow the determination of predicted field strength for any radiated power at any distance for 50 percent of the locations at that distance at either 50 percent or 10 percent of the time.

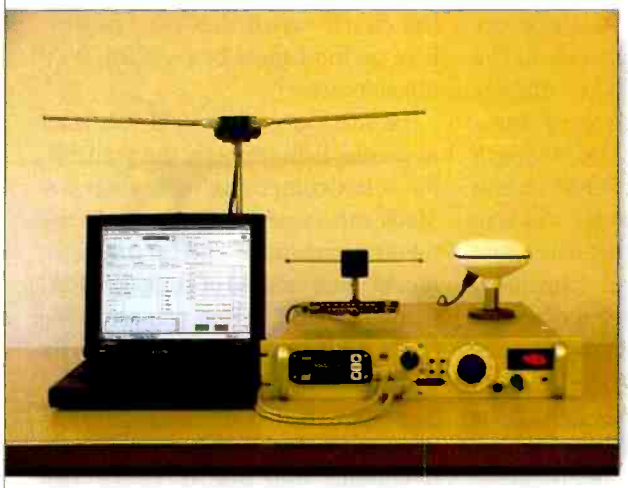
There are several limitations that affect the use of these curves. For instance, the height of the antenna is considered to be determined from an average terrain calculation. This becomes a problem when atypical terrain is involved. In that case, actual coverage may differ substantially from predicted coverage.

The use of the F(50,50) or F(50,10) curves has some problems, but one must remember that its use was the best thing available for many years. The more accurate propagation methods that are now in vogue all require a significant amount of number crunching. That is relatively easy to do with the fast and inexpensive microprocessors available today. However, one didn't want to even think about such calculations 30 years ago. It would have meant spending weeks (at least) with slide rules, math tables, adding machines and so forth, not to mention days and days pulling elevations off topographic maps. It used to take one full day to get eight radials from topographic maps, plot the elevations and determine the average – a process that is now done in milliseconds. The FCC curves allowed a reasonable calculation of field strength that could be done simply with the calculation techniques that were readily available. The method could even be almost understood by attorneys, making its acceptance at the Commission a fact.

Now that everyone has reasonable computers available, propagation studies can be done by more rigorous methods.

Now that everyone has reasonable computers available, propagation studies can be done by more rigorous methods. The biggest example is the allocation and interference studies that have been done by the Commission for digital television. Those studies are based on what is commonly known as the Longley-Rice Propagation Model or Tech. Note 101. The entire publication is not really a note, but a nice-sized book. You can find this, along with a lot of subsequent and related studies, through the Department of Commerce Web site at www.Commerce.gov.

But, be forewarned before you dig



Potomac Instruments' FSDAQ-DT system is focused on the DTV broadcaster's need to accumulate a large amount of field strength data to determine a station's coverage. It was designed to be used to collect data while traveling at highway speeds. Photo courtesy Potomac Instruments.

into its pages – the implementation of the method on a computer is a massive undertaking. You not only need to write the code for using the method, you will need a complete terrain elevation database.

The FCC has its own program written in Fortran. Several firms have been running that program on a machine such as a Sun workstation with results that essentially duplicate the FCC's calculations. Both EDX and V-Soft Engineering have developed programs for PCs. Of the two, the V-Soft programs are, in the author's opinion, more user-friendly. In addition, V-Soft has an in-house computer running the FCC's program that is available to online users for a reasonable fee.

Be warned, none of these programs are inexpensive. To do your own studies you will need to purchase the basic software program, a terrain elevation database giving elevations at 3" intervals, and a usable copy of the FCC database if interference studies are desired. Obviously, that database will have to be updated regularly, which can be done commercially. It is possible to download the database directly from the FCC. However, it is relational in nature and utilizes many different sets of data. Unless you are a very well-qualified programmer, don't mess with it – just buy it in the format you need. All of this will set you back enough that it probably won't fit on your Visa card, especially at holiday time. You can obtain the Commission's full program directly from them and modify it to run on a decent workstation, again, if you are a very experienced programmer.

So, what does it do? Basically, the method looks at a single point and determines the field strength at that point. It starts by calculating the free space field strength at that point. Then it reduces that field strength by all the factors that might be an influence. It starts by looking at the terrain for all the distance from the transmitter to the point and deciding what signal reduction the terrain will cause. It also considers the terrain coverage such as sparse or heavy vegetation. Signal absorption and clutter are evaluated and a final anticipated signal level is established. It does this very fast for the entire area involved and does it by breaking the study area up into small increments. If the study point in an increment is found to receive a certain signal level or interference, then the entire increment is considered to have that signal level or interference.

That is a broad explanation of a very complex study. However, it should be enough to understand the complex nature of the study involved. Running a Longley-Rice field strength study on a typical TV or FM station on a good 1GHz computer will take a few minutes. That translates to a whole bunch of number crunching. It also results in a good method of determining what a station's coverage area really may be.

There are other models that can be used for service predictions. Perhaps the most common of those methods is one named TIREM for Terrain Integrated Rough Earth Model. This method has also been developed by NTIA, along with various Department of Defense groups. The argument can be made that TIREM is better than Longley-Rice. TIREM is available from EDX for those who may wish to try it. However, the FCC has clearly stated that the Longley-Rice method must be used for DTV interference.

The message is simple. If you want to predict field strength, the availability of fast computing technology has made otherwise overly cumbersome methods practical. The Longley-Rice model is the method of choice for FCC work. However, unless you are going to do a lot of such work, the better programs are a bit expensive. The good news is that there are plenty of firms out there who have the software to conduct your studies. Check with your consulting engineer. Any engineering firm worthy of the name has the necessary capability. **BE**

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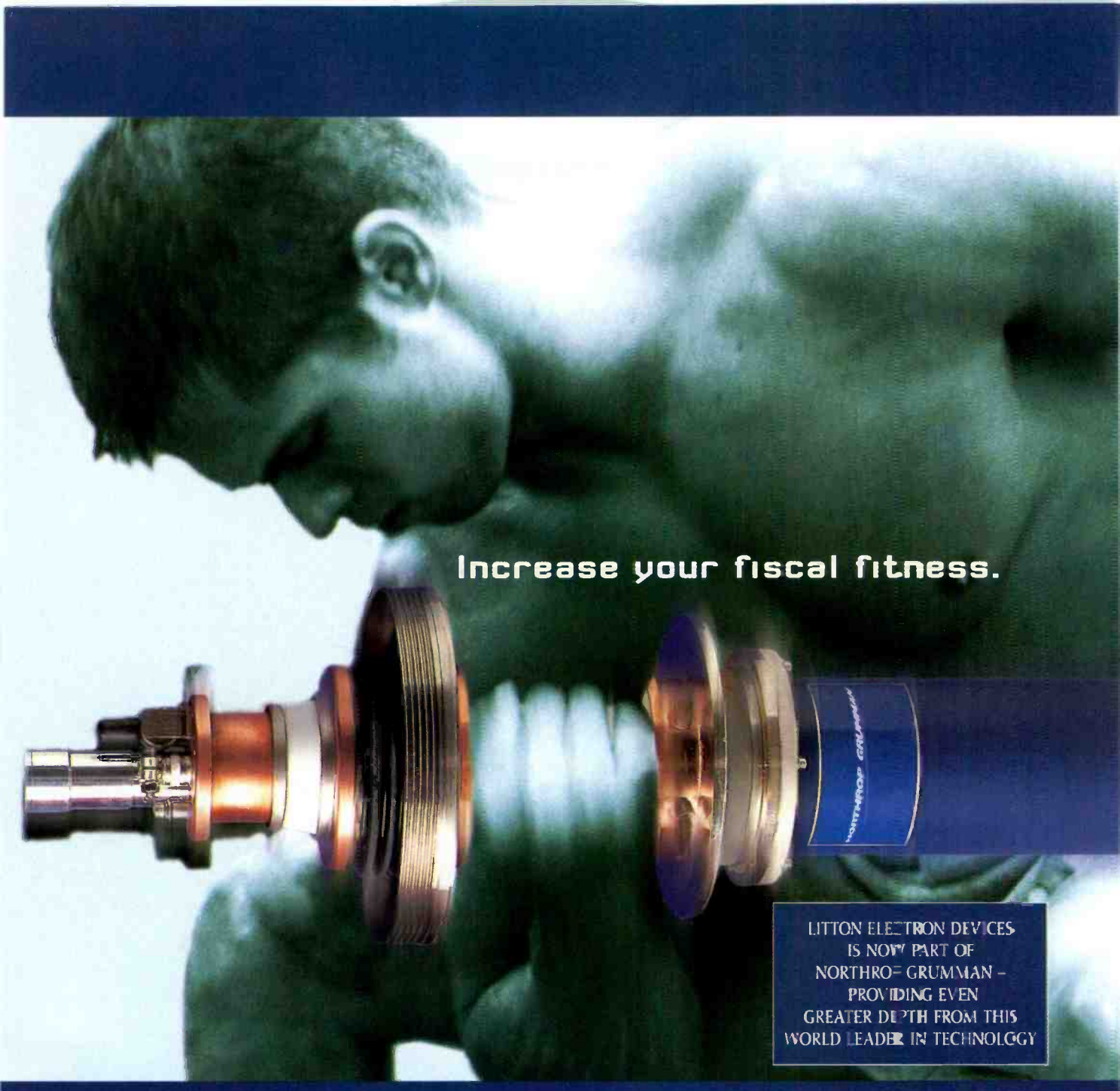

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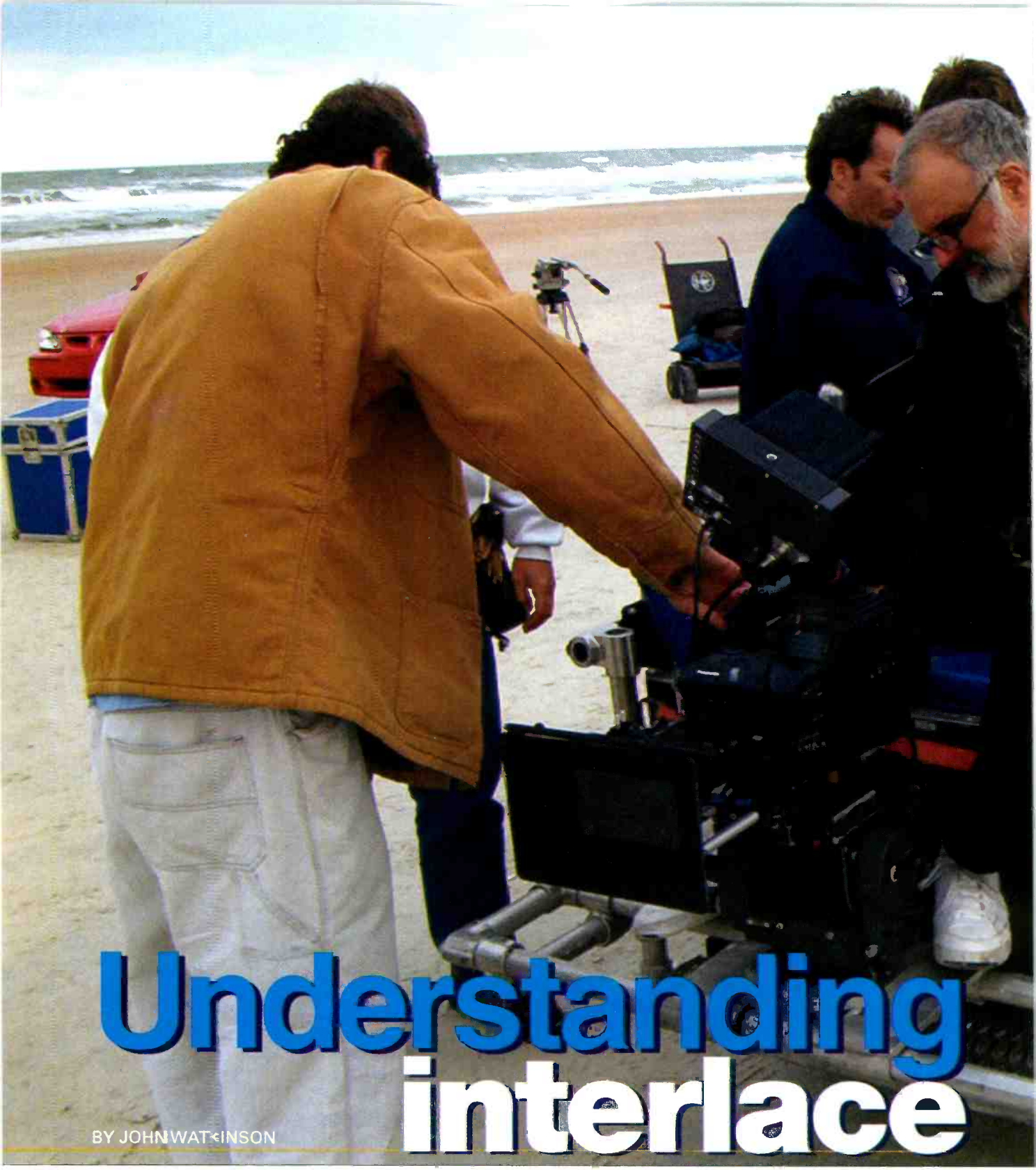


Understanding interlace

BY JOHN WATKINSON

Many years ago, a team of engineers in England worked on what was then called high-definition television. It had 405 horizontal scan lines and was monochrome only. It offered high definition compared to the television technology that had gone before, and had the potential to serve as a television standard for several decades. But the design presented problems. To achieve the intended resolution, it required hundreds of horizontal scan lines, each of which required quite a few cycles of detail. And to prevent flicker, the pictures had to be updated 50 times every second. Figure 1 illustrates the problem. Of the 405 total horizontal scan lines, about 380 would be visible on the screen. Since each cycle of vertical modulation can create two scan lines, the design would need 190 cycles of vertical modulation. Allowing for

Ticheli Productions uses Panasonic's AJ-HDC27 VariCam variable-frame high-definition camera in many of its applications.

aperture effect, we can reduce that number to about 150 cycles. Creating a raster with a 4:3 aspect ratio raises the required number of cycles of modulation in each active line to 200. Accounting for the entire line period (not just the visible part) puts the number at about 250.

Creating a raster of 405 lines at 50Hz would require a line rate of 20.2kHz. If each line had 250 cycles of vertical modulation, the system bandwidth would be 250 x 20.2kHz, which is just over 5MHz. Allowing for an audio carrier and a vestigial lower sideband would increase the required bandwidth to about 6MHz. This was simply too much bandwidth for the VHF technology of the day and would have significantly raised the cost of transmitters and receivers.

Weaving a solution

The solution to the bandwidth problem was an American invention called interlacing. This scheme does not transmit the scan lines of the frame in their natural order. Instead, each frame is divided into two periods called fields. The first field carries the first line, the third line, the fifth, and so on. The second field carries the second line, the fourth line, the sixth — all the lines omitted in the first field. This "division of labor" can be achieved by modifying the scanning process of the tubes in the camera and the CRT display. There must be an odd number of lines in each frame so that one field ends with a half line and the next begins with a half line. Figure 2 illustrates this process. In the figure, the solid lines represent the scan lines transmitted in the first field, while the dotted lines represent the scan lines transmitted in the second field.

Since the lines in the two fields are adjacent, the electron beam in the CRT very nearly revisits the same point on the screen once per field. Thus, it could be argued that the perceived flicker frequency would be given by the field rate, not the frame rate. So, to avoid flicker, a field rate of 50Hz was considered sufficient. This resulted in a frame rate of only 25Hz, thereby halving the channel bandwidth required to transmit the information. In modern terminology, we would describe interlacing as a 2:1 lossy compression technique — an early version of MPEG if you will.

Subsequent to the American interlace standard, a French team proposed a system with 819 horizontal scan lines using a triple-interlace scheme (three fields in a frame), but this was not taken up elsewhere. Instead, the 2:1 interlacing scheme was widely adopted. The United States developed a 525-line, 60Hz, 2:1 interlace standard (often

called 525/60i), which is still in use. The 525/60i U.S. standard has a line frequency of around 15kHz. When European teams designed a successor to the 405-line scheme, it seemed a good idea to select a line rate similar to the American design so that the same line-scanning components could be used. But, since the European frame rate was only 50Hz, the Europeans increased the number of lines to 625.

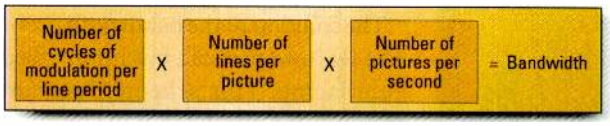


Figure 1. This diagram shows how to calculate a TV signal's bandwidth. Interlacing cuts bandwidth in half. For high-definition TV formats that need more cycles and more lines, bandwidth increases as the square of the definition.

The idea of treating interlacing as a compression technique is extremely useful because it allows you to make certain performance predictions. The fundamental caveat associated with compression is that you don't get something for nothing, and most techniques that reduce bandwidth will take a toll by causing picture artifacts or by requiring expensive hardware. For example, MPEG reduces bandwidth, but it also means you have to go out and buy preprocessors.

Other analog compression techniques

Traditionally, the television industry has made extensive use of analog compression techniques, as Figure 3 shows. In some cases, the compression technique causes no visual degradation of the images because the human visual system cannot detect the information lost through compression. A good example of this is the use of color-difference signals. Video engineers understood early on that the human eye detects detail only in the brightness of an image; it does not perceive color in detail. Using a matrix, the R, G and B signals from a color camera are converted to three other signals, one of which is a virtual monochrome signal called luminance. This is the signal that would be generated by a monochrome camera having the same spectral response as the human visual system. Since this signal carries the brightness (and therefore all of the detail) of the image, it is the only one that needs to be transmitted in its full bandwidth. The two color-difference signals (which are generated by subtracting the luminance signal from the original red and blue component signals) can be sent with reduced bandwidth because the human visual system cannot detect the resulting loss of color resolution. This color-difference compression method has attained universal acceptance, and is retained in modern video systems such as JPEG and MPEG.

Gamma is another analog compression technique. The video signal is made nonlinear in the voltage domain of the camera using a standardized curved transfer function. The effect of the curve is that changes in brightness occurring in the dark parts of the picture cause more voltage swing in the video than the same changes in bright parts. All TV displays need an inverse-gamma process that applies an opposite curve to the signal to produce a linear light output from the screen. A further effect of the reverse curve is that noise on the video signal in dark picture areas is reduced more than noise in light areas. This is the true goal of gamma because the human visual system is more sensitive to noise in dark areas. Were it not for gamma, the signal-to-noise ratio of video signals would need to be about 30dB higher, and transmitter power would have to be much greater. In the digital domain, gamma is retained so that eight-bit samples are adequate. Without gamma, linear light digital would need 14-bit samples. It is a pure coincidence that the nonlinear characteristic of the CRT allows direct decoding of gamma-corrected signals. Non-CRT-based television systems must use a gamma decoder.

The use of gamma itself is invisible, but it does cause some minor losses in color-difference and composite systems where the nonlinearity prevents accurate matrixing and de-matrixing of components. This is known as failure of constant luminance, and it isn't really serious.

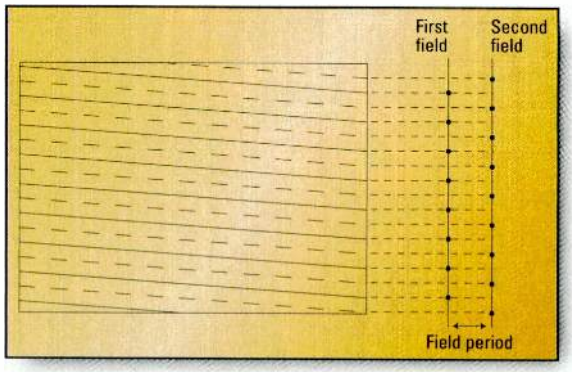


Figure 2. Interlacing meshes two subsampled fields together to make a frame.

In modern terminology, we would describe interlacing as a 2:1 lossy compression technique — an early version of MPEG, if you will.

Composite video such as NTSC is another form of analog compression. Using an amplitude-and-phase-modulated subcarrier linearly added to the luminance, engineers have shoehorned color into the same bandwidth as monochrome. By and large it works quite well, provided actors don't wear certain types of patterned clothing that creates luminance look-

ing like a subcarrier.

If all of the compression techniques used in NTSC are added up, as Figure 3 shows, it's quite a savings compared to linear-light, progressive-scan RGB video. Color-difference and composite together yield a compression factor of 3:1. Gamma yields a compression factor of about 1.7:1, and interlacing yields 2:1. The result is a total compression factor of more than 10:1. Not bad for analog technology using vacuum tubes. Given that the compression is relatively crude by modern standards, we would be surprised if it didn't cause some loss of quality. But most people don't notice it. There are two reasons for that. First, very few people have ever seen linear-light, progressive-scan RGB video, so they have no basis for comparison. People don't generally call for an improvement in anything unless they can see something better elsewhere. Secondly, consumer video does not have an enthusiast group equivalent to the audio hi-fi afficionados. The closest video counterpart to hi-fi is home theater, where picture quality does matter. But then, most people don't watch television in home theaters; they watch it on a relatively small screen in their living room.

Technology	How it's done	Compression factor
Color difference	R, G, B → Matrix → $Y_1 P_{R1} P_B$	3:2
Composite	$Y_1 P_{R1} P_B$ → Encoder → NTSC Subcarrier → Encoder	2:1
Gamma	Linear Light → Out/In → Y	1.7:1
Interlacing	See figure 2	2:1
	Total	10:1

Figure 3. The four analog video compression techniques. Interlacing creates the most problems.

Probably the most serious drawbacks to today's television involve not its picture quality but its content, and the interruption of that content. Today's television contains insufficient intellectual content, and the flow of whatever content there is has been largely destroyed by ceaseless commercial breaks and messages. But those issues are beyond the scope of this article.

For economic reasons, digital compression techniques are slowly but surely replacing analog techniques. The use of MPEG compression in digital television, for example, has been entirely driven by broadcast economics. But this has not improved the quality of the pictures — the MPEG artifacts have simply replaced the NTSC artifacts. Effectively, the consumer gets the same quality as with analog television. But less bandwidth is needed, so the broadcaster benefits.

The fundamental caveat associated with compression is that you don't get something for nothing.

Compounding the problem

Two lessons learned from compression are that, first, it is lossy and, second, putting compression codecs in tandem compounds the loss. Figure 4 shows the problem. If we agree that interlacing is a compression technique, then feeding an interlaced signal to the input of an MPEG encoder is effectively using two codecs in tandem. Interlacing is supported by MPEG-2, not because it is a good idea but because there is a lot of legacy interlaced material that needs support. In practice, MPEG-2 gives better results for the same bit rate by starting with a progressively scanned input. The only exception to this is at very low bit rates, where the adoption of interlacing will reduce the level of MPEG artifacts. But you wouldn't want to watch television at these bit rates, so this point is academic. It's a matter of fact that interlacing works best with pictures having a small number of lines and high field rates. For example, NTSC, with only 525 lines, actually has better dynamic resolution than PAL, which has more lines but a lower field rate. Thus, attempts to make high-definition television with interlacing are doomed because the dynamic resolution just gets worse unless the field rate is also increased.

To see why MPEG doesn't like interlacing, it's important to realize what interlacing does. Figure 2 showed that, given a complete picture in which all of the horizontal scan lines are present, interlacing takes every other line on the first field and comes back later for the ones in between on the next field. When there is no motion in the image, this works quite well. The problem becomes apparent when anything in the image moves.

In a still picture, the vertical detail is shared between the fields, and both fields are needed to display all of the vertical detail. But, when an object in the image moves, its location changes from one field to the next. This makes it impossible to combine the two fields to recover the vertical detail. Conse-

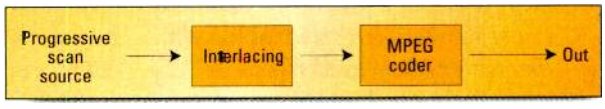


Figure 4. Using interlacing with MPEG causes concatenation. Two compressions in series cause more damage. In particular, interlacing prevents the MPEG motion estimation from working properly.

NBC's newsroom communication system

BY ROBERT STREETER AND THOMAS DREWKE

NBC's production intercoms and associated communications systems successfully support the efforts of NBC producers and technical staff for news, sports and entertainment programming. But changing economic times, increased system complexity and competition in the broadcast market demand that communications systems and infrastructure cost less and perform better. Automation and digitization are obvious ways to achieve these goals. Thus, NBC has embarked on an aggressive plan to automate and digitize all mission-critical, infrastructure-related processes. While the NBC production intercom systems use voice-over-IP (VOIP) and other voice-over-data (VOD) transport technologies to lower operating costs, the need to lower design and maintenance costs could only be fulfilled through the creation of a system-specific supervisory system, which eventually will be linked to other databases.

This article details an NBC automation and digitization initiative that provides efficient system management and maintenance for its production intercom systems.

The article focuses specifically on the intercom interconnectivity among more than 15 different NBC entities and locations around the world. Each NBC location may contain a system as elaborate as a huge intercom matrix with hundreds of ports, or only a few remote intercom panels. Regardless of the size of the facil-

NBC's control room 3A in NewYork. This newsroom's communication system is fully networked with other facilities around the world through a trunked RTS/Telex system controlled by Trunk Master software. Photo by Chris Papas.

ity, for maximum benefit and efficiency, each communications system needs to be connected to all other systems within the NBC enterprise. This interconnectivity among intercom matrices is referred to as "trunking," a word borrowed from telephone systems that used "trunk lines" to connect one phone switch to another.

A bit of history

In the old telephone long-distance model, when you wished to make a phone call from Chicago to New York, an operator (or later, a computer and a phone switch) would connect you to a physical copper path leading from a phone switch in Chicago to a phone switch in Pittsburgh to a phone switch in Philadelphia to a phone switch in New York. This was trunking. Major telecom systems have long since replaced this simple trunking method with a better one that digitizes and multiplexes phone conversations and passes them into massive data streams that flow along many possible paths to the required destination. Since there is no "trunk line" directly involved – but rather fiber optic cables carrying digitized conversations, video transport streams and other data flowing continuously – modern telecom systems achieve two enormous advantages over the old copper trunks: efficiency and reliability. The efficiency and the reliability are tied together in the same technology. When you pass conversations as data, you can transparently reroute conversations via hundreds of possible routes, bypassing failed nodes quickly and avoiding single points of failure. When many paths for data exist, conversations between New York and Chicago can travel via many alternative pathways, reducing the need to build new facilities and increasing the chance that a call will go through. A digital network is better than a single path.

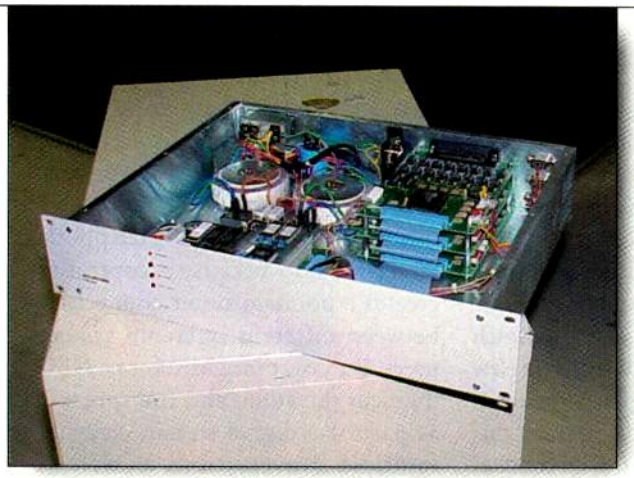
NBC's systems interconnect the many intercom matrices using a hybrid method combining the old analog telephone trunk method and the newer digital telephone trunking. If a user on the MSNBC intercom matrix in Redmond, WA, wants to communicate with someone in the NEWS intercom matrix at NBC headquarters in New York, some type of trunk controller is needed to set up a communications path from Redmond to New York. This process is similar to the old analog telephone trunk method because a controller creates a point-to-point connection between different intercom system users. But, over long distances, NBC digitizes the audio and transports it as part of a digital stream carrying multiple conversations as well as data and other communications.

Trunks and their master

An intercom-to-intercom communications path, called a trunk, is simply a four-wire (two-pair) audio link between a port on one intercom matrix and a port on another intercom matrix to provide communications between users of the two different matrices. The Trunk Master, a smart controller from RTS/Telex, manages these audio links.

In 1994, the controller was the first of its kind to allow interconnections (trunking) among several different intercoms, providing distributed processing of intercom systems. Within NBC's facility in New York, a single large intercom was replaced in favor of several smaller systems interconnected with copper audio trunks and controlled by this system. It was only later, beginning in about 1996, that the philosophy was extended to allow interconnection of matrices outside of NBC's main headquarters. Today, the very same controller connects more than 16 intercom systems from Washington state to Washington D.C., as well as providing international connections to London. Temporary connections have supported various news events such as political

Changing economic times and competition in the broadcast market demand that communications infrastructure cost less and perform better.



The first RTS/Telex smart trunking controller, known as the Trunk Master.

primaries and conventions, sports events such as the Olympics at various locations – even a research vessel used for the Titanic reclamation expedition.

Although NBC has taken an important step by adopting digital multiplexers and VOIP equipment for the transport of trunk audio, it is important to understand that the controller itself does not know that compressed, multiplexed or any other kind of digital audio paths exist between intercom matrices. Its logic is based on the premise that there is a four-wire audio link between intercoms for each trunk, regardless of the technology used to achieve the audio link.

It uses RS-232 or RS-485 asynchronous serial connections to deliver commands to and receive responses from each intercom matrix in the communications network to fulfill long-distance communications requests. If the intercom is distant, industry-standard converters convert this data to TCP/IP.

Maintenance and supervision

In maintaining a system with as many as 16 matrices spread out geographically, the system designers encountered many challenges. The first and most obvious was that since the Trunk Master communicates with each intercom matrix in an out-of-band manner as described above, it cannot know if any one given trunk is actually connected and capable of transporting audio. The Trunk Master can only report when an intercom controller is unresponsive. This conveys no information about the continuity of audio trunks or the acceptable fulfillment of a communications request.

The second and less obvious challenge is the simple management of all the information about each intercom system. For example, consider these questions: How many trunks connect New York to Washington? How many trunks are actually working? Which port in the NEWS intercom at NBC in New York is attached to Trunk 105, and to where does this trunk connect? Which trunk is currently being used to connect a director at CNBC to a remote studio in London? Is the smart controller fulfilling each request as it is submitted from remote intercoms, or is it having resource allocation difficulties? And so on. As the overall system progressed in complexity, it became clear that the option of hooking up a tone generator in London and a meter in New York and manually testing each trunk from time to time was a poor one. Not only was there not enough time to do these tests but, even if time were found, it was not always possible to get engineers in each location to drop what they were doing and gather on a conference call.

Meeting the challenges

The solution to these two challenges grew out of discussions between the authors of this article, with contributions from many engineers from NBC, MSNBC and RTS/Telex. It was obvious that there had to be a way to take advantage of today's automation technology and PC-based solutions to automate the management and supervision of the intercom trunking system. At first glance, one might think that simply adding intelligence to the existing system would solve the problem. But significant barriers precluded that solution. The most significant was the fact that the original Trunk Master was a task-built industrial controller with no capability to run a GUI. To leverage the databases of the Trunk Master and the intercom systems for future features, the engineers decided that the new system would require an external, supervisory PC and testing system.

The first breakthrough came when participants on this project identified a standard off-the-shelf product called the Auto-TIMS IIIR - Dataline Analyzer manufactured by Consultronics. The unit was capable of running automatic tests on the quality of a two- or four-wire voice circuit, data circuits or xDSL local loops. During the automated testing process, it can make a full suite of measurements and compare the results against pass/fail parameters. An RS-232 command port on the unit accommodates the commands sent to run tests, and the reported results. But, despite the capabilities of the Auto-TIMS unit, it still had a serious limitation. It would require several manually supervised units located at each end of trunk connections and/or at each intercom.

To overcome these limitations, the

The option of hooking up a tone generator in London and a meter in New York and manually testing each trunk from time to time was a poor one.

engineers developed a specification to link the testing capabilities of the Auto-TIMS unit and the intelligence of the intercom Trunk Master. A subsequent project undertaken between NBC and RTS/Telex resulted in a Trunk Master supervisory system.

Trunk Master supervisor

As built, the supervisor consists of a Pentium III PC running Microsoft Windows 2000, connected by serial port to the Trunk Master and the Auto-TIMS IIIR, and installed on NBC's corporate Ethernet LAN. (See Figure 1)

RTS/Telex provided the supervisor software according to NBC specifications. The software consists of modular sections within a main program that accomplish a list of tasks (discussed below). The Trunk Master operating software was also modified to support the functionality required by the new supervisory system.

NBC had several requirements for the new supervisor system. First, it needed to be a Win32 GUI program built to run on Windows 2000 and its successors, such as Windows XP. It also needed to collect all attached intercom configuration data from the controller and store it in a Microsoft Access-compatible database format (using the Microsoft Jet data engine). This information is readily available because the controller itself requires complete configuration data from each intercom to do its job. The supervisor simply piggybacks upon this existing data collection, consisting primarily of tables listing each port and trunk on each intercom, etc.

The software must be capable of testing all communications-network voice trunks using outboard automated test equipment (ATE) together with commands issued to each intercom matrix via the controller.

The supervisor software must be capable of critical management functions including automated testing; recording and reporting the results of automated testing; and recording and reporting the activities of the Trunk Master as it fulfills trunking requests. Other functions include displaying collected data in defined preformatted ways and notifying responsible parties when reported results are outside definable limits. These management functions involve the automated use of a sophisticated database, generating screen and output reports in real time.

In addition to screen and output reports, the supervisor software must be capable of graphically displaying the interconnections between all of NBC's communications systems and indicating the quantity and quality of connections in use and available.

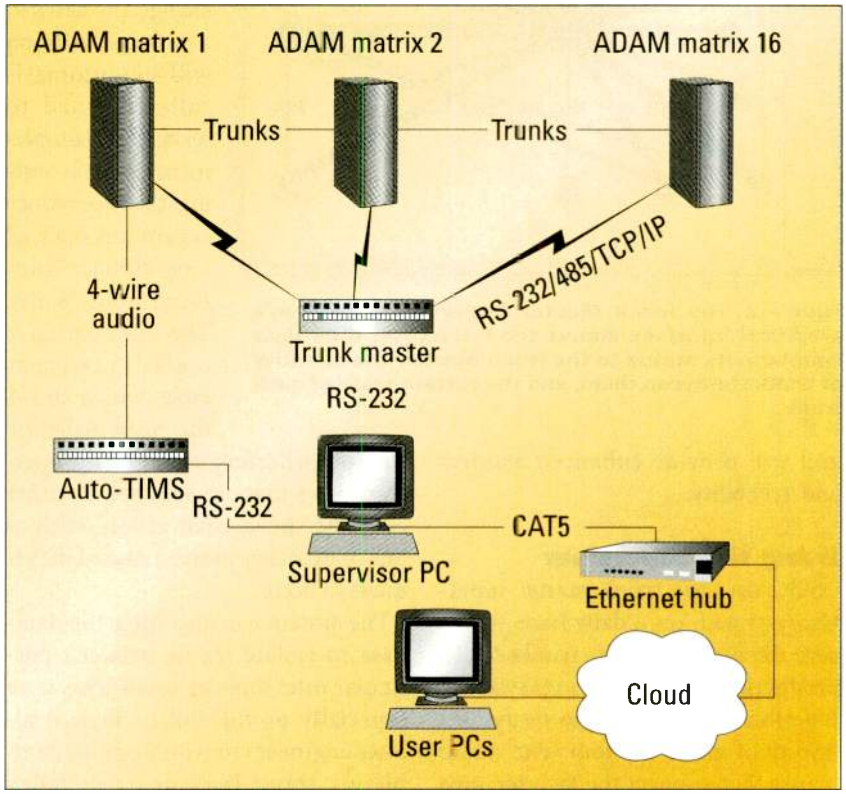


Figure 1. The Trunk Master Supervisor consists of a Pentium III PC running Microsoft Windows 2000, connected by serial port with the Trunk Master and the Auto-TIMS IIIR, and installed on NBC's corporate Ethernet LAN.

As a final developmental step, all of the current and historical information contained within the supervisor's database must be integrated into a larger, Web-based database to allow any NBC employee or others with security clearance to view this information using a Web browser. It also allows multiple simultaneous users to examine near-real-time, dynamically updated screens showing the current status of intercom trunking throughout NBC.

As of August 2002, the first five elements listed above had been completed, and the system had been installed at NBC's headquarters in New York. The recently introduced PC-based Trunk Master control by RTS/Telex will soon be integrated into the NBC systems

The engineers developed a specification to link the testing capabilities of the Auto-TIMS unit and the intelligence of the intercom controller.

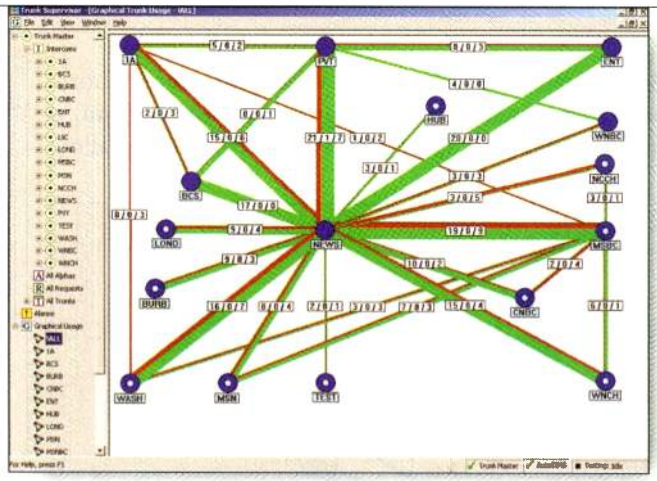


Figure 2. The Trunk Master Supervisory System's graphical interface shows the intercoms, their data connectivity status to the Trunk Master, the quantity of trunks between them, and the current state of each trunk.

and will provide enhanced features and reliability.

Using the supervisor

NBC uses the trunk master supervisory system on a daily basis to ensure the integrity of its trunked RTS production communications systems. It performs daily testing to verify continuity of all of the four-wire audio trunks that connect the 16 intercoms together. The system performs this test automatically at a user-specified time and interval, without any human intervention needed. It tests each trunk for audio continuity, loss and frequency. This is done by putting the trunk in a state known as "maintenance mode," in which the supervisory system directs the controller to move any traffic on the target trunk to another trunk, and temporarily prevents the controller from using the target trunk for any new traffic. The system lists all trunks with their most recent test results in a trunk-summary table.

After the system tests the trunks, it deems them as either passing or failing based on user-specified parameters for acceptable loss. The system lists failed trunks in a daily alarm report, generates an e-mail to the engineering staff, send an alphanumeric page to the engineer on call, and automatically leaves the trunks in maintenance mode, essentially taking them out of service.

During subsequent daily testing, a previously failed trunk that has changed its status to a passing condition will be automatically returned to service. To complement the daily testing, the supervisory system can track all long-distance communication paths. The information is tracked in a requests table, which shows the near-real-time state of each trunk, identifies the intercom users that are attached at either end, and shows what action (such as talk or listen key presses) caused the request to occur.

The system can also filter the database to isolate traffic between particular intercoms or users. This is an especially useful tool because it allows engineers to troubleshoot complaints about inadequate or failed communications from a central location without having to contact their counterparts at other NBC facilities. In this way, a trunk that has failed since the last daily test can be manually put in maintenance mode, correcting the communications problem instantly. In addition, engineers can check descriptions of symptoms against actual system actions to further help them troubleshoot problems. The system also shows the status of all intercoms with respect to their data connectivity to the controller.

Intercoms that lose connectivity will trigger entries in the alarm report, generate alert e-mails and pages, and cause the system controller to initiate busy signals when trying to establish communications to or from that intercom. One of the most powerful benefits of the system, however, is a graphical interface that pictorially shows the intercoms, their data connectivity status to the controller, the quantity of trunks between them, and the current state of each trunk. This capability allows engineers to view the loading on the system and helps determine the quantity of trunk paths that are needed between intercoms to prevent a "busy" signal from occurring, even during peak periods. Many user-created displays show usage between two intercoms, groupings of several intercoms, or all intercoms and trunk paths in the entire system. (See Figure 2.)

The display shows intercoms as circles, and trunks between intercoms as lines. Intercoms shown as blue circles are communicating with the controller, while intercoms shown as pink circles have lost their connectivity. The varying width of the trunk lines represents the total quantity of trunks between intercoms. The display uses three colors to show the state of each trunk: green indicates empty or available trunks, red indicates trunks currently in use, and yellow indicates recently used trunks temporarily awaiting use for an identical request. Summary boxes above each grouping of trunks show actual numerical values for this summary information. During busy times, these displays clearly show the dynamic performance of the trunking system.

The supervisory system efficiently maintains and supervises NBC's trunked production intercom systems. Future integration of the Trunk Master supervisory system into NBC's larger database systems will achieve additional efficiency by Web-enabling the existing solution. Although the scale of NBC's communications systems is large, the solution achieved is scalable and can be applied to smaller enterprises with as few as two intercom systems. BE

Robert Streeter is a senior systems design engineer for NBC and is responsible for the worldwide interconnection of NBC's production intercom systems.

Thomas Drewke is a video and communications systems engineer at MSNBC in Secaucus, NJ.

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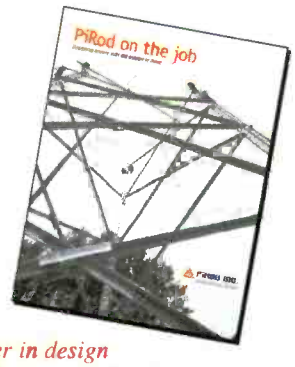

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Northrop Grumman's IOT with CEA technology

BY BUZZ MIKLOS

Many stations were waiting until the last minute to conclude transmitter deals, hoping that the FCC would delay the digital rollout. Recent changes in the FCC's position regarding the deadline for stations to begin transmitting high-power digital signals may now give station operators more time to make the right equipment choice, and transmitter OEMs more time to develop and demonstrate the constant efficiency amplifier (CEA) technology before the stations need to commit to an IOT-based system.

One option for broadcasters is Northrop Grumman's CEA, an IOT with a multistage depressed collector (MSDC), which sorts electrons according to their energy, causing both the beam current and the average electron collection voltage to go up and down with the RF output. In effect, the MSDC is operated at voltages that minimize the input power for a given set of TV signal statistics. As a result, the IOT can operate in digital service at a 50 percent improvement in efficiency compared to standard IOTs, enabling the television station operator to save at least $20,000 per year per tube in power expenses.

Portions of Northrop Grumman's CEA IOT used for low-power broadcasting do not need to be modified significantly when a broadcaster makes the transition to high power.

Evolution of an IOT

Following its product launch at NAB2001, Northrop Grumman Electron Devices began an intensive program of testing and refining the IOT, including sending it to transmitter OEMs for testing, qualification and system integration. The product now available was developed through a three-phase program. The first phase was the design and testing of a form-fit-and-function IOT that would operate in existing transmitters. In the second phase, RF cavity design, engineers focused on minimizing insulation, RF leakage and mode problems by connecting the input cavity directly to the grid of the IOT. An idler cavity of one-half-wavelength placed between the grid and anode minimizes RF leakage from the high-voltage seal while enhancing efficiency and linearity. The third phase included the development of the MSDC to provide nearly constant efficiency.

Today's tube will operate at 130kW of peak power or about 30kW average power in 8-VSB service. It meets all FCC requirements for IMD, mask, shoulders and phase noise when operated at full-rated power. It has been designed to fit into a standard L-4480T trolley assembly and uses the same heater, bias and RF drive voltages as a standard IOT. Safe PAO oil cooling allows the tube to operate at a maximum of 30kW average power.

Now a station can use what is essentially the driver section of a high-power transmitter to get on the air.

High-power marketplace

The recent decision by the FCC to allow stations to broadcast digital at reduced power and thereby hold their licenses will have a significant effect on the high-power marketplace. Now a station can use what is essentially the driver section of a high-power transmitter to get on the air. The portions of the system purchased to broadcast at low power do not need to be modified in a significant way and will not become obsolete. The exciter, control circuits, facilities and driver amplifier will all be retained, and when the station is ready to go to high power, the final power amplifier will be added. BE

Buzz Miklos is director, sales/marketing, for Northrop Grumman Electron Devices.

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Centralized graphics workflow

BY WILLIAM BYRNE

The continued proliferation and integration of wide area server-based technologies is providing broadcast station groups with the tools necessary to help ensure higher levels of quality, control and consistency with their affiliates, partners and distribution facilities. Solutions and practices once almost exclusive to information technology are finally establishing a healthy footprint in the world of broadcast. The concept of centralized graphics creation and distribution is just one example of the many benefits of this change.

In a centralized graphics model, station groups can produce standardized branding and templates for their programming and distribute the assets to other facilities for localization and customization tailored to suit individual station and/or regional preferences. Housing content creation talent and equipment in a single location less encumbers the production processes in remote facilities with the requirements of marketplace convergence among station groups, both network-owned and independent, have driven the trend of centralized control. Given the economic constraints and high costs related to graphics creation, the concept of centralized graphics creation and distribution can be beneficial to the broadcast community at large.

Factors such as the continuing marketplace convergence among station groups have driven the trend of centralized control.

branding and programming uniformity. Similar types of hub-and-spoke implementations (i.e., centralized component production and distribution to assembly operations) have proven their effectiveness in many other industries.

Factors such as the continuing

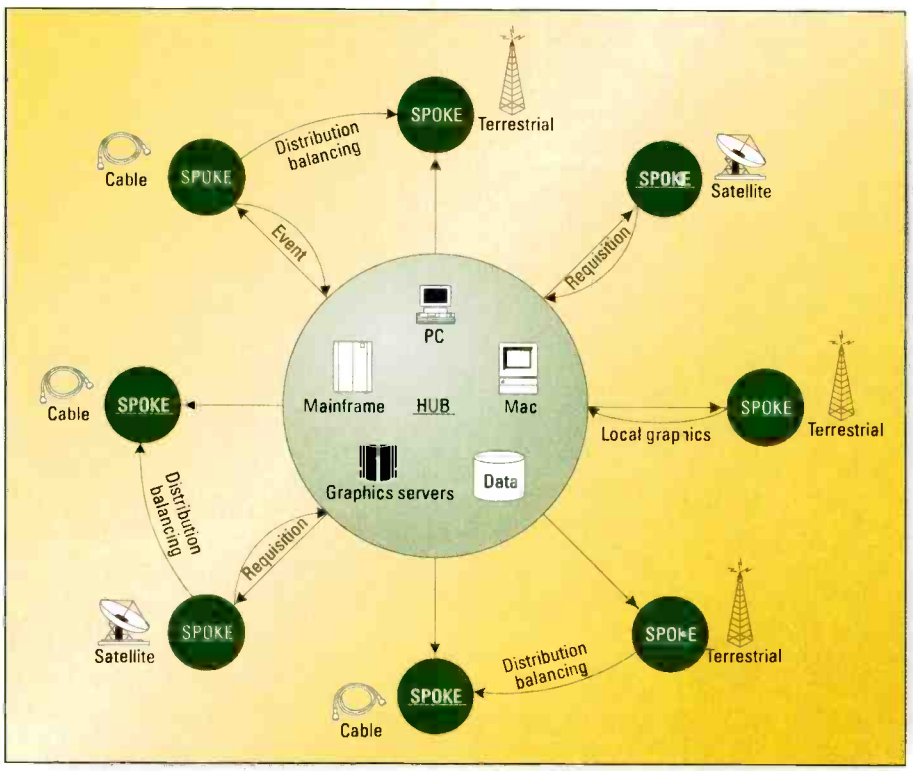


Figure 1. Advanced models for graphics creation and distribution systems utilize a cooperative design and decision process between the hub and spoke.

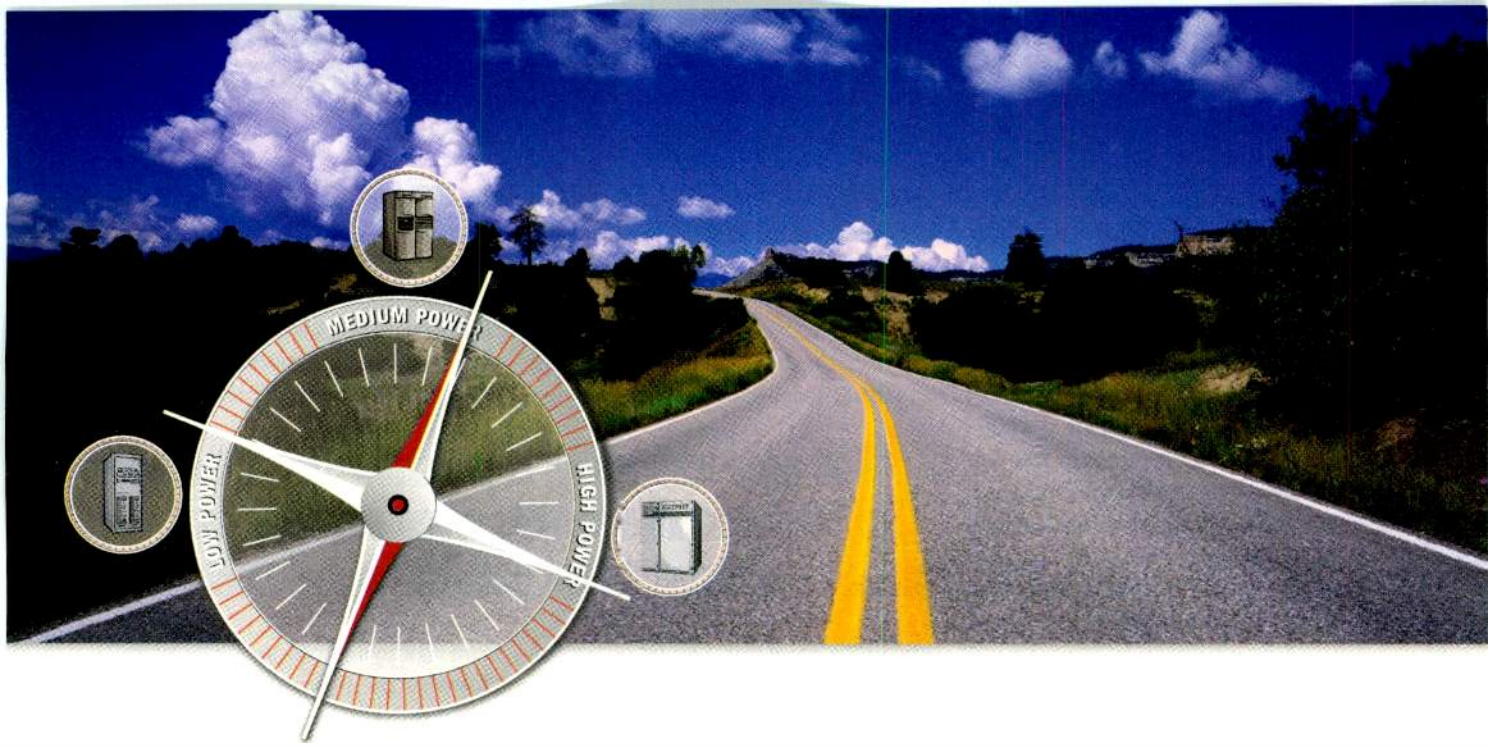
Graphics creation and distribution

The principles of centralized graphics creation and distribution can extend into various levels of complexity based on implementation requirements. Simple models would be for the most part unidirectional; the hub is the sole authority on the types of assets that will be produced and made available for distribution to the spokes.

Advanced models utilize a cooperative design and decision process between the hub and spoke and incorporate feedback and event mechanisms at multiple levels in the production process. Local feeds for high interest stories can be channeled back to the hub for redistribution to peer facilities. Replication, redundancy and distribution balancing should also be considered in advanced models (see Figure 1).

Simple implementation

A simple implementation for centralized graphics would include a team of artists and operators located at the hub who produce media assets using any combination of general to high-end



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graphics production equipment. The facility would also maintain a repository of images, clips, audio, templates and other components from which distributed assets would be created. Templates, composite assets, clips, macros and discrete metadata are then distributed to the spoke locations for update and playback. The spoke operators in this scenario need only apply local configuration and data bindings. Sample content would be time and temperature bugs, news tickers, lower thirds, squeeze & tease templates, and promos.

Extended implementation

The extended implementation builds on the simple implementation with added control and design decisions made at the spoke. Skilled operators at the spoke location produce the local content from the distributed assets created at the hub. Assets are accumulated into a local repository maintained at the spoke location. This type of workflow provides minimal support for news and sports reporting. In the case of news production systems, spoke operators and reporters can view and select assets from the distributed repository and construct localized media objects for upcoming programs. Live broadcasts of sporting events often require up-to-the-second design decisions and a mix of readily available graphics components and composites.

Advanced implementation

The advanced implementation inherits the core characteristics of both the simple and extended implementations. The defining characteristic of the advanced model is a closed communication loop. The simple and extended models relied on centralized graphics content with virtually no capabilities to predefine what the content should look like. Both models were not restricted from modifying their local repositories. However, no mechanisms existed that would provide the spoke with the ability to specify custom asset requirements and types of content it would ultimately receive from the hub.

The advanced model is preferred over the simple and extended models when cost and technical limitations do not prohibit its implementation.

The advanced model is preferred over the simple and extended models when cost and technical limitations do not prohibit its implementation. In general, its feedback mechanisms provide essential information and media vital to highly interactive broadcast groups. In addition to a media requisition pipeline, the model provides for off-site replication and archiving, distributed repositories, distributed asset version management, data distribution balancing, and local-to-national media paths.

Centralized graphics creation and distribution is a natural outgrowth of the private and public network technologies in use today. The solutions and opportunities it provides make sense. Practical levels of its deployment are technically and financially feasible; however, the greatest challenges facing its implementation rest in the thorough understanding of what it is designed to accomplish. The strict push model of the simple implementation demands the lowest level of integration and has the least impact on existing forms of production. Broadcast groups can start small by implementing the simple model and migrate to an advanced model at a rate that coalesces with the workflow of current production. BE

William Byrne is a software engineer and manager of interactive software for Chyron.

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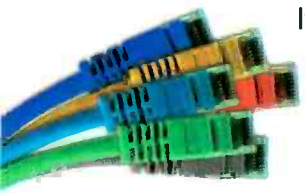

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TANDBERG Television's Voyager Lite

BY KHALID BUTT

Over the past four to five years, TANDBERG Television has worked to reduce the size of digital ENG solutions with each generation.

The most recent example is the Voyager Lite, an end-to-end wireless camera solution that refines the company's developments in COFDM and MPEG-2 technology. As a result of its recent acquisition of AVS, TANDBERG Television was able for the first time to add RF systems and design expertise in-house to create a complete, non-collaborative transmission system.

The system is comprised of a wireless backpack transmitter with MPEG-2 encoding, COFDM technology, RF upconversion and transmission; remote wireless camera control and two-way intercom; COFDM optimized receive antennas; downconversion; and a range of integrated receiver decoders for indoor and outdoor use. The lightweight solution weighs approximately four pounds. Professional cameras are generally fairly heavy pieces of equipment, so the size of the unit is particularly relevant when used for lengthy remote broadcast events! Adding additional weight by securing the unit onto the rear of a camera would tend to off-balance the camera, in addition to adding more weight onto the shoulder.

The TANDBERG Television Voyager Lite at the Deutsche Touring Masters auto racing championships in Germany.

A camera operator brings it into the field to capture content, while another operator waits at the remote truck or central receive site with the IRD to receive the signal for transmission back to the studio. The system uses the same technology found within a typical TANDBERG Television headend system for broadcast networks.

The system uses the same technology found within a typical TANDBERG Television headend system for broadcast networks.

The acquisition of AVS proved a major influence on the development of the system. Voyager Lite marks the first time the company has been able to produce an entire solution from the camera input into the transmitter through to the RF technology. This offers benefits including lower equipment costs and much faster reaction time to marketplace requirements.

The transmitter features "diversity antennas." These antennas have been integrated into the fabric of the backpack solution to eliminate the need for a rod antenna. These integrated antennas are designed to be as effective as the rod antenna without being cumbersome in live coverage situations. Rod antennas are also generally more fragile and prone to accidental damage — not the sort of event you want during a live broadcast.

Furthermore, the transmitters and antennas are designed to radiate out and away from the operator's body, without significantly reducing coverage. An omnidirectional rod antenna could potentially radiate directly into a user's head.

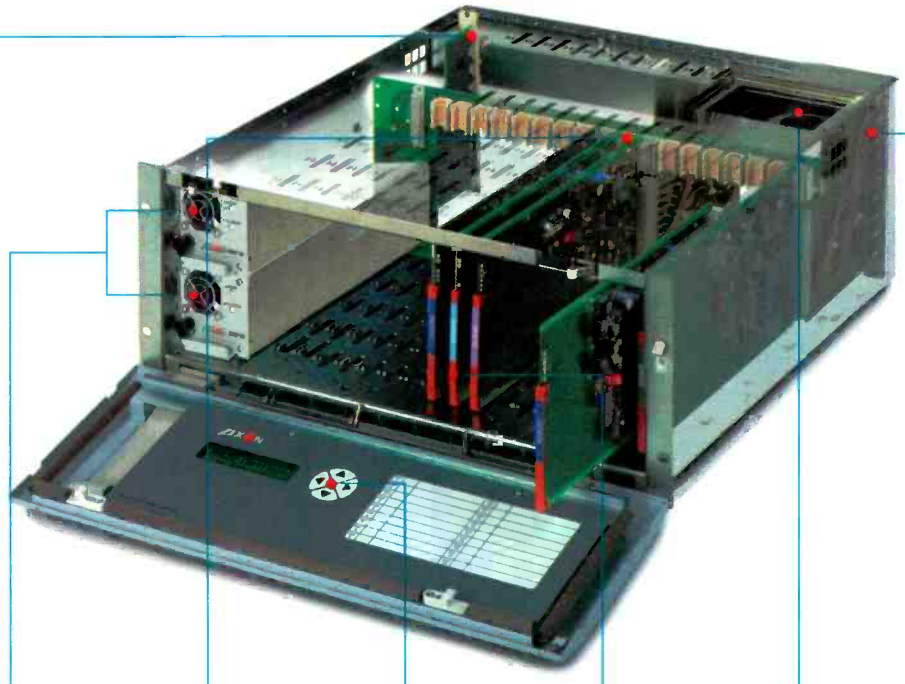
The system also measures at least 100 times lower than the maximum figure stipulated in Specific Absorption Ratio (SAR) tests. Therefore, if a user carries it for several hours while covering a live event, radiation is not a concern.

Also, the backpack solution includes more than one antenna for additional diversity. If in certain circumstances (such as body shielding) the receiver at the remote truck or central receive site is unable to pick up a quality signal from one of the antennas, it will likely pick up a signal from the second antenna. This increases the coverage area.

Officially, the coverage area of the system is specified as a minimum of 450 feet from the camera operator to the reception site, but this is a conservative figure. In practice, with optimal setup and depending on the shooting environment, the distance can be much greater. For example, Mexico-based broadcaster Televisa was able to successfully transmit broadcast quality content back to a remote truck from a variety of distances (from 900 to 1200 feet or 2400 feet when the camera had line of sight of the receive truck) at the Winter Olympic Games in Salt Lake City, with no external transmit amplifiers or rod antennas.

The system has a software-selectable

THE FUTURE



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"low-delay mode" in addition to a standard-delay mode. In standard delay mode, delays between the transmitter camera input to the decoded output are typically between 0.5 to 0.75 seconds. In low-delay mode, the end-to-end delay for the system is two to three frames. Although the standard delay is sufficient for most applications, niche live broadcast applications such as multiple camera cutovers can potentially benefit from using this mode. However, when selected, all MPEG-based low-delay schemes will exhibit a "latency vs. picture quality" trade-off that will be application-dependent, for which the company can advise interested users. As much as an additional 1.5Mb to 2Mb is required to obtain identical standard-delay picture quality. For remote broadcasts, where quality is a must, this can potentially be a serious issue. Hence, the system retains the standard-delay mode as a software option.

The camera-agnostic openness of the backpack solution allows the backpack transmitter to operate with a wide range of professional or prosumer cameras with readily available video/audio interfaces. While the system can be integrated into a camera manufacturer's interface, the open approach allows it to be interfaced with almost any camera for maximum interoperability. Likewise, it has an open output for further interoperability: Any MPEG-2/DVB-T receiver can decode the unit's signals.

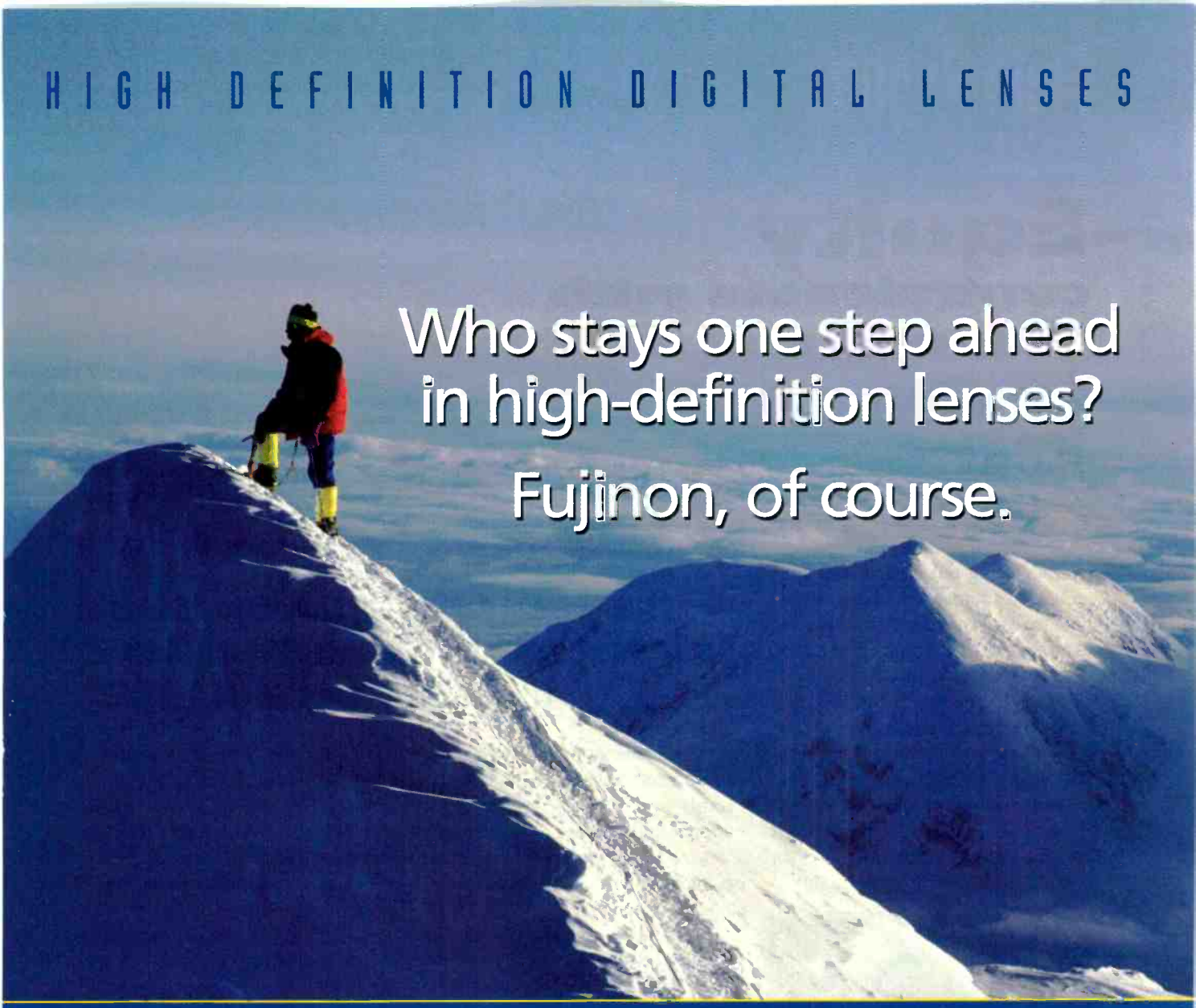
When audio is fed directly back to the remote truck from a wireless microphone and the video is fed back separately from the backpack solution, these two signals are usually out of sync. A simple way around this is an optional wireless microphone receiver/adapter adjusted to the transmitter. The microphone transmits content wirelessly to the transmitter, where the audio and video are sent to the truck in sync.

If a user carries the unit for several hours while covering a live event, radiation is not a concern.

When used in the field, the system enables the camera operator to obtain high-quality coverage in difficult terrains and situations, and eliminates the heavy cables and additional personnel associated with a traditional remote crew. BE

Khalid Butt is a product manager for TANDBERG Television.

HIGH DEFINITION DIGITAL LENSES



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Equity centralcasts with Omneon and NVerzion

BY DOUG KRILE

Equity Broadcasting, based in Little Rock, AR, has expanded to include low-power, full-power and call letter stations nationwide, with network affiliates such as PAX, WB, UPN and FOX. Using a centralcasting business model built around an automated Ku band satellite hub, the facility delivers programming to all four U.S. time zones. For Equity, centralcasting provides an efficient way to manage properties while reducing costs and increasing revenue.

As with any growing business, the magnitude of simplifying operations and pulling together an efficient playout and transmission system is a challenge. With five autonomous servers from different manufacturers routing programming to various remote sites, and five different playlist formats, the engineering team urgently needed a fundamental change in the facility's architecture. Equity's goal was a single networked server and automation system with the flexibility to route any material to any destination, and run multiple playouts simultaneously from common storage. Most importantly, in order to fulfill Equity's short- and long-term centralcast strategy, the new system needed to be scalable on demand.

Equity uses Omneon's MediaServer system with NVerzion software at its headquarters to automate its program playout nationwide.

If a company can control the maximum number of output channels at a minimum expense, then the centralcast model is worth pursuing.

They selected Omneon's MediaServer system and NVerzion's multichannel automation system as the backbone for the centralcasting hub in Little Rock. This combination offered a flexible, single networked solution capable of routing any material to any destination, while running multiple playouts simultaneously from common storage. From Equity's strategic standpoint, both systems have the ability to scale on demand.

Centralcasting operations

Equity coordinates programming for nine full-time television stations from their Little Rock hub. Programming is ingested from tape and satellite, and distributed from the server to the remote stations using their digital satellite uplink system – Central Automated Satellite Hub (CASH).

The NVerzion system consists of multiple modules that use RS-422 and Ethernet control to govern multichannel playout and commercial insertion from the server. One operator can handle all playout duties. As their operation grows, modular automation applications, additional channels and additional storage can be added.

The traffic department determines how and when each commercial or program is going to run. Once a clip arrives, either on tape or via satellite, there is relatively little human intervention from that point forward.

For commercials, tapes are inserted in available machines, which in turn are controlled by the automation system. Essential data for each clip is added, after which the digitizing begins automatically. For long-form syndicated programs that were recorded continuously from satellite, an operator uses an NPoint module to segment the single clip into multiple events, adding in-points and out-points as required.

Throughout the ingest process, clips are monitored as part of quality control. The automation software controls the VTRs, the router and the server's MediaPorts, ensuring that new material is properly written into the general database. Because playlists reside on more than one workstation, the general database refreshes all the peripheral databases on each modular control point.

Clips can play out individually, staggered or simultaneously to any (or all) affiliates – in any U.S. time zone. The automation system also allows operators to control tape decks for on-air playback, not solely for ingest. Operators

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can segment programs that air infrequently (such as commercials) input time code and play out directly from tape rather than taking up valuable server space.

The server system currently has a storage capacity of 1.5 TBytes. Content is encoded and stored in MPEG-2 format at 8 Mbits/s. The MediaServers and MediaStores use a redundant configuration that ensures no single point of failure, and are cross-connected through the Fibre Channel hubs. An extended file system ensures that all output channels have access to all stored media, as data is shared between servers.

A layered approach

The overall broadcast system is designed with three layers of functionality. The server falls within the inner digital layer, as interconnected by a Leitch 16x16 router. The middle layer performs conversion duties, with assignable A/D and D/A converters. A Utah Scientific 60x40 router interconnects the outer analog layer, within which all 15 tape machines and 18 satellite uplinks and downlinks reside.

This layered approach allows flexibility with regard to inter-format routing, and also simplifies monitoring duties. Any source can be routed to any ingest device, and if a problem occurs with a particular output, alternate pathways are available to keep an affiliate on the air.

The automation system controls elements within the analog and digital layers. The system is composed of modules for playlist automation, server encoding, file segmenting and clip preparation, and scheduling router events.

The bottom line

As Equity continued with the planned build-out of future stations, they needed the flexibility to quickly and easily add additional capacity. The NVerzion system provided the capacity and customization to accommodate their rapid growth. In terms of operator training and reducing operational problems on-air, the system's common user interface was beneficial. The Omneon system's scalability was also useful, with its ability to add channels on demand in increments of one or more. If there's a failure on any output channel, they don't have to take down any other channels in order to service the system. From a cost standpoint, because the system is tapeless, they've already lowered their maintenance expenses.

If a company can control the maximum number of output channels at a minimum expense, then the centralcast model is worth pursuing. Using Omneon and NVerzion systems, that model is successfully working in the Little Rock facility. BE

Doug Krile is the corporate director of news and public relations for Equity Broadcasting.

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16 Years in Business!

Vinten and the AMEX

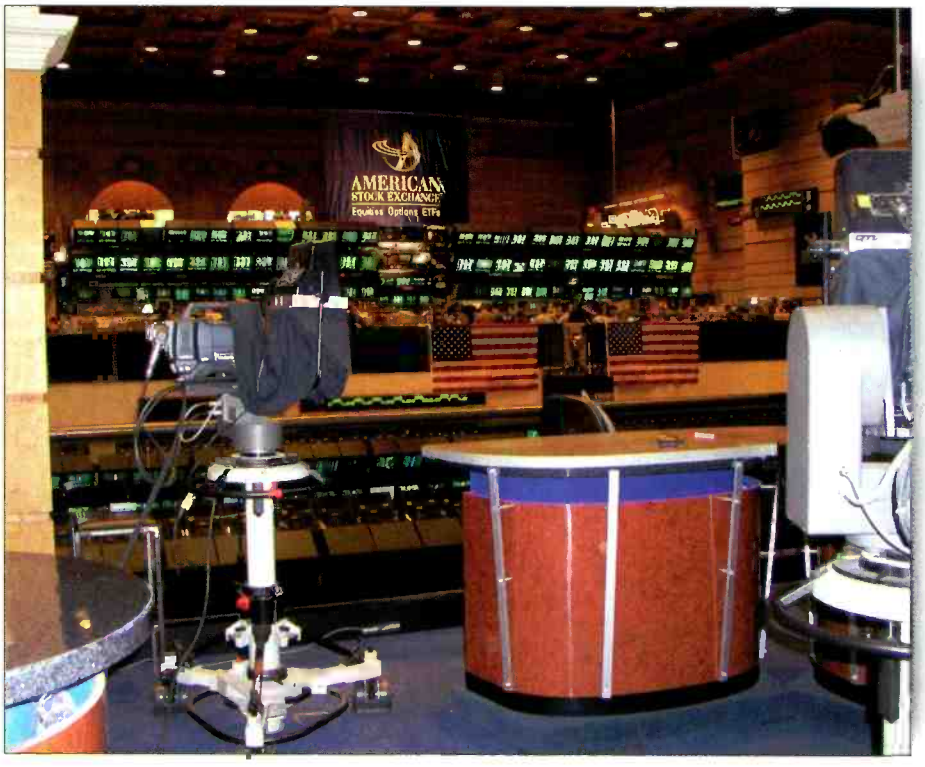
BY KEN MEYER

The American Stock Exchange might not be the first place one would think of in connection with television broadcasting, but the Broadcast Services department of the stock exchange does produce a weekly financial show with *Business Week* and BizNet Television News, which airs on WABC-TV in New York and on ABC affiliates across the country. In addition to this five-camera switched network show, the department facilitates upwards of 20 live reports and interviews a day, including daily financial market reports for use in broadcasts via cable, satellite and other television outlets throughout the trading day.

Depending on what is happening in the stock market on a particular day, AMEX also makes its facilities available to financial broadcast stations and cable programmers as a remote location for reports on breaking financial news or market updates. Space is also available for analysts to conduct interviews in AMEX studios. The stock exchange also provides related extended services, which might include taking in remote feeds, or facilitiating camera crews shooting on the trading floor.

In addition to maintaining the facility, as technical manager I work with stations to help produce their market reports, facilitate remote analyst interviews and direct a financial news show.

Since we have a relatively small staff, using robotic equipment eliminates the need for camera operators.



The American Stock Exchange isn't just about trading – it also does booming business in broadcasting. Recently, AMEX's broadcast department upgraded to the new HCP-8000 camera control system from Vinten to keep up with production demands.

The aim of the American Stock Exchange's television department is to gain maximum exposure through daily broadcasts, satellite media tours, special event programming, and by producing outside shows and taped segments. The department benefits from having access to industry professionals, traders, Exchange officials and AMEX-listed company executives for interviews. The department works closely with outside producers and directors to individually tailor all reports, interviews and specialized broadcasts to their specific needs.

To continue to meet the needs of these broadcasts and productions, the television facilities at AMEX recently went through an upgrade. As the facility grew and demands on it increased, the older equipment could not keep up. Since we have a relatively small staff, using robotic equipment eliminates the need for camera operators.

So we chose to upgrade to Vinten equipment because the facility's existing Vinten MCS-4000 controller with robotics had provided good service. The new equipment includes an HCP-8000 touchscreen camera control system with flat-panel display, HS-102P CCD camera pan/tilt heads, SLD-2010 servo drives and four Osprey Plus pedestal tripods.

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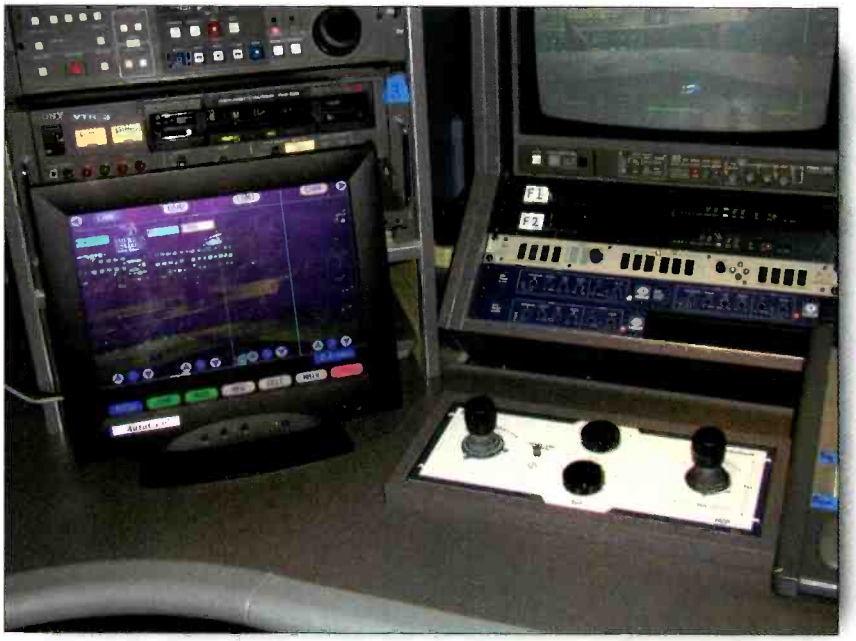

A Vinten AutoCam camera control system with a flat-panel touchscreen display in AMEX's broadcast department.

The new control system provides the flexibility to perform simultaneous camera moves among separate cameras in the studio, and allows more accurate positioning of camera shots for live broadcasts. It allows control of eight cameras, while the old equipment could only handle four.

Camera movements are smooth and precise, and the programmed shots are consistent.

The Vinten equipment is easy to use and has performed well. Camera movements are smooth and precise, and the programmed shots are consistent. The new equipment's ease of use and increased reliability will make any future expansions considerably easier. BE

Ken Meyer is technical manager, Broadcast Services, for the American Stock Exchange.

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When worlds collide:

DTV and the Olympics

BY PAUL BOYDEN

The Winter Olympics have come and gone. But KSL-TV, the NBC affiliate in Salt Lake City, was transformed when faced with the monumental task of managing their digital spectrum during the Olympics. The task involved broadcasting NBC-provided high-definition coverage, transmitting a standard-definition signal, continuing service to their traditional analog viewers, and leasing extra bandwidth to WOW Digital TV. (See Figure 1.)

Just before the Olympics, NBC announced that it would team with HDNet to provide eight hours each day of original HD coverage of competition and the opening and closing ceremonies. This meant that KSL would have the NBC/HDNet high-definition feed and their simulcast standard-definition feed multiplexed on their DTV channel.

KSL did not have a reliable way to quantify the differences in the encoding processes, so for comparison they left the original system in place in constant bit rate (CBR) mode, running SD at 3.5Mb/s and HD at 12 Mb/s.

By contrasting the two systems, they immediately realized that the MV50 SD encoders from Harmonic instantly responded to non-demanding content and dropped the data rate of the encoded output, even to its minimum rate of around 0.8Mb/s, with no discernible loss of quality.

KSL-TV was transformed when faced with the monumental task of managing their digital spectrum during the Olympics.

The HD was a little more challenging. They found the least forgiving monitor to be a native 720p (all of their HD is 1080i), 52-inch plasma display and used this as the most sensitive way to search for artifacts. In the de-interlacing process, this monitor appeared to enhance any MPEG artifacts. With no datacasting, they would have been running HD at 15Mb/s, which is about 100:1 compression. With data, the CBR encoded stream dropped down to 12Mb/s, revealing tiling artifacts in dissolves and detailed motion shots.

In the variable bit rate (VBR) configuration, the KSL team found the encoded HD video would frequently hover below 10Mb/s, lending a lot of space for quality SD video. They expected this, but were surprised at how much quality improvement the HD could recover by negotiating with the SD service — a true give-and-take.

There were other factors at work that enabled bandwidth efficiency. KSL used a large, 30-frame GOP on SD. The only disadvantage to a large GOP in transmission is the time required for a channel change. The SD encoder offers edge-processing options that allocate less bandwidth to the edges of the picture that would normally be hidden in overscan. The HD encoder, not as mature a product as its SD counterpart, still reduced bandwidth consumption using horizontal filtering. Incidentally, the configuration process proved that these other measures were important in achieving the highest perceptible video quality.

The end result of the test was that KSL met its objectives and demonstrated the viability, feasibility and the increased revenue potential associated with digital broadcasting. BE

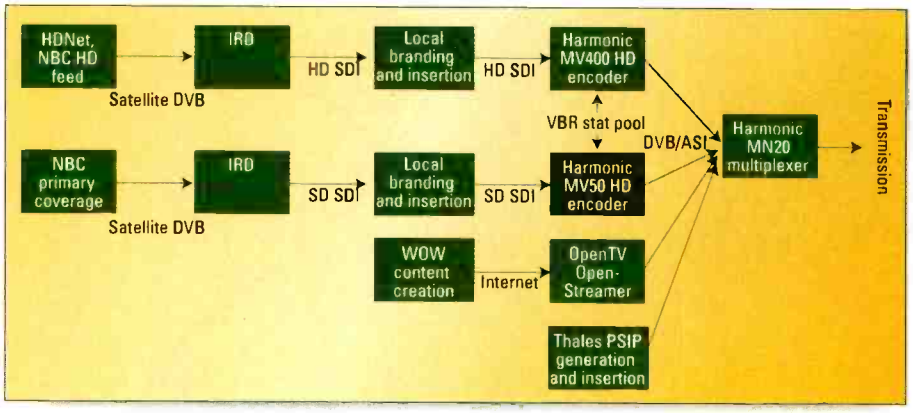

Figure 1. This graphic describes the demands placed on KSL-TV during its coverage of the Winter Olympics.

At the time this article was written, Paul Boyden was a DTV engineer at KSL. He has since joined WOW Digital TV as broadcast operations manager.

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Video storage

BY JOHN LUFF

When commercial broadcasting began, arguably at the 1939 World's Fair in New York, there was no effective means of routinely recording the signal for later playback. The most common method of the era was to point a film camera at a special picture tube and make a "Kinescope" recording on film. The electronic media captured film images. Isn't it interesting that film is now shot on video cameras and printed to moving chemistry?

Television is a medium of considerable immediacy, but it is steeped in technology that often shapes how the media is used. When Ampex demonstrated practical commercial video recording in 1956, television was changed in material ways. Archival copies on film need not be created, for an all-electronic medium could produce results that were higher in quality. Moreover, they could be played back as fast as the tape they were recorded on was rewound. Reruns could be almost as good as the original broadcast, and time zone delay could be achieved without recreating a live event a second time. To broadcast engineers of the time it must have been quite a marvel. Heads spinning at 14,400 RPM and sophisticated signal systems were required. Those who might faint at high costs would have been well advised to take a large aspirin. Twenty years later quadruplex recording reached the height of its sophistication with the Ampex AVR-1 recorder, which virtually eliminated the artifacts that were inherent parts of video recording to that point.

Contrasted with disk recording, tape is far from being the king of the hill.

Today we largely take video storage for granted. Home recordings can rival the quality of the first professional ENG recordings done on Umatic tape. The technology of tape was well understood when operators had to make routine adjustments to record drivers and playback amplifiers. Both tape and disk recording use the same principals from high school physics. If you pass a narrow gap wrapped by coils that induce a magnetic field in the area of the gap you can create alternating patterns of "north" and "south" poles in the thin recording medium. The recording medium is a material with magnetic particles either deposited in a vacuum on the substrate (typically a Mylar base layer), or painted onto the surface in a suspension of magnetic particles in a binder layer. (See Figure 1.) If the wavelengths to be recorded get shorter the gap must be narrower, and generally the coating thinner on the tape.

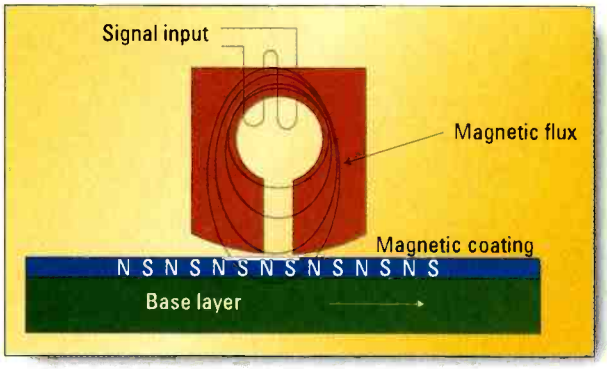

Figure 1. Side view of a magnetic recording head. In both tape and disk recording, the signal passing through a magnetic field affects the arrangement of magnetic particles on the recording medium.

Similar basic physics govern disk recording. The limits of modern storage technology are mostly driven by evolving methods of placing the recorded patterns on the medium and then reading them back accurately. Quadruplex and other early tape formats separated the tracks by guard bands to ensure they could be uniquely identified. A control track was used to synchronize the movement of the head across the tape with the location of the tracks made as the tape moved through the machine. Over time the guard bands got narrower and eventually disappeared as some formats adopted polarizing techniques to allow tracks that are essentially overlapping to be read back. In addition to narrow track pitch, the gap width, one of the key factors determining the minimum wavelength of the recorded signal, got narrower. The width of the pole piece also got narrower to allow even narrower tracks.

Storage media density

The net effect of all factors is the steady improvement in packing density on the recorded medium. Tape formulations have improved, to a large degree because of the research dollar poured into consumer electronics research where payback can be huge. The storage capacity of modern digital formats varies from about 11Gb/hour for DV up to about 140GB/hour for D-5. This would not be possible without all of the research into the fundamental physics of recording. It is worth noting that the same facts that

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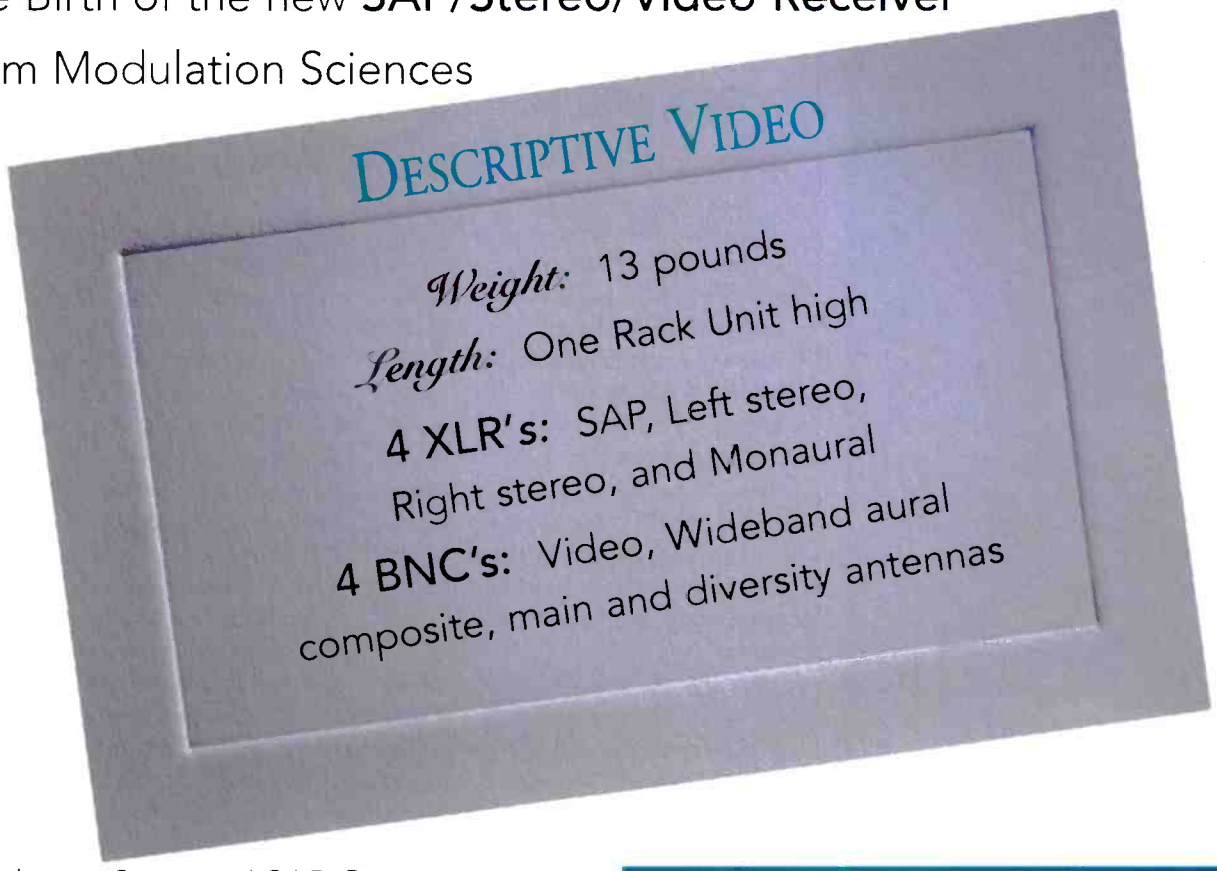

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All of this leads to a density per cubic inch that varies from under 1GB/in^3 to about 2Gb/in^3. Contrasted with disk recording, tape is far from being the king of the hill. The disk in the laptop I used to write this article stores a relatively low 12GB, but in only .5 cubic inches. The drives being delivered in many servers today hold 181GB in about 22 cubic inches, for a whopping 8GB/in^3. A DVD is only about 80 percent of that density when removed from the machine and considerably lower when counted with the playback drive.

But the trend is clear. The 181GB drives are the same form factor that 20MB drives were only a few years ago. That 90 times improvement is pretty incredible, but experts in disk drive technology predict we may soon see the leveling of the curve. The cost of drives drops like stones, with each new generation of drives achieving the same sub-$200 price point in a time period that approaches a year. In terms of cost of storage though, digital tape, and especially videotape, is an amazing bargain. A $125 D-5 tape manages under a dollar per GB, while the modern high-speed 181GB drive costs about five times as much per GB.

Storage options

The result of this admittedly back-of-the-envelope, order-of-magnitude evaluation, is a simple fact. The death of videotape, though long predicted and some think feared by manufacturers of videotape recorders, is still a long way into the future. Disk drives get better every year, and closing the gap is now possible in the next few years. But if you own thousands of hours of programming it is still far cheaper to store the content on tape, even if you must access it under control of a media asset management system. When will tape die? Perhaps in a decade when optical storage reaches high enough capacity and access speeds approaching modern disk drives. That will not be soon either.

The death of videotape, though long predicted and some think feared by manufacturers of videotape recorders, is still a long way into the future.

Researchers have their sights set on all kinds of technologies that may well take off this decade. Volumetric optical storage and a host of other rather complex but promising technologies could provide highly reliable and cost-effective storage for video.

I left out one medium that is critical to the future of television. It holds great promise of the highest image quality and reasonable storage density. It interfaces reasonably well with HDTV applications and has very long demonstrated shelf life. It is also ubiquitous on all continents, available for recording, archiving and display use. In fact most (or at least much) of television has been using it for decades. Of course it is the medium this article first reflected on, film. Film has a vibrant and important place in current and future recording and production, and it may outlive all current videotape and optical technologies. What goes around comes around. **BE**

John Luff is senior vice president of business development for AZCAR. To reach him, visit www.azcar.com.

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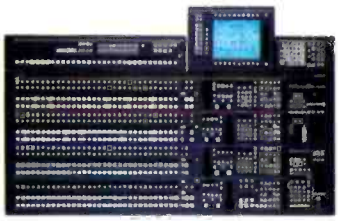

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Axon Digital DesignSFR04: new compact broadcast modular media system processes and converts audio and video; features a new infrastructure and control interface; 1RU system houses four cards and a single power supply; synchronizes video output and handles audio embedding and de-embedding with slave cards, making it easy to switch channels.

+31 13511 6666; www.axon.tv

SYNCHRONIZATION SOFTWARE

TrueTime Domain Time II: network time synchronization software suite combines with TrueTime's dedicated GPS-referenced network time server to create a comprehensive synchronization solution; distributes atomic clock quality time for mission-critical network applications.

800-328-1230; www.truetime.net

BROADCAST CARRIAGE SOLUTION

Triveni Digital end-to-end broadcast carriage solution: for carriage of terrestrial DTV signals over digtial cable to cable-ready DTV receivers; includes Triveni's StreamBridge solution for handling the off-air ATSC PSIP data at the local cable headend; also incorporates a cable-ready receiver from LG Electronics with a QAM tuner.

609-716-3500; www.trivenidigital.com

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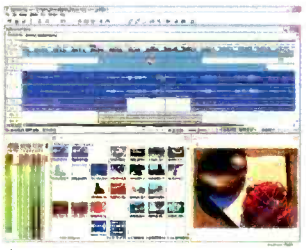

Leitch dpsVelocity 8.0: includes multi-camera editing, real-time "garbage mattes" and direct DV I/O support; features customizable hot keys and user-selectable A/X/B or single-track editing modes; is available as fully integrated turnkey solutions in mid-tower and rack-mount form factors.

800-387-0233; www.leitch.com

NONLINEAR EDITOR PRODUCTION SYSTEM

Avid Technology Avid / DS v6.0 Family: Avid / DS HD allows users to finish projects at multiple non-compressed HDTV and SDTV formats; Avid / DS HD Editor supports key formats and frame rates; Avid / DS is a NLE system for real-time creative editing and finishing projects in non-compressed standard-definition formats; Avid / DS remote processing system enables users to experiment while tasks are processed in the background.

978-640-6789; www.avid.com

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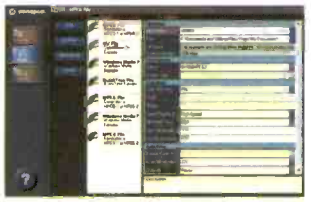

Canopus ProCoder: supports all video formats; converts single or multiple source files at one time; outputs to multiple files in multiple formats simultaneously; maximizes transcoding speed by optimizing conversion elements and filter applications; automatically performs operations such as pulldown and frame interpolation when needed.

408-954-4500; www.canopus.com

MPEG-2 COMMON INTERFACE RECEIVER

Standard Communications SDR422CI-A: includes an asynchronous serial interface; ASI is on coax or optical fiber; maximum data payload for the ASI/SPI version is 150Mb/s.

800-745-2445; www.standardcomm.com

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What's in your pocket protector?

BY PAUL MCGOLDRICK

There is magic in a child's face when you talk about how things were in the "old days." Although vinyl record sales are in the ascendant today – dwarfing cassette and minidisk sales, for example – most children have never seen a phonograph in any of its many forms.

It is the same within our industry. A technician or engineer trained in the last ten years probably cannot imagine a tubed oscilloscope on which – even with magic delay triggering from Tektronix – one could not look at an individual line of video; or the early days of UHF transmission, when the pathetic VHF panoramic receiver (we didn't yet call them spectrum analyzers) we had was made even worse by the connection of a downconverter at the front end. Yes, there were displays there somewhere, but which mirror image was the real spectrum we were supposed to be tuning? On a good Sunday (such work was always done on a Sunday, when there was no programming until the evening) you might see eight completely separate spectrum displays. We had no idea whether the downconversion and the doubtful filtering in the panoramic receiver were really making the whole thing just a complete lie.

In those days, too, the most significant question on a promotions-review panel would be to ask a candidate to define quadrature distortion. But we were proud of our newly found knowledge of that and ICPM, even though we couldn't really measure either.

There was one high-power VHF transmitter that would always fail its annual performance tests. It was reliable, but once a year we had to retube the aural side and the video modulator. Then some bright spark decided to question the validity of the test equipment...

But time and again the boys in Beaverton came to the rescue with boxes that defined what we could measure and, even if we were not too sure the results were real, at least the commonality of product made it as if we were all on the same playing field. By and large, measurements became extremely stable, and you were able to accept both program circuits and equipment as being to specification.

The computer is fast becoming the mother ship for a lot of test and measurement activities.

It is always rather amusing, then, to see subcarrier phase and gain numbers in semiconductor products like operational amplifiers quoted to three decimal places. I don't know of anybody in our industry who would claim that this could be done. When you talk to the manufacturers of these products the answer is usually in the form of, "Oh, we connected twenty amplifiers in series and then divided the numbers we measured by twenty." Right. Even if there was a consistent relationship between parts, there has been experiment after experiment showing that you cannot just add differential phase and gain numbers.

I was recently pleased with the performance of a product I thought was going to turn out to be a toy – a tone generator and cable tracer from B+K. The generator puts out a warbling tone at +3dBm (into 600Ω), and the tracer (a very high gain amplifier) can find the cable that tone is on when you are within about nine inches of it. It really works! And it saved having to replace a long multi-core cable. I just had to make a simple splice.

That product is delightfully simple. But so are many of the test products available to us today. It hasn't been that many years since you would have had to go to driver's ed to be qualified to drive a spectrum analyzer; now most of them do a lot of the thinking for you, and the limitations are greatly reduced. The front ends of digital oscilloscopes now have impressive bandwidths, and the displays have a truly reassuring analog look!

We also have waveform monitors/vectorscopes that allow for accurate measurements rather than just acting as operational guides (although I still see a lot of rackwide test equipment even in relatively modern engineering areas). And the computer is fast becoming the mother ship for a lot of test and measurement activities, and may just take over as a picture monitor for test displays.

But whether you are measuring differential phase in your still-analog system, or you are monitoring multiformat SDI material, there are things that don't change. The tools have advanced dramatically – because they have had to keep up with the technology, and real competition came along – but the purpose of the tools remains the same: to measure and promote quality. Today's buyers of vinyl disks would no doubt be difficult people to argue with about audio quality, but we have come a great deal further than that. **BE**

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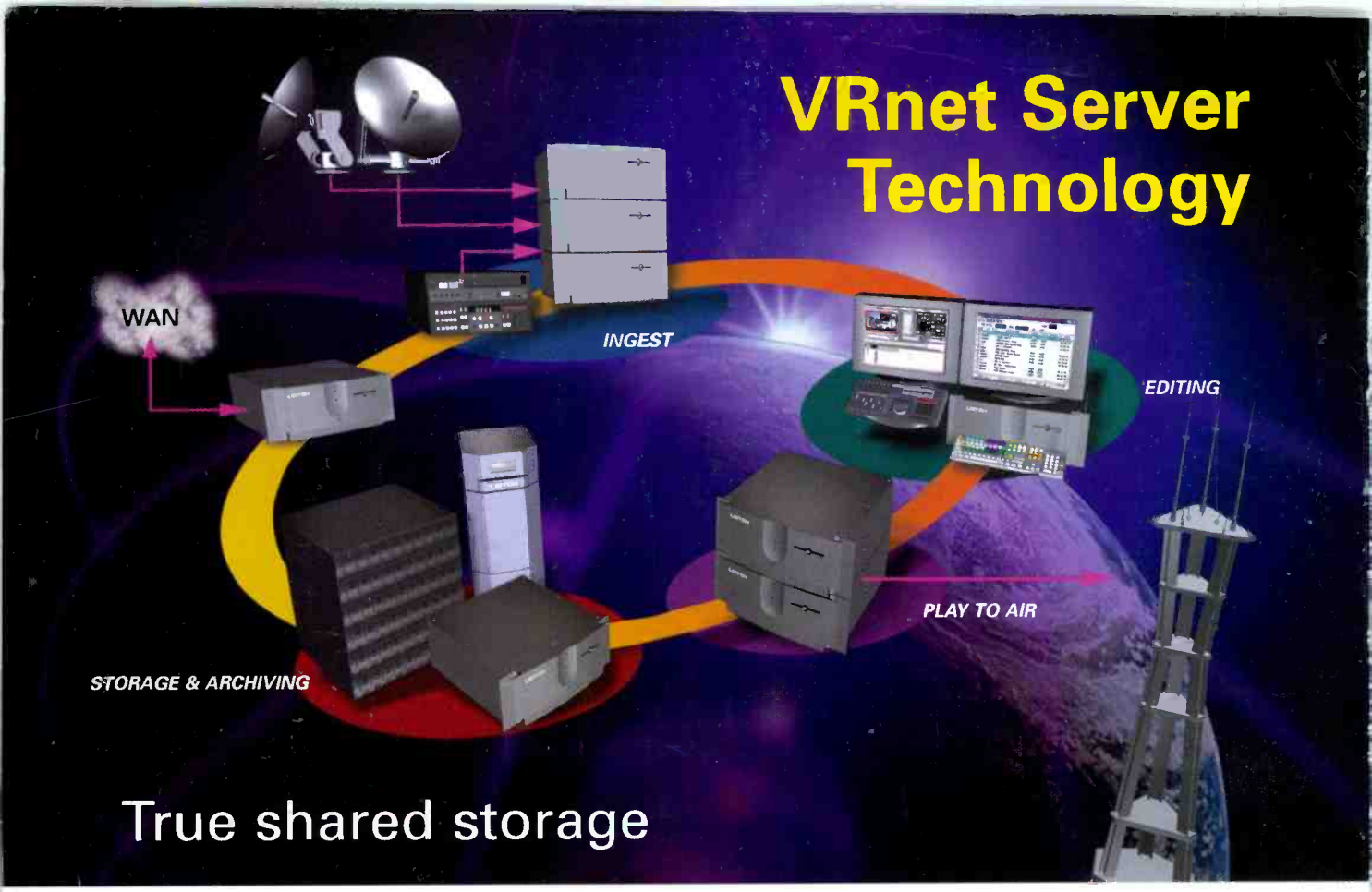

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