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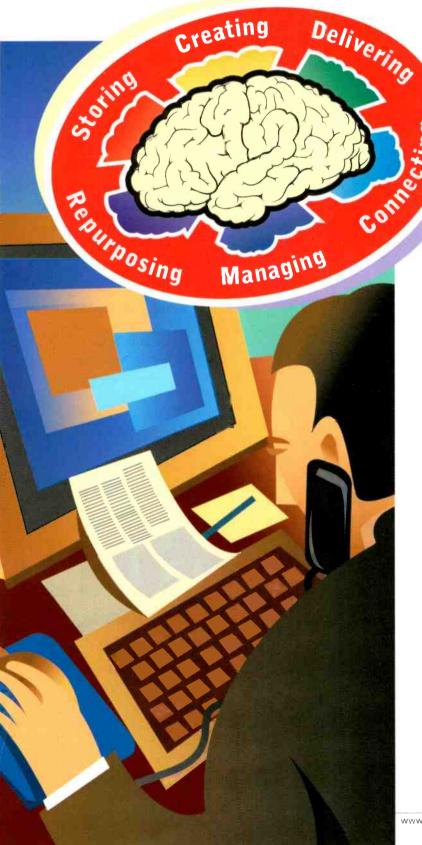
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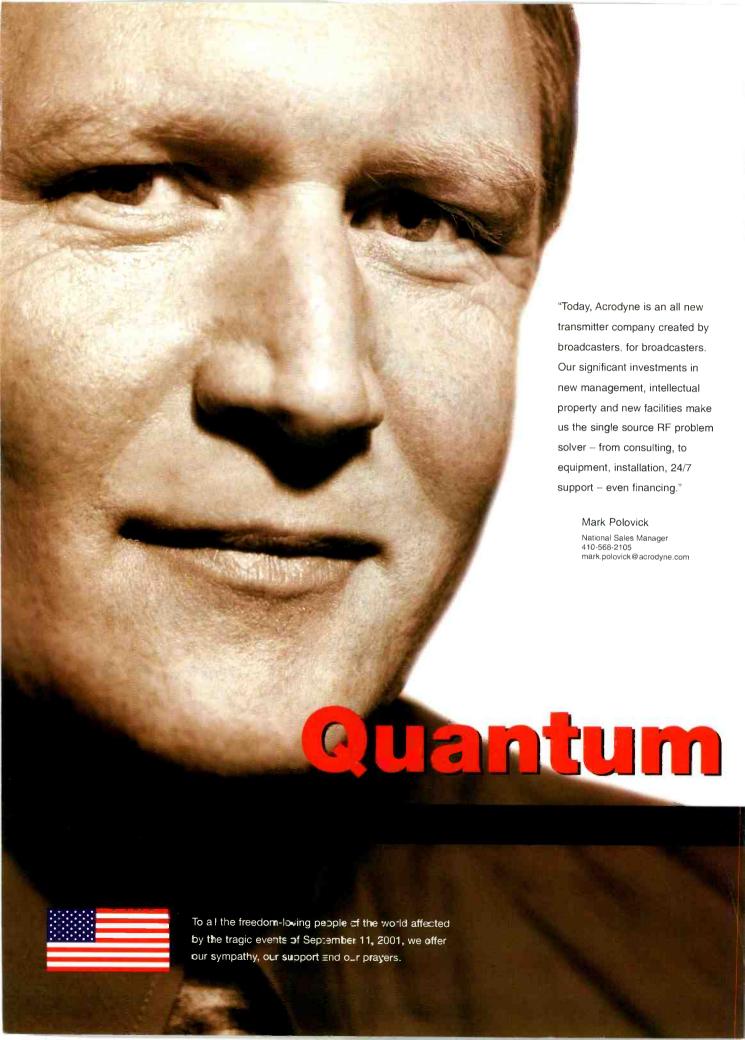
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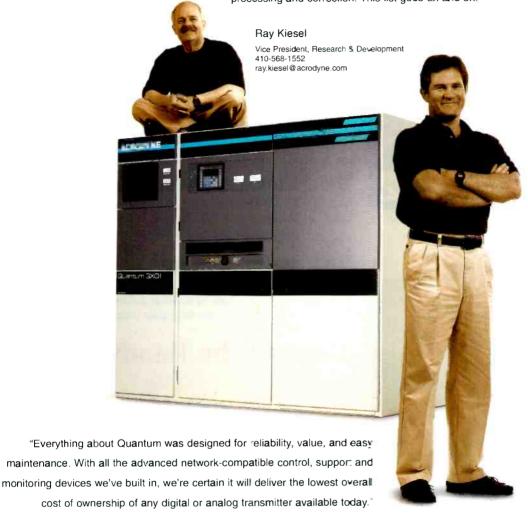
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Volume 43

Number 12



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#### IN THIS ISSUE







#### **Features**

#### 72 The broadcast station as a missioncritical facility

By Paul Kast

Building a broadcast facility that meets design and construction reliability standards for 100 percent "Up Time."

#### High-bandwidth coaxial cable 76

By David Lingenfelter

How to differentiate between cable types, match the correct cable to the task and install the product.

#### **Monitoring RF safety** 80

By Rich Biby

Maintaining safe operations around towers by monitoring RF levels and documenting safe broadcast operations.

#### **Beyond the Headlines**

#### **NEWS**

War coverage technology

#### **FCC UPDATE**

New channel 59-69 band-clearing plan

#### **BUSINESS MODELS**

Cable must-carry

#### **Digital Handbook**

#### TRANSITION TO DIGITAL

30 Digital interfaces

#### **COMPUTERS AND NETWORKS**

36 Resources on the Internet

#### STREAMING MEDIA

Tracking traffic

ON THE COVER: The Echostar Communications uplink control room provides mission-critical capability that is essential to the company's goal of interruption-free operation. The facility's design guarantees that it will continue to operate, regardless of external conditions. Photo courtesy Carlson. Photo by Mark Boisclair.

(continued on page 8)

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	Analog In/Out: Component/Composite/S-Video and Analog Audio				



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#### **Table of Contents**

Business Announcements Features Demo Room

#### **Magazine Content**

Features
Beyond the Headlines
Digital Handbook
Systems Design Showcase
New products & reviews
Departments

#### Featured links

- Browse Back Issues
- About the Magazine
- **Editorial Calendar**
- Magazine Rack

## Visit the Demo Room



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#### **Systems Design & Integration**

#### SYSTEMS DESIGN SHOWCASES

- 46 Hallmark Channel global playback center
- 54 NMT's DX11 mobile production facility

#### TRANSMISSION & DISTRIBUTION

60 Transmitter technology review

#### **PRODUCTION CLIPS**

66 Watermarking technology in A/V delay correction

#### SYSTEMS INTEGRATION

70 Digital video storage: IEEE 1394

#### **New Products & Reviews**

#### **APPLIED TECHNOLOGIES**

- 88 Videotek's SQM
- 92 Network problem, affiliate solution
- 94 Harmonic's MV50 MPEG-2 encoder
- 96 Video Design Software automates NFL Snap Channel

#### FIELD REPORT

98 Audio recording with Mackie's D8B console

#### **TECHNOLOGY IN TRANSITION**

100 Studio lighting systems

#### **NEW PRODUCTS**

104 Lectronsonics' IFB R5a, plus other new products

#### **BUSINESS WIRE**

112 Business highlights from broadcast and production

#### **Departments**

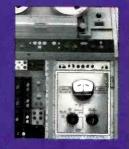
- 10 Editorial
- 12 Reader Feedback
- 122 Classifieds
- 125 Advertisers Index
- 126 EOM

#### FREEZE FRAME

A look at the technology that shaped this industry

#### VTR history

Early quad VTRs were inherently unstable. To help solve the problem, both RCA and Ampex introduced TBCs as add-on devices. Two early TBCs were the AMTEC and CAVEC. Name their manufacturer, define the acronym and tell what the key difference was between these two TBCs. Hint, it was unveiled at the 1973 NAB. Correct entries will be eligible for a drawing of the new *Broadcast Engineering* t-shirts. Enter



by e-mail. Title your entry "Freezeframe-November" in the subject field and send it to: bdick@primediabusiness.com. Correct answers received by Dec. 17th, 2001. are eligible to win.

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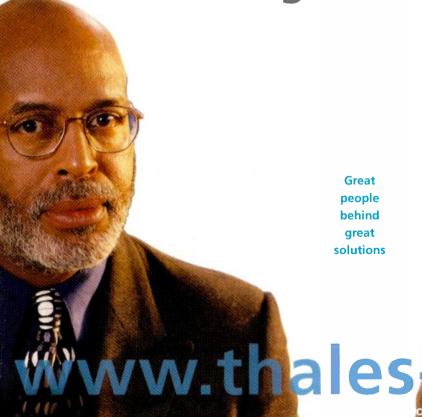
- Terrestrial television broadcasting
- MPEG-2 and multimedia systems
- Radio broadcasting
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#### Competition lets everyone win

or years, I've held out. I've denied my desires, even needs, and said no to the media sirens. The allure of those seductive images often bent my resolve, but it was never broken. No, I would hold out forever.

But now, I have to acknowledge that even I, one who should know better, have become *media-desirous*. I finally got cable.

The last straw was when SBC upped my phone bill another 10 percent. That made it okay to just peek at the alternatives for phone service. I was surprised to find there were other companies that could provide both local and long-distance for 20 percent less than SBC. Then, just as I was about to make

the switch, a brochure from a company called Everest appeared at my front door.

Everest has recently overbuilt the local cable company's monopoly. Because I wasn't looking for cable TV service the brochure was headed to the trash when I noted that both local and long-distance were available from the company.

Adding up the numbers, I discovered that for a mere \$15 more a month, I could get telephone service AND about 150 channels of wired programming. Hmmm, my resolve was weakening.

However, before making the leap I wanted to give the satellite folks a shot. If I was going to cure my media desire with cable or satellite, I really wanted to get the HDnet, the new high-definition channel.

I called DirecTV and the Dish Network. All I wanted to know was, "Do you carry HDnet?" After wading through those darn multi-level menus, I discovered neither company has a "question" option. You're either a customer or you are not. You either have an account and are reporting trouble, or you are signing up

for service. All I wanted to do was ask a question for Pete's sake!

After being on hold for more than five minutes, I hung up. These guys could have had me as a customer. All they had to do was answer the phone! As the consumer affairs guy Clark Howard would say, "Welcome to the customer disservice department."

Then I called the new competitor in the neighborhood. The first thing that happened was a person answered the phone — on the second ring. Then they acted like they were pleased I had called. No "pick your language from the four options," none of that "please be patient as we...blah, blah." A real person answered the phone.

I was able to build an a la carte package of cable TV and local and long-distance telephone service with all the desired phone options and high-speed Internet access. Time Warner, DirecTV, Dish Network and SBC, you all lose. Everest, you win. And so do I.

The point of all this isn't that cable now brings TV, telephone and Internet into my home. No, I'll still use an off-air antenna for local HD signals. But it was refreshing to be reminded that when there is competition, everyone wins. Remember that as your station begins HD and DTV transmissions. What will you do to win viewers to your signal?

Brod Dick

Brad Dick, editorial director

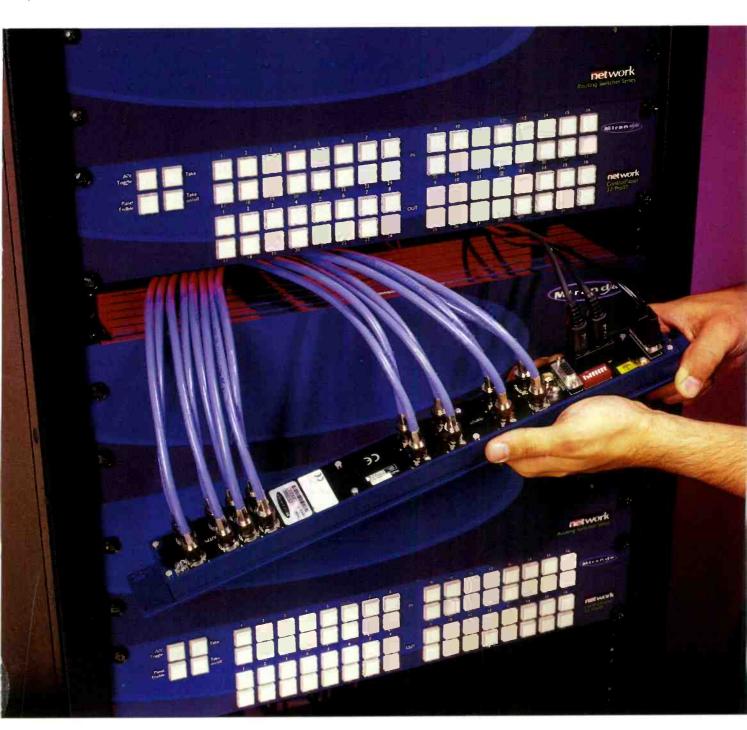
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### Reader Feedback

#### M-JPEG analyzer

Is there such a thing as an M-JPEG analyzer? We are using 22 CellStack codecs for audio and video, both for conferencing and streaming to Time Warner Cable. This is over an ATM (Cisco) network.

CARY LAHNUM,
ORANGE
COUNTY
BROADCAST
SYSTEMS ENGINEER

Eric Hodges, Americas Marketing Manager, Tektronix Test & Measurement, provided an answer to the question.

The answer to this question depends somewhat upon what type of analysis is desired. I'll address the two primary possibilities with the answer:

If you want to assess the impact Motion JPEG compression has upon your content quality, then yes, there are tools available to perform this type of analysis. For example, a referencebased tool such as the Tektronix PQA300 would be capable of comparing the original content (either serial digital or composite analog) with the resultant content (post-compression/ decompression) and providing measurements that indicate both perceptible changes in quality (based upon the human vision model) and changes in content on a bit-by-bit basis. Even single-ended picture-quality tools would be capable of providing information on the impact to your content quality, as long as they include the capability to monitor for Discrete Cosine Transform-based errors, since M-JPEG does use DCT as part of its compression process. The PQM300 would be an example of such a tool.

If your intent is to analyze the actual protocol of M-JPEG, your task is more difficult, since I am unaware of any

tools available to do this type of analysis. At Tektronix, our focus is on MPEG and its complementary standards (DVB, ATSC, ISDB), since they are the primary compression standards of the professional broadcast world.

More comments on the August editorial, Could dead birds derail DTV?

#### Never saw one....

In all my 34 years in broadcast television, I have never, and I

mean never, seen a dead bird under or even near a broadcast tower—let alone seen one hit a tower or guy wire. I won't say this never happens, just that I have never seen it happen. I did hit a bird the other day with my car—don't tell anyone because I live 17 miles from the station and don't want to walk.

Al GILLETT ASST D.E. WSYT TELEVISION 68

Dear Editor:

Regarding the editorial "Could dead birds derail DTV?" I was dismayed to read that ornithological groups are petitioning the FCC to deny 40 tower applications until the FCC conducts environmental studies. How long will that be? I feel that this request is unreasonable, as are requests to remove tower lighting, to severely limit tower height and locate towers in the middle of nowhere. Towers are being singled out unfairly for their role in bird deaths. Many birds perish from colliding with high-rise buildings, power lines and automobiles, but these objects are not being contested.

Based on what is currently known, lighted towers and corresponding guy

wires appear to pose a threat to birds on overcast nights. Unlit towers over a certain height pose a threat to aircraft on clear and on overcast nights. Bird lovers suggest removing tower lighting. The FAA will never approve this plan. Although I found the content at www.towerkill.com worrying, my concern for birds was tempered bу a picture www.towersafe.com depicting a passenger aircraft about to collide with an unlit tower. In my Internet search, I also found a cleverly named bird organization called FLAP (Fatal Light Awareness Program) www.flap.org. "Tower kill" of birds is unfortunate, but protection of human life through tower lighting needs to take precedence.

I think that the tower industry should pursue the goal of making towers as harmless to birds as possible, without compromising tower function or human safety. When thorough research finds the exact causes of bird-tower collisions, and reasonable solutions are created, steps should be taken to make towers safer for birds. Until that time, new towers should not be denied or delayed, and existing towers should not be modified because of birds.

VICKI KIPP

And finally...

#### The EPA staff is welltrained

...and then there was the sweet young lady just out of college a year or two who was performing phase one EPA studies on selected tower sites for a new owner of our properties. She told me with a very straight face that the purpose of those red lights was to "keep birds from running into towers."

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### **Beyond the Headlines**

#### News

#### War coverage technology

BY LARRY BLOOMFIELD

Ask almost any war correspondent and they'll tell you that covering a story is the easy part – filing it is a much different situation. Today's network news directors expect their field reporters to feed their stories back in for broadcast promptly and even do live shots.

Until recently, if a news producer wanted live coverage where no uplink was available, the common practice was to go on the air with a still of the reporter and use telephone audio.

Reporters now have the ability to do a stand up from nearly anywhere in the world via the videophone. The use of videophones to transmit pictures and data dates back to the Gulf War. They were also used, to a limited extent, in Kosovo.

The Wall Street Journal called the satellite videophone "the hottest new weapon" in news coverage. Probably the most attention to the methodology came when slightly modified

videophones were used to do live shots from Afghanistan; a country with little broadcast technology.

CNN's vice president of satellite and circuits, Dick Tauber, said: "Our viewers have grown to depend on us to be their eyes and ears for breaking news. With this responsibility, we want to put them right there." Tauber said CNN uses several devices that have grown out of video conferencing technology. The key is to have a live presence that gives the network a certain level of creditability.

Tauber described the CNN system as small, light and portable. Basically, it consists of a camera and mic that plug into a specialized codec, which feeds two 64 kbits/s, INMARSAT M4 satellite phones which, combined, provide 128 kbits/s bandwidth. The whole setup is powered by a car battery. "The pictures aren't exactly the finest," Tauber concluded, "but the package does live and only live.

For CNN, that's just what we want."

NBC's approach is similar. Stacy Brady, vice president of network field operations, said they have several of the 128 kbits/s units in various shapes, configurations and sizes. "The whole idea is to be portable and get to the

# Do videophones need to be part of every newsroom's cache of equipment or are they a luxury?

front line; if you're not portable, you're not going to able to get there."

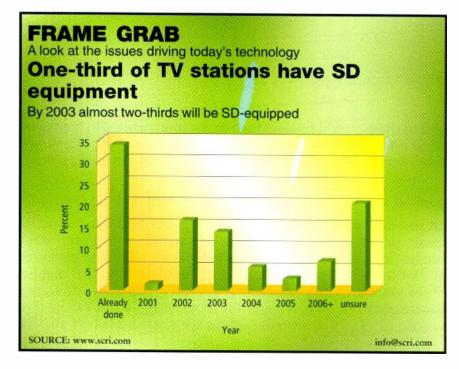
"We have about 20 of the 128 kbits/s units. One of them was used for the Antarctica rescue mission earlier this year, and there is no question that they'll be used even more now."

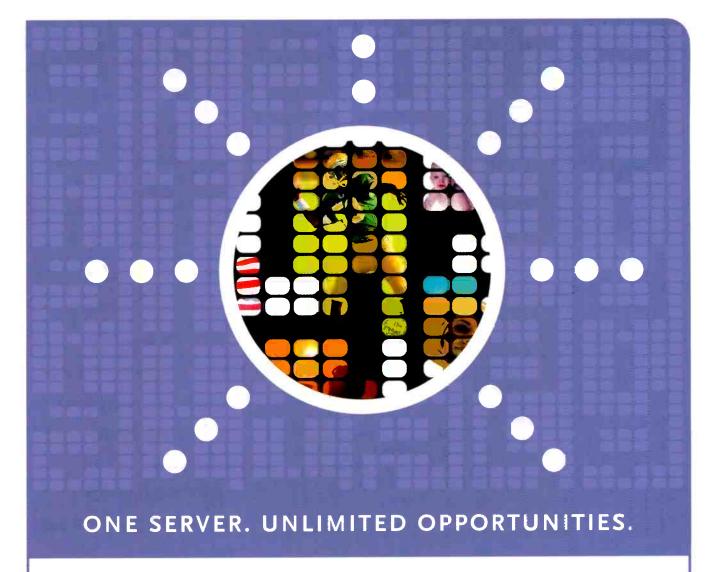
Brady said the pictures are received in their Secaucus, NJ, facility, where they are transcoded to NTSC and sent to NBC's news headquarters in New York City.

Brady said improvements in the technology should allow for significantly better pictures, adding, "We are testing a 256 kbits/s device that produces a beautiful picture. Although we haven't used it yet, it will be ready soon."

Because these videophones are full duplex, it's easy to send programming back to the field correspondent for various purposes. The phones can also be used for communication between correspondents.

Frank Governale, vice president of operations for CBS News, doesn't see the videophone as a significant item at this stage. "It's a great tool for





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The videophone can be a handy tool when live news coverage from remote locations is needed. Photo courtesy GMPCS.

advance surveys, but I don't think it'll replace our uplinks – it's just not broadcast quality. Uplinks provide a lot more facilities for CBS News. When we use videophones we have to shrink the picture 20 percent to 30 percent and put a graphic under it to mask the poor quality." He said CBS uses communications equipment that provides four-wire, IFB and telephone access in the field.

Governale said that CBS owns several Talking Head videophones from the 7E Company, but that its London bureau has bought off-the-shelf codecs and interfaced them with other INMARSAT M4 phones with equal success. "These and other units are being used on air from Pakistan and Afghanistan. I believe we have about nine in the field." Governale pointed out that the videophones have one advantage in that they are full duplex. CBS uses the back channel for IFB to cue the talent.

William Tracy, ABC-TV's director of electronic news gathering, said that CNN's use of videophone technology to cover the story of a U.S. Navy EP-3E surveillance plane's emergency landing on Hainan Island made ABC realize it needed videophones for live coverage. "Although we were there, we weren't ready to go live. It was that event that made us realize that we needed a device of this type," said Tracy. ABC now also uses the Talking Head videophones.

"As the technology improves," Tracy concluded, "I could see these devices being used to send slow bit rate, prerecorded digital videotape back to the studios for editing so it can be used

with the live shots."

Another company providing videophone technology is GMPCS, based in Pompano Beach, FL. GMPCS' owner, Craig Van Wagner said, "Videophones come in all shapes, sizes and durability and can be configured to the needs of the broadcaster."

For the most part, videophones available today are compli-

ant with several international videoconferencing standards: H.320 for ISDN, H.324 for POTS and H.323 for LANs.

It should be pointed out that the codec technology used in video-phones supports standards-based, two-way real-time transmissions over both analog and digital lines, in compliance with the international standards mentioned earlier and communications protocol software, to ensure interoperability between units from different vendors. Most units also support G.723 audio compression/decompression as well as MPEG-1 playback, making it a full-function multimedia platform for PCs and other consumer systems.

Do videophones need to be part of every newsroom's cache of equipment or are they a luxury? Videophones range in price from \$2,000 to \$25,000, depending on their configuration and features. Considering that they can fill a need, that they cost perhaps one tenth as much as a typical satellite uplink facility and are highly portable — you be the judge.

#### NBC buys Telemundo

NBC recently purchased Telemundo Communications Group Inc. for \$1.98 billion in equity from Sony Pictures Entertainment, Liberty Media and a consortium of financial investors.

With the acquisition of Telemundo's broadcast and cable properties, NBC becomes the only major broadcast

network with a business fully devoted to developing and airing programming specifically created for the Spanish-speaking market. Hispanics are the nation's fastest-growing demographic and are expected soon to be the largest minority group, representing one of the most attractive opportunities for dynamic growth in the television marketplace. The 24-hour Telemundo network currently serves 86 markets, reaching 88 percent of Hispanic TV households in the United States.

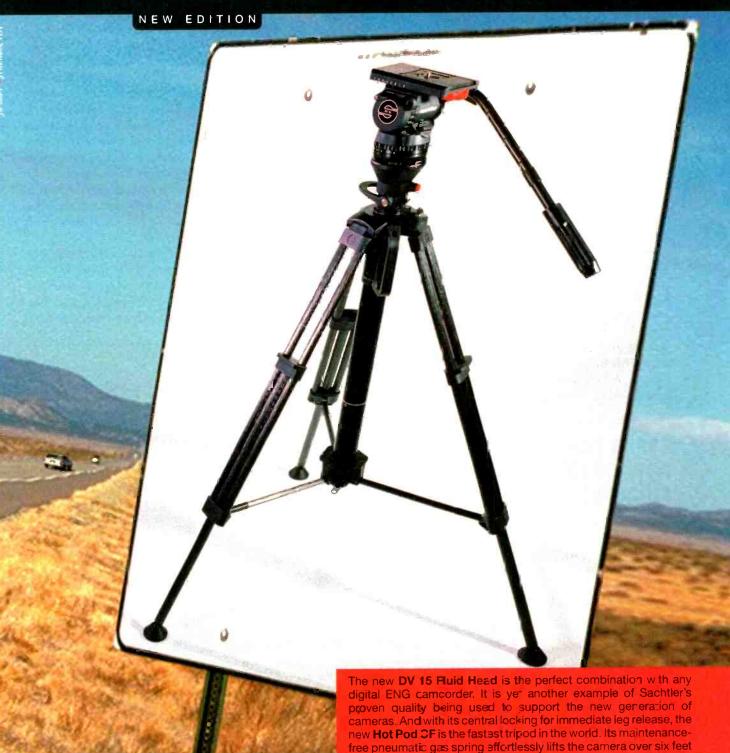
Assets being acquired by NBC from Telemundo include the national Telemundo network and full-power owned-and-operated stations in top Hispanic U.S. DMAs, including New York, Miami/Fort Lauderdale, Houston, Chicago, Dallas/Fort Worth, San Francisco/San Jose, San Antonio and Denver, as well as two Los Angeles

# Hispanics represent one of the most attractive opportunities for dynamic growth in the television marketplace.

stations (KWHY-TV & KVEA-TV). Other assets NBC acquired include the No. 1 station in Puerto Rico, 40 broadcast affiliates and two growing cable networks, Mun2 and Telemundo Internacional.

The combination of NBC's and Telemundo's resources creates strategic opportunities across all divisions, including sales and promotion, station operations, news, entertainment programming and sports. Possibilities include the addition of Spanishlanguage versions of NBC shows on Telemundo, including late night and reality programs and the Olympics. National sales efforts can also be integrated, network cross-promotion can be initiated and NBC cable expertise can be leveraged to grow Telemundo's national distribution.

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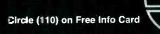


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NBC's acquisition of Telemundo won't come without its share of problems. For starters, it puts NBC over the FCC's thirty-five percent ownership cap and may hamper NBC's ability to buy the rest of Paxson Communications Corp., unless the ownership rules are changed, which may be in the works. NBC currently owns about one-third of Paxson's shares.

The acquisition of Telemundo may also quell industrywide rumors about GE possibly selling NBC – at least for a while. GE's new CEO Jeffrey Immelt has indicated that there are no plans to unload NBC, but his comments have done little to dissuade industry observers from speculating about a possible sale.

Telemundo's Los Angeles facility recently was expanded to include both KVEA-TV Channel 54 and KWHY-TV Channel 22. With less than five miles between the new Telemundo facilities and the NBC Burbank, CA, plant where KNBC-TV Channel 4 is located, one can only speculate about any additional consolidation.

# Zenith and NxtWave form strategic alliance

According to NAB, as of Oct. 10, there were 210 DTV stations in operation in 71 markets, reaching over 70

percent of U.S. households. This figure sounds good, but are there any sets out there to receive the new digital signals?

It's difficult to get a reliable count of digital sets that have actually been sold. The best figures seem to be between 150,000 and 200,000.

Little more than thirteen percent of all high-power television stations have made the transition and the deadline is May 2002 for commercial stations and May 2003 for non-commercial stations. The FCC has candidly said they'd grant one waiver per station, but after that, all bets are off.

Early on in the life of real-world digital over-the-air television, the most debilitating problem encountered was multipath. Attempts to address this issue have resulted in many generations of receiver/detectors. Most visible of the chip makers

addressing this issue have been Motorola and NxtWave.

Because Zenith holds a lion's share of patents on 8-VSB, they obviously have a vested interest in seeing it succeed. Receiver/decoder chip developers have come up with a myriad of patches. The Advanced Television Systems Committee (ATSC) recently issued a Request for Proposal (RFP) to improve 8-VSB performance that essentially had only three requirements: that it perform measurably better than the current ATSC standard; that it be backward compatible with at least some current receivers; and that it not use any modulation method other than VSB.

With millions of dollars being spent attempting to make a decoder chip that could cope with the multipath issue, it was only logical that Nxt-Wave would seek an alliance with the

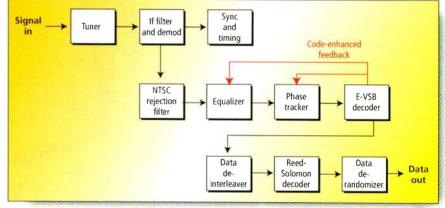


Figure 1. Zenith/NxtWave enhanced modulation scheme

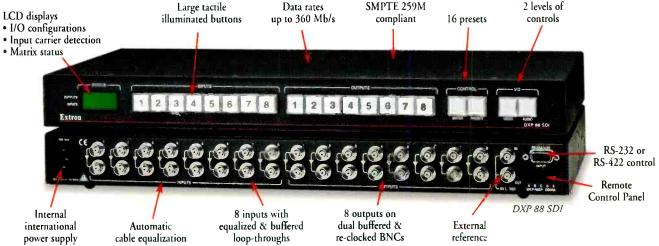
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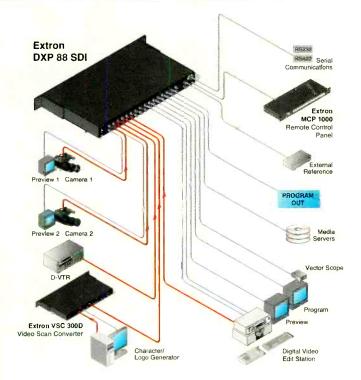
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800.633.9876 www.extron.com parent of 8-VSB – Zenith Electronics Corp. Before collaborating, NxtWave and Zenith had independently developed enhancements to the VSB spec and submitted them to the ATSC. The

modulation scheme" improves indoor DTV reception, it may open the door to portable and mobile applications. That would be the capability COFDM proponents have been asking

# If the Zenith/NxtWave alliance can demonstrate that their proposal improves indoor DTV reception, it may open the door to portable and mobile applications.

result of their alliance is the merger of their competing modulation technologies into a single multi-rate, dualstream system.

They have developed a compromise that combines NxtWave's error-correction coding and precoder technology with Zenith's data frame mapping, interleaving and packing algorithm. The combined system provides better signal-to-noise ratio than either company's individual approach. Under the Zenith/Nxt-Wave multi-rate, dual-stream architecture, a mix of regular 8-VSB and enhanced, robust streams are sent to receivers.

Broadcasters will have control over the dual streams; lending flexibility to the new system. They will be able to change the mix and bit rates of the two streams, as needed and on the fly, sending separate data, audio or video programs via the robust stream while the main video program is sent in the 8-VSB stream.

The backward compatibility requirements are met in that those few legacy receivers/decoders currently in use will be able to incorporate the "conventional" 8-VSB signal stream in their respective demodulator chips, while ignoring data sent via the robust stream.

The key to the new system's success lies in the fact that a DTV receiver with the new dual-stream demodulation capabilities will improve the pictures sent via 8-VSB due to the "training signals" sent via the robust stream. The bottom line is that the new system trades data rate for reliability.

If the Zenith/NxtWave alliance can demonstrate that their new "enhanced

for all along.

According to NxtWave, if the Zenith/NxtWave proposal stands up under the ATSC magnifying glass, the combined modulation approach would be ready for integration into DTV receivers 12 to 18 months after its adoption.



# Engineering achievement honored

BY LAURA COLLINS, ASSOCIATE EDITOR

This year's Technological/Engineering Emmy Awards ceremony, hosted by the National Academy of Televi-

sion Arts and Sciences, was held Oct. 16 at the Marriott Marquis Hotel in New York City.

Since 1948, the awards have been presented to honor companies and individuals responsible for breakthroughs in television technology. At this year's ceremony, 25 Emmys were award-

ed for advancements in areas including HDTV upconversion, personal television service, test and measurement, and digital asset management. The BBC, Faroudja Labs and YEM received Emmys for their digital HDTV upconverters.

Replay TV and TiVo were recognized for "pioneering development of PVR and accompanying personal television service."

Rohde & Schwarz received its second consecutive Emmy for its multistandard test transmitter technology.

Awards for consumer camcorder technology went to Hitachi, JVC and Matsushita Electric Industrial Co. Ltd.

Laser Pacific was awarded an Emmy for its 24p video system technology, and Zenith was recognized for its work on flat-screen CRT technology for consumer television.

THOMSON Multimedia, Pinnacle Systems and SeaChange International were honored for shared video-data storage systems technology.

CNN and KGO-TV received Emmys for "pioneering effort in digital asset management for television news production," as did ITN and Quantel, for their joint development of a tapeless news system.

Three companies received Emmys in multiple categories. Sony Corporation of America received the award for "development of consumer camcorders," "development of 24p video" and "development of flat-screen CRT technology for consumer television." Eastman Kodak won for its camcorder technology and its development of 24p video



Winners of this year's Technological/Engineering Emmy Awards. Twenty-five awards were given this year to honor outstanding engineering achievement in television.

technology, and Leitch was recognized for work on digital HDTV upconversion and shared video-data storage systems.

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#### FCC Update

#### New channel 59-69 band-clearing plan

BY HARRY C. MARTIN

n an effort to encourage television broadcasters to move from channels 59-69 as quickly as possible, the FCC has announced that it will permit such stations, where technically feasible, to operate on their assigned DTV channels in the analog mode until the extended DTV transition date (i.e., beyond 2005). However, existing analog channels 59-69 would be lost and, as a result, the participating broadcaster would lose the opportunity to conduct side-by-side DTV and analog operations as the DTV transition progresses.

The FCC has been attempting to auction the space now occupied by televisionchannels 60-69 (746-to 806MHz) for more than a year but, because of uncertainty as to when the incumbent channel 60-band TV stations will vacate, the Commission continues to delay the auction of these frequencies. The FCC recognizes that the auction will provide wireless telephone and data carriers with a gold mine of spectrum for wireless deployment. A portion of these frequencies will also be dedicated to public safety.

But, without a timetable for band clearing in place, the wireless entities do not know when the targeted spectrum will be available and therefore cannot evaluate its current value. If an auction were held now, these uncertainties would drive down auction bids dramatically. The FCC's plan is to give an incentive for stations on channels

#### **Dateline**

On or before Dec. 1, TV stations in the following states must file their biennial ownership reports: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont. 59-69 to move to their ultimate DTV locations by permitting analog operations on these channels until the DTV transition date. Broadcasters who voluntarily vacate channels 59-69 will have four years (until Dec. 31, 2005) to convert to digital television, and may seek additional extensions past December 2005 if there still is less than 70 percent DTV penetration in market households.

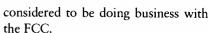
The FCC has established a 90-day processing period for applications proposing to clear channels 59-69. These applications will be automatically granted after 90 days if the FCC has not acted on them. This 90-day automatic grant would not apply in cases where an opposition is filed against an application or where an application is defective or requires a rule waiver.

One of the major problems facing some of the current broadcasters using channels 59-69 is that they have not been assigned and cannot find a channel within the core (channels 2-51) to which they can move. The new band-clearing initiative affords them no help. This problem is exacerbated by the current freeze on modifications to move to channels 52-59 pending a rulemaking on the future use of those channels.

#### FRN use mandatory Dec. 1

Everyone has seen the small box on Form 159 – the box that asks for the payor's or applicant's FCC Registration Number (FRN). Few have filled it in, choosing to provide their required TIN number only. However, beginning on Dec. 1, 2001, the FCC will require the use of an FRN number on all applications, linking such applications to the Commission Registration System (CORES).

The FRN is a 10-digit number assigned to an entity doing business with the FCC, including private, public, profit and not-for-profit organizations. A filer, licensee, certificate holder or any entity sending payments to the FCC is



Most Universal Licensing System (ULS) registrants were pre-registered in CORES, were given FRNs and their ULS passwords were converted to CORES as of June 22, 2000. With few exceptions, most ULS passwords will work in both the ULS and CORES systems until the two are ultimately integrated.

The FCC will use the FRN number to verify that all entities doing business with the FCC make proper payments and receive their annual fee schedules and other materials. The FRN number will be required with applications, Form 159, regulatory fee payments, waivers, auction payments, forfeitures, and other payments and collections. When an application requires a fee, the FRN is provided on Form 159. When an application is nonfeeable, however, an FRN Certification Form (Form 162) must be filed with the application. Form 162 is available on the FCC's website using the "Forms" link on the home page.

FRN numbers, while not yet required, were recommended for this year's September 2001 Regulatory Fee filings. If you did not have an FRN number, you were not allowed to use the current Form 159. Instead, you were required to use the 1997 version of Form 159.

If you still do not have an FRN number, the easiest way to register with CORES is to go to the FCC website and click on the "Commission Registration System" link on the left-hand side of the home page. Once your information is provided, the system will ask for a password and issue your FRN number on the spot.

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



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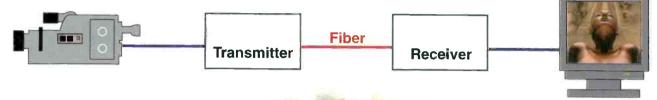
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#### **Business Models**

#### Cable must-carry

BY MARK R. SMITH

congress ruled in its 1992 Cable Act that all cable television companies must carry the regular analog signal of local broadcast stations. And, traditionally, most have.

There are executives at NAB and in the broadcast industry who argue that the analog must-carry requirement also applies to digital carriage. But whether cable must carry the digital signal of broadcast stations as well, giving each station two signals simultaneously on a cable system, is still under the review of the FCC – after the governing body tentatively deemed dual carriage unconstitutional less than a year ago.

At press time, the NAB board adopted a new policy shift on its insistence that cable carry digital and analog signals. The shift was conditioned on three goals: inclusion of over-the-air DTV tuners in every new television set; comprehensive interoperability of DTV sets with cable systems; and establishing secure full signal carriage rights for broadcasters' DTV signals on cable and satellite systems.

As of now, those simultaneous broadcasts on cable systems are slated to

happen at an undetermined date. The cable transmission is mandated to be digital only by Dec. 31, 2006, at which time stations will be required to shut off their analog signals (assuming an 85 percent penetration level has been reached by DTV receivers). That means there may be a transition period for the cable companies where they must carry the analog and digital broadcast signals of broadcast television stations. The

According to Wharton, stations in the top-ten markets and beyond are meeting the digital timeline set by the FCC, even though some stations in small markets may not make the 2002 deadline. At least 70 percent of TV households are receiving at least one DTV signal.

Broadcasters also argued that cable has more capacity to carry DTV channels than it did when the Supreme Court made its ruling nine years ago.

# There are executives at NAB and in the broadcast industry who argue that the analog must-carry requirement also applies to digital carriage.

cable companies aren't happy about it, but the broadcasters think it's their right.

The general feeling from broadcasters is that cable wants to use its "gate-keeper clout," as NAB spokesman Dennis Wharton termed it, to carry only the networks they have a financial stake in, as opposed to local broadcast stations they don't own. He cited a lack of incentive for cable to provide

local programming when it can't charge consumers for that programming.

The broadcast community makes the case that, in order for the digital TV rollout to succeed, cable has to participate by providing access to consumers. About 65 percent of consumers get local broadcast signals via cable.

Wharton feels there have been some encouraging comments from the new FCC and that key people there may want to take a fresh look at the issue, which is the role he believes they should play.

They want consumers to have an incentive to buy a digital set, but broadcasters need to develop digital programming to reach a big audience.

Bottom line, they aren't urging cable operators to drop programming that viewers want, just making sure local analog and digital signals are carried in their local markets. In most areas, that means less than 10 additional signals of simultaneous analog and digital broadcasts on a cable system.

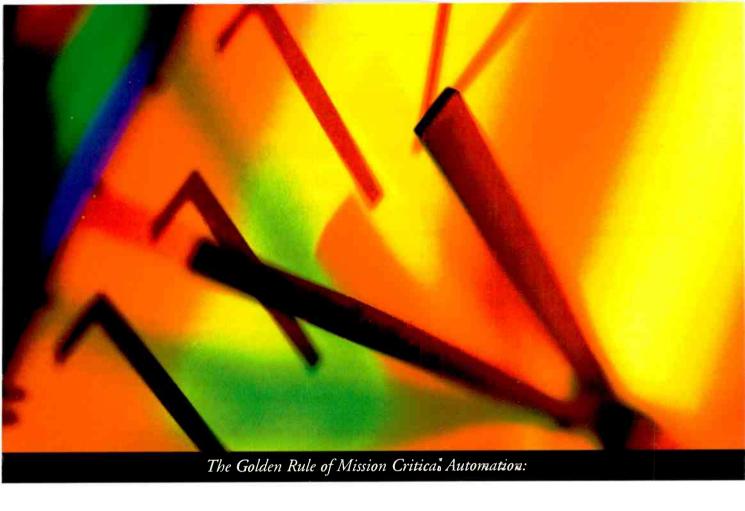
However, carrying digital and analog versions of "Friends" is not necessary from cable's perspective. Executives at C-SPAN add arguments of their own.

One commentator on the cable network recently pointed out that C-SPAN 3 hit the airwaves in January 2001, but the cablenet's brass was fearful of not getting a spot in cable lineups on various operators' systems. Executives at the public affairs channel think there is enough capacity to do it now, even with its selection a judgment call by each company.

Between analog (meaning over-theair broadcast stations) and public-access channels, about a third of the channels in a typical cable system are



The development of digital programming will help give consumers an incentive to purchase digital televisions.



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already mandated. Adding those stations' digital counterparts would mean losing twice as many channels of cable networks due to channel lock on virtually every system. That figure improves somewhat from cable's point of view

Cable & Telecommunications Association in Washington, said dual must-carry is unlikely to encourage viewers to buy digital TV sets. He said the \$60 billion worth of free spectrum given to broadcasters

#### Broadcasters argue that cable has more capacity to carry DTV channels than it did when the Supreme Court made its ruling nine years ago.

on a rebuilt analog system, which carries about 75 channels. That roster availability has risen over time, but not fast enough to accommodate digital must-carry. So, the bountiful choices cable operators want to give their customers would still be stymied. That can be an even bigger problem in a market like Baltimore-Washington for an operation like Comcast's in Anne Arundel County, MD, which is located between the cities and carries broadcast affiliate stations for each.

There are other issues. David Beckwith, spokesman for the National

should be enough to aid the digital transition.

There is a feeling in the cable community that broadcasters' sense of entitlement is inappropriate. That isn't to say that the cable industry is against carrying digital signals, just averse to the broadcasters going to the government to make them do so.

The feeling in the cable industry is that broadcasters expect cable to take the \$50 billion investment it has made in its infrastructure and just turn it over, when the broadcasters got their use of the spectrum gratis. Cable

executives think broadcasters should create their own digital infrastructure and compelling content, rather than try to get a carriage deal and decide what to create later.

The tentative conclusion that dual carriage was unconstitutional came at the end of William Kennard's tenure as chairman of the FCC late last year. It stated that must-carry did not apply in the digital world, therefore letting the cable operators off the hook. However, further input was requested. NAB contends that the FCC misread the wording on the statute. Today, however, the issue remains under review with no date set to decide whether analog and digital must be carried at once by cable operators. But, provided that a certain penetration level is reached by Dec. 31, 2006, stations will have to turn off their analog signals, period. And digital it will be.

Mark R. Smith is a freelance writer and has covered broadcasting and post-production for a decade. He resides in Odenton, MD, and can be reached at msmith 1277@aol.com.

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## **Digital Handbook**

#### Transition to Digital

#### Digital interfaces

BY MICHAEL ROBIN

Advances in technology have made it cost-effective to use bit-serial distribution of SDTV and HDTV video signals. All of the digital data bits, synchronization information and ancillary data (including several channels of digital audio), can be distributed inside a teleproduction plant through a single coaxial cable.

#### Bit-serial signal distribution model

Figure 1 shows the block diagram of a component digital bit-serial distribution chain. The source encoder consists of three A/D converters (one for each of the Y, B-Y, and R-Y analog video signals) followed by a time-division data multiplexer. The output of the multiplexer is a sequence of C<sub>B</sub>, Y, and C<sub>R</sub> parallel 10-bit words. The channel encoder transforms the bit-parallel digital signal into a bit-serial digital signal suitable for transmission through the chosen medium (e.g., coaxial cable). The received signal is corrupted to

some degree by thermal noise. In a studio environment, it is the receiver input stage that contributes most of this noise. The receiver channel decoder deserializes the received bit-serial signal and recovers the bit-parallel The signal decoder consists of a conventional demultiplexer followed by a set of three D/A converters, recovering the original Y, B-Y and R-Y analog component video signals.

The bit-serial data rate is given by:

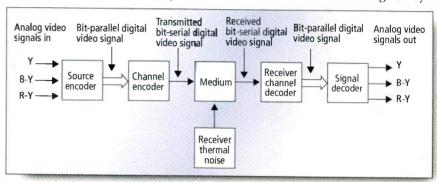


Figure 1. Bit-serial digital distribution model

digital video signal. Poor signal-tothermal-noise ratio at the receiver input may affect its ability to reconstruct the original signal, resulting in erroneous or missing bits. The output of the receiver channel decoder is the original sequence of C<sub>B</sub>, Y, C<sub>R</sub>.

Bit-serial rate (Mbits/s) = Parallelword rate (Mwords/s) x Number of bits per word

The SDTV 4:2:2 bit-serial rate is given by:

Bit-serial rate = 27 Mwords/s x 10 bits/word = 270 Mbits/s

The normalized HDTV bit-serial rate, based on 60 fps, is given by:

Bit-serial rate = 148.5 Mwords/s x 10 bits/word = 1.485 Gbits/s

The 59.94 fps data rate is equal to 1.485 Gbits/s/1.001

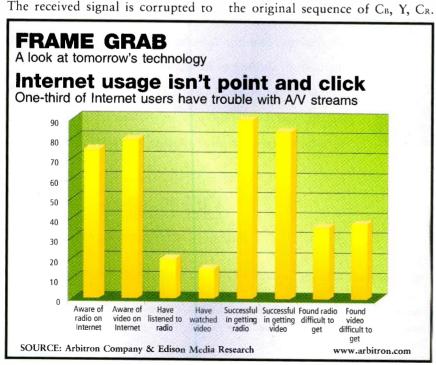
#### Claude Shannon's guidelines

According to Shannon, a noisy communication channel has a specific capacity measured in bits per second. The channel capacity is given by the well-known formula:

 $C(bits/s) = B log_2 [1+(S/N)], where B = The channel bandwidth (Hz),$ 

S = The received signal power (W), and

N=The accompanying noise power (W) In a studio environment, the first amplifying element of the receiver contributes most of the thermal noise. Thermal



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noise from other sources, and other types of noise, are present but negligible. The signal-tonoise ratio (SNR) at the input of the receiver depends on the attenuation of the interconnecting coaxial cable and the equivalent input noise of the receiver. This puts a limit on the length and associated signal attenu-

ation of the coaxial cable connecting the transmitter and the receiver.

At a given room temperature, the thermal noise power is proportional to the bandwidth. This is described in the formula N = kTB, where k is Boltzmann's constant, T is the noise temperature in degrees Kelvin, and B is the bandwidth in Hz. The channel capacity can then be expressed as:

 $C(bits/s) = B log_2 [1 + (S/kTB)]$ Shannon's theorem states that it is

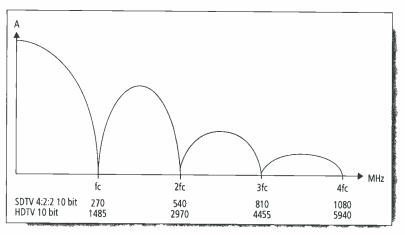


Figure 2. Bit-serial digital spectrum of SDTV and HDTV formats

theoretically possible to transmit information with a low probability of error through a channel having a specific capacity provided that the transmission rate is lower than the channel capacity. Shannon does not specify the means of obtaining an error-free transmission over a specific transmission channel, but simply states that there are means of achieving it. Each method results in a specific channel coding.

The channel coding describes the manner in which the 1's and the 0's of the data stream are represented on the transmission path. There are many channel-coding standards, and

they all aim at optimizing some aspect of the bit-serial digital signal. The SDTV and HDTV bit-serial channel coding use the Non Return to Zero Invert (NRZI) scrambled method. The result is an increase in the number of 0-to-1 transitions and the randomization of their occurrence to aid in the recovery of the clock in the receiver. A detailed description of

this method is beyond the scope of this article.

Figure 2 shows the spectrum of the 4:2:2 SDTV and HDTV NRZI scrambled bit-serial digital signals. The spectrum is typical of a suppressed-carrier pulse-amplitude modulation (PAM) with nulls at the sampling frequency and its multiples. The distribution of this type of signal requires very wide bandwidths – on the order of half the clock frequency. In a studio environment, this requirement can be best accommodated by adequate hardware technology.

#### Bit-serial distribution standards

The SMPTE Standard 259M specifies the characteristics of the bit-serial interface for 525/60 and 625/50 digital equipment operating with either 4:2:2 component digital signals or 4fsc composite digital signals. The standard can be applied in television studios where the length of coaxial cables used in the

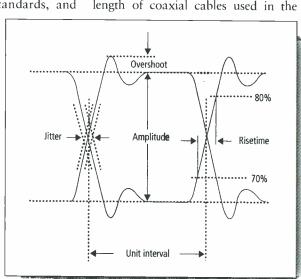


Figure 3. Eye diagram measurement dimensions

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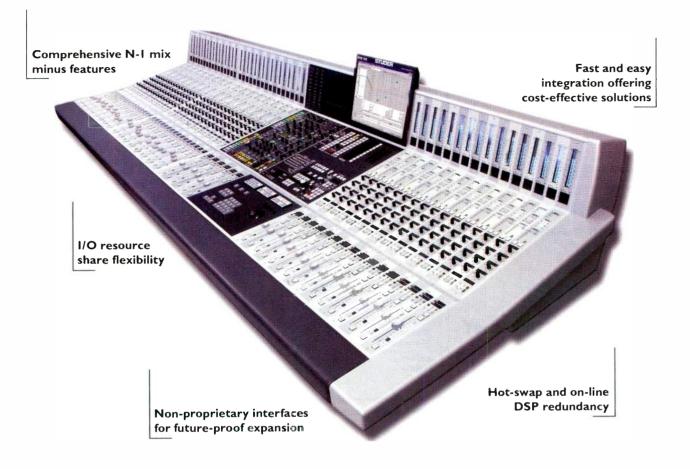
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B. S. C.	SMPTE 259M	SMPTE 292M
Signal format	Unbalanced	Unbalanced
Source impedance	75 Ω nominal	75 Ω nominal
Return loss	≥15dB (5MHz to 270MHz)	≥ 15dB (5MHz to 742.5MHz)
Signal amplitude	800 mV p-p ±10%	800 mV p-p ±10%
DC offset	0.0 V ±0.5 V	0.0 V ±0.5 V
Rise/fall time	0.4 to 1.5 ns (20% to 80%)	≤ 270 ps (20% to 80%)
Overshoot	<10% of signal amplitude	≤ 10% of signal amplitude
Jitter	See Table 2	See Table 2

Table 1. Transmitter characteristics of bit-serial interfaces

3350	SMPTE 259M	SMPTE 259M
Timing jitter lower band edge	10Hz	10Hz
Alignment jitter lower band edge	1kHz	100kHz
Upper band edge	>1/10 clock rate	>1/10 clock rate
Timing jitter	0.2 UI (740 ps p-p)	1 UI (673 ps p-p)
Alignment jitter	0.2 UI (740 ps p-p)	0.2 UI (134.6 ps p-p)
Test signal	100% color bars	100% color bars
Serial clock divider	≠10 (preferred)	≠10 (preferred)

Table 2. Jitter specifications of bit-serial interfaces

	SMPTE 259M (4:2:2)	SMPTE 292M	
Signal format	Unbalanced	Unbalanced	
Input impedance	75 Ω nominal	75 Ω nominal	
Return loss	≥15dB (5MHz to 270MHz)	≥15dB (5MHz to 1.485GHz)	
Optional cable loss equalization	30dB at 270MHz	20dB at 742.5MHz	
Interference tolerance	Not specified	DC: ±2.5 V <5MHz: < 2 V p-p 5 to 27MHz: <100 mV p-p >27MHz: <40 mV p-p	

Table 3. Receiver characteristics of bit-serial interfaces

studio does not exceed that specified by the receiver equipment manufacturer. In such applications, the signal loss at the receiver input is typically 30dB either at the clock frequency or half the clock frequency. The Belden 8281 coaxial cable, for example, has a loss of 30dB at 135MHz. Current receiver technology is capable of automatically equalizing losses introduced by up to 300 meters of this coaxial cable. Using a safety margin of 100 meters reduces the useful length of this cable to about 200 meters.

The SMPTE Standard 292M specifies the characteristics of the bit-serial interface common to several HDTV source formats operating at 1.485 Gbits/s and 1.485/1.001 Gbits/s. This standard deals with 1125-line, 1250-line (European HDTV) and 750-line scanning formats. Current receiver technology is capable of automatically equalizing losses introduced by up to 100 meters of Belden 1694A coaxial cable. Using a safety margin of 15 meters, the equalizing capability is of the order of 85 meters. For longer distances, fiberoptic distribution systems must be used

instead of coaxial cables.

Figure 3 shows the outline of the NRZI scrambled bit-serial digital signal. This signal is commonly called the "eye diagram." The

name results from the appearance on a storage oscilloscope of sections of digital symbol patterns superimposed on one another. For an infi-

nite-bandwidth system, the transitions from 0 to 1 are instantaneous and, consequently, the "eye" is square. But practical systems have a finite bandpass, resulting in tran-

sitions with a slower rise time and decay time, which show up on storage oscilloscopes as the familiar eye shape. Bitserial signals are specified in terms of eye amplitude, rise time, decay time, overshoot and jitter.

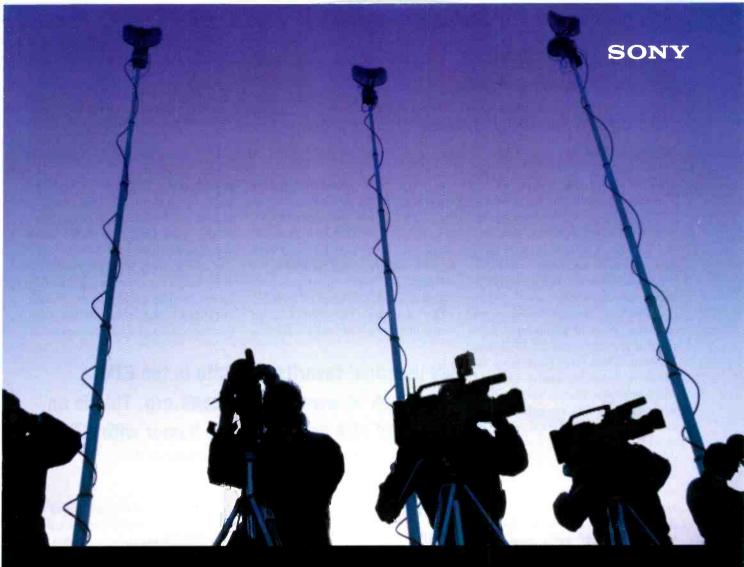
Table 1 summarizes the transmitter (bit-serial signal source) characteristics. Of particular importance are the tolerances of the eye-diagram parameters as well as the impedance matching of the signal source to the coaxial cable, specified in terms of return loss. Table 2 lists the jitter specifications and the frequency domain to which they apply.

Table 3 summarizes the receiver (channel decoder) characteristics. Of particular importance is the inputimpedance specification in terms of return loss,

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



Send questions and comments to: michael\_robin@intertec.com



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#### Computers & Networks

#### Resources on the Internet

BY BRAD GILMER

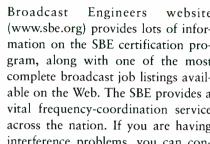
s the Internet has become ubiquitous, especially in the television world, we have all discovered special websites that help us do our jobs on a regular basis. I wanted to share some sites my friends and I have found. We hope these sites are as much help to you as they have been to us.

Andrew Corp. (www.andrew.com) has a number of free programs on its website that are very useful for RF system designers. These tools range from the "Andrew Broadcast System Planner," which helps specify everything from the feedline up to and including the antenna, to the "Radiation Hazard Analysis" program, which assists a designer in evaluating compliance with FCC guidelines on RF exposure. These free products can be found by following the "Free System Planning Software" link on the Andrew home page under "Solution Center," or you can get to the software area directly at http://www.andrew.com/ solutioncenter/systemplanningsoftware/ default.asp.

My personal favorite DTV site is the ETV Cookbook at www.etvcookbook.org. This is an excellent site that combines humor with DTV. (How do they do that?) I understand that this site is run by a couple of engineering types who would prefer to remain anonymous. Congratulations to

you, whoever you are, for putting together one of the best sites on the Internet. Visitors to this site will find information on everything from ACTV to XML. (Ichecked the glossary - there were no entries starting with Z.) But beyond the humor, you will find a solid site with down-to-earth information on DTV and ETV basics.

The website for SMPTE, at www.smpte.org, is a handy reference. Broadcast Engineers website (www.sbe.org) provides lots of information on the SBE certification program, along with one of the most complete broadcast job listings available on the Web. The SBE provides a vital frequency-coordination service across the nation. If you are having interference problems, you can contact the SBE frequency coordinator in



#### My personal favorite DTV site is the ETV Cookbook at www.etvcookbook.org. This is an excellent site that combines humor with DTV.

This site has been completely redesigned over the last year. You can purchase standards and test materials. choose from a large number of technical books, find out about your local SMPTE section, and for those interested in participating in the standards process, the "Engineering Committee" link provides all the details of upcoming SMPTE engineering meetings.

The official website of the European Broadcast Union (www.ebu.ch) provides a wide range of information about EBU activities. One of the most useful areas

> of the site is the technical publications (http:// www.ebu.ch/ tech\_texts.html). You can find a number of articles free for the asking on subjects ranging from compression to information on Broadcast WAV. You can also find information here on EBU technical conferences.

The Society of

your area for help.

How many DTV stations are on the now? Broadcast (www.broadcastcounts.com) has the answer. This site does one thing, and does it very well. The next time the GM wants to know who is on the air with DTV in your market, point him to this site.

How about the number of conventional television stations currently on the air? The FCC has this information at www.fcc.gov/mmb. Scroll down to "Broadcast Station Totals" and follow the link.

The FCC has another excellent site for broadcasters - you just have to know where it is. If you follow this link: http:/ /svartifoss2.fcc.gov/prod/cdbs/pubacc/ prod/cdbs\_pa.htm, you will find the FCC Mass Media Bureau CDBS database page. At this site, you can retrieve information about current station licenses, applications, EEO filings and more. This is an excellent page to use if you wonder whether your last application has been received and entered into the FCC database. Furthermore, you can download the entire MMB database if you need access to this information in the field.

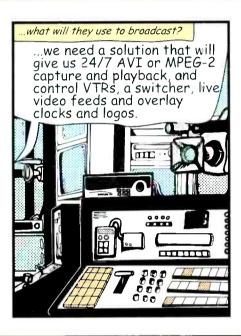
If you need information on satellites,



The SMPTE website offers a wealth of resources and is de riqueur for broadcast engineers. Image courtesy SMPTE.

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try www.lyngsat.com. This is a great site for "all things satellite." How many times have you had a call come in for a last-minute satellite feed only to find out that some critical information on your "feed fact sheet" was missing? A search of this site yields quick answers. Information is arranged by three regions: America; Europe, Africa and the Middle East; and Asia and the South Pacific.

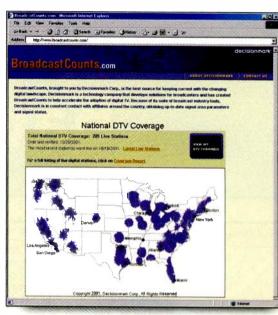
# The FCC has another excellent site for broadcasters – you just have to know where it is.

Once you select the appropriate region, choose from the list of satellites arranged according to position in the satellite arc. Selecting a particular satellite leads to a list of transponders on the satellite, along with a link to technical

information about the satellite, itself. If you are serious about satellites, this is the site for you.

One of the pesky problems posed by satellites is that twice a year, they manage to position themselves exactly between the earth and the sun. The sun is a continuous fusion reactor that produces radiation at all sorts of frequencies, including the C and Ku bands. If you direct your satellite dish to follow a satellite and the satellite's path across the sky crosses the sun's path, you will experience an outage during the time the dish is pointing directly at the sun.

Fortunately, you can know precisely when these outages will occur. The "Sun Outage Calculator" found at http://www.panamsat.com/sat/outage/calc.asp is just one tool available on the Web to tell you when sun outages are



If you want to identify DTV broadcasters, BroadcastCounts.com is the place to go. Image courtesy Decisionmark Corp.

going to occur.

If you do editing work, you may eventually run into 25-frame material. You will quickly be introduced to the pleasure of converting from 24-frame to 25-frame time code, and vice versa. Fortu-



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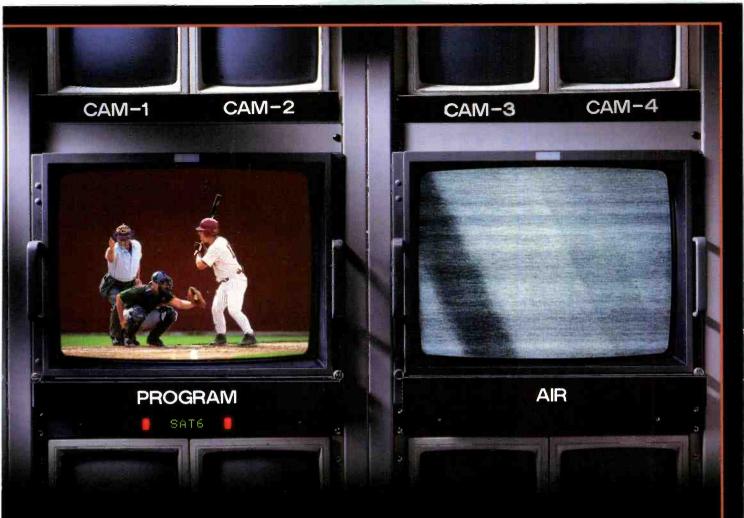
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your grounding system to 1-5 ohm resistance, as recommended by IEEE. At a fraction of what it would cost to repair and replace damaged equipment, you can get a correctly sized, properly installed copper-based grounding system. It's what these two stations did. And lightning hasn't been a problem since.

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nately, Kay Sievert, an editor in Los Angeles, has a number of handy conversion utilities. You can find these utilities at http://home.socal.rr.com/sievert/tcsoft/index.html.

Since this column is about computers and networks, I couldn't resist throwing in a few general-purpose computer websites. Many people are familiar with the Google search site (www.google.com). But did you know about the commands "site:" and "link:"? If you type the command "DTV site:www.nab.org," Google will search for all occurrences of the acronym DTV, but limit the search to the site www.nab.org. If you type "link:www.nab.org," Google produces a list containing every page that has a link to www.nab.org. Google has a new image-search feature that just emerged from beta testing. If you click on "Image" at the Google home page and then type "broadcast," Google will return images with the word "broadcast" in their filename.

The list of Linux reference sites is endless. For my money, one of the most interesting is the Open Source Development Network (www.osdn.org). Enter almost anything in the search field and you will find that someone, somewhere in the world, is writing software for it.

This month is the first of what I hope becomes an occasional, but regular part of my column. I would like to thank Mike Dolan, Jim Paulus and Merrill Weiss for their contributions. I hope you find that at least one of these sites is a useful addition to your toolbox. If you have a favorite site you would like to share, drop me a note at brad\_gilmer@intertec.com. If we get enough quality submissions, we may run an update sometime next year.

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



Send questions and comments to: brad\_gilmer@intertec.com

#### Internet toolbox

For conventional TV stations on the air:

www.fcc.gov/mmb

For conversion utilities:

http://home.socal.rr.com/sievert/tcsoft/index.html

For DTV/ETV basics: www.etvcookbook.org

For DTV stations on the air: www.broadcastcounts.com

For EBU reference: www.ebu.ch

For Linux reference (Open Source Development

Network): www.osdn.org

For the Mass Media Bureau CDBS database:

http://svartifoss2.fcc.gov/prod/cdbs/pubacc/prod/

cdbs\_pa.htm

For RF system design tools:

www.andrew.com; http://www.andrew.com/solution-

center/systemplanningsoftware/default.asp

For more on satellites: www.lyngsat.com

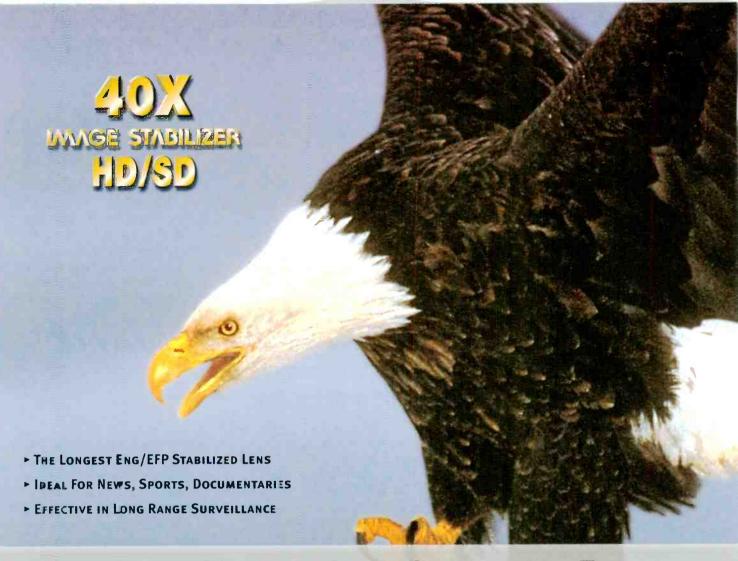
For search features: www.google.com

For SMPTE reference: www.smpte.org

For SBE reference: www.sbe.org

For a Sun Outage Calculator:

http://www.panamsat.com/sat/outage/calc.asp



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#### Streaming Media

#### Tracking traffic

BY STEVEN M. BLUMENFELD

ver the past few months I have been giving this topic a lot of thought. We all use information every day, and without it we would have a terrible time trying to run our businesses. Traffic is just one such measure, but as a consumer-oriented industry it is used to drive just about all our metrics. Traffic can be defined in many different ways, but for the sake of this article, let's define it as some kind of usage or throughput measurement. There are so many different ways to track traffic, each one playing an important, and sometimes crucial, role in our business.

Every day I spend the first part of my morning looking at traffic. It has become routine for me to wake up around 6:00 a.m. and immediately turn on my computer. My compatriots on the East Coast know I am alert (well, maybe) and starting to track my day. They have become so accustomed to this routine that they often schedule calls at this time. In fact, most of my traffic reports are generated overnight and arrive by e-mail in time for my first cup of java. Let me briefly describe some of them.

The first is an administrative report that tracks registrations on specific

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Visualware's VisualRoute 6.0 is a graphical trace-route tool that provides Internet connectivity information for network trouble-shooting and IP geographical locations for security purposes.

AOL services that I am interested in. This report is gathered and manipulated by various information sources within the company. Some of the data comes from our network switches, telco switches, routers and servers and is processed by one of our most valuable resources – our reporting

discuss adjustments to current market plans or features.

The next type of report is a little more technical and gives us hours, minutes and seconds of use for the entire service. We then break this information down by region, function, feature and overall usage. This allows

### Traffic can be defined as some kind of usage or throughput measurement.

group. It tells me how many people have signed up for a service on a daily basis, which promotion they used, how many canceled, 30-, 60-, 90-day churn rates, service-usage statistics and a whole wealth of other information.

This type of tracking has been invaluable to our business leaders. It is immediate (I only get a daily summary but finer reports are available if needed) so, as an example, we can tell if a new promotion is working or not. More importantly, as we roll out new features we can judge their effectiveness. Usually after looking at the raw

numbers my eves immediately migrate towards the trend graphs. A trend is a set of statistics plotted over time. If we are trending in the right direction (usage is up, registrations are up and churn is down) we get to call the team to congratulate them. If we start trending the wrong way, we

us to do network trend analysis but, more importantly, we can derive the health of our network/service. If we see a feature that all of a sudden varies from its normal trend, a red flag is raised. Most likely that feature is having technical difficulty and our customers are not able to access it properly. Certainly, if we had an update on the service we would know if something is broken. These trends allow us to make sure we are predicting our growth so we can order more bandwidth, increase staff and beef up our server complex.

The last report I get in the morning is the roadway traffic report. Are the bridges packed? Is BART on time? Is the 680 or the 880 flowing? Are there any accidents? This is the type of flow report that helps set up my day. So how does all this affect the way you should look at tracking your traffic?

The interesting thing about any report or statistics is that there are so many different ways to integrate the information into your work. A bandwidth usage report means totally different things to a network engineer than it does to a marketing VP.

The first thing you need to do is determine what information you have available. Then decide how it is going

```
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to be used, by whom, how often, and lastly, how to parse all the raw data into reports with meaningful statistics, ratios and comparisons. Most tracking reports should allow for trend analysis, as this is usually the most telling information.

If you are using an outside hosting company, most of them will provide you with various reports that flow from the raw data logs of their servers and switches. You need to be able to specify what data is important to you

and how often you need a snapshot.

Two good reasons for studying growth is to plan capacity and track business models. This can be done by interpolating the possible range of growth. This is derived from the "best-fit" regression curve based on your trend analysis. A regression analysis allows you to look at growth within a confidence interval or a range of possible values.

Using this kind of analysis will help you know how valuable your data is.

At a 95 percent confidence interval, the true value will fall outside the estimated range five percent of the time. A small variance within this range gives you "confidence" that the data is accurate. You should discuss these types of analysis with your reporting groups so you can understand how they are derived and how relevant they will be to your needs.

Recently, a product announcement came across my e-mail and I was intrigued so I checked it out. Visualware recently announced a new release of VisualRoute, which is a graphical traceroute tool that provides Internet connectivity information for network troubleshooting and IP geographical locations for security purposes. Visual-Route 6.0 is available on the Windows, Linux, Solaris, FreeBSD and Mac OSX platforms.

VisualRoute has the ability to identify the geographical locations of routers and servers. It can provide you with an effective means to identify the location of different groups of your users. The release includes new features, such as integration with Internet Explorer, automatic protocol recognition and an improved interface.

# Most tracking reports should allow for trend analysis, as this is usually the most telling information.

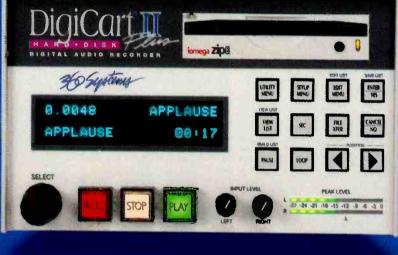
VisualRoute automatically analyzes Internet connectivity and performance problems, displaying the results in an easy to understand table and on a world map. A trial version is available from Visualware's website at http://www.visualware.com/.

Steven M. Blumenfeld is currently the vice president of advanced services for America Online.

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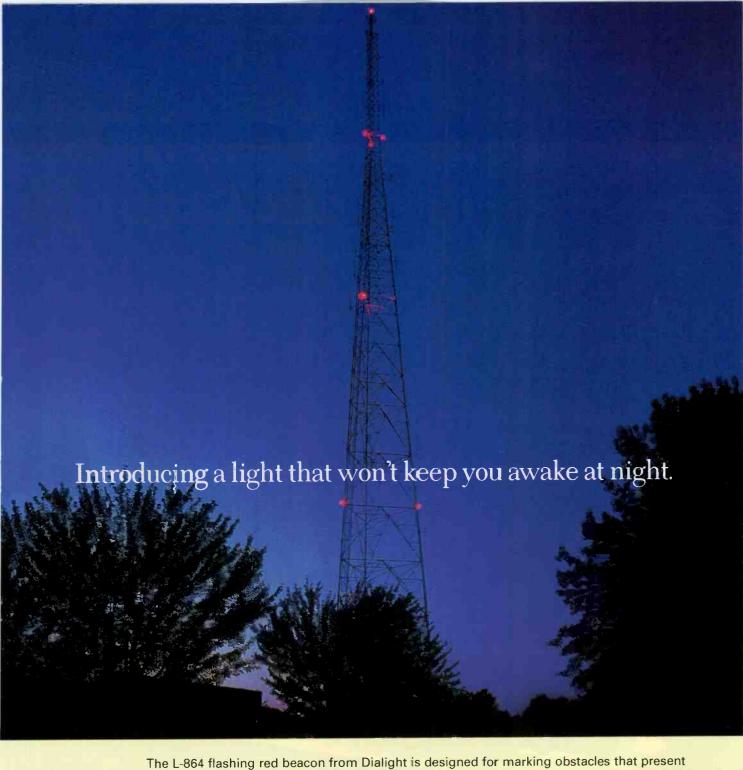
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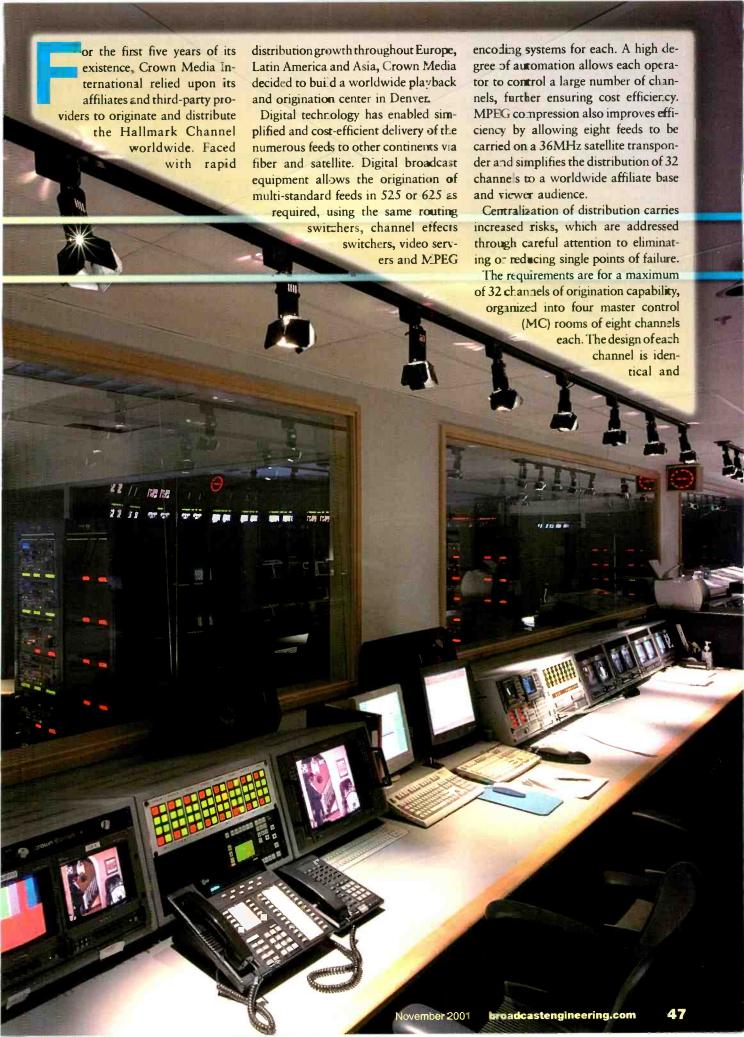
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# Hallmark Channel global playback center

Broadcast Operations Control (BOC) looking through glass windows into Master Control Room 1 (nearest) and Master Control Room 2. The large viewing windows allow operators to monitor signals from the BOC without duplicating all 256 video monitors. Photos courtesy Crown Media International.



may be configured for 525 or 625 digital signal format. Three VTRs per channel are utilized for long-format programming, with main and backup video servers used for short-format programming, promos and commercials. A single SDI routing switcher and backup provides all source switching for all channels. An Oxtel Imagestore 2 from Miranda implements channel logo insertion and automated effects. Each channel's output is re-entered into the routing switcher to provide a common programming source for multiple channels and to allow for separate interstitial and segment breaks. The initial build-out provides 16-channel capability, with the potential for expansion to 32 channels.

#### Project team

Crown Media's Network Operations and Engineering staff were heavily involved in developing the system concept and layout of the Network Operations Center. Aspen Engineering in Los Angeles was brought in to plan and manage construction of the physical facility. Sony SIC was chosen to handle implementation of the design, drawings, system integration and technical construction because of its domestic and international experience in directto-home and cable network broadcast facility design. The Crown Media project staff developed the channel design and remained immersed in the details of construction, system design and problem solving throughout the project. This level of commitment was a key factor in the success of this project.

Encoda DAL was chosen as the automation system for its ability to display multi-standard, multichannel playlists on one terminal and its demonstrated redundancy, as well as the wide range of equipment that can be automated using the system. Pinnacle video servers were also selected and Pro-Bel Eclipse routing switchers were chosen for their ability to switch both 625 and 525 in the same router frame. Another factor in the decision was that a 256x128 dual-output router occupies only 22 rack units. Scientific-Atlanta PowerVu Plus encoders and Screen Subtitling Systems were selected based on their ability to transmit six subtitle languages per channel and display any subtitled language on a standard PowerVu receiver.

#### Physical facility

Construction planning of the Network Operations Center (NOC) posed a significant challenge because the NOC was planned to occupy 4500 square

capability in BOC without duplicating all 256 video monitors.

Electrical requirements were planned around redundant 300 KVA UPS systems, which in turn were backed up by

## Electrical power and technical system interconnections are facilitated through a raised floor.

feet of a commercial office building. The NOC is co-located with the Production Operation Center at Crown



The facility utilizes redundant 750kW generators to guard against system failure.

Media International headquarters in Greenwood Village, CO. Challenges such as the lack of a freight elevator, existing building tenants and a limited deck clearance of 11.5 feet required significant attention and planning.

The NOC is organized into a central equipment room (CER) that houses all technical equipment except VTRs, monitoring equipment and computer workstations. Master control (MC) rooms 1 through 4 contain the VTRs and monitoring equipment for eight channels each. A Broadcast Operations Control (BOC) center allows each operation supervisor to monitor 16 channels and provides the ability to take direct control of any of the channels if needed. The use of large viewing windows between BOC and each MC room provides monitoring

redundant 750kW diesel generators. Both the NOC and the production facility are powered by the UPS and generator configuration. Recent rolling blackouts in California validate this decision. Each rack of equipment is supplied with a separate power source. Equipment such as the routing switchers, video servers and DA trays were ordered with multiple power supplies and AC mains; therefore, each main is supplied by a different UPS system through separate circuits. Equipment with only one power connection, such as workstations, video monitors and VTRs, is connected to AC switches fed from each UPS. These AC switches can activate a switchover between AC power sources in 6ms or less.

Electrical power, technical system interconnections and HVAC discharge air distribution are facilitated through a raised floor. The BOC uses a single 24-inch raised floor. The master control rooms are each built on a single 18inch raised floor. This difference in elevation affords BOC greater visibility into each master control room. CER utilizes two stacked raised floors of 12 inches each. The lower floor or slab level is used for electrical power distribution through conduits and HVAC discharge air distribution. The upper raised-floor level is utilized for system wiring. Separation of the system wiring from the HVAC distribution prevents wire congestion from obstructing the airflow. This raised-floor design requires the utilization of plenum-rated cable according to most local building and electrical codes.

Three 20-ton cooling units maintain a stable temperature by forcing cold discharge air through the bottom of



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each rack. This design ensures an adequate airflow to racks that dissipate a significant amount of power, typically the video servers and encoding-compression systems.

Fire suppression utilizes FM-200 throughout the NOC. A double-action pressurized dry sprinkler system provides additional protection. Fire detection relies upon a sensitive air-sampling system to provide early warning of smoke. Numerous hand extinguishers are also placed throughout the facility. Security into

used to transport the multiplexer output to the uplink sites are also 1:1 redundant.

In order to provide a seamless failover, all channel outputs of each router, air and backup, are fed to separate video monitors. It offers little protection to have an unmonitored backup path and find that it has failed prior to the time you need it. Additionally, all channel outputs from the redundant router are connected to SDI protection switches. Should the air router output fail, the SDI protection switch will is the Program (PGM) bus. This bus has an air and backup router output assigned for each channel. Each router output connects to the SDI protection switch, the output of which is connected to the effects switcher. This effects switcher implements logo insertion, credit DVE squeezes of programs and insertion of presqueezed promos, all under automation control.

The second signal bus utilized for each channel is the Preset-Effects (PST-EFX) bus. This bus is configured to operate in two distinct modes. In the Preset mode, it displays the next event from a source not currently on-air. This means that if the video server is on-air, the bus will be switched to the next VTR assigned to the channel. If a VTR is on-air, the Preset bus will display the first clip or spot from the video server assigned to the channel. As in the case of the PGM bus, a separate video monitor is fed from the PST-EFX outputs of the air and backup routers. An additional SDI protection switch is present to automatically select the backup router output should the air router PST-EFX output fail.

The second mode of the PST-EFX bus is the Effects mode. This is utilized primarily in the case of credit

# It offers little protection to have an unmonitored backup path and find that it has failed prior to the time you need it.

the NOC is controlled by magnetically coded employee identification cards and biometric hand scanning.

Two environmental monitoring systems display and track HVAC, cooling parameters and rack temperatures, and monitor each generator, UPS and power distribution unit throughout the NOC and the production facility.

#### System redundancy

Redundant or fault-tolerant system design was employed to minimize any outages affecting a large number of channels by reducing single points of failure. The NOC employs redundant systems on three levels. First, the electrical power distribution systems are redundant. The failure of one circuit, or an entire UPS distribution system, will not impact critical equipment.

The second level of redundancy is source device redundancy. All VTRs are allocated three to a channel. This allows simultaneous playback of air and backup program tapes. Video servers are 1:1 redundant, and all clips are ingested into both video servers and played out of both servers.

The third level of redundancy involves signal distribution. Source switching for all channels is 1:1 redundant, with air and backup routers. The PowerVu Plus encoders are 1:8 redundant, with 1:1 redundant multiplexers. Finally, the fiber circuits

automatically change to the backup router with minimal interruption. Each channel is re-entered into the air and backup routing switcher through separate DAs with the passive loop-through connected to the encoder for the channel. If one or both DAs fail or are removed, that channel's encoder still has input video.

#### Channel design

Two signal busses are utilized in the design of each channel. The first



Pinnacle redundant video servers in the central equipment room are shown above, with the A server (air) on top and the B (backup) on the bottom of each rack.



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## **Project team**Crown Media International

Richard Buchanan, senior vice president of operations, planning and analysis

Charles Zabilski, project manager and vice president of operations Kim LeGate, director of engineering Brett Pierce, chief engineer

#### Sony SIC

Darrell Lew, project manager John Bunton, lead engineer David Potter, network engineer Dan Lutz, engineer

#### **Aspen Engineering**

Patrick D. Huff, A.I.A. architect in charge, senior construction manager Steven G. Belasco, senior administrative manager Michel E. Gray, manager of special projects

#### **Equipment list**

Encoda DAL A8000, A8500, A8600 Scientific-Atlanta PowerVu Plus Miranda Imagestore 2 Cummins Onan 750kW generators Liebert 300KVA Pro-Bel Eclipse SDI Ross UDA-7500 RS-232 DAs General Video Systems GV160211K10 SDI protection switch Screen Subtitling Systems SRU-32 Tektronix SPG-422, ECO-422 sync generators GVG 8802, 8936, 8941 and 8911

squeezes and/or audio mix-overs, where a separate audio or video stream is required to be combined on-air under automation control.

Sony Digital Betacam DVW-A500P

(625), DVW-A500 (525) VTRs

#### Subtitled languages

video and audio DAs

With international channel distribution, subtitles are normally transmitted according to the demands of the local market.

World Standard Teletext allows the viewer to select one of several languages to display on that viewer's



Smart System Controller Computer displays (nearest computer) are used for monitoring HVAC performance and individual rack temperatures. The farthest monitor displays parameters for redundant UPS, power distribution units and generators.

television. Teletext is generally limited to Roman-based fonts and character sets.

Imitext subtitling is a proprietary system developed by Screen Subtitling Systems in conjunction with Scientific-Atlanta. Here the subtitles are transmitted as bitmapped images, and therefore are not limited to Roman-based characters but can include complex fonts such as Thai and Chinese. The limitation with the Imitext system is that the subtitle data is burned into the video. Once a cable headend selects a language, all subscribers view the subtitles, similar to open captioning. Imitext subtitles cannot be passed through to additional encoders or set-top boxes unless burned into the video.

Imitext subtitles are utilized in the NOC, with some channels transporting both Imitext and Teletext. At present, the maximum number of subtitle languages actually transmitted is four; however, the system is capable of six languages per channel. The Screen Subtitling Systems controller cues the subtitle file under automation control and transmits the subtitle data to the Power Vu Plus encoder in an RS-232 format, two languages per RS-232 stream.

With the ability to have common

programming feed more than one channel, a problem existed with supplying the three RS-232 outputs to multiple destinations. The solution involved modifying a video DA by changing its gain structure to drive ± 10 volts into a  $3K\Omega$  load. With three modified RS-232 DAs per channel, each of three RS-232 streams (six languages) can be distributed to eight destinations. The ability to monitor multiple subtitle languages in the MC room required design of a three-input, one-output RS-232 switcher to allow tandem Imitext decoders to display two languages on screen at once.

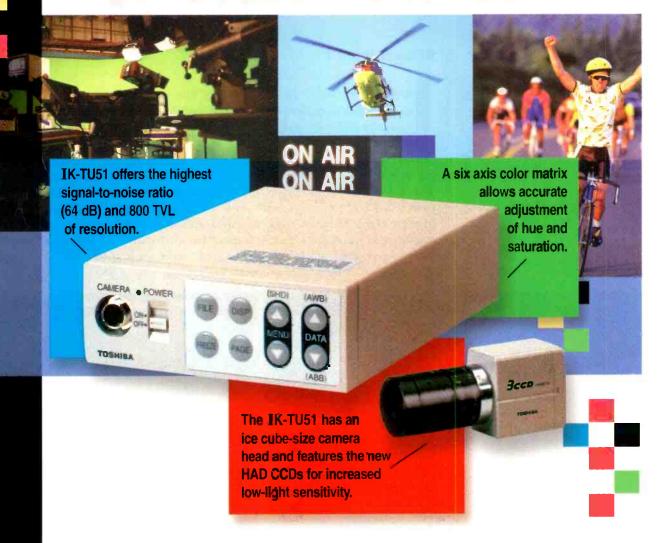
#### Turn-up of the channels

A combination of satellite and fiber allows worldwide distribution of the Hallmark Channel from its origination point to affiliates throughout Europe, South Africa and Latin America.

The NOC was inaugurated on Feb. 14, 2001, with the launch of three channels into Europe. In the following weeks, additional European channels were launched, followed by launches into Israel, Russia, the Mideast and Latin America. Currently, 12 feeds originate from the NOC.

Charles Zabilski is vice president of operations for Crown Media International, and Darrell Lew is a Sony SIC project manager.

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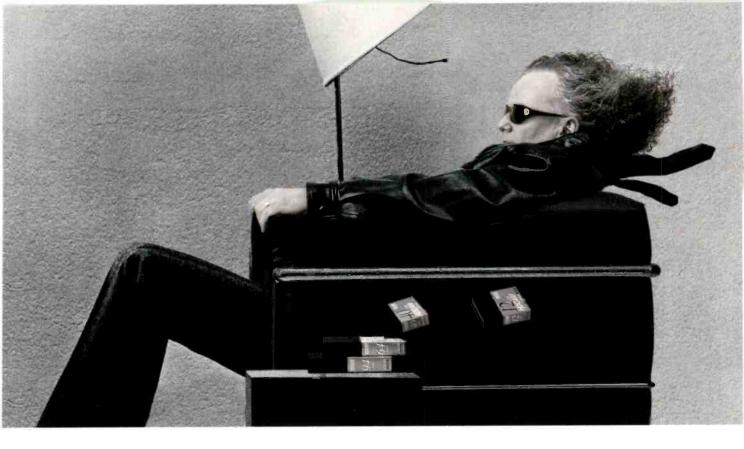
# NMT's DX11 mobile production facility

#### BY CHRIS BROWN

n August of 2001, National Mobile Television added a new face to its fleet of 46 mobile units, unveiling its latest digital mobile television production facility. It resides under the name DX11. DX11 represents an innovation of design and technology.

In an effort to please both production and engineering, a collaborative approach to the design and construction of this unit was used. DX11 is a 53-foot production trailer with a 47-foot curbside expando that opens up an additional five feet, bringing the overall width of the trailer (with stairs) to almost 21 feet! This design allows clients to enjoy a large and open production area, yet still provides ample room and access for engineers to work. DX11 achieves all of the goals NMT set for its new production facility, providing ample production and engineering space that allows smooth workflow and houses state-of-the-art technology.





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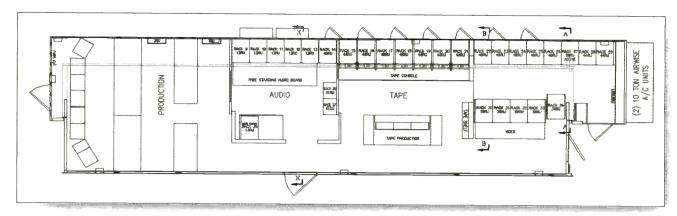


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Floor plan of National Mobile Television's DX11 production facility.

#### NMT's floor layout design

The floor layout represents two different designs already in use by NMT's DX6, A35, HD1 and HD3. Working with Aluminum Body Company and then Gerling and Associates, NMT made several innovations to the DX11 Starting in production, there is an extra-wide front row, allowing seating for up to four production crew members, including the technical director, and a split row that can accommodate additional production or technical personnel. It is here that NMT has installed a Grass Valley Group Kalypso live production switcher and Accom's Dual Twin DVEous. All of the production crew benches, including that of the graphics operator, have been equipped with Marshall Electronics flat screen LCD courtesy monitoring. The production monitor wall consists of over 90 B&W and color moni-

tors, and the wall itself has been 'toedin' some 15 degrees on each end to provide an inviting environment for the production crew. The production monitor wall is set up in two halves so that when placed into position, it leaves one half in the expanded section of the unit. Rather than create extra expando floor supports outside the unit, or risk ruining the tiling by rolling the monitor wall into place, this half of the wall slides into position on overhead rails that are supported from the expando ceiling with additional support on the floor. This makes for ease of set up, and helps to relieve a great deal of weight that would otherwise be placed on the expando floor.

DX11, like two other NMT units, DX6 and A35, places the audio booth in the center of the mobile unit between the production and videotape areas. This

design allows engineers and operators the comfort of access to all working spaces without ever having to step outside. The Solid State Logic Axiom MTP audio console was chosen for the DX11. Located above the Axiom console, NMT once again employs the use of the Mar-

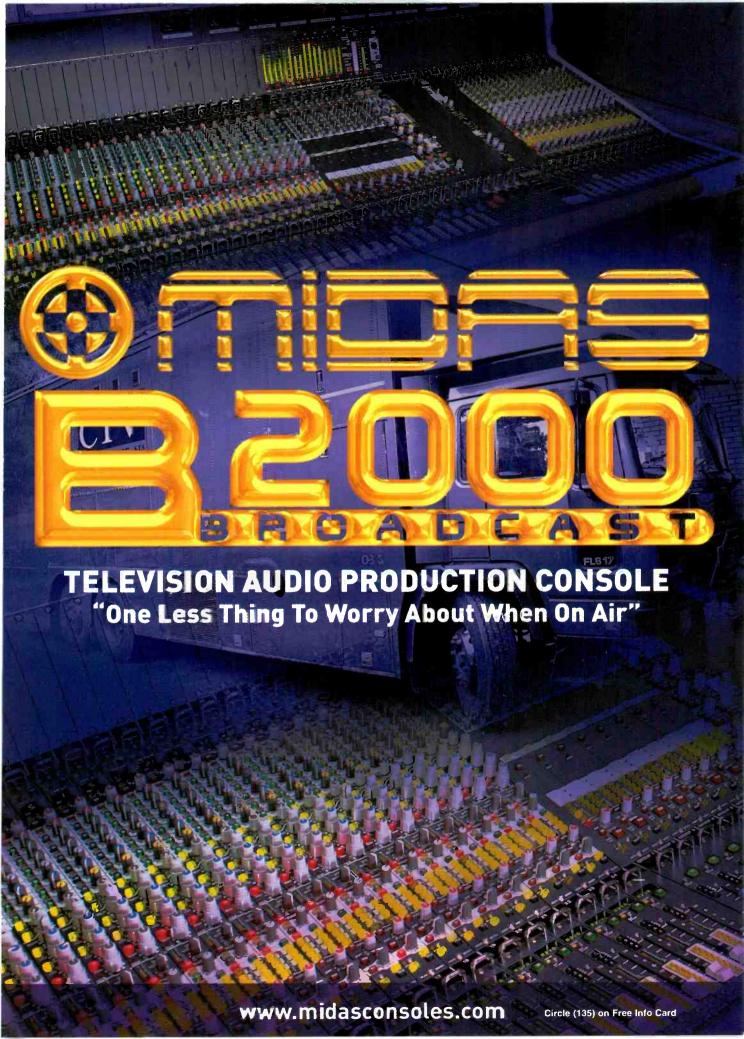
#### DX11 achieves all of the goals NMT set for its new production facility.

shall LCD monitors, again to reduce weight, but also to reduce the amount of heat created toward the rear of the console while increasing the amount of cold airflow around the console. The console can handle over 200 inputs.

The videotape area also features a new rack layout and design. Five Sony DVW-A500 Digital Betacams and one Sony BVW-75D are housed in the upper third of the tape racks with all monitoring located beneath. This allowed NMT and Gerling to recess the monitors in the wall below to create almost two feet of workspace depth for the videotape operators. This also lowered the sight line for the operators' crucial color monitors, allowing a more ergonomically correct and productive operator's position. DX11 is designed to accommodate two-dozen tape- and/or disc-based recording and replay devices. DX11 enters the 2001 NFL season with 16 channels of DDR capability installed and can be expanded to accommodate several more devices.



DX11 is a 53-foot production trailer with a 47-foot curbside expando that opens up an additional five feet.





NMT chose the Solid State Logic Axiom MTP audio console for the facility.

The rear bench in videotape is home to four sets of dual Marshall Electronic flat-screen LCDs and two 17-inch Marshall Electronic LCDs. Utilizing this flat-screen technology with every monitor on the rear bench affords the EVS

DX11 is designed to accommodate two dozen tape- and/or disc-based recording and replay devices.

operator and any other production staff more workspace. As with most tape room environments, this rear bench rolls in for transport; however, with its lighter, more energy-efficient design, the desk provides a productive workspace that sets up quickly.

The layout for the terminal and transmission area is a natural evolution from our HD units, with one important change. The floor in this area has been raised approximately four inches to allow for increased airflow return to the two 10-ton air-conditioning units on the front of the trailer. This was done without compromising headroom and engineering workspace in the terminal

area, and provides the necessary cooling for all of DX11's major components, such as the THOMSON Multimedia Venus 192x192 analog and digital routing system and RTS/Telex 128port ADAM intercom system. The terminal and transmission area have also been given their own outside access door, so engineering can come in and out of the truck without disturbing any of the production or operating areas. Because the racks in the terminal and transmission area face the street side of the unit, NMT installed access doors along the outer shell of the trailer, providing access to the rear of each rack, including transmission, videotape and audio.

The video operators' area of the mobile unit is located parallel to and behind the terminal area at the head end of the trailer (beside the rear bench in videotape). This location gives the video operators their own entrance from outside and the ability to close off from production. The rear of the CCU controls for the THOMSON Multimedia LDK 10s and LDK 20s open up into the terminal area, allowing ease of access for maintenance and troubleshooting for NMT's engineers.

National Mobile Television and its integration and wiring partner, Bennet Systems, were careful in laying out and wiring DX11 to ensure complete flexibility and future integration with

other NMT mobile units. By standardizing major systems on all of the DX series of digital production units, NMT is able to provide large production facilities for any size event. Communications, switching and routing systems can all be combined to create systems that allow productions such as the World Series, The Masters and the X Games to fully use and exploit the digital features of these units.

Chris Brown is operations coordinator for the CBS Sports Field Operations of National Mobile Television.

#### **Design team**

Mark Brooks, chief technical officer Lars Osterlind, senior project supervisor Thomas Foley, vice president of NMT Engineering Mel Shieltz, engineer in charge of DX11

Barry Bennett, president of Bennett Systems Integration

#### **Equipment list**

THOMSON Multimedia LDK 2000 studio cameras THOMSON Multimedia Buildup Unit studio camera Canon Digi 70x studio lenses Canon 55x Super studio lenses THOMSON Multimedia LDK 2000P HH cameras Canon 20x HH lenses Canon 8.5x wide-angle HH lens GVG Kalypso, four-M/E digital switcher THOMSON Multimedia Venus router Chyron 601 iNFiNiT! Solid State Logic Axiom-MTP audio console EV, Sennheiser and Audio-Technica Sony Digital DVW-500A Sony BVW-75D Four-channel EVS DDR VHS **DNF Controllers Dual Twin DVEous** Frame Syncs Vector 70 Fluid pan heads Sachtler System 20SL tripods and heads

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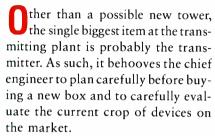
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### **Systems Design & Integration**

#### **Transmission & Distribution**

#### Transmitter technology review

BY DON MARKLEY



Transmitters are like cars in a way. Every year, manufacturers will come out with one or more new models. One can expect some performance changes, hopefully for the better, accompanied by a price increase. In some cases, the changes will introduce a whole new level in technology. More often, the changes resemble the automobile model that has simply had the chrome rearranged.

The final amplifier stage du jour is still the inductive output tube. This technology has evolved from four external cavity klystrons, five internal cavity klystrons, MSDC devices (still klystron type) and various other def-

initions, to the IOT, which is still a klystron type of device. The IOT itself has been fairly constant over the past few years and nothing seems to be on the horizon that will replace it for high-power UHF. That is not to

power levels. Hopefully, that will

#### Solid-state transmitters are becoming more popular for the obvious reasons of reliability and ease of operation. However, their cost is still prohibitive for most stations at high

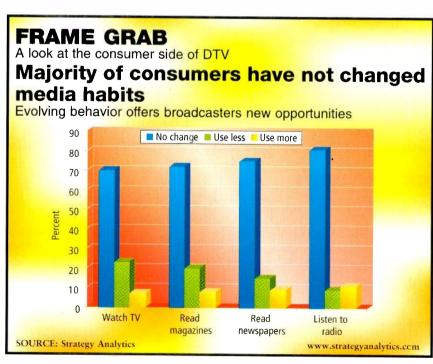
#### Work is being done every day to improve the performance of the output stages to the benefit of the industry.

say that there have been no improvements. Such a statement would bring down the wrath of the manufacturers, and rightly so. Work is being done every day to improve the performance of the output stages to the benefit of the industry. It's just that one does not see a giant leap into a new technology.

change in the future as more and more manufacturers look for the magic step to reduce the number of solidstate devices needed without making the linearity corrections impossible or impractical.

The most conspicuous changes have been occurring in the associated areas of improved exciters, new designs for driver stages and in the control of the exciters and transmitters themselves. In addition, it seems to be fashionable these days to change one's name. For example, ADC Broadcast Systems is now Axcera and Thomcast Communicatons has become Thales Broadcast & Multimedia. It seems that keeping track of the name of the manufacturers is almost as hard as keeping track of where your favorite salesman is working this year. It seems that Ma Bell started all of this, and it progressed through Hewlett-Packard down to television transmitters.

In any case, Axcera has developed a new line of LDMOS driver amplifiers for their IOT transmitters. They put forth the argument that these new devices require less correction than earlier systems, permitting more correction







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to be available for the IOT. The new amplifiers are claimed to run cooler than MOSFETS, reducing junction temperature and increasing reliability. It is such small changes as improving the driver amplifiers that seem to be the rule this year.

Axcera joins the other major manufacturers in offering a sophisticated system of correction for distortions in the amplifier system. At least two such systems are now fully usable from any remote location with a PC. The Harris system of control has been around for a couple of years now. Thales (see above) now has what they call their "thin client" feature, which is a complete control system for the transmitter. This system allows for

and/or the dummy load. While this is supposed to be automatic in case of failures, the control system backs up those features.

The Thales system and the Harris system are both capable of making changes to the correction circuits in the exciter. Both systems also allow

monitoring of the necessary waveforms to determine if further correction is necessary and to confirm that



The purchase of a transmitter requires careful evaluation. Harris' Sigma is shown above. Photo courtesy Harris.

The Thales system is also accessible by telephone call, but can be configured to present a Web page and be contacted via the Internet.

Obviously, arguments can be made about the advisability of opening such access, but the truth is that a modern firewall can provide more than adequate protection.

One change of note is the power levels available. Up to 35kW of average power is now available per highpower amplifier. That offers both a disadvantage and an advantage and should be considered carefully before a purchase. It is now possible to build the complete transmitting plant around a transmitter with a single IOT. This offers the obvious advantage of less space required in the building, a single power supply and heat exchanger, and considerably less initial cost than buying a two-tube unit for the same required power. Those same advantages are the disadvantage, other than the price. The station now has no backup for anything. This is probably unacceptable in a major market and provides food for thought in smaller markets.

With two amplifiers, the failure of a power supply, heat exchanger or IOT makes very little difference in the transmitted signal. Obviously, after switching, the output signal drops by 3dB. That isn't really the end of the world except in the far out boonies where the signal is becoming marginal. In the main market, it probably won't be noticed by anyone. That gives the station staff a reasonable period of time to make the necessary repairs

## Solid-state transmitters are becoming more popular for the obvious reasons of reliability and ease of operation.

the normal control functions such as on/off/power adjust and the like. It also permits changing the system mode of operation, such as which IOTs are switched to the antenna the system is providing the best possible signal. These two systems do vary somewhat in that the Harris system is only accessible by direct contact through a dial-up modem.



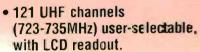
Transmitters have gradually, but steadily improved since WBTV in Charlotte, NC (shown above) first went on the air in July 1949. Photo courtesy of Thales Broadcast & Multimedia.

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in a pleasant working atmosphere. Otherwise, the staff will find themselves scrambling frantically to get the station back on the air while enduring screams and moans from the front office. As a rule, this will always occur during sweeps or while some major sports event is taking place.

The point is that the redundancy offered by having more than one output device is highly desirable may be even necessary. Today's transmitters do provide an excellent level of reliability, but they will still break down occasionally.

In summary, there hasn't been any big, earthshaking development in television transmitters for the last couple of years, at least. However, there has been a steady improvement in corrective circuitry, control systems, driver stages, power output capability per device and, thankfully, efficiency. All of this work is continuing and will show up this year at the big show as there are more improvements in the products being offered. While the changes aren't mind-boggling, they represent a lot of hard work and a gradual, but steady, upgrade of today's crop of transmitters. Now, if we could just get them to quit confusing us by changing their names all the time.

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



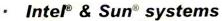
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#### Production Clips

#### Watermarking technology in A/V delay correction

BY TOM TUCKER

le have come to expect much of television over the last decade. including increased channel capacity and video and audio quality improvements due in large part to new digital processing capabilities. However, considering the attention that crowd-pleasing special effects receive from today's audiences, it is surprising to find the highest-ranking determinant of television program quality has actually proven to be proper and consistent lip-sync timing. A new method for testing lip sync based on digital video watermarking offers true "in-service" monitoring and correction capability.

#### Human vision and aural perception

Multi-sensory studies have shown that when audio is advanced or delayed with respect to video a considerable reduction in speech intelligibility is observed. Studies also show a bias of tolerance toward the delay of audio relative to video. Humans are conditioned to expect to see something happen before hearing it, possibly due to the natural difference in the speeds of sound and light. Some tests have found the threshold for detecting audio ad-

# When the advance or delay exceeds these just-noticeable thresholds, the effect becomes irritating.

vanced relative to video to be 30 ms (~ 2 NTSC fields) and for audio delayed relative to video to be 85 ms (~ 5 NTSC fields). When the advance or delay exceeds these just-noticeable thresholds, the effect becomes irritating. Due to the increased number of broadcast

audio-to-video timing issues occurring today, which quite often far exceed these thresholds, viewers are becoming more aware of these occurrences and are more likely to complain.

Because the A/V delay rules were informal and not consistently applied by all video distributors, in 1994 the

primary image. These secondary images can include a corporate seal "burned" into an advertisement or a logo or "bug" associated with the organization that holds the rights to the image. The secondary watermark image is visible to allow clear determination of the image owner, but translucent enough

Tolerance description	Established values
Tolerance assigned to entire chain from capture to viewer/ listener	Audio 90 msec early to 185 msec late
Tolerance assigned to chain frcm capture to final point of control (e.g. Master Control)	Audio 25 msec early to 90 msec late
Tolerance assigned to chain from final point of control to transmitter input	Audio 22.5 msec early to 30 msec late
Tolerance assigned to individual segments not under control of the broadcaster (e.g. digital codecs)	Audio 2 msec early to 2 msec late

Table 1. Viewer tolerances assigned to different distribution and contribution chains within a television network.

International Telecommunication Union (ITU) established a group to investigate A/V timing errors. Subjective testing with skilled and non-skilled test subjects was performed and led to the 1998 recommendation ITU-R BT.1359-1. Table 1 lists viewer tolerances ITU-R BT.1359-1 assigned to different distribution and contribution chains within a television network and/or plant.

#### Watermarks for A/V delay correction

Watermarking, a method of hiding data or information within still images, video or audio, emerged as an area of research around 1990. It is defined more or less as a digital data communication channel, using the image or image sequence in the video context as a carrier.

There are essentially two types of watermarks -- visible and invisible. A visible watermark is essentially a secondary image that is overlaid on a

to allow the primary image to be viewed with minimal visual impairment. An invisible watermark is a secondary overlaid image that cannot be seen, but that can be detected algorithmically.

Most of the research done on digital watermarking has been directed toward ownership authentication for copyright protection. There, it is desirable for the watermark data to be difficult to remove, since there is presumably a motive for hostile attempts to jam or strip the watermark data.

Digital watermarking of video signals involves adding (or modulating) areas of the images with a small signal that has little or no visible impact on the image or video quality. As long as the signal can be detected in the active video images, the watermarked video can serve as a subliminal communications channel for transmitting additional digital data. Watermark detection is possible even when blanking and sync have been removed, as in MPEG







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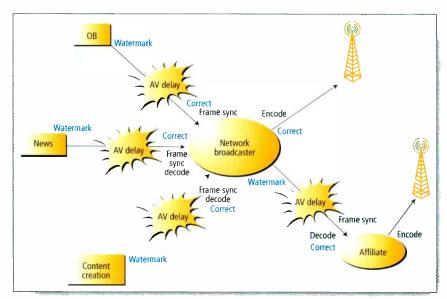


Figure 1. Watermark encoders are used to watermark programming content at its origination points. Then anywhere in the program distribution chain the embedded watermark can be decoded to recover the encoded audio timing information.

transmission. It is this characteristic that makes watermarking a viable method for A/V synchronization, since enough of the audio envelope information can be compressed to fit into a robust watermarking data payload to allow timing correlation with the actual received audio signal envelope.

For the purpose of A/V delay signaling, the watermark data need not be robust to hostile attacks as with copyright applications. However, it must be robust enough to be separated from the active video signal images even if the video signal has changed signal

of video occurring at the production sources and detection of the watermark and A/V delay correction occurring at the network facility, providing overall control of annoying lip-sync errors.

#### Potential A/V-delay problem areas

Lip-sync errors are certainly common in ENG productions. Video frame synchronizers that are used to synchronize ENG feeds to the in-plant reference can cause a variable A/V delay up to about four fields (66 ms). The period of variation depends on the frequency

# Digital watermarking of video signals involves adding a small signal that has little or no visible impact on the image or video quality.

format or undergone analog or digital conversion, scaling or MPEG compression. By encoding the associated audio envelope variation into the video as an invisible watermark at the start of a signal path, the relative timing between the received audio at the end of the signal path and the extracted watermark audio data can be measured. The measured value can then be used to control a variable audio delay to correct for A/V delay errors. Figure 1 illustrates a typical broadcast network with A/V watermarking

difference between the ENG source and the in-plant or studio timing reference. Ideally, there should be a compensating audio delay that tracks the variable video delay created by the frame synchronizer. However, a fixed delay is often used, allowing some periodic lipsync errors. For example, using a fixed audio delay of 50ms reduces the A/V delay error on average, but over time the A/V lip-sync delay could grow to more than one field.

Another source of A/V delay is the wireless cameras common in ENG

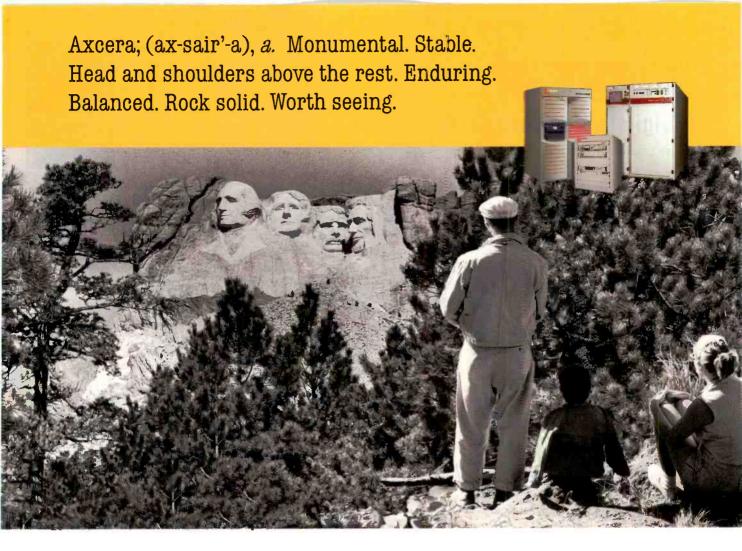
productions. These are sometimes subswitched with wired cameras. The wireless camera uses a compression coder/decoder that will add video delay relative to the audio and wired camera video. Since a separate microphone is not part of the wireless camera, there is often an additional A/V delay when the wireless camera is switched in place of the wired camera.

Clearly, problems that cause A/V delay need to be well understood by television engineers, but seldom are identifiable. Digital video effects (DVE) machines add a generally predictable fixed delay of an integer number of frames. If the DVE delay is two frames, for example, a fixed audio delay of two frames must be added to compensate. However, if the master control dynamically inserts and removes the DVE from the video path, the audio delay must also be switched or adjusted to maintain lip sync. Another problem is that A/V delay often accumulates through a network in minute increments that may be barely detectable, if at all. No one device might in itself be an overall cause. Most devices that process video can add from one field to several frames of latency. Color correctors, noise reducers, frame synchronizers, compression equipment and a variety of other editing and video processing equipment are commonly used throughout the television network. Even at the source, i.e. the video camera, CCD elements can add several fields of audio-tovideo delay.

Delay errors are increasingly evident in broadcast material and represent a key element of program quality. Monitoring audio-to-video delay becomes feasible with watermarking, as does automatic correction, providing an innovative solution to an old problem.

Tom Tucker is a product marketing manager in the video business unit of Tektronix.





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#### **Systems Integration**

#### Digital video storage: IEEE 1394

BY CRAIG BIRKMAIER

t goes by many names – FireWire, iLink, IEEE 1394-1995, or just 1394. Soon it will be available in a new high-performance flavor, IEEE 1394b, offering performance comparable to gigabit Ethernet. Within two years, 1.6- and 3.2-Gbit versions will be shipping.

It has already become synonymous with consumer digital video, enabling a DV camcorder and personal computer to become a low-cost desktop video production powerhouse. With recent Hollywood endorsements of the digital transmission content protection copy protection scheme, also known as 5C, IEEE 1394 is poised to become the de facto digital networking interconnect for consumer electronics products.

FireWire's creator, Apple Computer, was recently awarded a 2001 Primetime Emmy Engineering Award for its material impact on the television industry. CNN's global news-gathering forces are now equipped with 3Chip DV camcorders and Apple Titanium PowerBooks running Final Cut Pro. Stories can be edited anywhere and transferred to a pocket-sized FireWire hard drive, which can be connected to a networked server at the studio for playout to air. Threeperson news crews may soon be as common as "film at eleven."

#### Plug and play

When Apple invented FireWire in the early '90s, the design included a mix of



In this workstation at Digital Lighthouse in Gainesville, FL, IEEE-1394 (FireWire) plays a major role in supporting I/O via an Apple G4 Mac running Final Cut Pro. It supports media storage with an 80 GByte Glyph DV Project array and multiple FireWire drives.

features aimed at facilitating the convergence of video and computing on multiple fronts, including the U.S. advanced television standards setting process. These features included point-to-point connectivity, peer-to-peer operation, plug-and-play capability, isochronous operation and asynchronous operation.

The IEEE 1394-1995 standard supports 200 Mbits/s or 400 Mbits/s data rates. It can also supply power to peripherals, although this contributes

DVDs. These products should be 1394-enabled within a year.

For professional video applications, IEEE 1394b provides extensions that make it a viable alternative to other studio networking technologies. It will support data rates of 800 Mbits/s, 1.6 Gbits/s and 3.2 Gbits/s, all over copper wire. It supports long-distance transfers to 100m over a variety of media: CAT-5 unshielded cable at 100 Mbits/s, existing plastic optical fiber at 200 Mbits/s,

## It is expected that IEEE 1394b will lead to expanded adoption in many of the applications where 1394 is firmly established.

to a major weakness as a networking technology; the maximum distance between links is 14 feet. It supports up to 63 hot-pluggable devices. You don't have to turn off a scanner or CD drive to connect or disconnect it, and you don't need to restart your computer. Also, it uses a lightweight cable with small connectors, so you don't need device IDs, jumpers, DIP switches, screws, latches or terminators.

Finalized earlier this year, IEEE 1394b will supplement the legacy IEEE 1394-1995 and 1394a specifications. It keeps all the vital features of those earlier versions and will support mixed net-

works with devices that conform to any of the 1394 standards.

It is expected that IEEE 1394b will lead to expanded adoption in many of the applications where 1394 is firmly established, including DTV, set-top boxes, VCRs and

next-generation plastic optical fiber at 400 Mbits/s and 50-micron multimode glass optical fiber at up to 3.2 Gbits/s.

Omneon Video Networks has developed a networked content server system comprised of network interfaces, packet switches, disc-based storage subsystems and system software. The system consists of modular components attached to an IEEE 1394 and Ethernet network. The components manage data storage and the transport of data within the network and handle the connection of external devices to the network.

At this year's NAB, Glyph Technologies introduced DV Project, a FireWire RAID Array that can be used with a variety of high-performance nonlinear editing systems including Avid's DV Xpress, Media 100i and Matrox's RTMac. Internal transfer rates can exceed 440 Mbits/s enabling video streaming rates of over 40 MBytes/s per DV Project.

IEEE 1394 is currently supported by Microsoft's Windows 2000 and Windows 98 Second Edition.

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

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# The broadcast station as

A MISSION-CRITICAL

BY PAUL KAST TO CAL

TO CHART TO CHART TO CAL

TO CHART TO CHART TO CAL

TO CHART TO Compartmentalization and appropriate backup can ensure that facilities like the antenna farm at Echostar's Uplink Center continue to operate without interruption. Photos courtesy Carlson, Photos by Mark Boisclair.

broadcastengineering.com

November 2001

he term "mission-critical" has always seemed a bit dramatic, almost as if it were a phrase from one of those save-the-world Arnold Schwarzenneger adventure movies. The mission-critical concept has been around a long time, and the phrase is gaining popularity. But what, exactly, does it mean?

Mission-critical refers to the operations that are critical to an organization's ability to carry out its mission. In other words, mission-critical operations are those operations that are essential to an organization's ability to perform its intended function. A mission-critical facility is one that guarantees it will continue to operate, re-

The mission-critical facility is an emerging concept that station owners and engineers are just now starting to embrace.

gardless of external conditions. Examples of such "hardened" facilities include hospitals, "911" call centers, emergency-management agencies, banking systems, credit-card companies, telco networks and express-delivery operations.

Different facilities require different levels of guaranteed support based on two main factors. First and foremost is the cost of failure. There are tangible and intangible costs to bear for failure, such as consequential loss damage or loss of reputation in the marketplace, and

short-term or long-term loss of revenue. The second factor is availability. Most facilities have peak-service periods when the corresponding level of protection must also be at maximum readiness. The idea that the facility's resources will be operational when it needs them means that the facility will be available during the time frame (hours per day and days per week) that best suits its clients' needs.

While the concept of the mission-critical facility is not new to the broadcast industry, it is an emerging concept that station owners and engineers are just now starting to embrace. When many stations were being built, designing into them the types of systems and infrastructure necessary to support a 24-hour-a-day, seven-day-a-week failsafe environment was beyond imagination. In most markets, the need simply did not justify the cost.

But things have changed. Today, more than 70 percent of Americans rely on television for their daily news, and the average amount of time they spend watching is seven hours daily. The public need is clearly there. Add to that the failure factors previously mentioned (not to mention frustration and embarrassment), and soon the balance is tipped in favor of providing something more than the traditional backup generator.

The buildings that house most TV stations were not designed specifically for that purpose. More often than not, the station construction was a retrofit in an existing building originally intended for something else, and systems such as power distribution and cooling were modified to fit the new station's requirements.

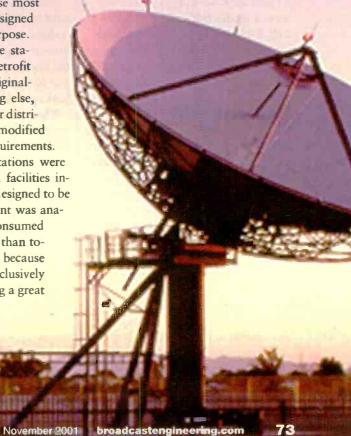
Even in cases where stations were housed in structures and facilities intended for TV, few were designed to be mission-critical. Equipment was analog, and, in general, consumed more power per device than to-day's equipment. And because studio lighting was exclusively incandescent, generating a great

deal of heat, it was impractical to include more than a flash camera with a single light on a backup power system. Air conditioning was usually excluded as well, leaving the traditional station with little chance of staying on the air in a prolonged power outage.

#### New requirements

The PC has been pervading the office environment for many years. In the technical professions, the change has been slower, but inevitable. Devices built around a PC platform gain improved reliability, and broadcastspecific frames offering hot-swappable power supplies and other features have been built around PC-based devices to form character generators, still-store devices, video file servers, and more, and to control devices for critical systems. Still, these PC-based devices are more sensitive to their environments than traditional broadcast devices. When planning a new facility, care must be taken to provide the necessary space, air conditioning and power conditioning for a safe and reliable environment.

For example, chronic device failures, freezes or crashes can be totally eliminated by the insertion of an uninterruptible power supply





UPS systems are one of the most costly redundancy items in a broadcast plant. To control costs, careful consideration must be given to which areas of the broadcast plant are on UPS.

(UPS) between the power utility and the device in question. The online UPS is fast becoming the engineer's best friend because of its ability to condition power as well as provide reliable service. As the demand for electrical

power threatens to outpace the supply, it is likely that the quality of that supply will worsen. Broadcasters are finding a greater need to be energy selfsufficient, especially where energy quality is a concern.

There are several

ways a studio can conserve power as well. Exclusive use of fluorescent lighting would consume significantly less power than its incandescent counterpart. A video file server can replace many VTRs in a master-control or newsroom edit environment. Modern routing switchers and production switchers continue to grow smaller and consume less power. Flat-panel display technology is advancing, prices are declining and they continue to replace CRTs. If a station implements these energy-saving strategies without expanding its functions, it will decrease the amount of space, power and cooling it requires.

UPS technology has improved steadily, becoming smaller and more feature rich with each new generation. Improvements in UPS, backup-generator and energy-storage technologies allow the station's entire critical load to be made failsafe within a workable

footprint. A welldesigned power system can also include dual utility feeders from separate power grids. These feeders are path diverse and completely independent, and each is capable of handling the entire load of the facility.

There are two ways to upgrade a facility: the tradi-

tional "replace-it-as-it-breaks" method, and the "tear-it-out-and-startover" method. Each has advantages and disadvantages. In time, the former usually leads to the latter. But, short of a new facility, a facility upgrade is the

#### New technology, old facility

tent storage and data paths delivering audio and video someplace else. If the station does not already have an equip-

makes more sense today than ever.

This approach allows a control room

to go just about anywhere, with conment room, an upgrade is the perfect opportunity to consider installing an equipment room, where the environment can be tailored to the equipment, and power and cooling can be well managed. If the budget permits, the backup-power capabilities of a UPS and standby generator can be most easily implemented when designing an equipment room, since the critical load will be concentrated within one area. When sizing the system. determine the extent of the entire load and overrate the capacity of the system by 30 percent.

#### New technology, new facility

For a new facility, technology place-

ment and integration are only part of the equation. Site selection is the first step, and is of paramount importance. In this decision, proximity to utilities, fuel and telecommunications networks, and space for terrestrial and satel-

lite links, are obvious factors. Less obvious are considerations for disaster avoidance, including such factors as flood plane vs. building elevation,

#### Care must be taken to provide the necessary space, air conditioning and power conditioning for a safe and reliable environment.

next best thing. Upgrading a master control to digital, for example, can present opportunities to fix some of the known problems within a facility,

and to provide some backup if desired.

When planning an upgrade, it becomes evident that much of the new equipment, including its associated power and heat load, can be physically located further away from the operator(s). Ideally, the only things that need to be near the operators are control panels and monitoring systems. Putting all of the station's core equipment together



Redundant cooling and power schemes are critical for central equipment rooms. Overheating equipment will greatly shorten its lifespan. Without proper cooling, the majority of technical equipment will fail within 30 minutes.

ground water, geological and meteorological disturbances, and locations of natural and manmade barriers.

The needs of the station must be addressed in a master plan. Ideally, this plan should describe every aspect of use of space as well as the build program. Everything must be considered, from departmental adjacencies to levels of redundancy. Some questions to ask when deciding the level of protection required include:

- Is the facility supporting a product that must be available without interruption?
- What is the business cost of downtime?
- Are short-term interruptions acceptable?



Generator noise is always an issue in broadcast plants, and generator placement must be carefully considered.

- What level of risk is acceptable?
- How does reliability or the lack thereof set your business apart from its competition?
- What are the market trends and your anticipated growth?
- How much redundancy is enough? Where N is the number of unprotected systems online, would your business require N + 1, N + 2, or even 2N?

Integrating the technology becomes much easier after resolving these issues. The foundation for reliability is laid during the building's planning phase. Master control, newsroom, studios and edit suites are generally arranged so that they surround the equipment room. Depending on the level of redundancy decided upon, several equipment rooms may be employed

in a distributive-processing approach.

For example, the studio router can be in one equipment room, while the master-control router is in another. Using this approach, each router can be smaller and can share its room with a few backup destinations. The routers can share sources through tie-line management or through the use of time-domain multiplexing employed by some of the newer routing switchers. In anoth-



It is not uncommon for redundant chiller schemes to include reserve underground water storage tanks to replenish make-up water in emergencies.

er example, a storage-area network can be clustered across several rooms. The rooms don't have to be far apart. The idea is to distribute processing devices, but not so far apart that they can't work as one.

Compartmentalizing is the ultimate goal. True mission-critical facilities are designed so that a catastrophic event in one area does not shut the whole facility down.

#### Vision of a mission-critical station

The facility needs to take its location into account. What are the environmental threats that may need to be overcome? How critical is critical? If it is deemed that downtime is unacceptable, the next question to ask is, "For how long?" The planning of the facility takes into account the duration required by the user. Twenty-four-hour, 48-hour or 72-hour durations are not uncommon, and some users demand more. Fuel capacity, emergency water supplies, physical security and even food rations can be included in the deployment plans.

One thing to keep in mind when planning for the future is growth. While new devices consume less power than

their predecessors, the trend is to take advantage of the newfound space and power with new equipment. More capabilities add to the bottom line by increasing revenue or by decreasing production costs so that even if the square footage remains fixed, the overall consumption will increase.

The needs and expectations of the public are growing. The ever-increasing demand for information, coupled with growing viewer reliance on TV, make service interruptions increasingly unacceptable. The demands on resources are growing as well. Electricity consumption in the United States has increased to the point where it now accounts for over 37 percent of the total energy consumed worldwide. This is up from 25 percent in 1975. Given the problems in California, and how those problems are beginning to expand to other regions, one can only assume that the current trend will get worse before it gets better.

The broadcaster must determine the requirements placed on his new facility, for both short- and long-term. The priority level of the final product is a major consideration when determining what the facility must be able to withstand.

Paul Kastistechnical director of Carlson Broadcast & Media. His e-mail address is Pkast@carlsonsolutions.com.



# High-bandwidth

#### BY DAVID LINGENFELTER

e are all familiar with RG-6 type coaxial cable. Many of us have probably earned blisters installing BNC connectors on these cables at one time or another in our careers. As more facilities are being rebuilt with SMPTE 259M, SMPTE 292M, ASI and perhaps some SMPTE 310M around the microwave or at the transmitter, this is a good time to review the reasons why a particular cable is or is not suited for a particular application.

This month's column discusses the various sorts of coaxial cable used for studio video applications. Many of the

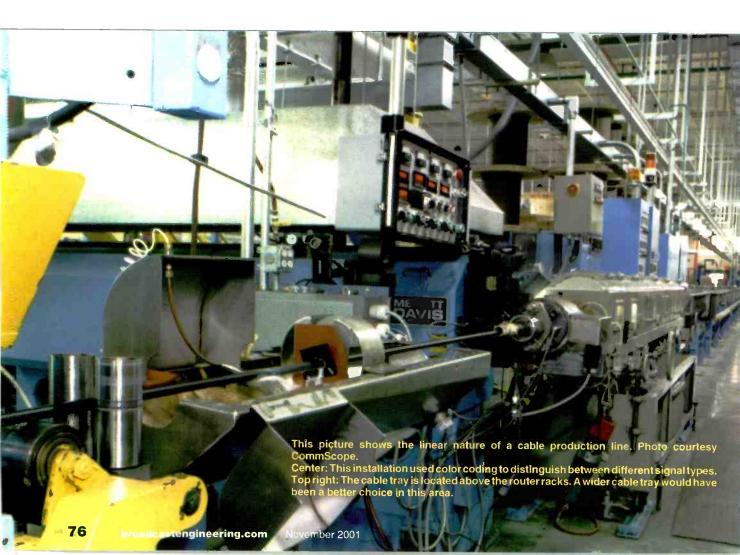
criteria used in deciding what type of coax to use are also important when selecting other types of cable. The column also covers issues that are important when selecting connectors and patch panels.

Cables and connectors are often lost in the shuffle when fancy new equipment arrives on the scene. But cables and their terminations are the backbone of the plant and will typically outlast the equipment they interconnect. Although cable is not particularly expensive, the labor required to install, label and terminate it is. Selecting and using the wrong cable can cause budget and schedule problems. A bit of time and investigation in this

area will pay off handsomely over the long term. For example, when wiring an equipment rack, ask yourself what equipment might end up in that rack in the future – high definition, perhaps? If so, it would be nice to simply relabel the existing cable and carry on rather than re-wiring.

When selecting cable, ask yourself the following questions:

- What signal will the cable carry, and how far will it carry it?
- How much loss can the receiving device tolerate?
- In what environment will the cable will be used?
- How and where will the cable be installed?



## coaxial cable



- Are there any size, weight or fire restrictions on the cable?
- Could the use of the cable change in the future?

#### **Electrical considerations**

Let's take a look at the signals a new plant might carry. There is NTSC, component analog, SMPTE 259M, DVB-ASI, and possibly SMPTE 310M and SMPTE 292M. The frequencies of these signals range from near DC to well over 1.5GHz. The characteristic impedance specified for all these standards is  $75\Omega$ . That leaves cable loss and shielding as the major issues with which to contend, particularly with digital signals that must travel over any appreciable distance.

Digital signals have the advantage of being tolerant of cable loss because the receiver regenerates the signal. The receiving equipment's ability to lock onto the stream and decode it sets the maximum cable length for any particular cable. Several different manufacturers make receiver chipsets, and the performance of these chipsets differs, so you must allow headroom in your design. Patch panels and demarcation panels can also reduce the cable's useable length.

Acceptable losses, as stated in the applicable standards, are: SMPTE 259M, 20- to 30dB at half the clock frequency; SMPTE 292M, up to 20dB at half the clock frequency. DVB-ASI has the same bit rate as SMPTE 259M and the same cable requirements.

Although the rise times of digital waveforms are controlled, harmonics are an important consideration for accurate signal recovery. Cable tilt could be a factor when using smaller, higher-loss cabling. If you are terminating longer runs into a patch

panel and using smaller cable from the patch panel to the switcher, you must account for the cascaded losses of both cable runs and the patch panel to ensure adequate headroom. Failing to do so could cause intermittent problems that are difficult to locate.

The caple tilt is defined in the SMPTE 259M standard. The frequency response, in decibels, is approximately equal to 1 divided by the square root of the frequency, from 1MHz up to the clock frequency of the signal being carried.

You can get an excellent indication of the cable's bandwidth from its velocity of propagation, which is available from the cable manufacturer's catalog. The higher the velocity, the lower the shunt capacitance and, therefore, the higher the frequency cutoff.

As a general rule, use a larger, lowerloss cable and use the same cable throughout the signal path unless there are substantial constraints on space, weight and distances (such as in a truck). Using the same type of cable also simplifies connectors and connector tooling. The difference in cost between large and small cable is minimal – generally within the "noise floor" of a project's budget, but the larger cable offers insurance and peace of mind.

Table 1 uses the criteria mentioned above to determine the maximum usable distance for several types of cable at three data rates.

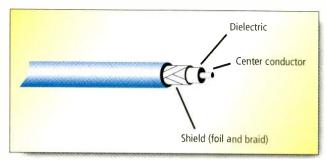


Figure 1. This coax cable displays foil and braid shielding. Image courtesy Extron.

A quick look at the table reveals an obvious trend: the higher the data rate, the shorter the typical cable length. For SMPTE 292M, this trend shows that you will require larger-sized cable unless the cable runs are short. To avoid the error cliff (and as a matter of just plain good engineering practice), de-rate the values by 10 percent. To allow for patch panels and different runs of cable, derate the numbers in the table by another 10 percent. Margin is cheap; re-installation time and cost isn't. The author has

Cables and their terminations are the backbone of the plant and will typically outlast the equipment they interconnect.

seen a "good run" go bad when equipment at the receiving end was replaced by that from a different vendor.

There are three shield types available: braid, double braid, and foil and braid, and all are available for different frequency ranges. Considering the fact that digital signals span wide frequency ranges, and the fact that ingress could possibly just nudge the receiver over the error cliff, foil and braid (shown in Figure 1) is a good choice. And a bonded foil makes connector installation much less troublesome.

#### **Environmental considerations**

The installation environment is another factor to consider when selecting

cable material. Starting with the outer jacket, the primary concern is plenum or non-plenum and UL and/or other agency approval. Generally, the plenum cables have a 20 percent higher loss over the non-plenum ver-

sion. If the new cables are being pulled into existing conduits or cable trays, jacket friction could affect the existing cable. Some jacket materials in existing cable can develop holes or "burn spots" when new cable is dragged across it during installation.

Generally, the ability of a cable's outer jacket material to resist chemical corrosion is not a concern in a studio environment. If you are installing the cable in an unusual environment with conditions such as high heat, water or battery fumes, the cable manufacturer can supply information for these applications.

The cable's inner dielectric is an important consideration. Foams have lower loss but are not as crush or abuse tolerant as polyethylene. Some NEC-rated foams have slightly higher loss than polyethylene.

Lastly, some cables are available in a broad range of outer jacket colors for color-coding the signals.

If you carefully select the loss, shielding and jacket characteristics of a cable for the application, the cable failure modes will be limited to manufacturing failures or installation errors.

#### **Quality control**

The manufacture of a coax cable is a dynamic process. It takes place on a production line that can be many hundreds of feet long. Once such a line is set up and the copper-drawing and foaming processes start, it is a major event to shut the line down. Automatic detectors are used throughout the line to measure wire diameter, speed through the dielectric foaming machines, wire temperature and centerconductor centering. When a fault is discovered, the section with the error is marked and physically cut out of the finished cable in a later process. The line keeps running. On rare occasions, errors go undetected, resulting in a reel of cable having a bad section in it.



The rear of this small router shows smooth cable radius and good cable support.

A type of manufacturing error difficult for the end user to discover is periodicity. This is a small change in the impedance of the cable on a periodic basis. It can be caused by a bad bearing or an eccentric wheel used in the production-line equipment. Such faults can cause minute speed changes in the wire as it travels down the line and can affect the thickness of the wire or the dielectric,

#### Typical distances per cable size

Cable type	Data rate		
	259M	259M	292M
	270 Mb/s	360 Mb/s	1.5 Gb/s
sub-min RG-59	183	158	52
RG-59			
double-shielded RG-59	305	259	79
RG-6			
RG-11			

Table 1. The maximum usable distance for several types of cable at three data rates

resulting in a slight impedance change at that point. If the period is related to the wavelength of the signal, then the cable's return loss will increase. The higher the frequency carried in the cable, the more this manufacturing error will affect the usability of the cable. The effect is the same as using the wrong length of transmission line at the transmitter site for the TV channel in use. To catch this problem, perform a return-loss sweep on the cable before

# As a general rule, use a larger, lower-loss cable and use the same cable throughout the signal path.

using it. Unfortunately, this type of incoming quality control is rarely practiced. The end user nearly always depends on the manufacturer's quality control to catch this problem. Poor installation techniques can also damage a cable in a periodic manner and cause an increase in return loss, although this is generally localized. For example, tie-wrapping a bundle of cable too tightly at regular intervals of the cable run could introduce a periodicity



This roll of coax is being swept for return loss during the manufacturer's final quality control procedure. Photo courtesy CommScope.

error in the cables located at the bundle's periphery. Dropping a full roll of cable on a loading dock could also cause a similar periodic deformation of the cable. (See Figure 2.)

#### Installation considerations

Installation errors can cause immedi-

ate damage to the shape of the cable or can result in such damage over time. Examples of installation errors are:

- using a pulling effort greater than that for which the cable is rated
- exceeding the manufacturer's bend radius
- providing inadequate cable support Kinking a cable and then straightening it out again does not fix an impedance discontinuity, particularly with low-loss foam dielectric. Cable used in highfrequency digital applications must be installed with attention to the manufacturer's guidelines.

The standards mentioned earlier call for connectors having an impedance of  $75\Omega$ . This can be achieved either by using a true  $75\Omega$  connector or by using a  $50\Omega$  connector on equipment having impedance-compensating circuitry so that the combination yields  $75\Omega$ .

Although not directly related to cable selection, the choice of a connector is important, especially when purchasing a large number of connectors. The characteristics of connectors from different manufacturers differ widely. In particular, center-pin retention is an important consideration. Pin retention in both directions is important. Using connectors that lack sufficient centerpin retention can cause intermittent connections, and result in many hours lost tracking down such problems.

A patch panel can be your best friend or a saboteur. Many engineers may be tempted to use existing old faithful jack fields for digital signals. This could reduce headroom. There are measurable differences in patch panels from different vendors. If you are building a new plant, it is advisable to rent a network analyzer and perform sweeps on vendor

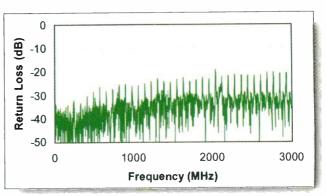


Figure 2. This displays a coaxial cable's return loss vs. frequency. Note the periodic spikes and the general increase in return loss at higher frequencies. Chart courtesy Belden.

samples to determine their impedance and response over the frequencies of interest. Other questions you should address about jack fields include:

- Are the connectors standard?
- Are the jacks sealed or in some way protected from dust?
- Can jacks be changed from the front of a panel?
- Is there adequate spacing between jacks on a panel so they do not touch each other now and will not years later due to cable loading or movement?

Lastly, you should sweep terminators with a network analyzer. This process will be a real eye-opener, exposing the differences between vendors. This may not seem very important, but

#### Margin is cheap; reinstallation time and cost isn't.

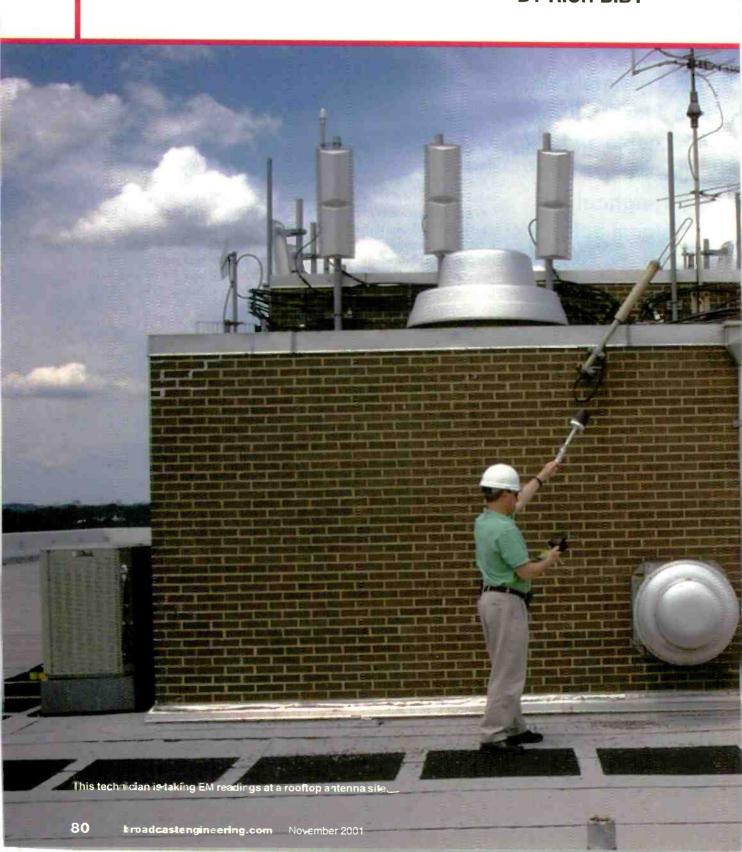
you are putting a lot of time and money into the plant, so it's best to attend to the details.

When selecting a cable to use in a digital plant, your primary concerns are loss and quality issues. These higher-performance cables, and the signals they carry, are not as forgiving to manufacturing and installation errors as those used in the good old analog days. However, they are easy to install and use. And, if you follow the manufacturer's guidelines, the cables will provide a long service lifetime.

David Lingenfelter is director of engineering for The Evers Group.

# Monitoring RF safety

BY RICH BIBY



imiting human exposure to nonionizing radiation (NIR) is an important concern for the communications industry. Both the FCC and OSHA have rules and regulations regarding human exposure to NIR with which the communications industry must comply. In pursuing compliance, broadcasters can enlist the aid of numerous articles that have been written about NIR, many of which offer

mathematical formulas to determine RF power densities and estimate their effects on humans. In addition, advances in technology have eased the broadcaster's job of protecting employees and contractors. But despite this help, many broadcasters find that the FCC and OSHA rules and regulations are difficult to apply on a day-to-day basis, which has caused some confusion in the industry about how to

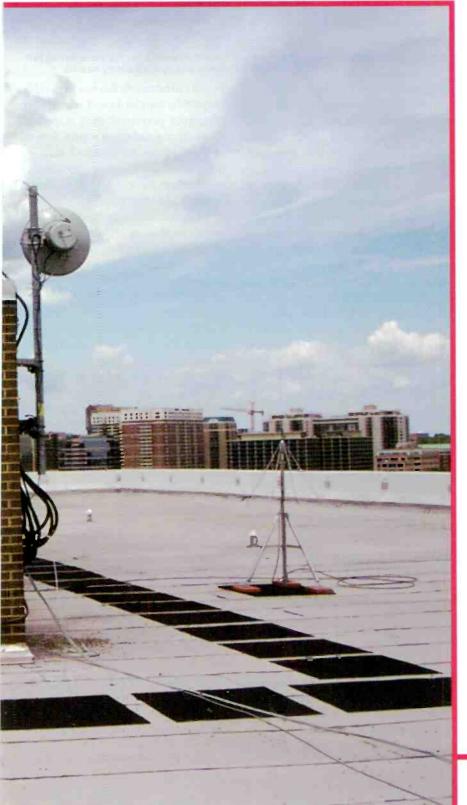
comply. To address these issues, this article offers a plain-English discussion on several compliance topics.

First, broadcasters must realize that compliance with FCC rules and regulations regarding human exposure to NIR must be extended to include compliance with the OSHA safe working standards. In other words, after achieving compliance with FCC rules, some additional steps are required to comply with OSHA rules.

The FCC's plain-English explanation of its rules and regulations regarding NIR is provided in Bulletin 65, Human Exposure to Non-ionizing Radiation (OET65), from the FCC's Office of Engineering and Technology, available at www.fcc.gov/oet/rfsafety/. The document fully explains the mathematics necessary to determine compliance, and understanding it should not be difficult for any RF engineer. But implementing safe working procedures based on those calculations can be difficult. OET65 does a good job of initiating discussion on a broad range of the topics, but it fails to present clear solutions to many of the issues it raises.

As a condition of licensing, nearly all licensed broadcasters should have been compliant with the new OET65 rules by Sept. 1, 2000. These rules are "new" primarily in that they are an extension of the rules that have governed broadcasters for several years - they have been expanded to include licensees above 100MHz. Not much has changed with respect to the basics of RF exposure, except that the rules have become somewhat more stringent. One fact has remained constant: Broadcasters must take action to ensure that people are not exposed to radio frequency radiation (RFR) in excess of the FCC limits. OSHA (on both state and federal levels) has become more actively involved in the industry. Officially, OSHA has exposure limits on record that are different from the FCC's, but it publicly supports the new FCC limits and recognizes them as reasonable and appropriate.

Generally, OSHA compliance requires broadcasters to create a written healthand-safety policy to identify potentially unsafe work areas that may expose



workers to NIR levels above the 100 percent maximum permissible exposure (MPE) level, and to develop safe working practices for anyone who needs access to those areas. OSHA considers the written health-and-safety policy the cornerstone of compliance. The overall purpose of the written document is to adopt clear, concise policies on how the site will be administered and what steps will be taken to ensure worker safety. It must include practical and real-world considerations, including the ability of workers to adhere to the program. For example, if broadcasters develop a policy that relies on personal monitoring devices, broadcasters must train users on the application and limitations of these devices. (A personal monitor is a beeper-sized, belt-worn device that alerts the wearer when he or she enters an area in which RF is present above a predefined level.) The key elements of a health-and-safety program are discussed later in this article.

The OSHA website and the NAB handbook (discussed later) give specific guidelines and information regarding content and actions broadcasters can use to develop an OSHA-compliant health-and-safety policy. Visit the OSHA website at http://www.osha-slc.gov/SLTC/radiofrequencyradiation for detailed information

law" (the FCC rules) alone can be rather simple. However, complying with the intent of the rules is just as important and should be a primary concern to employers and operators of broadcast facilities. The intent of the rules becomes clear when broadcasters ask themselves, "What needs to be done to ensure

worker safety?" This is where the difference between meeting the minimum requirements of an FCC rule and true worker safety begins.

Consider going further than the minimum requirements necessary to achieve compliance. For example, all broadcasters are comfortable with the idea that an interlock on the transmitter door can prevent harm. Yet many broadcasters rely on a remote operator to deactivate the main transmit antenna, preventing the on-site tower workers from reducing power to the main transmitter. Obviously, while this procedure may be consistent with FCC and OSHA rules, it would not take



Poorly maintained fencing around a broadcast antenna permits unauthorized access and poses a safety hazard.

FCC's Enforcement Bureau to develop inspection standards and educate enforcement personnel with respect to non-ionizing-radiation topics. Several of the conclusions reached through this effort are important to keep in mind when writing and deploying a health-and-safety plan.

- Control access to the site. Broad-casters must be careful that access to a site is truly controlled. For example, fences around sites that are supposed to be closed actually need to be. We have all seen fences around the base of AM towers that are falling down, have had boards knocked out of them, or are left open. If the site is not "properly controlled," the FCC will enforce the general-public exposure standards (these are the lower of the two tiers of exposure—see OET65 for a full discussion of "occupational" and "general-public" exposure standards).
- Those who do access a controlled area must have the proper training. People who have not had a chance to ask questions about the situation and do not have a complete understanding of the signage have not had proper training and do not meet the condition of being "occupational" (occupational people can access areas of great RF energy, due to their knowledge and training). Posted signs with particular industry-specific information may be perfectly clear to those in the industry, but may be vague or confusing to others. For example, a common compliance action is to limit the time an individual can stay in a particular area. Imagine the possible interpretations

#### Broadcasters must take action to ensure that people are not exposed to radio frequency radiation (RFR) in excess of the FCC limits.

and examples on developing procedures and documentation for OSHA compliance efforts. Additionally, the IEEE has a group called SCC 28 that is responsible for developing NIR exposure standards. Within SCC 28, working group 4 is preparing a detailed document that will address procedures and documentation, and help to define responsibilities for compliance. When released next year, the document should also provide many additional practical resources.

Complying with the "letter of the

much effort on the part of the broadcaster to go beyond the minimum requirements and provide a mechanism for an authorized person at the transmitter site to de-energize the transmitter or antenna, and prevent a remote operator from re-energizing it until the site is vacated.

#### **FCC** issues

The FCC has re-committed itself to enforcement of its rules. Jerry Ulcek, one of the writers of OET65, is currently leading an effort within the

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of a sign that simply says "three-minute exposure limit." To a properly trained person, that sign would be perfectly clear. But, to just about anyone else, it might raise questions such as, "Does that mean three minutes a day?" "Does it mean three minutes an hour?"

- Even if people are prevented from accessing areas that are perfectly safe, many people become overly concerned about RF exposure due to a lack of basic knowledge. A fairly small amount of information and educational material can go a long way toward preventing unnecessary alarm or concern. Consider making some basic educational material available to anyone who wants it, not just those who need it.
- Generally, most of us would consider "professionals" to be occupational, and allow them access to areas that might have higher-tier, occupational exposure levels. Electrical contractors, phone repair/installation

OSHA considers
the written
health-and-safety
policy the
cornerstone of
compliance.

personnel and other contractors are mistakenly assumed to be occupational persons and thus improperly are allowed access to areas that exceed general-public exposure limits. Unless a person has met all of the conditions to be categorized as occupational, he or she is not occupational and must be protected to the general-public standards. This situation most often occurs at mountaintop sites, rooftop sites and AM stations. There are few contractors who climb towers who are not in the industry and who have not met the conditions to be considered occupational. Trade associations such as the National Association of Tower Erectors promote tower rigger safety, including RF awareness training. Broadcasters should always make sure that subcontractors supply persons appropriately trained for the RF environment in which they will work.

• In multiple-licensee situations (antenna "farms"), there are few sites that have effective power-down agreements. Where multiple transmitting antennas are co-located, it is important to have agreements with the other licensees regarding times or windows in which one licensee can ask the others to reduce power so that maintenance operations can be performed safely. In densely-located broadcast sites, the RF energy from one station's facilities can be at or above the safe limits at a neighboring site or tower. Thus, one broadcaster may not be able to have someone safely climb a tower or work on an antenna without the cooperation of another licensee. The author has heard many anecdotal stories of tower climbers who are told, "Just get it done, regardless of safety." Too often, the cost of a delay associated with reducing power is considered too high. So, rather than rescheduling maintenance at a time convenient to all parties, climbers have been "incentivized." This situation can be eliminated through proper multi-

nated through proper multiuser agreements, clearly defining the responsibilities of all parties.

• The RF Worksheets Appendix to FCC Form 301 helps broadcasters assess their level of compliance, step by step. The FCC forms are available on its website at http:// www.fcc.gov/formpage.html. But, simply completing the worksheet and stating that there are no publicly accessible areas that exceed general-population exposure limits is certainly not the end of a broadcaster's compliance responsibilities. The facility must maintain ongoing compliance - forever. A broadcaster's obligations under FCC and OSHA rules and regulations just begin when he signs Form 301. Routine review of work practices and updating exposure calculations with changes to the RF environment are paramount to maintaining ongoing compliance.

- Currently, the FCC rules do not include specific protection guidelines or limits for RF shock and burn. At the time the rules were developed, the equipment for measuring induced and contact currents were not as readily available as they are now. While no time line exists for adding limits to the standards, such limits will be included at some point in the future.
- Enforcement Bureau Field Activities at this time, FCC employees are being trained to deploy additional enforcement of guidelines nationwide. This training is occurring not just at the Colorado office, or the Washington, DC or Gettysburg, PA headquarters all FCC Enforcement Bureau personnel are being trained on non-ionizing radiation rules and regulations. In the very near future, when the FCC inspects broadcasters, its questions will address radiation as well as the public-inspection file and tower lighting.

#### **OSHA** issues

Mr. Richard Strickland of NARDA Microwave wrote <u>Key Elements of a</u> <u>Safety Program for Broadcasters</u>, part



Marking hazard areas with proper signage is a key step in the development of an RF safety program.



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Proper fencing around a site allows broadcasters to control access to the site, which is an important part of a safety program.

of the NAB "A Broadcaster's Guide to FCC RF Radiation Regulations Compliance" (Item #3859, available at http://www.nab.org/nabstore). This document details 11 key elements of a health-and-safety program, which are summarized below. While these 11 elements are not official OSHA elements, they have earned general industry acceptance. If implemented, they can help any broadcaster become OSHA compliant.

Written documentation of the program. If it isn't written, broadcasters do not have a safety program.

Management support. A safety program must have the full backing of management and must commit to and allocate the appropriate resources.

Education and communication. The safety program must be communicated to the broadcaster's employees, who must understand the work rules, procedures and policies they are expected to follow. Education is an ongoing requirement. Initial training is required when the safety program is first put in place, and periodic refresher training is also required.

Enforcement. As an employer, broadcasters must enforce the safety program. It is up to the broadcaster to make sure that its employees are following the program.

Identification of hazard areas. Broadcasters must have a reasonable idea where the field strengths may exceed the Maximum Permissible Exposure ("MPE") (see OET 65 for a complete discussion of MPE) levels for both occupational/controlled areas and for general-population/uncontrolled areas. This requires periodic surveillance by a competent person who can effectively assess hazard levels.

operators should consider adding sitespecific work rules to the corporatelevel safety program.

Employee involvement. Employees must understand the rules and procedures of the safety program, and a program's procedures must incorporate practical, efficient working considerations. The program must not be unduly impractical for someone to accomplish his or her job.

Medical program. First, employees who are expected to work in areas with potential exposure to RF fields above a modest level should be screened to identify those with medical implants that contain electronic circuitry. Second, the safety program must have provisions to handle overexposure incidents, whether real or unsubstantiated. Severe situations will require a physical exam. All incidents should be documented using a standard form that helps broadcasters quantify and record the level of the exposure. Often, a reported overexposure incident is found to be fully within the FCC regulations once the elements of whole-body averaging and time averaging are considered.

Scheduled reviews. Broadcasters

# The intent of the rules becomes clear when broadcasters ask themselves, "What needs to be done to ensure worker safety?"

Marking and control of hazard areas. Once a broadcaster has determined potential hazard areas through calculations or measurements, it must identify such areas to those who would have access. Broadcasters often accomplish this by posting appropriate signs.

Controls and/or work practices. Establish work practices. Mr. Strickland's document highly recommends that broadcasters establish boundaries that do not depend on time averaging. It is risky to depend on human behavior, for example, when allowing an individual to work in a certain area for three minutes because the field levels are 200 percent of the MPE. Multiple-site

should review their safety programs annually so that deficiencies can be identified and resolved.

Assignment of responsibility. A broadcaster must clearly identify someone in its organization as the RF safety person. This individual, who will have other duties as well, must have the necessary authority and resources to implement and enforce all aspects of the safety program.

A broadcaster's obligations to human health and safety do not end with FCC certification—they begin there.

Richard P. Biby is a professional engineer and chief technology officer of Sitesafe Inc.



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### **New Products & Reviews**

#### Applied Technology

#### Videotek's SQM

**BY GREG HUTTIE** 

n increasing number of broadband, satellite (DBS and uplink facilities), data path providers, content providers, and even traditional broadcasters, are faced with growing numbers of channels/services, sources and system path points to monitor. In addition, all are tasked with the basic operational accountability issues we know so well: assurance of signal quality, outage recognition, service restoration time and source uptime. All of these issues are underscored by the ultimate accountability concern of customer satisfaction.

However, in today's quality control environment, people remain the primary monitoring medium, and are normally found perched adjacent to the typical broadcast monitor wall. These individuals may be responsible for upward of 80 monitors, and regardless of the wall makeup – tube or flat screen display – it can mean

tired eyes and dazed minds. Further, personnel costs, as well as skilled talent allocation needs, demand an an attempt to address issues directly associated with QC. Equipment manufacturers have recognized the

# Personnel costs, as well as skilled talent allocation needs, demand an automated quality control solution.

automated solution. In light of tightening quality control standards, the limitations of this age-old approach to quality control are increasingly questioned. Yet, until recently, there has not been a viable, cost-effective alternative.

In the mid-90s, some major facilities recognized the shortcomings of this quality-control approach and began designing "home-grown" systems in recent need for more cost-effective, central monitoring systems. Development of a QC central monitoring system must also take into consideration the ever-changing demands of the industry. One company that has launched into this arena is Videotek.

Focusing on current needs and a changing future, Videotek has been developing a comprehensive QC central monitoring system to standardize the way facilities address this QC concern. Videotek's Signal Quality Manager (SQM) tackles many issues faced by facilities.

The system has been designed to grow in an industry that continues to evolve in the area of standards, consolidation and delivery medium. It provides centralized monitoring of core video, audio and data parameters; alarm capability; system expandability; and network compatibility.

The system monitors multi-standard video and audio feeds and specified data through a set of modules mounted in a CPU-controlled frame. Users set their own alarm limits for monitoring specific parameters to identify degradation, outages and system conditions.

The QC monitoring system allows the mixing of any video/audio format in the same frame. Each frame reports to a central database, which in turn



This control room is maintained by Videotek's QC monitoring system, which monitors multi-standard video and audio feeds and unspecified data through a set of modules mounted in a CPU-controlled frame.



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distributes information to multiple viewing stations in the network. Videotek's system has been designed for use in all types of signal monitoring environments, from smaller local stations to large satellite receive/transmit centers to POP sites located around the globe. A typical system integration scheme is shown in Figure 1.

The SQM has plans in place for current and future system growth. Currently, the system will support analog video, analog audio, digital video, digital audio, MPEG, GPI/GPO, signal routing and router control. In the future it will support other MPEG, data and HD video formats. This issue of quality control will continue to be a concern for broadband, satellite (DBS and uplink facilities), data path providers and traditional broadcasters in years to come.

Companies like Videotek will need to continue to develop solutions for the communications industry that can evolve with future requirements.

For more information on Videotek's SQM QC monitoring system, circle (450) on Free Info Card.

Greg Huttie is director of product development for Videotek.

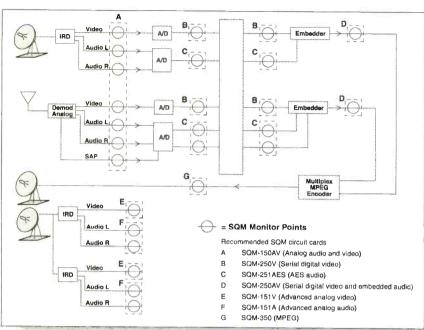


Figure 1. This diagram shows a simple system integration plan with SQM monitoring points and the associated circuit cards. A wide variety of cards are available to accept all common video and audio formats. Multiple monitoring points can be located along a signal path to provide fast diagnostics of errors.



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#### Applied Technology

#### Network problem, affiliate solution

BY BILL HENDERSHOT

his is a crucial time for broadcasters. Networks are cutting back compensation to affiliates and may phase compensation out altogether. Affiliates must find new ways to generate revenue.

The Time Machine is a new way to generate revenue by generating additional commercial time.

The system transparently creates 30 seconds of extra commercial time in a 20- to 30-minute program. In all cases, the process occurs in real time without pre-recording or pre-processing, does not reduce program content, and is virtually undetectable to viewers. The amount of additional time created and the period over which it is created are programmable and variable.

It does not need to be used all day everyday, just two or three times during popular programs where commercial time is sold out. Most stations have popular programs that have high commercial value, as well as popular affiliate programming.

In addition to contributing to day-today profit, the system can help stations with funding for their transition to digital and provide time for public service announcements, newsbreaks, weather updates and station promotions.

#### Operation

To insert an extra 30-second commercial into a 20-minute program, users can set the machine for a 30-second audio/video delay at any time during a program. The time delay can be triggered manually or automatically using BVW protocol. The program is then delayed 30 seconds. During the 30-second program delay, stations can insert an additional commercial.

Twenty minutes of programming is seen in the remaining time, with no pitch change or other unwanted anomalies. detected. It takes at least two or three frames of offset for even an expert to detect a lip-sync problem.

The system also passes full closed captioning with no impairment. This is accomplished by utilizing a variable delay equal to the remaining time delay for the audio/video. First, the closed captioning is removed from the vertical interval and decoded. Then it is

#### The system can provide time for public service announcements, newsbreaks, weather updates and station promotions.

This is accomplished by carefully throwing away the 30 seconds of delay and thus ending in real time.

The Time Machine uses a patented process that automatically looks for identical or near-identical (no motion) adjacent frames and transparently drops one of them, thus dropping one-thirtieth of a second of video time in NTSC or one twenty-fifth of a second in PAL or SECAM. This much time can't be dropped in the audio domain because one-thirtieth or one twenty-fifth of a second is part of a word. Furthermore, the best time to drop audio is not necessarily the best time to drop video. Therefore, the system drops smaller digital packets of audio more often than the larg-

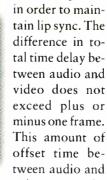
> er video packet video cannot be

passed through the variable delay and encoded and reinserted into the outgoing vertical interval. The result is closed captioning that is not as accurately timed as audio with respect to video; however, closed captioning does not need to be as time accurate as audio.

The second-generation serial digital version of the Time Machine is now available and is shipping. The basic digital real-time unit easily creates up to 30 seconds of extra commercial time in a 20- to 30-minute program. Options are available to allow the digital unit to go up to several minutes of extra commercial time.

Digital input and output are standard, and the Digital Time Machine offers four channels of analog or AES/ EBU audio. Optional features include analog component or composite video input and output, four additional analog or AES/EBU audio channels, redundant power supply, and multi-format HDTV input/output.

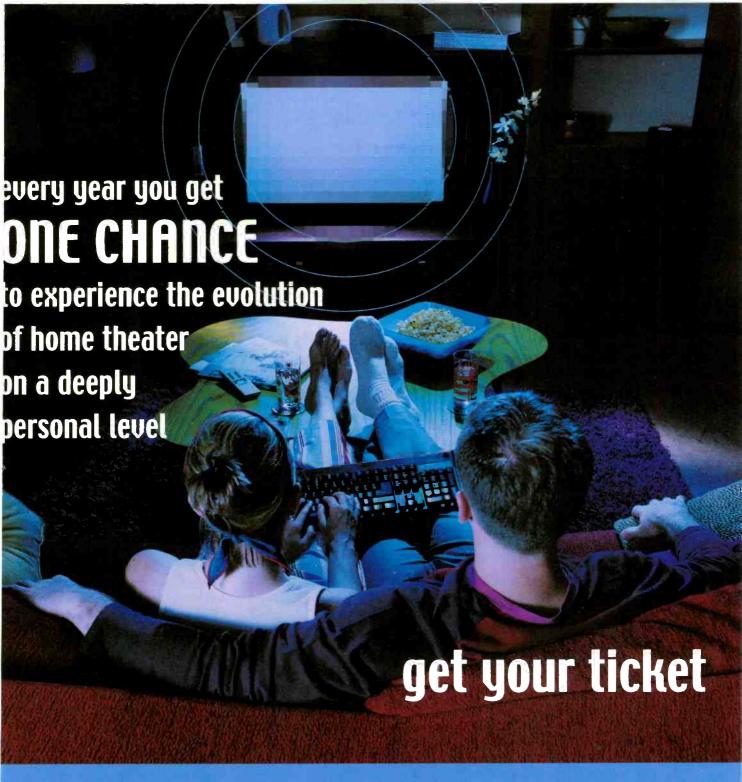
For more information on Prime Image's Time Machine, circle (451) on Free Info Card.



Bill Hendershot is president and founder of Prime Image, Inc.



Prime Image's Time Machine.



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#### Applied Technology

#### Harmonic's MV50 MPEG-2 encoder

BY ANDREW W. JOHNSON, PH.D., AND NEIL BRYDON

ntegrating noise reduction and video preprocessing functions with the hardware that performs video compression offers key performance advantages as well as the obvious savings of rack space, power and cooling support. Encoding noise is a waste of bandwidth. Removing noise enables improved video delivery at lower bit rates.

Noise shares the same space as valuable picture detail, and levels of noise can vary dramatically. This is especially true with archive material and news feeds. A solution is to deploy multiple preprocessing filters, each with a specific role, and then combine them with an automatic control system to apply the optimal filter at the right strength in the right places. The final objective of the video preprocessing and compression operation is to maximize the subjective quality of the decoded video signal for a given encoded bit rate.

#### Meeting the challenge

Harmonic's MV50 MPEG-2 encoder now supports its third evolution of noise reduction (NR) technology. A central feature is "LookAhead" architecture, a multi-processor combination designed to aid both NR and compression by providing analysis of the incoming content before it meets the master compression engine. A dedicated MPEG-2 video signal processor is used to extract input signal statistics that are used to assist the decision processes by the compression engine and preprocessing filters.

The MV50 employs a suite of preprocessing filters that perform spatial, temporal and spatio-temporal processing of the input video signal.

Motion Compensated Temporal Filtering (MCTF) is a technique used to remove/attenuate Gaussian noise from video content. This form of filtering is much more powerful than temporal-only filtering, in which pixels are filtered with other pixels at the same spatial location. With MCTF, filtering is applied along "motion trajectories."

If an object within a sequence moves from frame to frame, block-based motion estimation (ME) is used to track the direction and magnitude of the motion. Filtering is then applied using pixels that retain the same position relative to an object moving within the frame sampling structure.

MCTF all but eliminates ghosting and

Once the impulses have been identified, it is relatively easy to substitute them using values based on spatio-temporal filtering operations.

The Edge Adaptive Texture (EAT) filter is a spatio-temporal filter used to drive down bit rates, extending the encoder's performance. It is well-known that progressive scan video material is

## Viewers generally have limited tolerance for reduction in detail and edge definition.

trailing normally associated with temporal-only filters. Random components are heavily suppressed, yet picture details are preserved. It also limits artifacts to within the threshold of visibility.

Simple spatial filtering applies intraframe, two-dimensional low-pass filtering to suppress high-frequency noise. The downside of this technique is less picture detail. Viewers generally have limited tolerance for reduction in detail and edge definition; therefore, basic spatial filtering should be applied sparingly. Harmonic has developed a new spatial technique that is naturally edge preserying but allows significant filtering to remove noise with Gaussian characteristics. This filter's operation is coupled to the MCTF when motion within a sequence is not well-approximated by the translational block motion model. or when it has been determined that the input sequence contains a strong Gaussian-type noise component.

Impulse noise occurs for a single frame and is commonly seen as dots, scratches or film damage. This type of noise does not waste bits like random noise, but it has a significant effect on perceived picture quality and reduces the effectiveness of other noise reduction and compression mechanisms.

The MV50 encoder devotes two thousand million pixel comparisons per second to ascertaining whether a pixel, or group of pixels, are single-frame rogues.

more efficiently encoded than interlace video. Interlaced video can be made more efficient by performing an interlace-to-progressive spatio-temporal format conversion. Unfortunately, this operation introduces motion artifacts when viewed on an interlaced television.

The EAT filter has been designed to perform an adaptive de-interlacing function on the input interlaced video signal. Filtering is performed on regions identified as texture. However, edge-defining objects, or those containing regions of texture, are left in their native interlaced format. Filtering the textured regions in this way can provide the benefits of improved coding efficiency - much like those realized by de-interlacing - without the drawbacks. When this preprocessing technique is applied to sequences containing high spatial detail and motion, significant improvements in low bit rate encoding efficiency are obtained.

The combination of advanced compression technology and powerful and innovative preprocessing techniques is enabling enhanced delivery of digital content at ever-lower bit rates.

For more information on Harmonic's MV50, circle (452) on Free Info Card.

Dr. Andrew W. Johnson is staff development engineer and Neil Brydon is senior group marketing manager for the Convergent Systems Division of Harmonic Inc.

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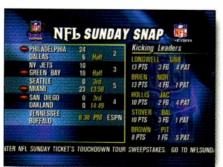
#### Video Design Software automates NFL Snap Channel

BY LARRY MINCER

nore than one million C-Band and DirecTV subscribers tune in each week to "NFL Sunday Ticket" to see the bone-crunching action of the NFL that is broadcast coast-to-coast. Part of this successful package is a dedicated stats and information channel called "NFL Sunday Snap." The NFL developed this channel with the intention of increasing its overall viewership while providing in-depth coverage of players, teams, scores and game action. Specifically, the NFL wanted to deliver local content to its viewers, while still presenting the entire NFL game lineup, stats and league information to all the subscribers.

To achieve these goals, the NFL established a plan to completely revamp its Sunday Snap channel. The plan for the new Sunday Snap would provide coverage of games in progress with higher-quality displays of graphics and statistics, as well as real-time updates of game and team information. In addition, added provisions deliver local content in different parts of North and South America with the local channel assignments for each of the NFL games.

The NFL contacted Video Design Software due to the company's experience in developing systems for the retrieval and on-air display of time-critical information from databases and live wire feeds. Video Design Software has developed several mission-critical systems for the automated display of broadcast graphics for such clients as CNBC, Viacom, Fox News



The Snap Channel that was designed and implemented by Video Design Software.

and Sports, Microsoft, and the NBA.

In order to ensure that the complete system was ready in time for the start of the 2000 NFL season, the NFL contracted Video Design Software to manage the overall development, installation and integration of all data- and graphicsrelated system components. The company put together a complete team consisting of a project manager, lead developer, support developers and a systems engineer. This team worked closely with the NFL's broadcast operations and information systems departments, as well as Video Design's internal production and management staffs to identify and schedule the complete list of tasks to be accomplished to meet the fixed on-air date. Chyron was also engaged to help with any new features required.

To achieve the display of game scores, clocks, news and statistical information required for the new look, the central databases for the system were designed to be updated from data retrieved in the SportsTicker premium feed, internal NFL statistical databases and manually entered data. Five applications were seamlessly integrated with the Duet and CODI boards and affect different areas of the displays both simultaneously and independently.

GameTrak, a distributed client/server system for the display of sports scores and information, is the core application used to retrieve and generate graphics on the Duet and CODIs through the SportsTicker delivered data.

A second application is responsible for generating all the graphics seen on the main Duet-generated feed. This information includes game clocks and scores, a news ticker, league leader and game-day leader statistics, promotional information and sponsor logos.

A third application provides an Internet-based interface to the NFL's internal statistical databases. This application retrieves and generates information on the Duet for current league leaders, as well as game-day leaders.

A fourth application allows for the entry of text into the news crawl and other areas of the screen. In addition, the NFL is given the ability to update a section of the display dedicated for NFL and sponsor promotions, as well as the entry of channel

# One of the major goals of this project was to minimize the amount of hardware.

number assignments and updates for each of the headends supported by the system.

A fifth and final application, the NFL Snap Channel localization engine, interfaces to the Digital CODI board located at each headend. This application receives updated game scores and clock information from the GameTrak Client for display on the Digital CODI board.

In its first season of operation, the Snap Channel exceeded its goals and proved to be a big success, increasing both the number of viewers and quality of its programming. Based on this success and the scalability designed into the system, the NFL and Video Design Software have enhanced the graphics and information for the current 2001 season. Enhancements include live connections to stadium scoreboards for real-time clock and score updates, live "red-zone" indicators to flag games in potential scoring situations, and enhanced league leader stats with player headshots, sponsor and promo logos, post game box scores. and game summaries.

For more information on Video Design Software's GameTrak, circle (453) on Free Info Card.

Larry Mincer is the president of Video Design Software.



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#### Field Report

#### Audio recording with Mackie's D8B console

BY RANDY ALBERTS

pigital mixing consoles can provide users with enhanced functionality in the broadcast studio, as well as in the home studio. They accept an everincreasing number of inputs to expand users' range, giving them the option of recording tracks on site and carrying them back to the studio for editing.

I used Mackie's D8B console in conjunction with an HDR 24/96 hard disk recorder to perform edit, effect and mix-down tasks. I also used the HDR 24/96 to record and edit simple guitar tracks. The console has its own power supply and display window, and the recorder provides mouse, keyboard and SVGA monitor plug-in ports. Seamless integration between the units enables the console's jog/shuttle wheel to be used to scrub the recorder's audio tracks. It also works as a stand-alone 24-bit capture machine for Foley, sound design and remote recording applications.

I also ran a CD input through the mixer to get a feel for basic pan/assign features. A display shows EO, gate,

| The state | The

Mackie's HDR 24/96 hard disk recorder/editor (GUI shown above) integrated with the D8B mixing console allows users to capture audio on site and return it to the studio for editing.

compressor and plug-in parameters for a selected channel and is controlled by four virtual potentiometer (V-Pot) soft knobs beneath the screen, corresponding to the console's physical channel strips. Each strip features buttons for mic/line, record ready and channel select/assign, as well as a 100 mm motorized fader.

I switched between the various EQ types and opened a plug-in to add verb. The console allows users to switch between three EQ modes: low-band/

and 24x track zoom displays; and a continuously scrolling track waveform display. A 100 Base-T Ethernet port, nine expansion slots for optional audio, MIDI and sync I/O cards, and a remote controller connector round out the recorder's back panel.

## The band simply took the HDR home, connected a mouse and edited their performance.

high-pass filter with two mid-parametric bands, low-band/high-pass with three upper parametric bands, and standard four-band parametric EQ.

Surround enhancements such as surround LFE gain control per channel, surround-corrected bus/track assignments, front-to-rear pan control and a 72-channel overview surround GUI environment are useful in mixing for more than two speakers. The new surround software interface also provides visual orientation and control

over multichannel mix-down modes including quad, LCRS, 5.1 and 7.1.

Each of the recorder's 24 tracks features a dedicated peak/VU LED signal level meter and a track-arming button. The transport controls, menu buttons, SMPTE/MIDI readout and 24-character/four-line LCD are all logically placed. The built-in 20 GByte internal hard drive is supplemented by a

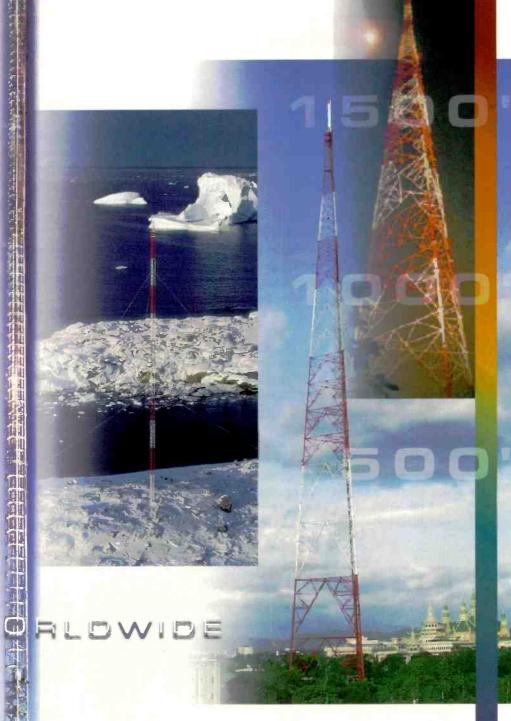
floppy drive and a second drive port on the front panel.

Full-featured editing software is built in and includes non-destructive cut, copy and paste; 999 undo levels with a real-time history list; 2x, 4x, 8x, 12x I was a bit surprised to find that the recorder requires three PDI-8 AES cards in order to achieve 96kHz resolution, but hardly daunted by it. The 24 tracks are supplemented by 192 virtual tracks, and the ability to operate the HDR as a stand-alone recorder/editor came in handy when the live recording mentioned before needed some tweaks. The band simply took the HDR home, connected a mouse and edited their performance.

I also checked out Mackie's HR 824 speakers along the way. Each speaker has a power mode switch, low-frequency roll-off switch, highfrequency adjustment switch, input sensitivity control, 1/4-inch phone, and XLR and RCA audio inputs on its back panel. They also feature 150 watt (@  $4\Omega$  load) low frequency and 100 watt (@  $6\Omega$ ) power amplifiers, which handle a range of loads. Its 8.75-inch low-frequency driver transducer and 1-inch high frequency driver with edge-damped aluminum dome and ferrofluid-cooled voice coil perform well in compact enclosures, generating a wide and highly detailed stereo sweet spot.

Randy Alberts is a San Francisco-based writer, engineer and producer exploring music and recording technology. He is a regular contributor to BE's sister magazines, Mix, Remix and Electronic Musician and has just published a book about the history of TASCAM for Hal Leonard Publishing.

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#### Technology In Transition

#### Studio lighting systems

BY JOHN LUFF

ike many adolescent nerds I found my way in high school onto the stage crew. Since, as my long-suffering wife knows, I have little skill with a hammer or paintbrush, I gravitated to the lighting crew and found it was great fun to manipulate the huge dimmer controls, which resembled levers the Wizard of Oz might use. My fascination with science, and physics in particular, made playing with light even more interesting.

Those ancient controls, now long since decommissioned I am sure, were little more than enormous resistors. Long-worn contacts made smooth transitions in dim corners of the sets a little more challenging than the minimal skill of a high school student could overcome, and instead of analog smoothness, I often created quantum energy steps. The selection of lights was simple: a couple of strip lights with the ordained red, blue and green gels, a few 500-watt fresnels, and even

fewer ellipsoidals with patterns that were not very useful. But the effect was magical, turning a high school stage into a Scottish village called Brigadoon, the home of the elderly women of "Arsenic and Old Lace," of Frankenstein might have picked for the strange doctor's laboratory.

Today, compact fluorescents, HMIs, solid-state dimmers, computerized lighting boards, and dimmers on the grid are tools that lighting profession-

# With lighting technology physics and engineering provide the tools — ingenuity and creativity create the illusions.

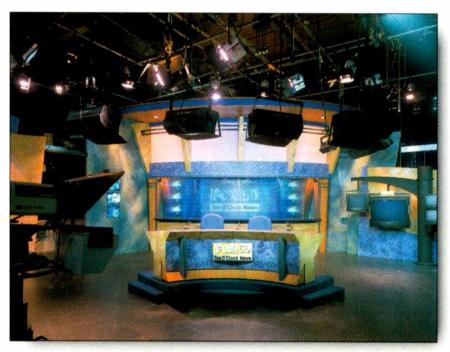
and a Harold Hill's parade ground. If I could revisit that stage as it looked then I am sure my jaded eyes would perceive a less-magical transformation, but suffice it to say those nights high above the stage in the lighting cage were an important part of hooking me on technology.

At that time, in the early 60s, a twoscene preset lighting board resembled something that the production designer als of an earlier generation might have pined for.

Lighting technology is the original analog medium. Physics and engineering provide the tools — photons emitted from a source and controlled in direction and intensity. Ingenuity and creativity create the illusions. Lighting, when done well, does much more than provide the photons that are reflected from the set and focused on an imager to make television. It sets the mood, it replicates reality in places where lighting looks unnatural and it creates visual interest in much the same way a painter draws your eye to parts of his canyas.

However, light must be carefully controlled. The direction of the light, its intensity, the diffuse or point-source nature of the illuminant, and the color and color temperature of the luminous source are all-important in creating a visual illusion. Some are controlled in the instrument, some by the physics of the light source and some by filtering the output of the instrument. One, intensity, is controlled by the energizing source. A lighting system must, as a result, be looked at as a holistic system in which the lighting director uses all of the notes of his scale to play the proper luminous music.

When building a studio one tends to think first of the permanent, or semipermanent, portions of that holistic system. A lighting control system



Studio lighting on the news set of Fox affiliate WRAL-TV in Raleigh-Durham, NC. Photography courtesy Rees Associates. Photo by Andrew Lautman.



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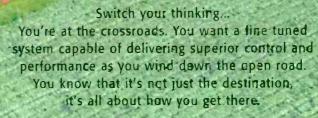
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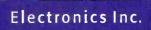












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varies only the intensity of the sources unless remote-controlled instruments with remote pan, tilt and focus are specified. I worked in a studio in Moscow where the lights not only had remote pan, tilt and focus, but moved around the grid under remote control from an elaborate control desk. That's pretty uncommon anywhere, but imagine it in a country where labor was easy to come by and not well paid. Lighting control systems today are generally computer memory systems that provide a stored value for intensity to each dimmer and vary those values according to a time line controlled by the operator. Most television lighting tends to be set once for the production and recalled for future use.

At one time dimmers were highly

inefficient, creating both acoustic and electrical noise. They were therefore located outside the studio if possible. Planning for the electrical distribution to the grid had to take into account the loss of the interconnection and the effect of having multiple conductors interacting in ducts headed to the grid. Today, dimmers are much more efficient, and lower-power dimmers are not mounted on the grid itself, reducing the cost of installation and increasing the efficiency of the total system. Control wiring must be distributed instead of dimmer outputs. Time will tell if this strategy becomes expensive to maintain, but it is hard to imagine that it is not less expensive to install.

Instruments have also evolved considerably in the life of commercial

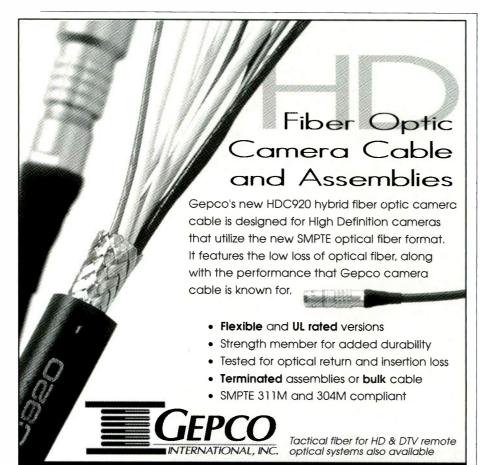
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broadcasting. New lamp technologies allow high-power instruments, like HMIs, which can also be much more efficient. The development of extended source luminaries, like compact fluorescents, has enabled energy-efficient operation for many types of sets. Such

## Light must be carefully controlled.

instruments are not applicable to all needs, as they tend not to be as easy to control as point-source instruments, but they have advanced quite a bit in the decade they have been available. Operations that run 24 hours a day, such as American shopping channels and 24-hour news, have benefited from both the energy efficiency and the long life of the sources. Where once dimming was not possible, it can now be fully controlled, and a variety of lamp color temperatures are available.

The range of options available to the lighting director presents an interesting challenge when designing a studio today. There is a temptation to make rash assumptions about the kind of instruments the studio will use, which has implications on the selection of control systems, dimmer size and count, and total power capacity that can be delivered to the grid. While some situations can be predicted well before construction and installation of the set (for instance, a 24-hour news channel or live newsroom set), general-use studios must still be planned for a reasonable "worst case." Cutting off options early in the design phase of a project may allow the building budget to remain on track, but may seriously compromise future use that was not predictable or well understood. It is wise to employ a studio designer with a broad range of knowledge and project experience. One current client of ours anticipates a studio for major film work, commercials, episodic video production and live audience shows. Such use cannot come from a studio that has not been carefully thought through.



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Since the conversion, the performance of the units have lived up to the specifications and with very few problems. We have included RossGear Terminal Equipment in our next conversion plans as well as future expansion plans because of our first success.

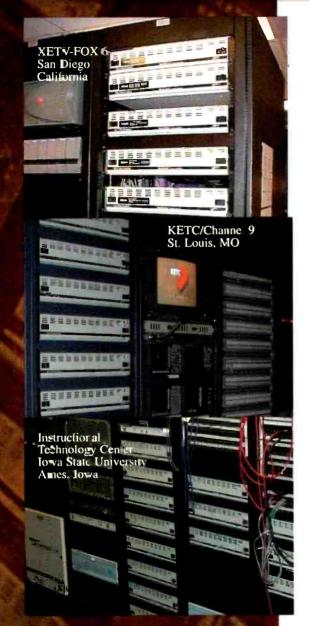
Carl Roszczybiuk Director of Engineering Trio Video, Chicago, Illinois

By going with Ross, we were able to get more of what we needed at substantial cost savings.

The bottom line is, we never even know that RossGear is there. And that's the way it should be. It has been steady and reliable.

Bob Anderson Operation Manager XETV-FOX 6, San Diego/California

Durable Powder-Coat



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1RU Digital Product Frame 2RU Digital Product Frame Universal Power Supply

The new Ross Digital Products Frames feature a unique ventilation design which allows fully stuffed frames to be stacked one on top of the other, saving unused rack space and providing superior cooling characteristics.



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Optional

#### BROADCAST DIGITAL VIDEO SERVER

Inscriber Technology E-Clips server: a multichannel, digital video server; combines delivery power with ease of use; available in two-, four-, six- or eight-channel configurations; able to playback multiple channels of independent content simultaneously; has complete control over external devices and the flexibility to integrate with automation systems; provides easy access to an array of media; provides playback of video clips; captures output from VTRs; displays and captures live video feeds; controls switchers and accesses material from digital disk records; 519-570-9111; fax: 519-570-9140; www.inscriber.com.

Circle (359) on Free Info Card

#### **DIGITAL MICROPHONE RECEIVER**



Stagetec Nexus XER card: AES/ EBU receiver allows a digital microphone to be connected directly to the Nexus digital audio routing system; can be used by all connected base devices; offers digital phantom powering for digital microphones as well as remote control of microphone functions; reads and monitors the factory ID, serial ID and model ID of the connected digital microphone; prepares for future developments

such as digital wireless microphones; +49 9545 440 300; fax: +49 9545 440 333; www.stagetec.com.

Circle (360) on Free Info Card

#### BACKPACK WIRE-LESS CAMERA

Tandberg Television Voyager Lite: a backpack D-ENG solution designed for wireless cameras; incorporates high-quality video encoding with an integrated DVB-T modulator/upconverter providing 2.4GHz RF output; unit fits in a small pack weighing 2 kilos and is carried on cameraman's



back; 407-380-7055; fax: 407-380-6691; www.tandbergtv.com. Circle (361) on Free Info Card

#### SHOTGUN MICROPHONE

Azden SGM-1X: a single-barrel hyper-directional super-cardioid shotgun microphone; has a wide frequency response (80-18, 000Hz); low noise and accepts up to 110dB SPL input levels; uses battery that last more than 1000 hours; has balanced low-impedance XLR output; 516-328-7500; fax: 516-328-7506; www.azdencorp.com.

Circle (362) on Free Info Card

#### SMART ENCODE SUITE

Virage Video Logger 5.0 Software Developer Kit 5.0 and Control Center 2.0: suite creates a simultaneous real-time process for controlling, automating and integrating the workflow, surrounding video transformation, including encoding, indexing and delivery; enhanced automation; tighter time synchronization; control for simultaneous, multi-format

encoding; control center manages, monitors and schedules multiple video feeds; videologger automatically creates a rich, multi-layered video database; encoder software automates and controls the encoding workflow for multiple formats and bit rates; media analysis plug-ins enrich video database through enhanced signal analysis; software developer's kit features extended open architecture for custom integration; 650-573-3210; fax: 650-573-3211; www.virage.com.

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#### TIA TOWER STANDARD Q&A BOOKLET

**PiRod "Revision G: How it's going to impact your job":** sheds light on changes likely to occur after standard is in place; explains how changes will impact tower design; 219-936-4221; fax: 219-936-6796; www.pirod.com.

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#### **SOURCE TRANSFER SWITCH**

MGE UPS Pulsar Source Transfer Switch: switch automatically and instantaneously transfers up to 1400VA (12A of 120V 50- to 60Hz AC current) of load power from a preferred source to an alternate in the event of a power failure; simple and effective way of adding a second input power source to a single input sourced piece of equipment; features separate electromagnetic compliance filters, pairs of dual redundant power connection management relays and electronic control circuits; transfer of load power from the preferred to the alternate source takes seven milliseconds; 714-557-1636; fax: 714-435-1445; www.mgeups.com.

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#### **DTV SOLUTION**

Heartland Video Systems High Definition Integrated DTV System: provides a single rack containing upconversion, routing, monitoring, encoding, multiplexing and PSIP generation; highlights front panel control and PC control of most components; integrates equipment from Tandberg Television, Miranda Technologies, Dolby, Evertz and Triveni Digital; can be configured from SD only to HD/SD with dynamic PSIP and multiplexing of pre-compressed inputs; 800-332-7088; fax: 920-893-3106; www.hvs-inc.com; www.hvs-dtv.com.

Circle (366) on Free Info Card

#### **METAPLAYER**

**Microsoft Corp. and Chyron Corp. Metaplayer:** allows broadcasters to manage and maintain millions of hyperlinks instantaneously; uses Simple Object Access Protocol; retrieves incoming interactive triggers from multiple sources; redirects sources to various channels; Microsoft: 425-882-8080; fax: 425-936-7329; www.microsoft.com; Chyron: 631-845-2000; www.chyron.com.

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#### IMAGE CORRECTION

Snell & Wilcox Shakeout:

uses Snell & Wilcox Ph.C motion estimation technology; provides real-time correction for

unstable images so that pictures from remote locations are as watchable as those from studio cameras; 408-260-100; 408-260-2800; www.snellwilcox.com.

Circle (368) on Free Info Card

#### **DIGITAL ADAPTER**

ZGC P+S Technik Mini 35 Digital

Adapter: allows videographers to attach any 35mm film lens with an Arri PL, Nikon or Panavision mount to their Canon XL-1 or new XL-1S digital video camera; designed for any type of video production; can watch test footage shot with a Canon XL-1 mounted with the P+S Adapter and Cannon 35mm and Zeiss 35mm motion picture lenses at the ZGC Web site; 973-335-4460; fax: 973-335-4560; www.zgc.com.

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Circle (371) on Free Info Card

#### **IMAGE STORE SYSTEM**

**Leitch MediaFile:** designed to integrate into demanding broadcast environments; supports two analog fill + key channels or one digital fill + key channel 2RU; also supports up to two digital channels in 4RU; features rack-mountable chassis and shock-mounted drives; 757-548-2300; fax: 757-548-4210; www.leitch.com.



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#### MONITORING DOWNCONVERTER

Evertz F9-2410MD: uses full-resolution digital data output from camera to provide full-image downconverted composite analog outputs for local and remote monitoring; supports all HD video formats from the HDW-F900 camera; rugged and lightweight; attaches to the rear of the HDCAM; integration battery mount for easy installation and use; available in several versions; 905-335-3700; fax: 905-335-3573; www.evertz.com.







#### CONVERTER

K Tech Telecom DTV Broadcast
Products VSB-FRQ-200: 8-VSB to DVBASI/SMPTE 310M converter; takes an 8-VSB terrestrial signal to baseband; updates the PSIP VCT; generates DVB-ASI and SMPTE output signals simultaneously; accepts DVB-ASI and SMPTE-310M inputs; updates PSIP; produces DVB-ASI and SMPTE 310M outputs; 818-361-2248; fax: 818-270-2010; www.ktechtelecom.com.



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#### CINECAST HD DECODERS

Vela CineCast HD, CineCast HD/1, Cinecast HD/2

decoders: single- and dual-channel SCSI-based MPEG-2 decoders are DTV and HDTV solutions for broadcast, post-production, advertising and electronic cinema; support all 18 ATSC formats defined as standard HDTV resolutions; capable of decoding DVB and ARIB-compliant transport streams; command and media are received through a fast, reliable SCSI Ultra-2 LVDS interface;



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#### **Business Wire**

#### Business highlights from broadcast and production

BY ELIZABETH WAKEMAN, ASSISTANT EDITOR

NBC is turning to Cyradis Technology Group to provide a custom software solution for their broadcast of the 2002 Olympic Winter Games in Salt Lake City. NBC has asked Cyradis to supply an expanded version of the Router Web Gateway control system they used for the 2000 Sydney Games broadcast.

Idaho Public Television recently installed the AGV-1000 MPEG master control switcher/server by AgileVision. This product enables Idaho PTV to insert logos and other local content into a live compressed high-definition bit stream.



Corplex TV (Northfield, IL) recently installed the first Solid State Logic 192-input MT Production (MTP) mobile digital console in 'Sterling', its new state-of-the-art Expando Gerling trailer.

The Public Broadcasting Service Technology Operations Center has installed a complete datacasting/interactive television and PSIP metadata management systems by Triveni Digital. The systems will be used for expanded ATVEF technology deployments on a nationwide scale.

Pinnacle Systems has entered into a definitive agreement to acquire the assets of FAST Multimedia. Pinnacle Systems plans to integrate FAST's products into its family of video, authoring and streaming solutions.

Zenith Electronics Corp. and Nxt-Wave Communications have agreed to jointly develop compatible enhancements to the ATSC DTV standard. The joint system combines Nxt-Wave's error-connection coding and pre-coder solution with Zenith's dataframe mapping, interleaving and packing algorithm. New receivers with Zenith-NxtWave technology will be able to decode the standard 8-VSB and the more robust enhanced signal, providing improved multipath performance.



Digital System Technology Inc. has partnered with Convera, a provider of advanced technologies, products and solutions for managing digital content. DST will configure, implement and integrate Convera's Screening Room solutions to address digital asset management needs in broadcast facilities throughout the United States. Screening Room is fully integrated with EMC's Avalon Archive Manager technology and the Grass Valley Group's Profile XP Media Platform.

Virginia Public Television WVPT has purchased a Broadcast MediaCluster digital media server system from SeaChange International. The system enables WVPT to keep months of programs, promotions and underwriter's credits encoded in MPEG-2, and eliminates its need to purchase a robotic archive. WVPT had previously been running its programming on videotape and a limited amount of disk space.

#### **Screen Shot**

Fujinon Cine Style Prime Lenses capture Mideast



To shoot a high-definition 3D feature in Saudi Arabia, Paradise FX cofounder Max Penner used matching sets of Fujinon HDTV Cine Style Prime lenses affixed to two Sony HDW-F900 camcorders mounted on a Paracam dual-camera rig for ground shots and on a custom WesCam stabilized helicopter rig for aerial shots.

Paradise FX, which is shooting the feature for Saudi Aramco, a major oil company, tests high-definition cameras for future 3D IMAX production and develops technology for high-definition 3D movies.

#### Panasonic Cinema Camera used in "Tattered Angel"

Cincinnati-based production company Cincinnatus Motion Picture is using Panasonic Broadcast's AJ-HDC27V variable-frame HD cinema camera to shoot "Tattered Angel," a feature-length theatrical movie.

The AJ-HDC27V allows digital cinematographers to capture 24-frame high-definition progressive scanned images and offers variable frame rates of 4- to 33-, 36-, 40-, and 60 fps, providing the capability to "overcrank" or "undercrank" the camera to achieve fast- or slow-motion effects.

# **Today's broadcasting** requires the **seamless** integration of **stills**, **clips**, and **animation**

Show openings
Sumpers
Instant cues
Live playback





Images courtesy of TSN

"Kaydara mediastore provided us with instant cues to images and animations, all the stuff we use to dress up our [Olympic coverage]. Trying to create these effects without Kaydara mediastore would have been a nightmare for us."

- Paul McLean, producer, TSN

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CBS has turned to Hamlet for test and measurement equipment. The upgrade to the edit area was dedicated to the popular current affairs show "60 Minutes," and included the purchase of an 11th Digi Scope 601AS digital-processing measurement device.

AccuWeather and Wired Kingdom have partnered to announce the release of the AccuWeather Media Theatre, a customized media player that makes accessing, navigating and enjoying streaming media as simple as using a TV converter. Consumers are presented with a channel navigator, similar to an interactive TV Guide, that provides one-click access to video and audio feeds organized into one environment, so users never have to leave the player to switch channels.

Video Design Software recently completed the final stage of a three-tiered project with the integration of its AirPlot system for Canada's only all-business specialty channel, ROBTv. The system generates real-time financial line graphs and was the final component of a multi-million dollar renovation by ROBTv, including the construction of a new facility and complete equipment and technology updates.



Snell and Wilcox demonstrated its Alchemist Platinum upconverter at the SMPTE Technical Conference and Exhibition. Alchemist Platinum addresses the higher conversion quality criteria demanded by many broadcasters, and is the world's first motion-compensated, frame-rate converting upconverter. It also utilizes Phase Correlation technology and offers improved resolution, lower artifact levels and a noticeable improvement in picture fidelity.

Sony Electronics has unveiled a new CineAlta website for television, independent film and motion picture professionals. The website is to be used as an industry resource for its 24p technology. The site offers breaking news from the CineAlta technology news desk, technical information, critical reviews and articles about 24p, as well as 1080/60i high-definition projects, case studies, equipment- and media-specific FAQs, and industry white papers.



Tandberg Television introduces its Voyager Lite backpack ENG solution designed for wireless cameras. The system incorporates high-quality video encoding with an integrated DVB-T modulator/upconverter, providing 2.4 GHz RF output. The entire unit fits into a small pack and is carried on the cameraperson's back. Once attached to a wireless ENG camera, Voyager Lite turns the cameraperson into a moving broadcast station.

Telecast Fiber Systems has announced that its fiber-optic transmission and linkage solutions are being implemented in Action Sports and Entertainment's new 53-foot HDTV truck, a comprehensive HDTV production facility housed entirely within a single mobile unit. The truck provides live, high-definition coverage of sports, entertainment and corporate events for the Paul G. Allen family of sports companies.

Triveni Digital has announced that DTV Plus and Capitol Broadcasting Company have officially launched their TotalCast datacasting service using Triveni Digital technology. TotalCast

is a service of DTV Plus that broadcasts broadband content directly to personal computers using the digital television signal. Triveni Digital's technology provides the enabling infrastructure for TotalCast through its SkyScraper system, consisting of the SkyScraper DataFab/Hub and Sky-Scraper DataReceiver.

Inscriber Technology Corp. has announced the release of Inscriber TitleMotion AVX for Avid products. The TitleMotion AVX plug-in will support the following Windows-based Avid Products: Symphony, Media Style Composer, Avid Xpress and Avid Xpress DV systems. TitleMotion's features include lower-thirds, rolls, crawls, anti-aliased text, soft-edge shadows, drawing tools, background import, and productivity tools such as drag-and-drop style chips.

The AES 111th Convention, which takes place Nov. 30-Dec. 3 at the Jacob K. Javits Convention Center in New York, will feature a special event on digital broadcasting in the United States. With the advent of digital television, satellite-delivered digital radio, and in-band on-channel digital radio beginning broadcast, the audio community will be expected to deliver the highest quality of audio utilizing all these mediums. The impact of the various broadcasting services on the audio industry will also be presented.

#### **PEOPLE**

**Scott Johnson** has been named sales engineer for Klotz Digital America.



Digital System Technology has announced that Kenny Miller was named regional sales manager for the Atlanta division.

Kenny Miller

Professor David Youlton has announced he is stepping down from the chairmanship of Snell and Wilcox, the company he has headed for the past 13 years.

Is the video jack you're using today designed for the signal standards of tomorrow? If not, it's time you started thinking about Switchcraft's video jack.

Engineered to be ahead of its time, our video jack already meets the SMPTE 292M specification. Our new HD Series delivers consistent characteristics across the bandwidth, offering you the reliability you need now...and the required performance for tomorrow.

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one and two rack units, 24 or 26 jacks. No matter what your needs are, we're prepared to deliver.

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allow two scanning modes: 480 progressive (still) or interlaced (for video) - One touch auto focusing in manual focus mode

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as on DSR500/1 & DXC-D35) enables easier focusing. Automat-lcally switches from 4:3 aspect to 16:9. 58mm lens with 12x optical zoom.

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## SONY

#### DSR-250 3-CCD BV & DVCAM

Introducing everything you need in an event camera and more. The new completely digital DSR-250 from Sony is a high image quality reduced size camcorder which has been optimized for shooting events and parities. Every feature you could want is included in this revolutionary. acquisition tool

- . Flip out 2.5" 200,000 dot LCD monitor, finally available on a
- professional camera Time date stamp. Soft shoulder pad.

  Advanced optical stabilization allowing for a high quality dig tal zoom out to 24x, with a maximum digital zoom out to 48x

  Assignable time code (Rec Run, Free-run, User-bit)
- State of the content of the con
- from memory stick or USB adapter, software included

  Phantom 48V power Built in speaker Directional micro-
- phone in pro mic holder, 2 XLR audio inputs
- Built in edit controller. Equipped with an i.LINK raterface, al.
- lowing camcorder to serve as edit player or recorder.

   External 12V supply/Connection for light. The DSR-250 is equipped with light output (DC 12 V, maximum 38 watts)



#### **DSR-300A** 3-CCD Digital (DVCAM) Camcorder

The affordable DSR-300A actually extends operational convenience The affordable OSR-300A actually extends operational convenience with a range of new features and peripheral products. Remarkably compact and lightweight, the improved OSR-300A provides high nobility without compromising picture quality and can be held comfortably on your shoulder through the longest shoots and gives videographers the ability to acquire their footage quickly and easily

- The DSR-300A has three 1/2" IT Power HAD CCDs to deliver 800 lines of horizontal resolution, 62dB S/N ratio and high sensitivity of F/11 at 2000 lux. sensitivity of F/11 at 2000 lux. With bull-in 26-jin VCR interface, they can feed composite or S-Video output sipnals to an external recorder for parallel or back-up recordings. VCR recording modes including Parallel Internal (only) and External (only) are selected via the trigger switch positioned on the diperational panel - ISE logital Signal Processor (the very same one used by the DXC-303 cameras) for a high signal-to-noise ratio of 62 dB - Both mini cassettes (PDVM series) and standard cassettes (PDVM series) and standard cassettes (PDVM series).
- series) can be used with the DSR-300A. With PDV-184ME (standard), a maximum recording time of 184 minutes can be acheived. They can also play back tapes recorded in the consumer DV format
- consumer UV forms. For operational convenience while shooting, the "lime Code is super-mossed on the viewlinder screen or MONITOR DUT screen, even during playback. Charles of the convenience of the convenience of the convenience Charles of the convenience of the convenience of the convenience and a white LED light with 2 levels of intensity to illuminate the lens setting. FLEET394 i.Link (out only)



#### DSR-500WSL 2/3" 19:9 CCD (DVCAM) Camcorder

The DSR-500WS camcorder gives the video journalists the ability to acquire footage quickly and easily because the required functionality and performance was packed into this camcorder. In the meantime, the next generation widescreen TV's have been introduced and the demand for video material in widescreen (16:9) has greatly increased not only in broadcasting, but also in the event production and corporate communications market. To meet this demand. Sony offers this Widescreen Digital Camporder. The DSR-500WS offers outstanding picture quality by adopting full Digital Signal Processing and three 2/3-inch (520k) Power HAD WS (Wide Screen) CCDs which are

specifically designed for a 16:9 aspect ratio, switchable to 4:3 full screen. The camcorde extends the mobility, operational convenience and system flexibility with a range of peripheral products. Built-in digital-output of the i.LINK interface for backup and simple field editing is just one example. Technological advances in Sony DSP and CCD Technologies many powerful options and a convenient low price-point make the DSR500WS a formidable tool for a wide range of applications



The DXC-D35WS camera is the latest Sony digital camera

The DXC-D35WS camera is the latest Sony digital camera designed to the highest letchnological standards. With the proven Sony DSP technology combined with Sony high perior and the DXC-D30 series now being replaced by the NEW DXC-D30 series sonw being replaced by the NEW DXC-D35 series. DXC-D35 series feature a new Prism Assembly, new Pre Amplifiers, new DSP Software and a new Digital Encoder resulting in astounding performance. The DXC-D35WS camera fully interfaces with Sony's CCU-TX7 Wideband Component Triax System. It provides 8 set-up files (3 user) as a stand alone. 16 additional scene files (all user settable) are available when combined with the RCP-TX7.

settable)are available when combined with the RCP-TXT remote control panel. The DXC-D35WS is equiped with three 2/3" IT Power HAD CCD's switchable between 16:9 and 4:3 aspect ratio's. The camera docks to DSR-1 DVCAM and DNV-5

### **DXC-D35/D35WS Dockable (DVCAM) Camcorder**

The DXC-D35/ D35WS cameras are designed to the highest specifications, providing unprecedented video quality in this price range. The DXC-036 is at home in the studio or field, docking directly to a host of backs including Betacam SP and DVCAM, as well as studio backs and viewlinders. The highly adjustable picture means that these cameras are ideal for capturing detail in low or changing light, as well as compensating for peoples skin flaws while keeping the rest of the image sharp. DxC-D35WS is switchable 4:3 to wide screen 16:9 ratio

- BVV-5 Betacam SP recorders for analog recording.

   880 TV lines of resolution for DXC-D35

   850/800 TV lines for D-359VS. \*Two REC rafy lamps

   DXF-601W New Viewfinder Switchable 16 9 to 43

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   Display characters on/off switch Take Taily

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   Better flare compenstation Dynafri shoulder pad
   Lower minimum illumination (0.25 tux with HyperGain)
   Better color reproduction at high gain
   Improved dark detail and contrast. New preamplifier, prism
- and encoder Better performance at overlicads
   Reduced noise at Gain Up Variable color temperature adjust
   Adjustable 4.3 safety zone when at 16.9
- . New HyperGain mode of 42dB gain
- Aspect ratio select from Main Menu

## JVC

### GY-DV500U

1/2-inch 3-CCD Professional DV Camcorder

The GY-DV500 combines the convenience and cost-effective ness of Mini DV with the performance and features you need. Incorporate three 1/2-inch 380,000 pixel IT CCDs for superior picture performance (equivalent to 750 lines of resolution) superb sensitivity of F11 at 2000 lux and minimum illumination of 0.75 lux (LoLux mode). Rugged construction with a rigid diseast magnesium housing, Extremely portable, compact and light weight (lesss than 11 lbs. fully loaded). Additional teatures like the menu dial and Super Scene Finder assure ease-of-use and shooting flexibility, while the IEEE1394 and BS-232 interface allow integration into various non-linear and post

production systems. A professional camcorder in every sense, the compact, lightweight GY-DV500 redefines against in one corporate, educational, cable and broadcast production, as well as wedding videography and multimedia applications



DIAL 74



### **GY-DV550U** 1/2" 3-CCD DV Camcorder

Introducing the Versatile GY-DV550 from JVC. Designed by professionals, for professionals, the GY-DV550 is the world's first DV camcorder to offer studio camera capability. Thanks to the built-in 26-pin interface, you can connect the GY-DV550 to a CCU for remote-controlled studio operation or backup. recorder in the field. But that's not all. It also comes with pool feed input/output, so you can transfer image data back and forth to another camera or cameras, making it ideal for special

shooling situations such as press conferences, exclusive interviews, and sporting events. Record isolated camera views (ISD-Cam) during a live multi-camera shoot, making it ideal for parallel shooting at live concerts and other events. Naturally, we've made sure the GY-DV550 is equipped with all the other capabilities you need, including a standard 1/2-inch bayonet mount for use with a great diversity of professional lenses, bidirectional IEEE 1394 (NTSC), two 48 kHz 16-bit digital PCM audio channels, and a built-in SMPTE or EBU timecode reader/generator, as well as XLR microphone inputs, audio outputs, headphones output, and both composite and Y/C outputs. Maximum versatility, top-level performance, and superior cost-efficiency make the GY-DV550 the smart solution for producers who need a camcorder capable of doing double-duty in both the studio and the field.

Ready for EFP remote control (RM-LP57/LP55) The EFP remote connects cirectly to the GY-DV550 for precise control over the video paramete

Return video output for Tele-Prompter Tele-Prompte capability assures full support for studio program production. **Genlocking function To** meet the demand for systemization, the GY-DV550 is equipped with a genlocking function that includes SC lock to assure high-resolution pictures.

State-of-the-art 1/2" 3-CCD image pickup incorporates three 1/2 380,000 (NTSC)/440,000 (PAL) pixel interplaces line 1/2 380,000 (NTSC)/440,000 (PAL) pixel interline-transfer cCD's Each CCD is equipped with highly advanced circuitry that eliminates vertical smear when shotning bright lights in a dark room Lag and image burn are also reduced to indiscernible levels. while high sensitivity of F11 at 2000 tux assures creative flexibility and simplifies lighting requirements.

#### **Panasonic** AJ-D610WA 2/3" 16:9 IT-3CCB DVCPRO Camcorder

The AJ-D610WA is an affordable DVCPRD camcorder which combines three high sensitivity 2/3" IT CCD's. with digital component technology, to create a true broadcast recording. The AJ-D610WA is switchable between 16:9 and 4:3 aspect ratios. A built-in PCMCIA card slot makes it quick and easy to adapt the camera to different shooting conditions. Features Super Gam. Super Iris, and Digital Signal Processing (DSP). The AJ-D610WA can operate with a minimum illumination of 0.5 lux (F1.4. +36 dB Gain), and resolves 750 lines of resolution

- . The AJ-D610WA has three high density (520,000 pixels) 2/3° CCD's. The CCD's feature a large light collecting area that gives the camera a S/N ratio of 63 dB, plus a sensitivity of 1 11.0 @ 2000 lux.
- . The Digital Signal Processing (DSP) helps to deliver a very high quality picture. The user has the ability to adjust different parameters of the camera to accompdate any situation
- · A PCMCIA card slot is built into the operator side of the camera, allowing the set-up (DSP) data to be saved. The saved set-up data can be used to reset the camera parameters.



- The optional AJ-YAP900P Picture Link Board is part of an exclusive Panasonic production data information system which stores shot logging in camera memory and records it on tape during the eject cycle. The logging information can be read by Panasonic's newsBYTE DVCPRD native nonlinear news editing system.
- Exceptional resolution of 750 horizontal lines.
- A Super Gain feature is available to boost gain by a full +30 dB or +36 dB for high quality shooting in low light, making it possible to shoot as low as 0.5 lux (11.4, +36 dB).

  An optional Digital Triax for studio or mobile use is
- available. A six speed electronic shutter (1/100 to 1/2000 ec) features Synchro Scan to match the frequency of a



Pickup Device: 2/3" IT Power HAD 1000 16:9 x 3 Picture Elements: 1038 (H) x 504 (V) Filters: Clear, 5600K + 1/8 ND, 560DK, 5600K + 1/64 ND

## SONY

#### **DNW-9WS** 2/3" 16:9 IT-3CCD **Betacam SX Camcorder**

Equipped with three 2/3 inch 16:9/4:3 switchable Power HAD 1000 16:9 IT CCD's.
Designed as a cost effective camcorder to help bridge

the transition from 16.9 to 4.3, yet it still maintains a high performance and high mobility.

The DNW-9WS weighs less than 14 lbs. Including a battery, tape, viewfinder and lens, Includes an integrated slot for the optional WRR-855A wireless

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### **DSR-1500 DVCAM Studio Editing Recorder**



DVCAM becomes more and more flexible with the intro duction of this brand new, half-rack width studio editing deck. The DSR-1500 boasts studio editing function capability in a compact size. The new DSR-1500 incorporates the same innovative, high standard

technology featured in the DSR-2000.

The space-saving size makes the DSR-1500 ideal for installations in OB vehicles and desktop editing systems.

- · SDI interface ensures a migration path to Digital
- Betacam", Betacam SX' and SDI-based systems.

  SDTI(DSDI) and LINK IEEE-1394 interfaces enable a high quality, virtually lossless transfer with DV compression based systems.
- Compatibility to consumer DV (SP mode only) and DVCPRO 25 format recordings in addition to DVCAM, automatically accommodate all cassette sizes without the need for an adapter
- Analog input interface board which includes component composite and S-Video is also available as an option.

#### DSR-1600/1800 **DVCAM Studio Editing Player/ Player Recorder**



The DSR-1600 is a studio editing player, and the DSR-1800 is a studio editing recorder.

Both incorporates innovative technology at an affordable price. Excellent playback of all DV based (25 Mbps) formats and cassette sizes is possible without the need of an adaptor. A jog/search dial is standard, including jog audio. A variety of option boards are available for SDI. SDTI, and i.Link outputs.

They both provide two selectable audio channel modes:

Two channels of 16-bit (48 kHz) Four channels of 12-bit (32 kHz), PCM Digital Stereo recording is used in both modes to ensure superb audio performance with a wide dynamic range and excellent signal-to-noise ratio.

Automatically adjust for playback of any DV based format, including DV (SP only), DVCAM or DVCPRO 25

#### **DSR-2000 DVCAM Editing Recorder**



The DSR-2000 is a highly flexible DVCAM studio deck designed for demanding ENG editing. It can playback all DV (25 Mbps) based formats, including two consumer DV formats (Standard and Long Play), as well as all types of DVCPRO tape as an editing source, without any mechanical tape adapters. Equipped with audio/video pre-read editing and includes a Jog/Shuttle dial that allows two-machine editing. A SMPTE standard MPEG SDTI-CP interface option is available for the DSR-2000 to output an MPEG stream in addition to the optional i.LINK interface. This allows the DSR-2000 to seamlessly link to Betacam SX and other MPEG-based video equipment by means of SDI, i LINK and MPEG SDTI-CP

## SONY

#### **DSR-11 Compact DVCAM VTR**

Compact desktop DVCAM recorder. This VTB provides a compact desking by CAM returner. This Vir provides a powerful and cost-effective option for NLE editing systems. Provides basic VTR features, along with an i.LINK (IEEE1394) interface and is compatibile with both NTSC and PAL color systems. Designed to be used in either a horizontal or vertical position; A footprint of only 2 3/4" in the vertical position.

• The DVCAM format uses 8-bit component digital recording

- at 25 Mbps, with Intra-frame 5:1 compression, 500 lines of resolution and 4.1.1 color sampling. A 15 micron track pitch provides superior picture quality, superto multi-generation capability and production flexibility. Two 1/4 cassette sizes are available. Standard and Mini.
- Plays and records either a DVCAM format signal or a DV format signal... Both Minl and Standard size cassettes can be used with the DSR-11 without the need of an adaptor



- · Play or record in either the NTSC or PAL color systems Equipped with a 4-pin i-LINK (IEEE-1394) interface, for lossless transfer of digital video and audio information with obsess trained to injustative and adult infiniation with other IEEE-1394 equipped devices. The single 4-pin LLIMK cable can be connected to MAC or PC based NLE systems or to another VTR for degradation-free editing. • DV EE (electronics to electronics) Out: Analog Input signals
- can be converted into digital signals, and can be simultaneously output from the i.L.INK interface.

#### UVW-1200/UVW-1400A

#### Betacam SP Player • Player/Recorder

The UVW-1200 and UVW-1400A are non-editing VCRs which deliver Betacam SP quality and offer features for a wide range of playback and recording applications. RGB and RS-232 interface make them especially ideal for large screen, high quality video presentation, scientific research and digital video environments.

- Ideally suited for work in computer environments, because RGB signals can be converted into component signals and vice versa with minimum picture degradation.
- 25-pin serial interface allows external computer control of all VCR functions based on time code information. Baud
- rate can be selected from between 1200 to 38,400 bps.

   Built-in Time Base Stabilizer (TBS) locks sync and subcarrier to an external reference signal as well as providing stable pictures. High quality digital dropout compensator further ensures consistent picture performance.

  Equipped with two longitudinal audio channels.



- Auto repeat of entire or a specific portion of the tape. Built-in character generator can display VTB status
- time code, self-diagnostic messages, set-up menu, etc.
  Both read LTC Time Code) and UB (User Bits). The
  UVW-1400A also generates LTC and UB ( Free-
- Run/Rec-Run). Control of jog. shuttle, playback, record, pause, FF and REW with the optional SVRM-100A Remote Control Unit.
- Composite and S-Video as well as component via BNCs which are switchable to RGB output. The UVW-1400A has two switchable sync connectors and a Sync on Green.
- . Built-in diagnostic function and hour meter

#### UVW-1600/UVW-1800

#### Betacam SP Editing Player • Betacam SP Editing Recorder

The UVW-1600 and UVW-1800 are the other half of the UVW series. They offer the superiority of Betacam SP with sophisticated editing features. They feature an RS-422 9-pin interface, built-in TBCs and Time Code operation. Inputs/outputs include component, composite and S-Video. All the features of the UVW-1200/140NA PLUS-

- Optional BVR-50 allows remote TBC adjustment

- RS-422 interface for editing system expansion.
   Frame accurate editing is assured, thanks to sophisticated servo control and built-in time code operation.

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

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

- HR Trinitron CRT enables the PVM-14M4U and 20M4U to display an incredible 800 lines of horizontal resolution. The PVM-14M2U and 20M2U offer 600 lines of resolution. M4 models also use SMPTE C phosphours for the most critical evaluation of any color subject
- Dark tint for a higher contrast ratio (black to white) and crisper, sharper looking edges.
- Each has two composite, S-Video and component input (R-Y/B-Y, analog RGB). For more accurate color reproduction, the component level can be adjusted according to the input system. Optional BKM-101C (video) and BKM-102 (audio) for SMPTE 259M serial digital input.
- · Beam Current Feadback Circuit

- 4:3/16:9 switchable aspect ratio.
- · True multi-system monitors they handle four color system signals: NTSC, NTSC
- 4.43. PAL & SECAM · External sync input and outputcan be set so that it will automatically
- switch according to the input selected.
- · Switchable color temp: 6500K (broadcast), 9300K (pleasing picture), User preset. (3200K to 10000K)

  • Blue gun, underscan and H/V delay capability



#### PFM-42B1 Flat Panel Plasma Display Monitor

Flat Panel AC plasma display monitors are used where space and aesthetics are a major consideration. They accept and automatically detect computer and video signals ranging from NTSC to HDTV and VGA to UXGA

- 42-inch screen
- 1024 x 1024 pixel display, with a 160° viewing angle
- Aspect ratios from standard 4:3 to widescreen 16:9 · Accommodate DVD presentations and widescreen broadcasts
- Advanced scan converter reproduces digital video signals (including SDTV, and HDTV) & UXGA computer signals
- 3.25" thick & weighs 65.5 lbs.



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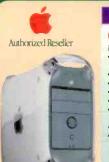




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#### Best system

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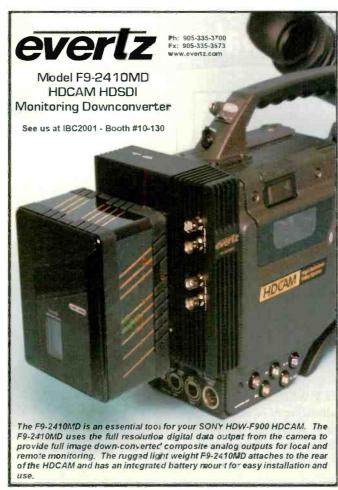
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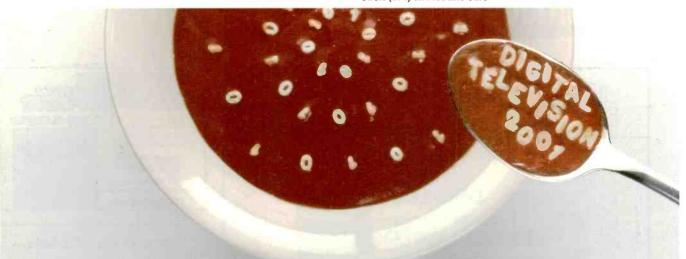
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### The world of television

BY PAUL MCGOLDRICK



What is the purpose of television? Is it to entertain? To inform? To disinform? To push an agenda? To sponsor terrorism? To make money? To act as a jamming signal? To give broadcast engineers jobs? I've seen it used for all those things in different parts of the globe.

The fact that it is a powerful medium goes without saying (although some things are more effective when presented well on radio). The Taleban in Afghanistan ban television because, well, who knows the real reason... but under their version of the Sharia'h Law of the Quran, perhaps? Chechnya, the run-away Russian province, does not ban TV even though their version of the Sharia'h is not a timid one. They do, however, ban the reception of a couple of channels from Moscow. Other countries, like Lebanon's Manar TV, use the medium to show how the Palestinians are poorly treated by Israel.

Fortunately, we have not seen the need for a TV police force in the West, and instead leave viewers to decide what they watch or do not watch. Some stations that are in the information business, like CNN and MSNBC, have been repetitively spreading good news, bad news and rumor for the last few months. No government censorship is the preferred situation for me.

If the BBCs of the world are there to entertain and inform, and the Manar TVs are there to push an agenda and misinform, what of other motives? The new Muslim TV services in north Nigeria are pushing an agenda that is anathema to the constitution of their own country, making both religious and political statements at the same time. Every country that follows the Wahabi version of Islam also practices a version of the Sharia'h Law – but some of those countries also try to protect themselves

from the zeal of their neighbors.

I installed a number of transmitters in Saudi Arabia, both radio and TV. Some of those installations were for entertainment/information purposes, but many were not. The Quran is recited 24 hours a day in Mecca and its use as a jamming signal is incredibly effective. The level of modulation is almost constant, and on TV service the APL is quite high due to the way images are set up. Such trans-

and virtues. Its ex-BBC Arab Service employees will air any point of view from any nation, and the criticisms it receives, particularly after its debate programs, show it equally reports (and annoys) all its neighbors. It broadcasts on satellite to a potential audience of 35 million people and is also widely available as streaming video on the Internet. It is estimated that 40 percent of the Palestinians, for example,

## If the BBCs of the world are there to entertain and inform, and the Manar TVs are there to push an agenda and misinform, what of other motives?

mitters are available in Saudi in both fixed locations and in portable shelters: complete transmitting stations with their own air-conditioning. The medium-wave shelters are all easily retuneable, so if one of your neighbors decides to bombard your people with information you don't want them to hear, you take a shelter to that border, set up a re-broadcast receiver and jam them – on their channel – with the Quran. But what do you do about satellite TV?

Saudi has not been able to block one signal: al-Jazeera TV in Doha, Qatar. This 24-hour news station has been little known in the West except to those whose business it is to track these things, but it is now known to most as bin Laden's mouthpiece. al-Jazeera (the Peninsula) started broadcasting in 1996 using a "loan" from the Emir to set up in a prefabricated building virtually in the courtyard of the official Qatari TV. It started after a short-term relationship between the BBC and the Saudis collapsed when that country realized it could not live with the BBC's interpretation of news.

al-Jazeera broadcasts very freely about its neighbors' sins, weaknesses

watch only this service. This is an incredible amount of influence for 200 employees in little Qatar. Saudi retaliated with its own service, into which it poured a fortune for talent, look and equipment. It has failed to make even a dent in al-Jazeera's audience.

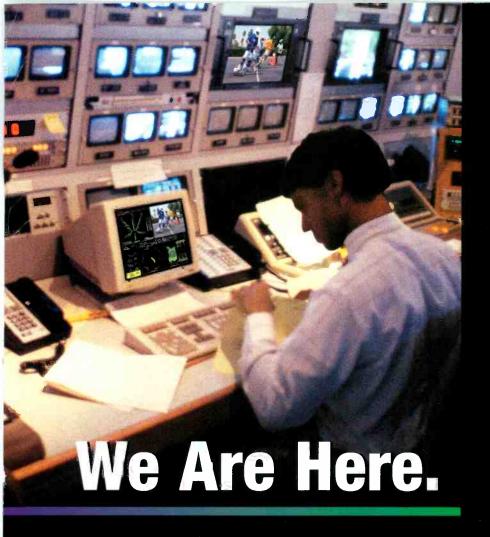
But, as always, that is not the full story. The Government of Qatar will tell its complaining neighbors that it has no control over what al-Jazeera says or reports on, as it is a private company. But there is one rule that the station does not break, and that is that it does not report on events in Qatar. The station is available to Qatar on cable, but satellite receivers are forbidden in the country so Qataris cannot receive competing stations critical of events in their own emirate. Qataris still have to rely on the government's version of events.

So, what's al-Jazeera TV's real purpose? One of the above...or something entirely new?

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



Send questions and comments to: paul\_mcgoldrick@intertec.com



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