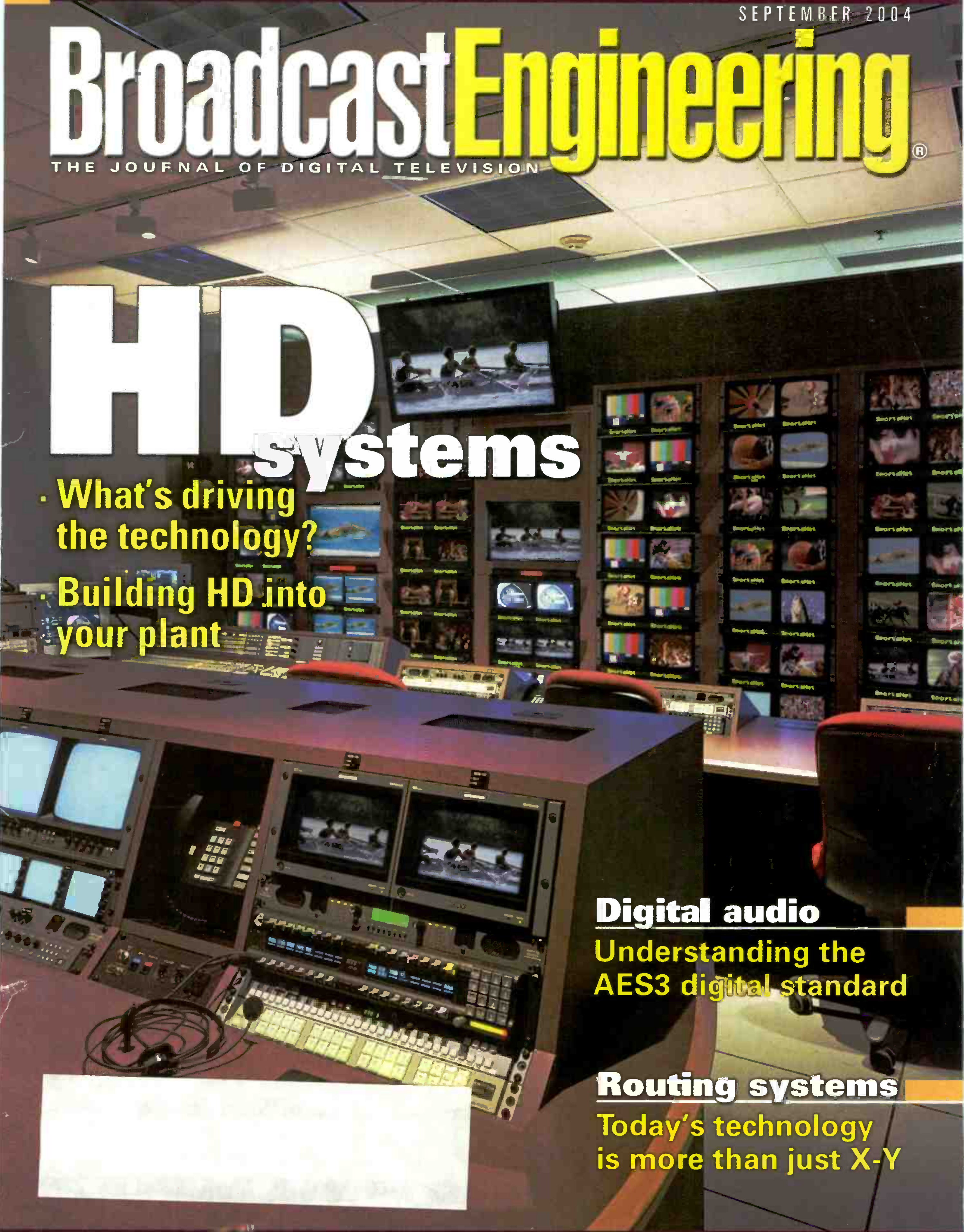
www.broadcastengineering.com

SEPTEMBER 2004

Broadcast Engineering®

THE JOURNAL OF DIGITAL TELEVISION



HD systems

- What's driving the technology?
- Building HD into your plant

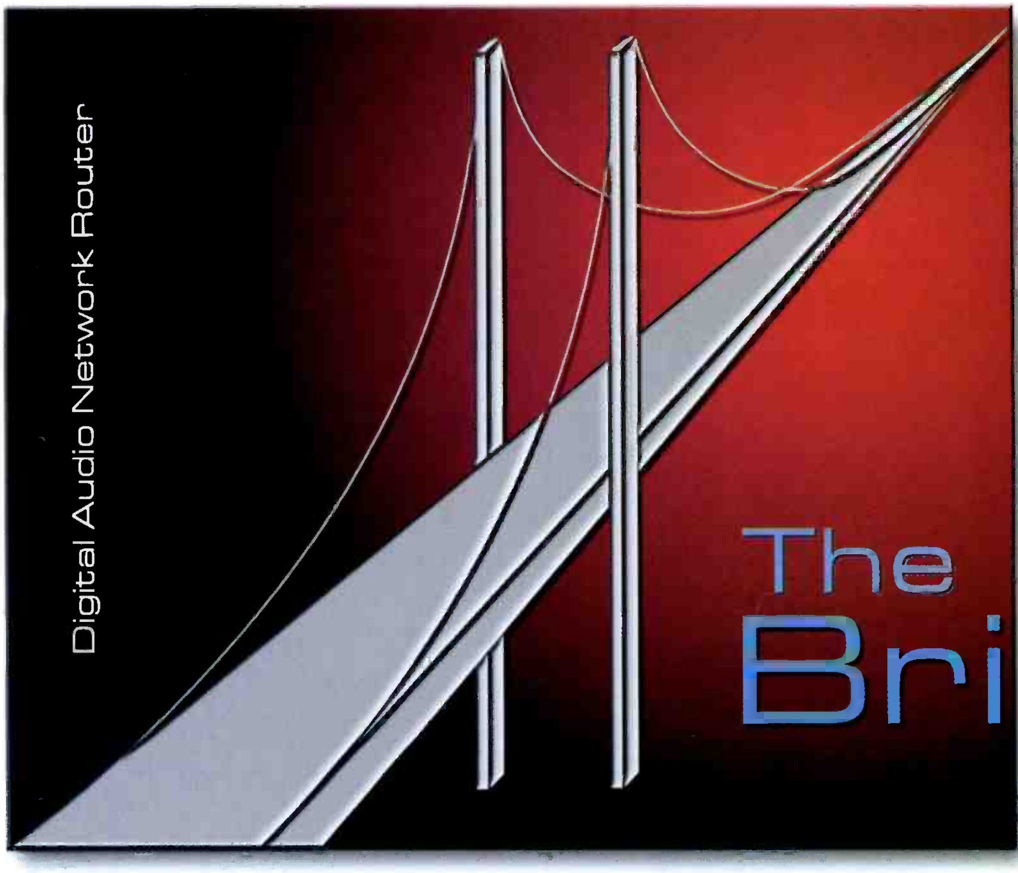
Digital audio

Understanding the AES3 digital standard

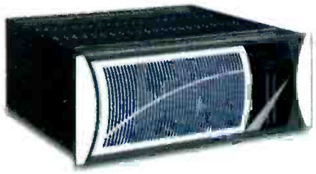
Routing systems

Today's technology is more than just X-Y

A PRIMEDIA PUBLICATION



The Bridge Router can hold all the electronics you'll need for a small console: I/O cards, mix engines, and DSP processors. Naturally it can also have automatic fail-over DSP and CPU cards to keep you on-air. You can expand the system with a simple cage-to-cage interconnect.

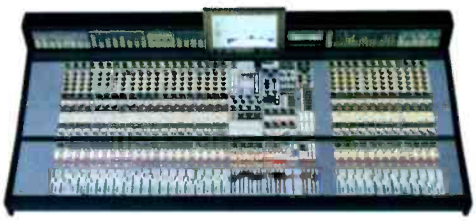


It's not just a Digital Console,
It's an ENTIRE Audio Infrastructure

You Can Start with a simple AES router with analog and digital inputs and outputs. From there you can add logic I/O cards and scheduling software; you can link multiple master bridge cages together to achieve thousands and thousands of I/O ports; you can create a custom system that includes multiple smaller remote satellite cages— with everything interconnected via CAT5 or fiberoptic links.

But That's just the Beginning: you can also add mix engine cards, interface to your automation system; you can choose from two different WHEATSTONE series control surfaces (D-5.1 or D-9), each specially configured for production room, on-air or remote truck applications. We also provide a full complement of Ethernet protocol remote router control panels, as well as a complete family of plug-in modules that interface the routing system to existing Wheatstone digital and analog standalone consoles.

The D-9 is Compact yet Powerful: It can route, generate and monitor 5.1 surround signals and produce simultaneous 5.1 and stereo master signals for your dual broadcast chain. The console also provides extensive, rapid communication paths throughout your entire Bridge system. Motorized faders and control setting storage and recall make show-to-show transitions fast, easy and accurate.



Wheatstone Knows Live Audio. The D-5.1 is loaded with MXMs, foldbacks, and clear easy-to-read displays. You'll have all the power you need when the news breaks! Its intuitive layout helps your operators work error-free, and it can handle and generate all the 5.1 content and simultaneous stereo capability any large or medium market station could need.

Wheatstone

the digital audio leaders

600 Industrial Drive, New Bern, North Carolina, USA 28562
tel 252-638-7000 / fax 252-635-4857 / sales@wheatstone.com

www.wheatstone.com

Made in USA

Becau

This is technology you can touch. AirSpeed™, a revolutionary new breed of broadcast video server, accelerates your I/O by providing immediate access to incoming feeds. Affordable, reliable AirSpeed systems scale easily and play to air within moments of editing the story – with an interface you already know how to use. Call your Avid broadcast sales manager today or visit www.avid.com/airspeed.

Avid Broadcast Solutions

Be first.

se it's only news once.

From ingest to playout, nothing stands in the way of a great story.

To be a leader, you have to stay on top of the news, the competition, and the latest technology. That's why Avid has become a leading choice of news organizations around the world for innovative editing, media asset management, networking, storage, and newsroom systems. Integrated, all-digital, end-to-end broadcast solutions from Avid continue to set the pace in versatility, reliability, and price/performance, so broadcasters can focus on today's news – and not worry about tomorrow's technology.

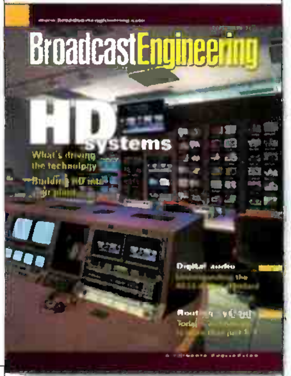
www.avid.com/broadcast

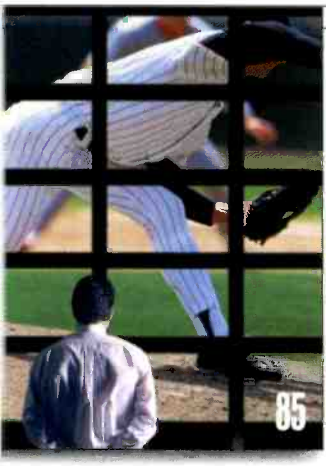
make manage move | media™ Avid®

BroadcastEngineering
THE JOURNAL OF DIGITAL TELEVISION

CONTENTS

FEATURES





BEYOND THE HEADLINES

DIGITAL HANDBOOK

ON THE COVER: Comcast's new HD facility comes equipped with a Solid State Logic C100 digital broadcast console to handle the 5.1 surround mixes of major sports events. Cover photo by Dave King. Cover illustration by Robin Morsbach, associate art director.

(continued on page 8)

now on the streets of new york

NY1 making big news with P2

Around the clock, around the block, news here happens in a New York minute. That's why NY1 News has taken Panasonic P2 to the streets, covering national events like the Republican National Convention where reliability is paramount. P2 gets breaking news on-air faster by eliminating digitizing and providing seamless connection of camera original-quality DVCPRO data directly to laptop editors, servers and IT networks. With P2 and Pinnacle Edition non-linear editing, NY1 can cover New York's non-stop news with greater speed and efficiency. How about your city? To find out more about Panasonic P2 news solutions call **1-800-528-8601** or visit **www.panasonic.com/broadcast**.

Panasonic ideas for life

BroadcastEngineering
THE JOURNAL OF DIGITAL TELEVISION

CONTENTS

Systems Design & Integration

New Products & Reviews

Departments

Freezeframe

Submit your nominees for the most unusual, distinguished or confusing names for television-related products. Unique examples provided by other readers include: the "Space" products from Pluto, Chyron's iNFiNiT! (note the combination of upper- and lowercase letters), the Toaster or Scientific Atlanta's SCARLET.

Keep in mind this has nothing to do with the quality of the product itself, just the unusualness of the product name.

The editors will select and print the winning entries in a later issue. Readers submitting winning entries will receive a *Broadcast Engineering* T-shirt. Enter by e-mail. Title your entry "Freezeframe-September" in the subject field and send it to: editor@primediabusiness.com. Entries must be received by Nov 1, 2004, to be eligible to win.

XDCAM HERE AND NOW!

SUPPORTED BY: AVID, EVS, INCITE, LEITCH, OMNEON VIDEO NETWORKS,

Copps:
The FCC's yappy dog

Have you ever had a neighbor with one of those little yappy dogs? You know, the kind that bark all the time? They bark at nothing and everything. The wind blows, they bark. The wind doesn't blow, they still bark. Sun up to sun down, there's that little yappy dog barking his head off. The constant barking must come from a complex about being so insignificantly small.

Well, we have a yappy dog on the FCC: Commissioner Michael Copps.

Commissioner Michael Copps is prone to incessant tirades. And he's been a thorn in the side of broadcasters since his appointment to the commission by President Bush in May 2001.

In one of his many tirades, this time about what he perceives as inadequate news coverage of his party's convention, Copps criticized broadcasters — saying that they were "not fulfilling [their] role or pulling [their] weight." He called upon broadcasters to "make a meaningful commitment to cover real issues."

To quote your presidential candidate's wife, "Shove it."

The political conventions are staged shows. There is no drama. There is no debate. There are no "candidates" anymore at these events. By the time the Republican and Democrat conventions take place, the winners are all known and most Americans don't want to watch. Don't take my word for it, check out the ratings. The ratings for this year's DNC hoopla were among the worst ever.

Copps, Jonathan Adelstein and their brethren always lament the perceived "media ownership" crisis in broadcasting. They never mention that 98 percent of American cities have only one major newspaper.

In 1975, the FCC adopted its biennial review of broadcast ownership rules. At that time, there were 1700 daily newspapers, 7500 radio stations and fewer than 1000 TV stations. Three national commercial broadcast networks had a combined prime-time audience share of 95 percent.

By 2001, the number of TV stations had increased to 1600 and radio stations to 12,000. Yet, the number of daily newspapers dropped by 12 percent to 1500. The number of broadcasters went up, the number of daily newspapers went down. Let's see....almost 14,000 broadcasters versus 1500 newspapers. Where do you see diversity?

You claim that Americans are not getting what they should from broadcasters and that stations should "step up to the plate and correct this deplorable mess."

What deplorable mess, Mr. Copps?

The only "deplorable mess" is the chaos you've created for this industry by yapping long enough that Congress bent to your tantrums and reversed the FCC's proper actions. The inability to sell, buy and exchange properties has forced station owners to withdraw their checkbooks for new investment. Your actions have brought an industry rebound to a screeching halt.

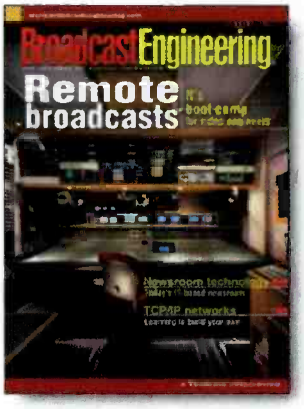
Stop it, Mr. Copps. You're acting like a yappy dog that's been allowed to misbehave for too long. It's time someone jerked your chain, and I'm only too happy to do it.

Brad Dick

editorial director

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

Chrominance phase



Mr. Robin,

I am an intern working with the Naval Air Warfare Center. After reading your article entitled "Analog video synchronization" in the January 2003 issue, I have a few questions. I understand the specifications for the chrominance amplitude phase and luminance pedestal for red, green and blue fields. But, what exactly does the chrominance phase refer to, and what is it referenced against? Also, can you explain how the chrominance amplitude affects color saturation? I always assumed the scale was from 0V to 0.7V (as opposed to -313.33mV to 313.33mV), and 0V would have implied no color; thus, the positive and negative voltages have thrown me for a loop. Finally, I'm confused as to what exactly the luminance pedestal is. Any help you could provide would be much appreciated.

MEGAN C.
NAVAIR, LAKEHURST

Michael Robin responds:

Television is an evolving technology. It is amazing how the 1941-vintage NTSC television standard withstood the test of time, while making way for monochrome-compatible color transmissions in 1954 — all this without altering the vestigial sideband negative modulation transmission standard.

Negative modulation means that the instantaneous video transmitter power is proportional to the black level of the transmitted picture. So, early decisions adopted a composite video signal, which contained brightness information as well as horizontal and vertical scanning information. In the 1940s, the brightness information in video signals varied from black (0V) to white (+1V). The synchronizing signal has a negative value of -400mV to allow for an easy recovery of the synchronizing information through a process of removing (clipping) all positive excursions. Difficulties with unstable vacuum-tube technologies of the late 1940s made it difficult to maintain a stable black level (0V). Therefore, the black level was shifted to a slightly positive value, which was called "setup" (also called the "luminance pedestal").

Color television initially used three primary colors: red, blue and green. Early transmissions in 1950 used the CBS sequential-color system, which transmitted the three primary colors sequentially. This system was incompatible with the existing monochrome transmitters and receivers and eventually was abandoned.

The NTSC color television system, which went on the air in 1954, was fully compatible and still is being used today. Among the changes introduced was a redefined composite video signal. Now the composite video signal carried luminance information, chrominance information, scanning sync and chrominance sync.

The luminance information (Y) is the equivalent of the brightness information in monochrome, and it was obtained by adding red, green and blue signals according to a well-known and universally adopted mathematical formula. The chrominance information was carried by two "color-difference" signals, namely blue-minus-Y (B-Y) and red-minus-Y (R-Y). These signals are bipolar (equal in positive and negative excursions) and are reduced in amplitude to avoid transmitter overmodulation.

These signals amplitude-modulate two equal-frequency subcarriers (about 3.58MHz) in phase quadrature (their phase is offset by 90 degrees). The subcarriers are cancelled so the system transmits only the chrominance sidebands.

To recover the B-Y and R-Y signals, the receiver requires two demodulators: one for B-Y and the other for R-Y. The receiver must also regenerate the missing subcarrier. To this effect, it uses the transmitted color-sync signal, a burst of about 10 cycles of subcarrier phase and amplitude reference to control a crystal oscillator, which feeds properly phased subcarrier signals to the B-Y and R-Y detectors. The burst is the system phase reference, so any instantaneous or constant phase shift of the B-Y and R-Y results in a change of signal shape, which translates into a color change.

Existing (pre-color) monochrome television signal distribution elements had difficulties carrying the composite color video signals, so the signal amplitude was reduced from 1.4V p-p to 1V p-p while maintaining the 1:4 video-signal-to-sync-amplitude ratio. This resulted in the currently used signal with 714.3mV of video and 285.7mV of sync. **BE**

April Freezeframe:

Q. In 1992, *Broadcast Engineering* judges for the first time selected a handtool as a Pick Hit. While it was the least expensive item ever selected as a Pick Hit, it remains a common item in almost every video engineer's tool box. What was it?

A. Canare Cable, Coaxial cable stripper

Winner:

No correct answers were received.

Test your knowledge!

See the Freezeframe question of the month on page 8 and enter to win a *Broadcast Engineering* T-shirt.

Send answers to *bdick@primediabusiness.com*

Limitless possibilities.

Whether it's a handful of crosspoints or 10 million in a single installation, Grass Valley™ routers deliver the reliability, scalability, and multi-format capabilities that fit your facility best. This balanced approach has made Thomson the undisputed market leader in router technology.

For instance, our new Grass Valley Acappella™ utility router packs unmatched capabilities into a 1 RU frame. With three levels—one video and two audio—its advanced control panel functions streamline your workflows. And its built-in redundant power supplies provide peace of mind without taking up any extra rack space.

For mid-size applications, our Concerto™ Series routing matrix offers peerless performance. By offering a wide range of board format types and sizes, as well as two different frames, it makes your digital transition as smooth financially as it does technologically.

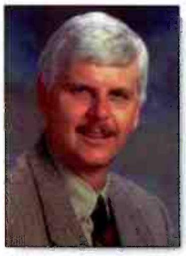
When you need the largest, most compact, and most easily serviceable routers available, our Trinix™ and Apex matrices lead the industry. And we have a full range of control systems for all our routers that are just as popular—and every bit as reliable.

For a better sense of everything Grass Valley routers can do for you, visit **www.thomsongrassvalley.com/routers**.

grass valley

A THOMSON BRAND

Prime time for [H]DTV?



BY CRAIG BIRKMAIER

Historians tend to look for events that represent a turning point in the prevailing views of those affected by historic changes. History is likely to look upon a succession of events that have unfolded since the beginning of 2004 and conclude that we have reached the turning point in the slow-moving transition to digital and high-definition television.

The year began with the revelation that consumers are beginning to embrace a new generation of display technologies that may eventually relegate the venerable CRT display to the scrap heap of history. Thin is in, whether it takes the form of an LCD or plasma panel, or a slimmed-down big-screen rear-projection system based on an LCD or DLP display engine.

In early January, USDTV announced an ambitious plan to compete with cable and DBS by offering a package of 20 to 30 channels, delivered by local DTV broadcasters, for $19.95 per month. The Salt Lake City-based company is leasing "unused" portions of the DTV channels operated by broadcasters in each market to deliver popular networks offered by competing multichannel services, alongside the SD/HD programming offered by the DTV broadcasters in each market served. Wal-Mart is working with USDTV to promote the service and sell the HDTV-capable set-top box needed to receive it. The set-top box costs $99 with a USDTV subscription. Wal-Mart is selling the receiver, manufactured in China by Hisense, for $199 in markets not currently served by USDTV. When USDTV begins to serve those markets, owners will be able to add the smart card needed to activate the subscription service.

The cost for a receiver that meets all of the FCC mandates is beginning to decline.

Currently, USDTV has about 8000 subscribers in three beta test markets: Salt Lake City, Albuquerque and Las Vegas. By the end of this year, they expect to offer the service in 30 markets, along with an improved receiver that will use a fifth-generation ATSC receiver chip developed by LG Electronics.

Receiving DTV

In July, the first of a series of FCC receiver mandates kicked in. Now a minimum of 50 percent of all receivers with screens 36 inches or larger are required to include an ATSC receiver. In the next few years, the mandates will require 100 percent of receivers (of all sizes) to include an ATSC receiver and support for the broadcast flag content protection system.

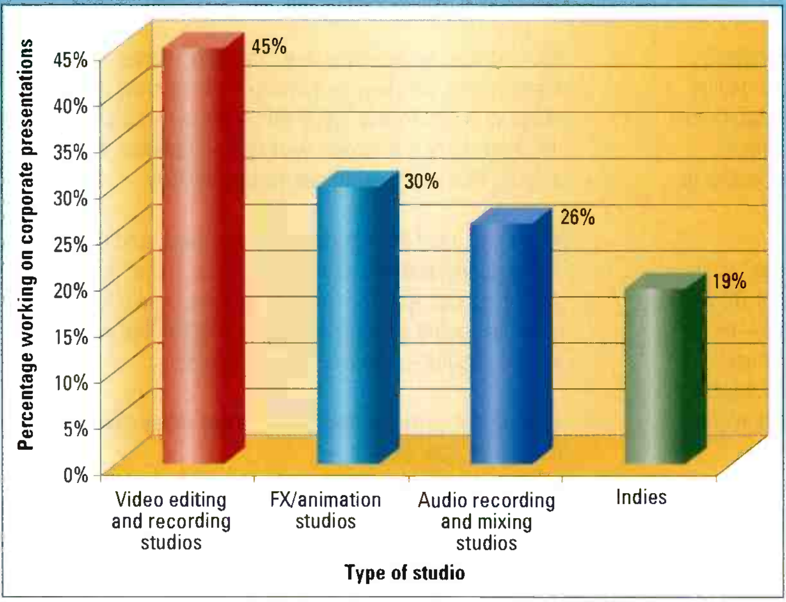
The marketplace reality is that virtually all of the receivers that include an ATSC tuner also include a one-way, cable-ready digital tuner and support for the broadcast flag. Another emerging market reality is that the cost for a receiver that meets all of the FCC mandates is beginning to decline.

Also in July, one of the nation's largest and most outspoken station groups, the Sinclair Broadcast Group, announced that the fifth-generation ATSC receiver developed by LG Electronics has largely resolved the reception issues that have plagued the DTV

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

Studios and corporations work together

Studios of all types are helping businesses create presentations



SOURCE: TrendWatch www.trendwatch.com

transition. Sinclair was the primary advocate of changes to the FCC power rules that now allow stations to maximize the power levels for UHF channel assignments. Several years ago, Sinclair conducted a series of reception tests in Baltimore, comparing the 8-VSB modulation system with the COFDM modulation system to demonstrate problems with 8-VSB reception due to multipath. The COFDM system handled the multipath issue far better at that time. According to Sinclair, recent evaluations of the fifth-generation LG receiver, at the same sites used in the earlier tests, indicate that the multipath issue has now largely been resolved.

2004 also will be remembered as the year affordable HDTV production became a reality. Apple Computer and Avid Technologies demonstrated a range of HDTV production solutions that leverage the tremendous increase in computer processing power driven by Moore's Law. In essence, the same computer-based tools that dominate standard-definition video production are now scaling up to handle high-definition production. Equally important, most new computer designs have adequate processing power to store and display HDTV quality content, which is, in turn, enabling the deployment of a new generation of HD-capable displays for digital signage applications. The last remaining barrier to widespread adoption of HD production is the cost of HD cameras and professional recording systems. But this barrier is expected to crumble in the next few years.

It's the content, stupid.

Unquestionably, the most important development in 2004 is the growing availability of HDTV content, especially the coverage of live sporting events. The broadcast networks are getting on the HDTV bandwagon, with significant increases in the amount of prime-time HD programming. FOX and UPN will offer many of their prime-time programs in 720p. Also, FOX will offer six NFL games every week in 720p. NBC provided time-delayed coverage of many Olympic events in HDTV and plans to offer more prime-time HD programming this season. ABC and its cable sibling ESPN-HD will cover all of their NFL games in 720p.

But a question remains: What are HD-enabled consumers really looking for? The cable industry is moving rapidly to upgrade its premium subscribers to new digital and HD program tiers. HD is becoming synonymous with premium, as more HD cable networks and HD VOD offerings roll out. And both cable and DBS services are adding HD personal video recorders to their set-top box offerings.

It is less clear, however, that HD is an adequate incentive for upscale consumers to drop their current multichannel subscription service in favor of an antenna to receive USDTV or "free TV." One significant factor is the growing demand for broadband Internet services by U.S. consumers. Cable currently enjoys a significant advantage over DBS — bundling broadband, TV and often telephone services on a single bill. To combat the cable advantage, the DBS providers are teaming up with the regional telephone companies to offer their own service bundles. DISH Networks has achieved significant subscriber growth in markets where it has teamed up with SBC to offer broadband, phone and TV bundles.

This suggests that broadcasters may be well advised to begin discussions with the telephone companies in their markets to offer service bundles. Broadcasters lack the infrastructure to deal with customer-service issues, something that the regional telcos do well. And a high-speed "back channel" is likely to be a critically important requirement if broadcasters hope to compete in a world where consumers have more control over the content they watch, and where they have the desire to integrate electronic commerce with their traditional use of TV as an entertainment medium.

Web links

Sinclair DTV Web site and PSA
www.myfreehdtv.org
www.myfreehdtv.org/video.html
www.usdtv.com/

The power to compete

If this is indeed the turning point in the DTV transition, then broadcasters need to get on the bandwagon too. Do broadcasters really care about reaching an audience with antennas? In far too many cases, they have become comfortable with the current reality that the way to reach their audience is through the wires or satellites of their multichannel competitors.

But you can't place all of the blame on the broadcaster, given the troubled waters they have been navigating during the DTV transition. Nat Ostroff, vice president of new technology for the Sinclair Broadcast Group, bluntly lamented that broadcasters haven't been able to gain an audience for DTV until fifth-generation receivers came along. Ostroff is optimistic that these receivers will enable broadcasters to promote free HDTV.

Like many broadcasters, Sinclair limited its risks by operating its DTV channels at low power levels. The station group built out the transmission facilities but did not put high-powered output amplifiers into many of their DTV transmitters. In preparation for the new TV season, Sinclair is upgrading the facilities of most of its FOX-affiliated stations to pass through 720p signals from the FOX Network, and is upgrading transmitters to high power.

Perhaps even more important, the station group is about to do something almost unheard of in the broadcast industry: It is going to start promoting DTV through its legacy NTSC broadcast channels. Sinclair has developed a series of generic public-service announcements promoting the availability of free [H]DTV programming with an antenna. The spots can be viewed at a Web site created to promote DTV broadcasts (see "Web links"). Sinclair will offer the PSAs to broadcasters across the country, who can order a full-quality version for their stations to adapt and air. BE

Craig Birkmaier is a technology consultant at Pcube labs, and he hosts and moderates the OpenDTV Forum.

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

Cable/satellite programming à la carte?

BY HARRY C. MARTIN

In response to a Congressional mandate, the FCC recently inquired whether satellite and cable TV operators should be required to offer their programming on an *à la carte* basis instead of in bundled form. The inquiry is not limited merely to cable-originated programming services; it also includes broadcast channels carried pursuant to retransmission consent and must-carry.

Cable TV operators offer most of their programming in bundled packages, such as basic and enhanced-basic tiers. These packages contain anywhere from 30 to 120 channels. Of course, most subscribers do not regularly watch programming on the vast majority of these channels, a fact that they are keenly aware of when contemplating rising cable TV rates.

Members of Congress state that issues involving television programming typically generate a large percentage of their constituent mail. Thus, it is not surprising that, with cable rates increased by an average of five percent in the last year, Congress would hold hearings looking into the causes. In May, a bipartisan group of the House Commerce committee asked the FCC to review the feasibility of *à la carte* cable program pricing. Senator John McCain, a longtime critic of the cable TV industry, made a similar request. *À la carte* in this context would mean providing cable subscribers the opportunity to pick and choose each individual channel of the programming they receive, irrespective of any bundling the cable provider might have offered before.

Most subscribers do not regularly watch programming on the vast majority of cable channels.

In addition to concerns over service costs to consumers, another issue driving this inquiry is viewer resentment over the levels of sex and violence on TV. Some consumers apparently believe that one solution would be to give viewers the ability to choose the individual cable channels to which they subscribe.

The FCC is seeking comments on a number of issues, including (1) contractual limitations on the ability of cable and satellite operators to offer programming on an *à la carte* basis, (2) the potential impact on rates for individual channels and on diversity of programming, and (3) what set-top box and system equipment is necessary to move the industry to an *à la carte* model. The commission also wants to know whether the must-carry rules would allow cable operators to offer must-carry broadcast stations on an *à la carte* basis, and the impact of networks and affiliate groups using the retransmission consent process to leverage carriage of affiliated cable programming networks. While not the initial focus of the *à la carte* option, the interplay of that opinion with the must-carry could raise important issues that might impact TV broadcasters who may view the *à la carte* debate as a limited skirmish between consumers and cable operators.

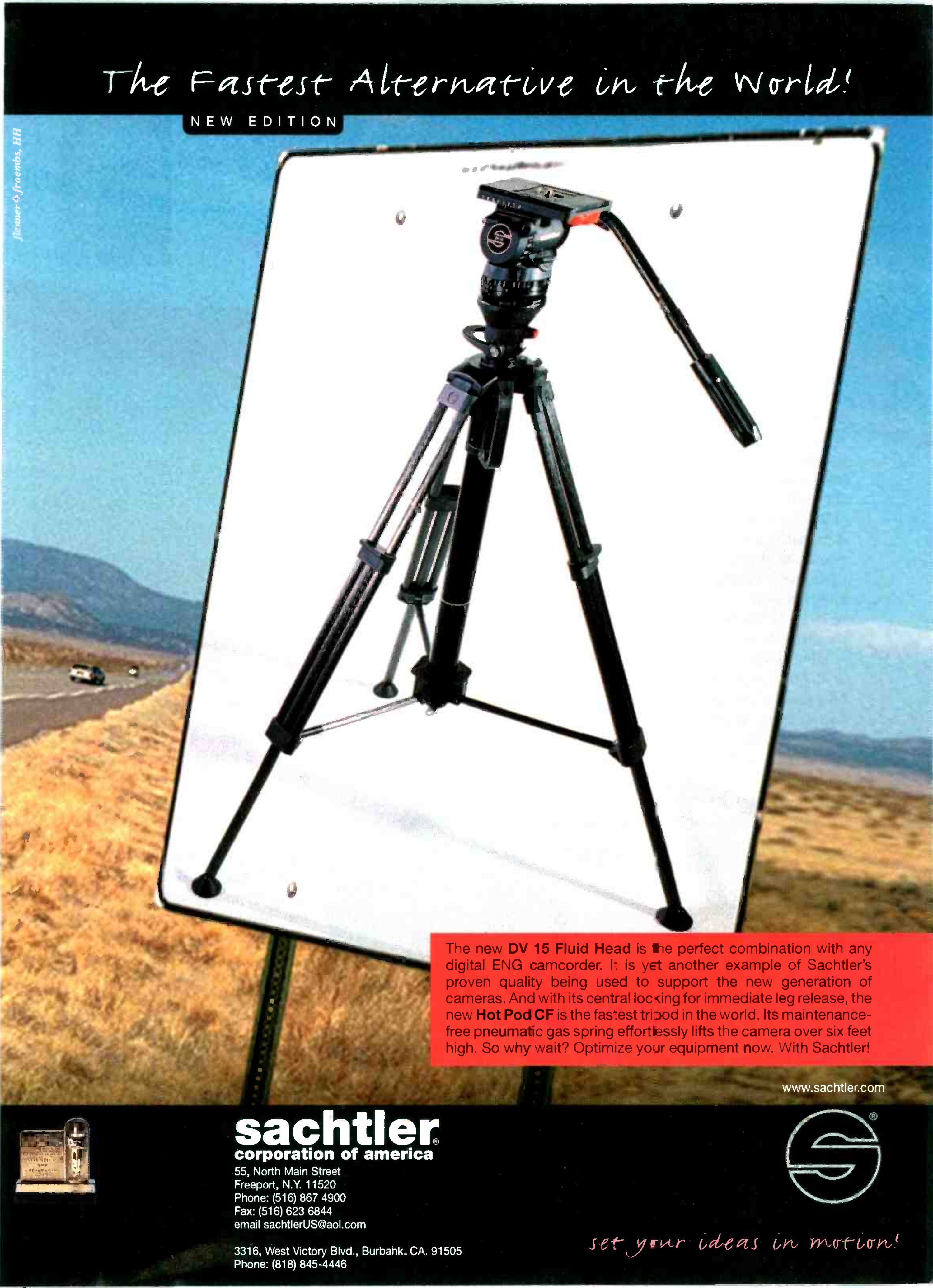
The cable programmers oppose *à la carte* out of fear that viewers will not choose to subscribe to their channels. Large cable operators also oppose *à la carte* pricing, stating that limited subscription to most individual channels will require increased per-channel charges, resulting in consumers getting fewer channels at a higher overall cost. It should be noted that the major cable operators are also the owners of many major cable channels. Interestingly, some associations of small cable operators support providing subscribers the option to purchase programming on an *à la carte* basis, along with the option of purchasing the current packages. The Consumers Union has supported this approach. Television broadcasters do not appear to have made major statements on the issue. The FCC's report to Congress is due in mid-November. **BE**

Dateline

Oct. 1 is the deadline for TV stations in Florida, Puerto Rico and the Virgin Islands to file their license renewal applications, ownership reports and EEO program reports. Oct. 1 is also the date TV stations in Alabama and Georgia must begin broadcasting their pre-filing renewal announcements. Oct. 10 is the date TV stations should place their third-quarter issues/programs lists and children's program reports (FCC Form 398) in their public files.

Harry C. Martin is president of the Federal Communications Bar Association and a member of Fletcher, Heald & Hildreth, PLC, Arlington, VA.

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


The Fastest Alternative in the World!
NEW EDITION
The new DV 15 Fluid Head is the perfect combination with any digital ENG camcorder. It is yet another example of Sachtler's proven quality being used to support the new generation of cameras. And with its central locking for immediate leg release, the new Hot Pod CF is the fastest tripod in the world. Its maintenance-free pneumatic gas spring effortlessly lifts the camera over six feet high. So why wait? Optimize your equipment now. With Sachtler!
www.sachtler.com
sachtler®
corporation of america
55, North Main Street
Freeport, N.Y. 11520
Phone: (516) 867 4900
Fax: (516) 623 6844
email sachtlerUS@aol.com
3316, West Victory Blvd., Burbahk. CA. 91505
Phone: (818) 845-4446
set your ideas in motion!

The AES/EBU digital audio signal distribution standard

BY MICHAEL ROBIN

The Audio Engineering Society (AES), together with the European Broadcasting Union (EBU), developed a digital audio transmission standard known as the AES/EBU standard as well as AES-1992, ANSI S.40-1992 or IEC-958. The transmission medium is wire, which has a wide bandwidth capability and allows for the bit-serial transmission of the digital audio data. The interface is primarily designed to carry monophonic or stereophonic signals in a studio environment at a 48kHz sampling frequency and with a resolution of 20 or 24 bits per sample. The bit-parallel data words are serialized by sending the least significant bits (LSB) first. Word clock data is added to the bit stream to identify the start of each sample in the decoding process.

The bit-serial data stream uses the non-return-to-zero (NRZ) coding. This means that a low voltage indicates binary zero (0) and a high voltage indicates binary one (1). NRZ results in the signal voltage remaining constant and not returning to zero between each data bit. As a consequence, information about signal polarity needs to be transmitted to correctly interpret the message. Because a single NRZ serial data stream contains no information about the signal polarity, another coding format is required. The format chosen is the Bi-phase Mark Code (BPM).

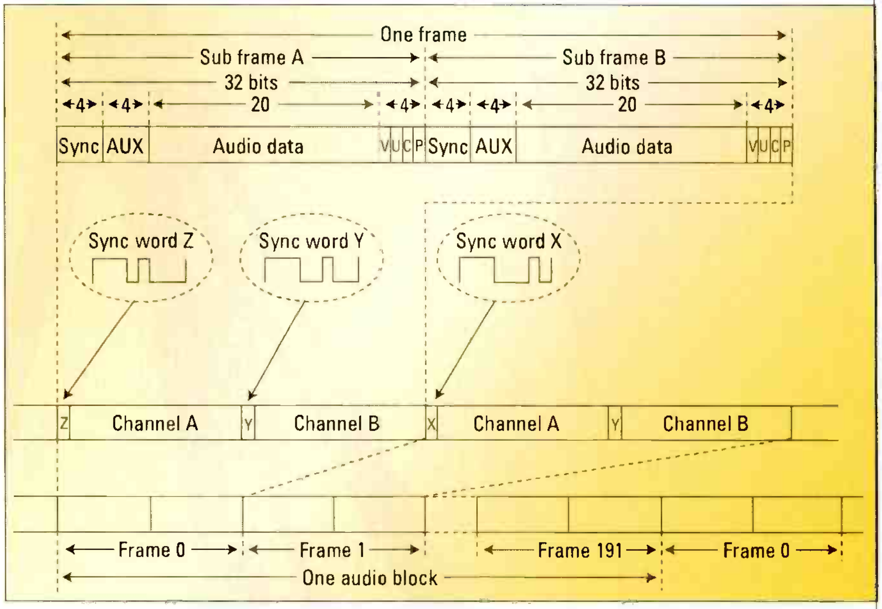


Figure 1. The AES/EBU digital audio data structure

General structure of the AES/EBU interface protocol

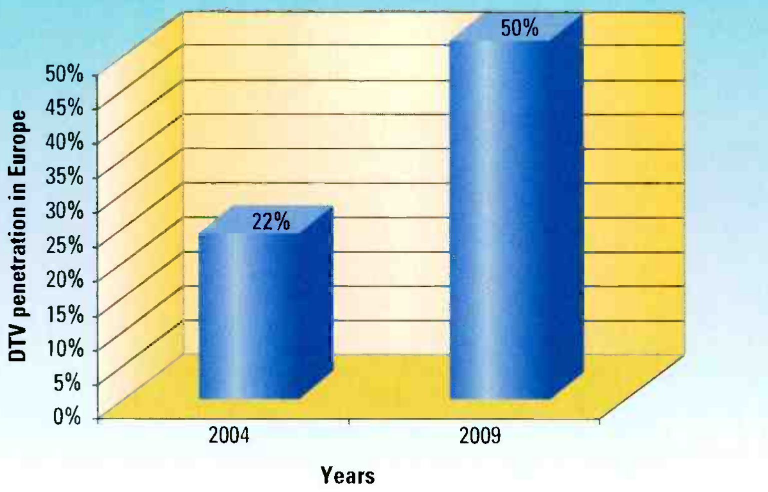
The AES/EBU digital audio interface is designed to transmit two channels of digital audio, each using between 16 and 24 bits per sample on an electrical wire. The original AES/EBU standard specified the use of a twisted/shielded wire. A more recent version specifies the use of 75Ω coaxial cable.

The AES/EBU signal format has a structure shown in Figure 1. The signal

FRAME GRAB A look at tomorrow's technology

DTV grows in popularity among Europeans

Half of Europe will have DTV in 2009



SOURCE: Forrester *www.Forrester.com*

signal integration solution.

General Features

Supported Standards
NTSC, PAL, PAL-N, PAL-M or any ATSC standards.
480i, 480p, 576i, 576p, 720p, 1080i, 1080sF

Format Conversion
INPUT:Composite, SVHS, Component, RGB, SDI, DV*
to OUTPUT: Composite, SVHS, Component, RGB, SDI, DV*

Genlock
REFERENCE: Composite Black Burst, or HD tri-level sync.

Video Test Generator
SIGNALS: Various patterns + zone plate + size chart with circle.

Optional 4 Channel Audio Delay
SIGNALS: SDI–Embedded audio.; Analog Audio (balanced) 25 F Dsub (Industry standard pinout); AES (unbalanced)

Remote Control
SERIAL: RS232 / RS422 (SONY pinout)
NETWORK: 10/100 ETHERNET
GPIO: 2 Programmable BNC's for control inputs or outputs.

Miscellaneous Features

TBC/Sync, Auto freeze/trouble slide, Hot switch, Auto Proc adjust, Noise reduction, Color correction, Audio/Video test signal generator, VITS inserter, Audio embedder/de-embedder, animated logo inserter, User presets, 64 Meg user frame/logo storage, Upload/download stills through Ethernet to emulates still store with dissolve/clean cut. FLASH firmware/software upgradable.

1 RU x 17 inches x 17 inches case.
Power = 100 – 120/120 – 240 VAC 60/50 Hz Auto Switching

*DV (IEEE 1394) can be configured for input or output but not both simultaneously

SPECIFICATIONS MAY CHANGE WITHOUT NOTICE

CME
California Media Engineering

HD/SYNC High Definition Synchronizer

The HD/SYNC is an ALL definition video synchronizer ideally suited for HD broadcasters and production facilities, or those planning to make the transition to high definition. The HD/SYNC supports all world standards from SD through HD in either analog or digital formats. Incorporating full 10-bit processing, digital FIR filtering, a three-dimensional adaptive COMB filter, motion adaptive noise reduction, full proc amp controls, and color correction, the HD/SYNC provides superior processing for analog to digital conversion. A built-in test signal generator, frame store with linear keyer, and an animated logo inserter, are just some of the extra features that make the HD/SYNC the most versatile synchronizer in the industry. Designed to be future proof, the HD/SYNC satisfies your needs today, and tomorrow.

Prime Image

Performance by definition.

Tel (408) 867-6519
Fax (408) 926-5177
www.primeimageinc.com

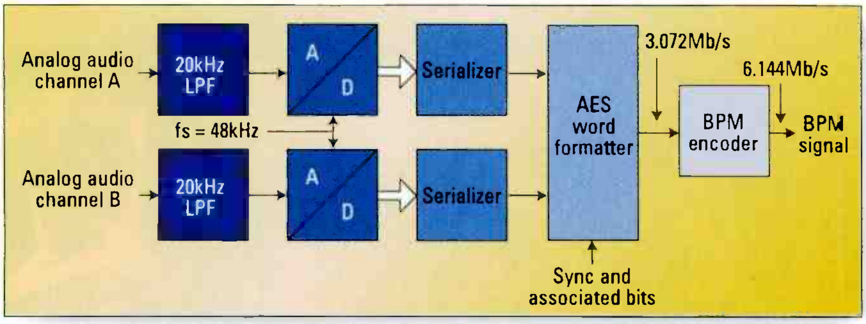


Figure 2. Conceptual block diagram of an AES/EBU channel encoder

is transmitted as a succession audio blocks. Each block is made up of 192 frames numbered 0 to 191. Each frame is made up of two subframes, subframe A and subframe B. Each of the subframes is divided into 32 time slots numbered 0 to 31 and combines sample data from one audio source or channel, auxiliary data, sync data and associated data.

Time slots 0 to 3: These time slots carry one of the sync words denoted as X, Y or Z.

• *Sync word Z*: This bit sequence indicates the start of the first frame of an audio block.

• *Sync word X*: This bit sequence indicates the start of all remaining frames.

• *Sync word Y*: This bit sequence indicates the start of every B subframe.

The sync words are not BPM encoded. Their structure minimizes the DC component on the transmission line and facilitates clock recovery and subframe identification as they are unique in the data stream.

Time slots 4 to 7: These time slots can carry auxiliary information such as a low-quality auxiliary audio channel for producer talkback or studio-to-studio communication. Alternately, they can be used to augment the audio word-length to 24 bits.

Time slots 8 to 27: These time slots carry 20 bits of audio information starting with LSB and ending with MSB. If the source provides fewer than 20 bits, the unused LSBs will be set to the logical "0."

Time slots 28 to 31: These time slots carry associated bits as follows:

• *Validity bit (V)*: The V bit is set to zero if the audio sample word data are correct and suitable for D/A conversion. Otherwise, the receiving equipment is instructed to mute its output during the presence of defective samples. This capability has not been implemented by all manufacturers, and some equipment may not generate or verify the sample word validity.

• *User bit (U)*: The U bit in each subframe is sent to a memory array. The AES18-1992 recommended practice specifies the format of the user data channel of the interface.

• *Channel status bit (C)*: The C bit carries, in a fixed format, information associated with each audio channel that is decodable by any interface user. Examples of information to be carried are length of audio sample words, pre-emphasis, sampling frequency and time codes.

• *Parity bit (P)*: A parity bit is provided to permit the detection of an odd number of errors resulting from malfunctions in the interface. The P bit is always set to indicate an even parity.

Figure 2 shows a conceptual block diagram of an AES/EBU encoder. Figure 3 shows how the BPM-encoded signal waveform is obtained from an NRZ data stream. The NRZ is characterized by "ones" having a determined high value and "zeros" having a determined low value. This means that long strings of zeros and ones have no transitions and result in difficult clock recovery in the receiver. BPM alleviates this condition by introducing transitions in the middle of each "one" bit interval. At a 48kHz sampling rate, the total data rate is 32 x 2 x 48000 = 3.072Mb/s. The BPM encoding doubles the data stream rate to 6.144Mb/s. Figure 4 shows the respective spectra. Figure 5 on page 28 shows a conceptual block diagram of an AES/EBU decoder.

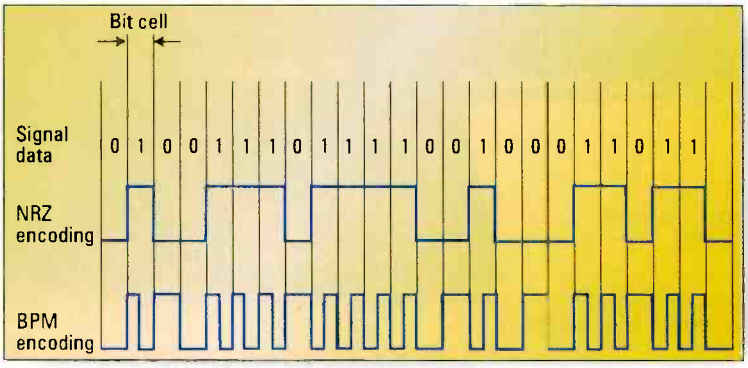


Figure 3. Formation of a bi-phase mark encoded signal

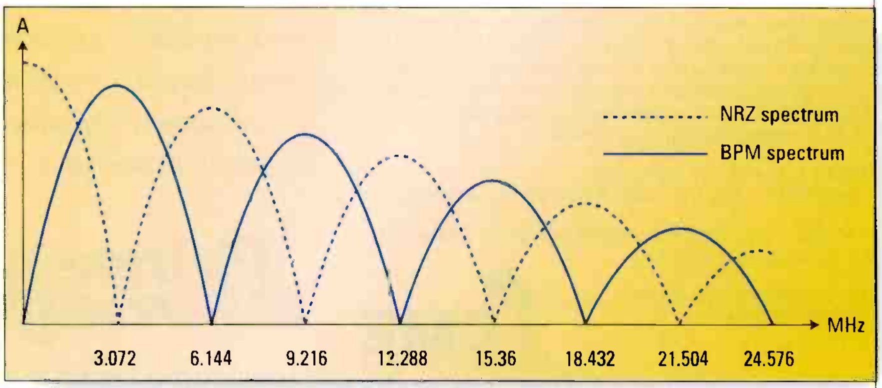


Figure 4. Spectrum of an AES/EBU digital audio signal


TAKE THE "HIGH" ROAD
See VelocityHD in action in a city near you!
The "Take the High Road" Tour is coming this fall to:
Toronto, New York, Atlanta, Orlando, L.A., Vancouver, Dallas, Chicago
For more info, or to register online, visit
www.leitch.com/HighRoadTour
Take Your Editing Performance "Higher"
Discover the freedom to express your creativity in high definition without sacrificing productivity. VelocityHD makes HD editing fast and easy, bringing guaranteed, full-quality, real-time non-linear editing performance to the HD domain. VelocityHD's HD/SD format flexibility offers the best of both worlds, while its remarkable affordability brings a new level of HD power within your grasp.
www.leitch.com/vhd
Exceptional HD/SD Non-Linear Editing Performance for Your Post Production Integrated Content Environment
VelocityHD™
Winner of Six Awards
MAKING THE CUT
Canada +1 (800) 387 0233
USA East +1 (800) 231 9673
USA West +1 (888) 843 7004
Latin America +1 (305) 512 0045
LEITCH
www.leitch.com

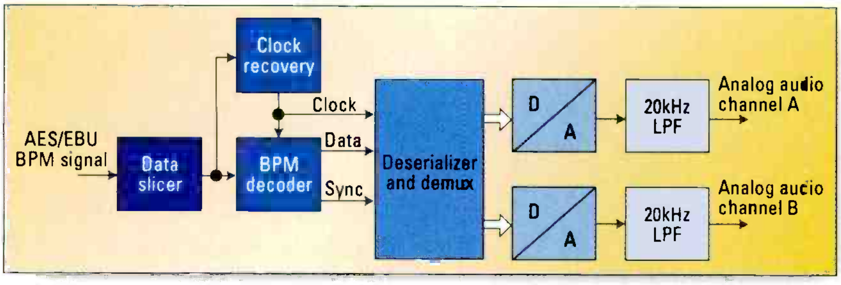


Figure 5. Conceptual block diagram of an AES/EBU decoder

Interface characteristics

Table 1 lists the characteristics of two types of interfaces: balanced and unbalanced. The original AES3-1985 standard defined the distribution of AES/EBU signals through a twisted-pair shielded audio cable. It specified a transmitter source impedance of 110Ω and a receiver input impedance of 250Ω, and it stipulated that up to four receivers could be connected in parallel across the audio cable. However, it gave no guidance on precautions needed to be taken by the user or systems integrator. This resulted in difficulties with reflections and standing waves, as the performance of the distribution link was unpredictable and depended on the wide variety of installation conditions encountered in practice. The unpredictability is compounded by the loose specification of the output signal amplitude, which puts an additional stress on the receiver. The standard was revised and reissued as AES3-1992. This second version specifies a receiver input impedance of 110Ω and warns against the use of more than one receiver across the feeding cable. The AES3id-1996 standard defines the unbalanced 75Ω impedance interface. This version recognizes the need to narrowly specify impedance tolerances in terms of "return loss" and transmitter output signal levels and, if properly implemented, results in a more predictable performance as it is based on well-known SDTV video signal distribution concepts. However, most digital audio equipment is equipped with XLR connectors and conversion to BNC connectors, including the use of 100Ω-to-75Ω balun transformers and signal amplitude normalizers, must be considered. **BE**

	AES3-1992 (Revision of AES3-1985)	AES-3id-1996
Transmitter characteristics	Balanced output with XLR connector Source impedance: 110±20%Ω Balance: <-30dB (to 6MHz) Output signal amplitude: 2 to 7 Vp-p across 110Ω load (balanced) Rise and fall time: 5ns to 30ns Jitter: ≤20ns p-p	Unbalanced output with BNC connector Source impedance: 75Ω nominal Return loss: >25dB (0.1-6MHz) Output signal amplitude: 1Vp-p±10% across 75Ω load DC offset: 0.0 V±50mV Rise and fall time: 30ns to 44ns Jitter: ≤20ns p-p
Receiver characteristics	Balanced input with XLR connector Input impedance: 110±20%Ω Common mode rejection ratio: Up to 7Vp-p to20kHz Maximum accepted signal level: 7Vp-p Cable specification: Shielded twisted pair, 100 to 250m maximum Cable equalization: Optional	Unbalanced input with BNC connector Input impedance: 75Ω nominal Return loss: >25dB (0.1MHz to 6MHz) Minimum input level sensitivity: 100mV Cable equalization: Optional

Table 1. Interface electrical characteristics

Michael Robin, a fellow of the SMPTE and former engineer with the Canadian Broadcasting Corp.'s engineering headquarters, is an independent broadcast consultant located in Montreal, Canada. He is co-author of Digital Television Fundamentals, published by McGraw-Hill and translated into Chinese and Japanese.

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

Enterprise networks

BY BRAD GILMER

Enterprise networks are usually large computer networks that connect many divisions of a large company. The term may also be applied to hardware and software configurations that are tailored for large applications spread over many sites. As production professionals, we might not consider that our applications fall into the enterprise category unless we work for a large media company. But we can apply many of the techniques used to support enterprise applications on our networks. Even for those who do not work at a large company, it may be useful to have an overview of some of the techniques used to support large operations.

When one is not enough

As operations become larger, additional traffic strains server capabilities. More people want to connect to the server, and applications running on the server become more complex. For example, companies may begin to deploy advanced database applications that perform processing on the server, taxing network resources. The simple solution is to buy a bigger server. These larger servers typically have multiple processors, large amounts of memory and storage, and multiple network connections. But what happens when even the largest servers start to become heavily loaded? One solution is to deploy multiple servers in a cluster. Figure 1 shows a typical server cluster — several smaller servers working together as one. Special software enables the cluster to divide the workload among different pieces of hardware. To the user, the multiple servers appear as one unit. Benefits of a server cluster include reduced cost, redundancy and scalability. Typically, a server cluster costs less than a single-server equivalent. Additionally, many implementations provide increased reliability through redundancy. Should one server fail, the others in the cluster automatically pick up the load. Finally, it is possible to build large clusters employing tens or hundreds of individual servers. It may be technically impossible to create the equivalent in a single monolithic server. For our industry, the benefits of lower cost, redundancy and scalability directly apply. Clusters are inherently more complex than a single server. But, beyond a certain size, clustering makes good sense in the production environment.

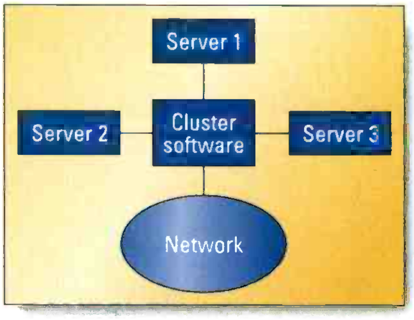


Figure 1. Server clusters appear as one server to network users.

Another way that enterprise networks grow is to use dedicated servers to provide specific services. When a network engineer first designs a small facility, she may choose to deploy a single larger server to handle e-mail, file sharing, Web services and FTP. While some may disagree with this as a starting point, it's important to recognize that the network engineer frequently does not have all the money she would like at startup. Combining services on a single server is a way to save money while still providing required functionality. As the organization grows, it is common to begin to provide dedicated servers for each service. For example, e-mail may be moved to its own server. A dedicated e-mail server allows the network engineer to add centralized virus and spam scanning software — both of which are processor-intensive applications — without affecting other services on the network. Similarly, file sharing may start out on a centralized server, but later it may move to servers that are dedicated to sharing on a departmental or regional basis. Enterprise-level Web servers at organizations such as FOX, CNN, Warner Bros. and others almost universally deploy multiple servers.

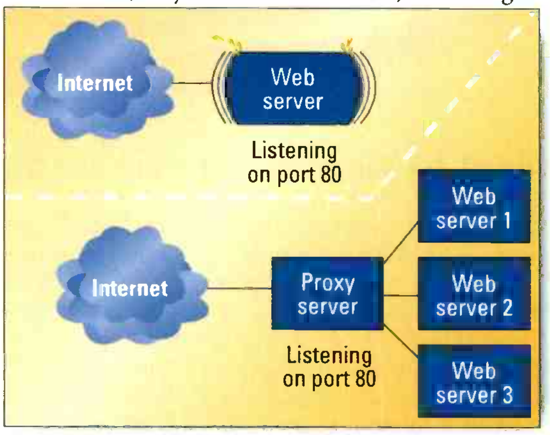


Figure 2. A single Web server may run out of resources when demand is high. Production applications can use a proxy server to share the load between multiple Web servers.

Distributing the load with proxy servers

One area where broadcasters are definitely in the enterprise realm is

SONY

HD Anycam.

LUMA LCD display

HDW-250 Portable HDCAM VTR

Welcome to the HD goalpost cam. HD weather cam. HD church cam. Or HD machine vision cam. Welcome to the Sony HDC-X300, so small and affordable, it boldly goes where no high definition camera has gone before. Switch instantly among 60i, 50i, 30P, 25P or 24P signals via flexible HD-SDI, R/G/B or Y/Pb/Pr outputs. Marvel at Sony's all-new 1/2-inch 1.5-megapixel CCDs. And benefit from tally, trigger and Slow Shutter. There's even auto focus with the matching, digitally-controlled 19x zoom lens. And you can systematize with Sony's LUMA™ HD monitors and HDCAM® portable VTR. The Sony HDC-X300 is the definitive high definition camera for anytime... anywhere... anyone.

Visit WWW.SONY.COM/HDCX300

LIKE NO OTHER™

Web sites. CNN.com is typically one of the most viewed sites on the Web. According to *www.alexa.com*, CNN.com was ranked number 40 over the last week, out of approximately 44,000 Web sites on the Internet. In November of 2000 (the most recent time for which I was able to verify the statistics), CNN's Web sites supported more than 100 million page views. Any way you slice it, that's a lot of traffic. On the local level, broadcasters may find their Web servers taxed beyond their limits. For instance, a local television station in the Southeast may find that its Web traffic increases several orders of magnitude during and after a hurricane. Enterprise solutions to this problem usually involve proprietary, internally developed software and hardware. But a practical solution exists for smaller facilities.

When someone types in a uniform resource locator (URL) such as *www.broadcastengineering.com*, he initiate a process called domain-name resolution. The early architects of the Internet knew that humans would be much happier typing in a domain name than a hard-to-remember set of numbers, such as 207.241.152.157. The domain-name resolution process starts by asking a local domain-name server (DNS) if it knows the IP address for *www.broadcastengineering.com*. If the local DNS does not know, it passes the question to a higher-level server. The answer to the question ultimately comes from the DNS that is responsible for the *broadcastengineering.com* domain, controlled by an administrator at Primedia, the publisher for *Broadcast Engineering* magazine. Once the Web browser knows the IP address, it initiates a conversation with that IP address on port 80, a well-known port for Web servers. Typically, a Web server with that IP address is listening on port 80 and replies, beginning the HyperText Transfer Protocol (HTTP) session. If many people try to initiate a session with the same server, the server quickly runs out of resources and the Web site becomes unavailable. One way to handle this is to set up a proxy server to listen on port 80 (see Figure 2). This software then distributes HTTP session requests to several identical internal Web servers, based upon various algorithms. Typical algorithms include random and round-robin. The random algorithm assigns incoming HTTP sessions to servers at random. The round-robin algorithm assigns sessions in order based upon a list of available servers.

Mesh vs. switch

Another area where production professionals can employ enterprise solutions is in the proper selection of network topologies. One such topology is the mesh. Figure 3 shows a mesh

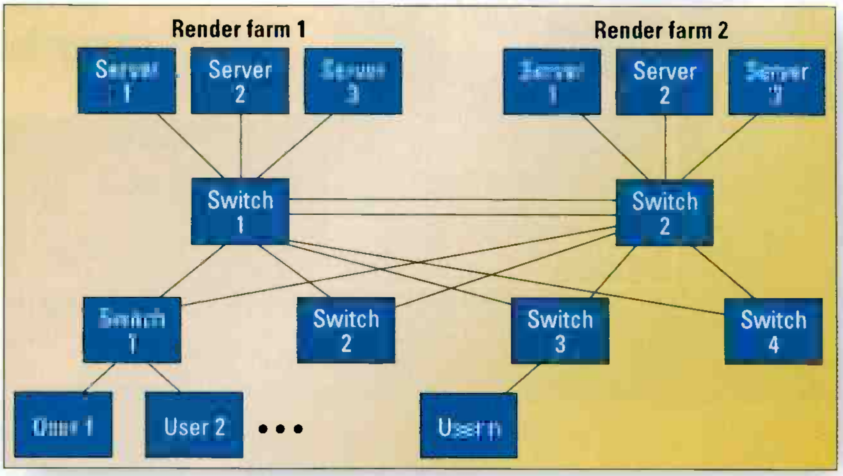


Figure 3. Mesh networks provide high bandwidth, automatic fault recovery and fastest path routing for demanding production applications such as rendering.

network with connections to multiple switches. Not only does a mesh provide higher bandwidth than a simple switched topology; it allows the creation of a self-healing network. If one switch in the mesh fails, traffic is re-routed automatically across the mesh. Furthermore, a mesh automatically looks for the fastest path between any two points. Mesh networks are powerful tools for creating high-bandwidth, fault-tolerant networks. But network engineers should be aware of design limitations when creating large networks. All implementations of mesh networks limit the maximum number of switches that can be contained in a mesh, as well as the maximum number of hops between mesh ingress and egress points. These limits are only a problem for the largest mesh networks. Network engineers also should be aware that there are interoperability issues between different manufacturers' implementations of mesh networks.

External storage

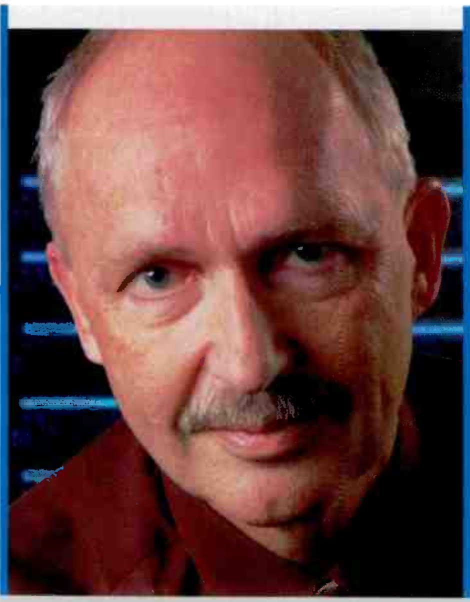
External storage is one last area where enterprise technology can benefit production professionals. It is common for enterprise-server solutions to employ large external disk- and tape-storage systems. Of course, IT-based production has required this sort of storage for quite some time, so this will not be anything new. But storage costs continue to fall, and it is becoming more feasible for production professionals to store all of their content online. Companies such as EMC and Hitachi have made a business out of fine-tuning hardware and microcode in disk subsystems to deliver large amounts of data simultaneously to large server systems. Traditional broadcast and post-production hardware vendors have embraced these solutions. As users, we should educate ourselves about what is available from these enterprise storage vendors.

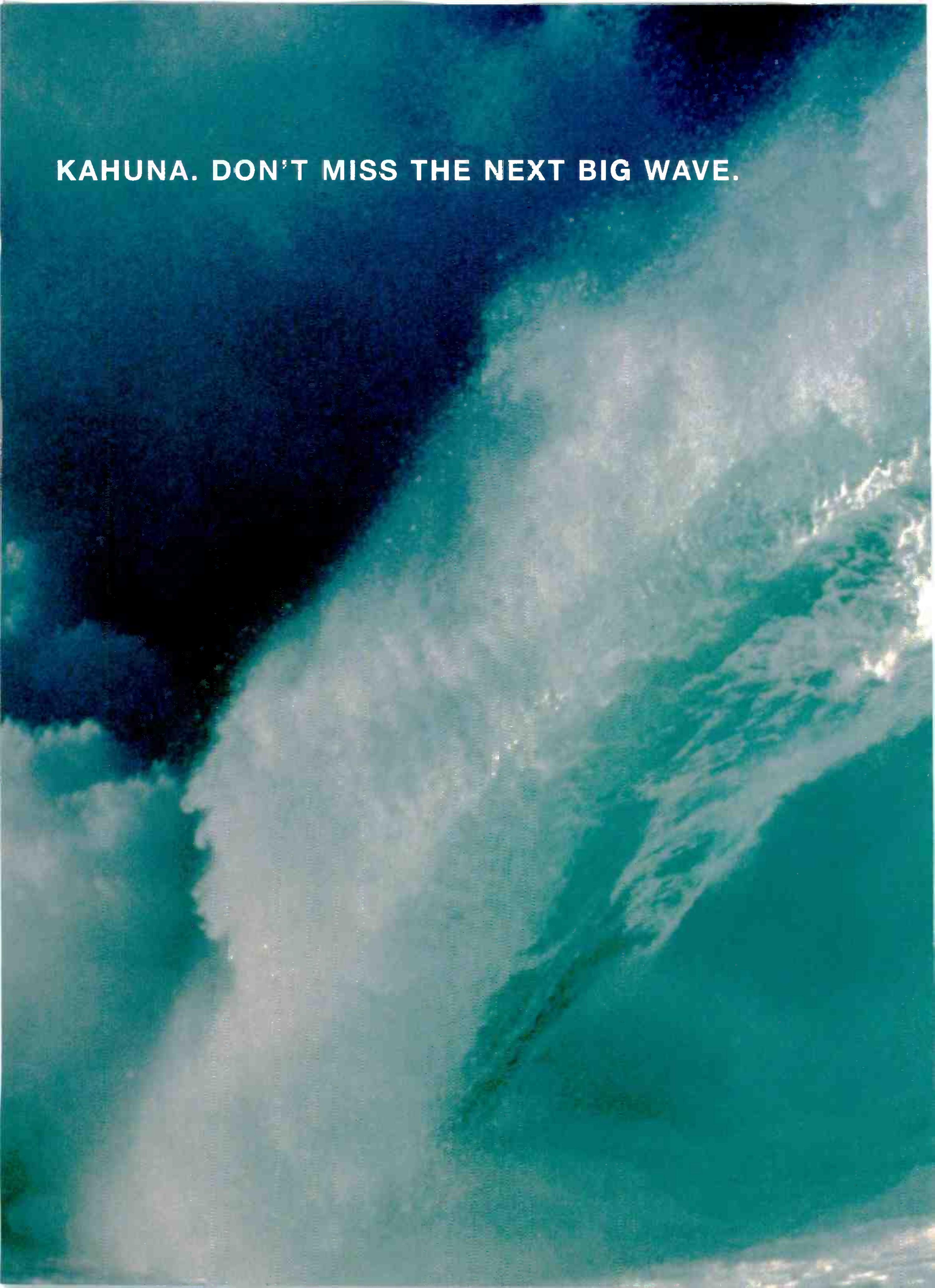
Do you need an enterprise solution?

This is the ultimate question: Do you need an enterprise solution? Typically, an enterprise solution means paying a lot more for the technology. In some cases, the marketing surpasses the reality, and what a proposes as an enterprise solution is really just a way to move you up to a more expensive system. But, in many cases, production professionals require the bandwidth, speed, reliability and fault tolerance of enterprise technology. As a technologist, the decision may fall to you. Start by evaluating whether the increased cost of a particular technology is worth the benefit. Understanding enterprise solutions can help you make the call. **BE**

Brad Gilmer is executive director of the AAF Association, executive director of the Video Services forum, editor in chief of the "File Interchange Handbook," and president of Gilmer & Associates.

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




KAHUNA. DON'T MISS THE NEXT BIG WAVE.


www.snellwilcox.com/kahuna

Video over IP
for news acquisition

BY MARK BROWN

Most news producers today will say that the way to win the broadcast news game is to get more stories to air faster. Although this objective seems simple enough, it is often hampered by a lack of necessary equipment and resources required to make it happen. Could advanced codecs and IT-based technologies provide an answer to this quandary?

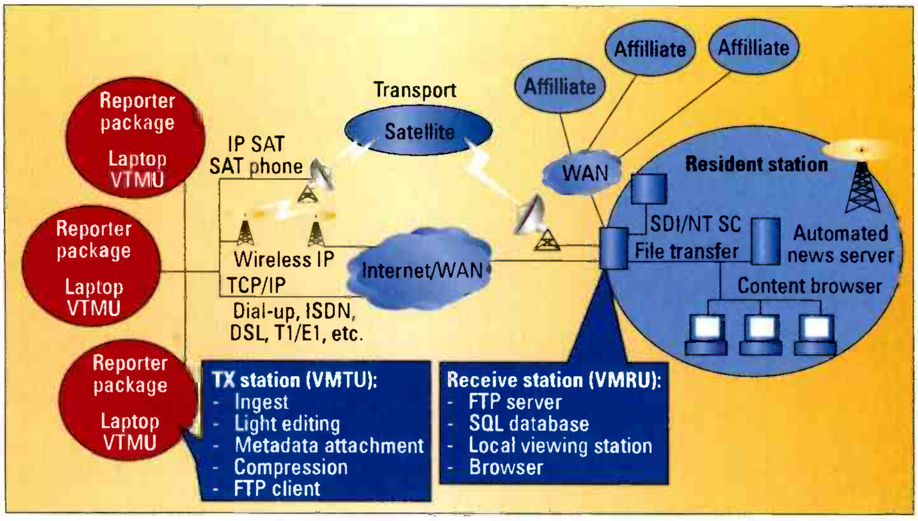


Figure 1. The VPNG architecture shown here allows for live as well as store-and-forward file-based news coverage.

IT-based technologies can serve effectively in areas ranging from content production to editing and transmission applications. But, could these technologies also serve reliably and practically in acquiring and sharing both file-based material and live content?

The IT vision

Over the past 25 years, video newsgathering has migrated from analog SNG and microwave-based ENG to digital newsgathering (DNG), MPEG-2-based compressed systems and portable systems that include videophone technologies. Over the last two years, the advent of efficient, high-quality codecs such as MPEG-4 (H.264) and Windows Media 9 (WM9/VC-9) have enabled Very Portable (laptop-based) Newsgathering (VPNG) systems. In addition, as faster, more powerful computing platforms are coupling with new IP-based transport and transmission platforms, it seems the industry is poised to take another step forward.

More than a year and a half ago, SignaSys began investigating approaches to IT-based news acquisition and sharing. One of the fruits of this investigation is the systemic architecture shown in Figure 1. This VPNG architecture allows for live and store-and-forward file-based news coverage from any reporter armed with a camera, laptop and an IP transport link. Upon investigation, additional capabilities emerged, including interfacility content sharing through streaming live and file-based media transfer applications — a feature valuable to station groups. This article focuses on the acquisition capabilities of such a system.

The elements

The proposed VPNG system is predicated on three major elements: the VidLink Mobile Transmit Unit (VMTU), the VidLink Mobile Receive Unit (VMRU) and the VidLink Transceiver System (VTS).

A VMTU, which addresses field acquisition, is a simple, cost-effective and portable reporter package. Based on commodity platforms, it basically consists of a DV-based camcorder, a laptop computer, and refined but simple software compression and metadata tools. The package allows reporters in the field to acquire, prepare and transmit file-based and live content over common, low-cost IP networks. It allows them to send content not only to an associated station but to any station within their group. The same approach can be integrated into rack-mount PCs for fixed or vehicle-mounted applications.

The transmit unit allows direct ingest of DV-based content through an IEEE 1394/firewire interface. The DV format provides good performance, has a low component cost and is well-established in the news industry. Because non-DV-based material may also need to be ingested, the system supports baseband audio and video.

Beyond ingest, the system supports light editing, metadata generation and attachment (i.e. script information, thumbnail creation, etc.), transport compression, and transmission of content to the VMRU located at the station or studio. The transmit unit can use various communication modes: satellite phones, Wi-Fi, cell phone (GSM/CDMA) IP satellite, dial-up, DSL or ISDN. The network transport interface uses TCP/IP and well-developed FTP protocols, so

LUMA
Sony Professional LCD Monitor

SONY®

New Faithful.

For years, an entire industry has been faithful to Sony PVM monitors. But now there's something better. Sony LUMA™ series LCD monitors are dramatically more space efficient. More energy efficient. More flexible. Impervious to flicker and less vulnerable to ambient light. LUMA monitors have the faithful pictures, brightness, contrast, color depth and viewing angle you expect from Sony. Plus Multi-Format Signal Support, Area Markers, Blue-Only and other production features that video professionals require. And Sony offers a choice of 32, 23 and 17-inch widescreen or 21-inch* 4:3 sizes. Sony LUMA™ monitors. The all-new way to keep the faith.

VISIT WWW.SONY.COM/LUMA

Protect your investment with a Sony SupportNET℠ Service Contract. Call 1-800-304-7533.

LIKE NO OTHER™

interfacing to the various communication modes is straightforward.

Transport protocols

FTP is the preferred way to transport store-and-forward video clips and associated metadata files because, if the file download process is interrupted (as it often is on public networks), FTP permits the download to resume at the point of interruption instead of requiring the retransmission of the complete file. The Windows Media 9 (WM9/VC-9) codec was selected as the transmission-compression algorithm for both live and file-based material. VC-9 professional uses encoding algorithms similar to that of MPEG-4 (H.264) to provide a bit-rate savings two to three times that of MPEG-2.

Efficient tools to browse forwarded field content are key to a streamlined workflow.

In support of live applications, the system would employ VC-9 over User Datagram Protocol (UDP). In news applications, UDP is tolerant of network disruptions, degrades gracefully (dropping frames instead of experiencing system lockups) and requires less protocol overhead.

During system testing of live transmission, packet buffering was modified to support total system delays of less than 500ms instead of the six to 10 seconds common in VC-9 and other advanced video codecs. This allows reporters or anchors to use the system for interviews or conversations. In certain compression modes, lip sync issues can be a problem. The solution is to modify the audio codec to allow audio packetization and transport to take place prior to the video packetization and transport. This affords the decoder sufficient time to properly decode the audio packets and reference them to associated video frames.

File access

At the station, easy retrieval and ingest of video and audio and metadata, is important. Efficient tools to browse forwarded field content, as well as file and metadata compatibility with existing automated news production environments, are key to a streamlined workflow. As previously noted, the receiver located at the station acquires information from the field through the FTP client/server interface.

Once the system acquires the file-based content, assigned journalists can browse it and check it for integrity at their workstations, or the system can play it directly to air. If required, the video and audio

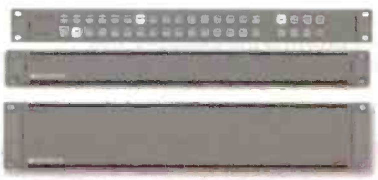
Ross Video Introduces 10 New Multi-Definition Synergy Switchers

SYNERGY MD/MD-X MULTI-DEFINITION PRODUCTION SWITCHERS

The Synergy MD and MD-X series offers models ranging from the compact and powerful Synergy 100 MD single ME switcher to the extra large, hyper powerful Synergy 4 MD-X 4 ME switcher. Synergy MD and MD-X support all popular formats of HD and SD out of the box. Using the absolute latest technology, these switchers are full of standard features at a price point that puts a multi-definition switcher within reach of a typical mid-market customer.
www.rossvideo.com/synergy/switchers.html

OVERDRIVE PRODUCTION CONTROL SYSTEM

OverDrive is a powerful production control system that enables touch screen control over devices used in productions such as news, sports or live events. OverDrive integrates with the Synergy SD and MDX series of production switchers, leveraging powerful control interfaces over video servers, VTRs, DDRs, audio mixers, robotic cameras, routers, still stores and more.
www.rossvideo.com/overdrive/overdrive_overview.html



TALIA NK ROUTING

The NK Series is a new line of compact and cost effective routing switchers. NK routers are available in sizes of 16x16 or 32x32 and in a full range of signal formats including serial digital, analog video, AES/EBU, analog audio and data routing. NK ships with a powerful web browser based configuration system and is available immediately.
www.rossvideo.com/talia/nk/nk_overview.html

GEARLITE MD

GearLite MD is a line of Multi-Definition (High Definition & Standard Definition) products. These include the DAC-9213 Multi-Definition Digital to Analog Converter, the SRA-9201 Multi-Definition Reclocking DA, and the

SEA-9203 Multi-Definition Serial Equalizing Amplifier.
A -PVM version of the DAC-9213 is used specifically for Sony PVM/BVM monitors.

Sony, PVM and BVM are trademarks of Sony Corporation

http://www.rossvideo.com/gearlite/gearlite.html

can be translated automatically (or manually) to a file format compatible with a station's newsroom production system. This includes file formats compatible with Avid (OMFI) and Pinnacle (DV25). The baseband digital and analog outputs allow for decompressed transfer and record as well as quality checks or real-time play-to-air. Received metadata is accessed through an SQL database query or extracted directly from the browser through standard cut and paste techniques.

Decoders

Live content received at the studio is handled by tightly coupled decoders integrated into the IP-addressable receivers. These VC-9 decoders are responsible for decoding incoming live streams to digital or analog baseband, allowing for interface into the plant infrastructure. The streams can then be recorded or staged for air.

Compression tools

All compression and metadata software tools for supporting both store-and-forward and live modes must be easy to use yet flexible enough to account for the varying transport link and quality requirements that may arise in the field. Thus, the system uses compression profiles to simplify operator compression settings. This allows operators to preset compression parameters and to select compression profiles based on familiar terms such as fast motion or talking heads. If need be, operators and individuals that are more familiar with compression technology have easy access to create or modify compression profiles.

Summary

SignaSys put together a system, performed various factory trials and deployed it for field tests. Although each trial was unique, they all demonstrated similar strengths and weaknesses. In each case, the system proved to be much quicker to deploy and get information back to the station than the standard approach. The system was fairly easy to operate, but requires some training.

Each trial has shown the system to be reliable if configured properly. Full system integration has proven to be moderately difficult, and it will require RF- and IT-savvy individuals to get a full system up and running. Image quality from these systems has been very good but, for live feeds, the quality is bandwidth-dependent. Overall cost-effectiveness of the system has been exceptional. This type of IP-based store-and-forward ENG system could represent the future of TV newsgathering. BE

Mark Brown is the executive vice president and CTO of SignaSys.

30th Anniversary

HD CHAMPIONS!

Videotek Continues to Dominate On Screen Test and Measurement

Building on a 30-year commitment to the television industry and Emmy winning technology, Videotek's VTM-400HD series of test and measurement instruments are innovatively designed as complete system solutions for HD, SD and composite formats. The 400 Series conquers high definition needs with features such as an intuitive gamut display, pixel zoom, HD and SD data analysis, eye pattern, 708 closed caption display, lip-sync and loudness monitoring, Metadata display and alarms, plus Dolby® surround decoding and display. Get in the game – call one of our product specialists today!

Dolby® is a registered trademark of Dolby Laboratories.

FREE 5 YEAR WARRANTY

VIDEOTEK®
A ZERO DEFECTS COMPANY

Toll Free: 800-800-5719 • Direct: 610-327-2292 • www.videotek.com

Comcast's new studios do HD and surround

By Bob Ayars

On April 12, 2004, the Philadelphia Phillies Major League Baseball team took the field for their inaugural home game against the Cincinnati Reds at Citizens Bank Park, with simultaneous HD and SD broadcast production taking place in Comcast SportsNet's (CSN) newly refurbished Wachovia Center facility. The unusual thing about this event is that the Wachovia Center is several city blocks away from the actual stadium.

The 24-hour regional sports network has broadcast HD video with 5.1 audio for a selection of games since 2003 from an HD mobile unit shared with the Comcast SportsNet Mid-Atlantic network, which serves Washington, DC, Baltimore and the surrounding areas. The two networks wanted to maximize the number of HD events each carried, so they developed a plan to send the mobile

Comcast's event-control room includes two Sony 24-inch HD monitors and KRK monitors equipped with 5.1 surround-sound monitoring. Photos by Dave King. Photo illustration by Robin Morsbach, associate art director.

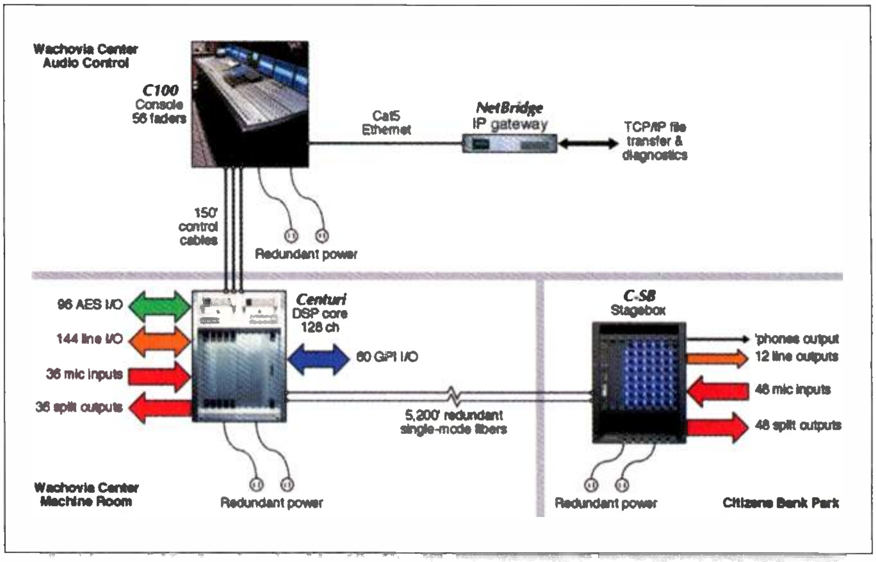


Figure 1. Location and interconnection of the digital audio console components, showing power and signal redundancy. Long-distance fiber and CAT5 connections provide remote signal acquisition and diagnostics, respectively. Diagram by Andrew Clark/SSL

unit to Mid-Atlantic full-time and replace it with a permanent facility in Philadelphia.

The process

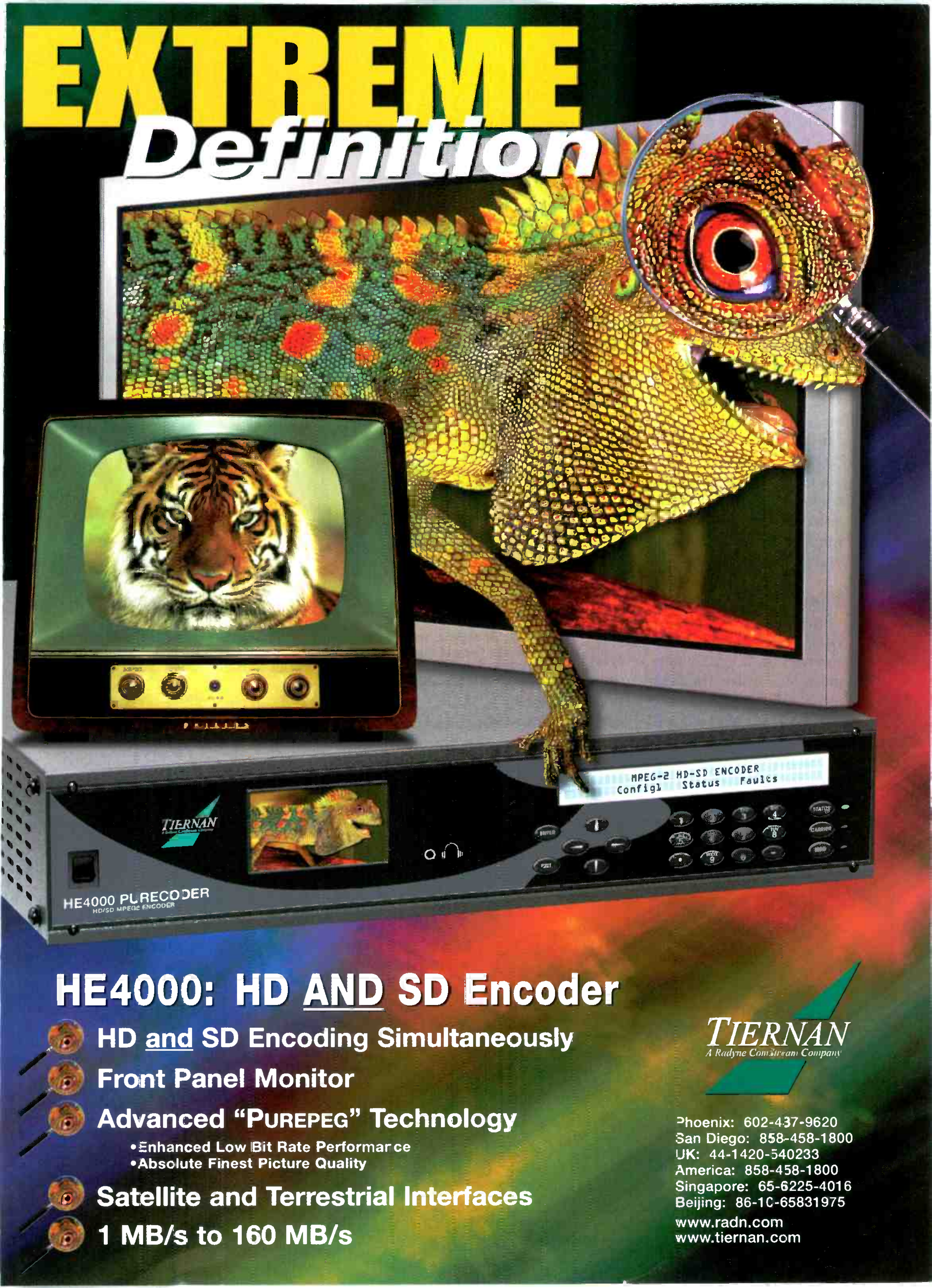
In November 2003, the network stripped its original SD production suite bare and the design team began installating the new HD facility. To cover all three sports from a single production facility, the ballpark microphones had to be connected to the audio mixing booth through a series of conduits more than a mile long. Bexel BBS Fiber laid a 72-strand, single-mode fiber to connect the various audio devices between the two sites, as shown in Figure 1. A Solid State Logic C-SB remote mic stagebox under remote control by the SSL C100 digital audio console handles the remote capture of mic signals and selected cue feeds back to the ballpark. The new facility uses Telecast Fiber Systems' Adder 161 and Adder 8821 units for intercom and IFB.

The mic stagebox uses multimode fiber for runs up to 1800 feet. But, for the Comcast installation, Solid State Logic developed a single-mode fiber option that could transport audio signals up to 15 miles. The option has redundant fiber and power supplies, supporting 48 analog mic preamps, 12 line outputs and a headphone jack for local confidence monitoring. Announcer mics, camera/field mics and PA feeds currently occupy two-thirds of these inputs.

Sports in 5.1

In addition to controlling the C-SB I/O unit, the SSL audio console provides facilities for fast and accurate 5.1 audio production. Mixing in 5.1 can be a daunting prospect for engineers who have not experimented with the possibilities of the format, but Mike Giacalone, lead audio mixer for Comcast, has developed his own rules of thumb to anchor the mix to the picture, while still using some artistic license to bring home the excitement of being there.

To do this for baseball, Giacalone places the crowd ambience only into the rear of the mix, using a mixture of Crown and Shure stereo mics slung above the fans in left-center outfield to pick up the excitement and reaction of the crowd without highlighting individual fans. He blends front effects and a few home-plate shotgun mics sparingly into the rear as well to give a fuller sound. The Sennheiser shotgun mics on the low-angle cameras also go partly to the rear, although not hard panned, to


EXTREME
Definition
MPEG-2 HD-SD ENCODER
Config1 Status Faults
TIERNAN
HE4000 PURECODER
HD/SD MPEG2 ENCODER
HE4000: HD AND SD Encoder
HD and SD Encoding Simultaneously
Front Panel Monitor
Advanced "PUREPEG" Technology
•Enhanced Low Bit Rate Performance
•Absolute Finest Picture Quality
Satellite and Terrestrial Interfaces
1 MB/s to 160 MB/s
TIERNAN
A Radyne ComStream Company
Phoenix: 602-437-9620
San Diego: 858-458-1800
UK: 44-1420-540233
America: 858-458-1800
Singapore: 65-6225-4016
Beijing: 86-10-65831975
www.radn.com
www.tiernan.com

SYSTEMS DESIGN SHOWCASE

avoid mismatching the audio and picture when the director chooses one of those cameras.

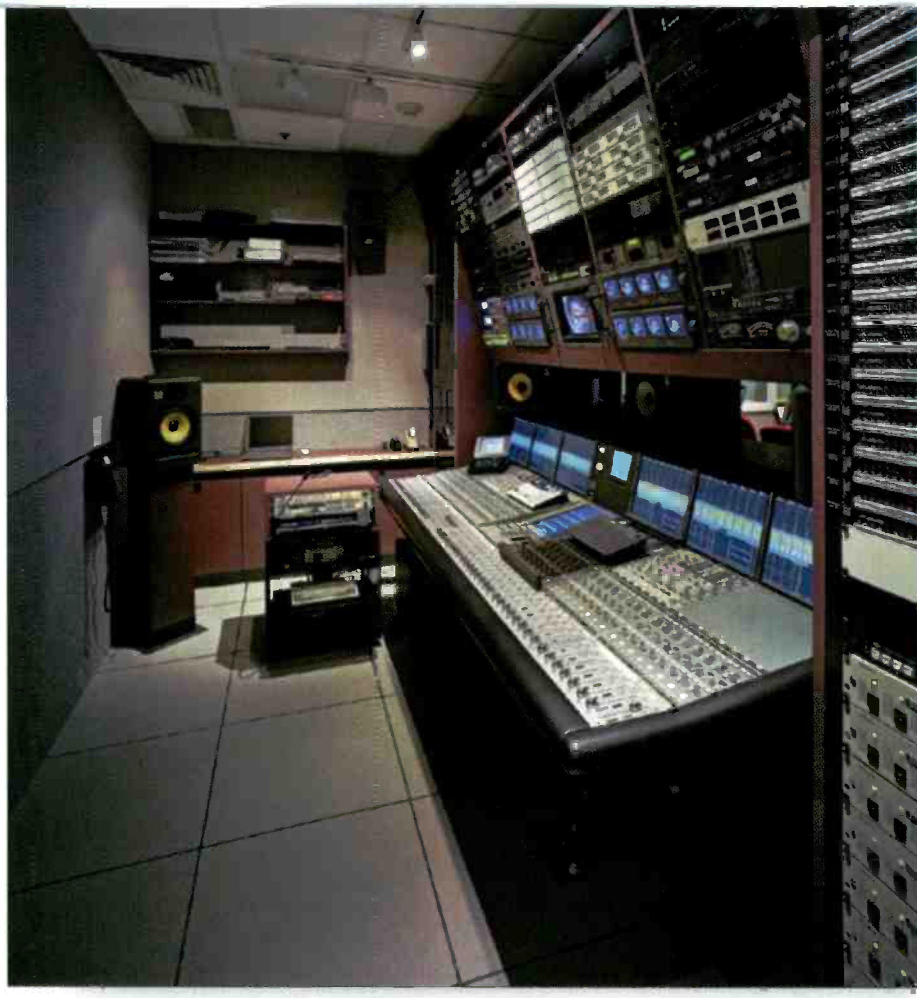
Announce mics are locked into the center channel. In addition, the three spot mics pointing toward the plate from the catcher and baselines are panned as they appear, except that the center mic uses the console's divergence control to place it in "phantom center," feeding signal equally to left and right buses. The audio mixer uses the music, effects and PA sources to create each broadcast's LFE signal.

In a typical production, there may be six different mixes for the various network feeds, including simultaneous 5.1 mixes for HD, international, NBA and MLB feeds, and surround-effects stem, plus stereo for analog TV.

Multichannel replay

Another major audio challenge in any HDTV environment is the replay of 5.1 sources, such as effects, music or even the action replays. The facility uses a 360 Systems' Digicart with Dolby E encode/decode units wrapped around them to allow 5.1 audio through their two-channel interfaces. The facility has upgraded three EVS servers for eight-channel operation and uses them for dual format, simultaneous 5.1 and stereo. Other stereo sources are synthesized to surround either with an outboard device or, more often, in the SSL console.

With the flexibility of its new production facility, Comcast SportsNet is able



An SSL C100 digital broadcast console generates 5.1 surround, stereo and mono mixes for production and distribution to Comcast SportsNet's two stadium locations: the Wachovia Center basketball/hockey arena and Citizens Bank Park baseball stadium.

to produce home games for all three teams from a single live-event-control room. Although the baseball stadium is 6000 feet away, to operators in the new Wachovia Center, it feels like it is located next door. The new facility allows the network to deliver exciting and realistic major sporting events to its viewers, while raising the bar for modern sports production. BE

Bob Ayars is vice president of technical operations for Comcast SportsNet.

Equipment list

- Solid State Logic
  - C100 audio console
  - C-SB stagebox
- Sennheiser
  - MKH416 shotgun mics
  - ME67 mics
- Shure VP88 stereo mics
- Crown PCC 160 mics
- KRK V8 loudspeakers
- Alesis Monitor One loudspeakers
- Telecast Fiber Systems Adder 161 and Adder 8821 interfaces
- Wohler audio monitors
- EVS HD-LSM servers
- 360 Systems Digicart/E rec/rep machines
- Dolby 571, 572 and 569 encode/decoders
- Sony
  - HD-CAM 2000 VTRs
  - Digital audio router
  - Processing and distribution
  - HD cameras
  - MV8000 switcher
- RTS Adam system

Design team

AF Associates:
Graham Bentley
Randy Silverman, lead engineer
Comcast SportsNet:
Bob Ayars, vice president of technical operations
Dave Finocchiaro, assistant director of engineering
Mike Giacalone, lead audio mixer
Dick Miller, director of engineering

The Wachovia Center machine room connects the console with the stagebox at Citizens Bank Park via 5200 feet of redundant single-mode fibers.

Euphonix: Live On Air...

Euphonix System 5 Launches into Space

Going up? The Euphonix System 5 all-digital audio console will be. Broadcasting major shows on Earth like the royal wedding of the century in Spain, the New Zealand Golf Open and the Australian Tennis Open is not enough, Euphonix has a new mission in front of it—outer space.

NASA's Johnson Space Center now has a System 5 audio mixing console. The 64 fader console with 130 channels of processing will be based in the Houston Audio Control Room at JSC to transmit audio between all NASA centers around the country, partner space agencies around the world, the International Space Station orbiting the Earth and the Space Shuttle upon its Return to Flight mission planned for next year.

The console will be used for 24-hour coverage of Space Shuttle missions, press conferences, in-house productions, live media interviews with the Space Shuttle and International Space Station, and live interactive events from Russia and other partner countries. The System 5 will also serve as primary backup equipment to the Space Shuttle Air-to-Ground system during Space Shuttle flights.

Euphonix Max Air Goes Remote with Another PBS Station—Milwaukee Public Television

Euphonix is becoming increasingly popular with public broadcast stations across the nation. The audio manufacturing company has done installs coast to coast for PBS from KCET in Los Angeles, CA to WEDU in Tampa, Florida. Milwaukee Public Television is just the latest. A newly purchased, 48-channel Max Air digital audio console is being installed in Milwaukee Public Television's new high-definition remote unit.

Senior Engineer, Brian McArthur, commented, "We were very impressed by the console's versatility, dependability and power. The console ranked high above the others. Being able to change the channel layout to suit the situation makes this board one of the more flexible mixing desks around. By having a Max Air digital audio console in our new HD truck, our audio engineers can feel comfortable getting through high-pressure situations in a remote environment."

Digital Audio Mixing Products for Broadcast

SYSTEM 5B DIGITAL

System 5-B is Euphonix's top of the line digital audio broadcast mixing system designed for larger installations. System 5-B has 8 knobs per channel, hi-res stereo meters next to each fader and a color TFT screen at the top of each channel showing routing, metering and panning graphs. The system can be expanded with over 300 channels and can be fitted with full dynamic automation for live/post applications.

Max Air

Max Air

Max Air is a compact and cost effective on-air digital audio mixing solution. Max Air has 96 channels, 32 mix busses, 12 aux sends and 24 mix minus/clean feeds plus a dedicated mix minus bus with N-1 feeds from each channel. Each channel strip includes 4 knobs, with a central assignable Superchannel. Max Air has been designed to be fast, easy to learn and use, with a highly intuitive touch screen display for master functions.

Both systems make use of the same rugged routing, DSP and I/O hardware, and both have comprehensive redundancy packages designed for reliable on-air operation. Each console is fully 5.1 surround capable.

Top Rated NBC Affiliate, WTMJ to Broadcast with an All-Digital Euphonix Max Air Audio Console

Wisconsin's television leader, an NBC affiliate which has been broadcasting to viewers for over 55 years, has just recently installed a Euphonix Max Air all-digital audio console. The 96 channel 40 fader console went on-air in August without a hitch.

WTMJ Chief Engineer, Tony Lucas commented, "The Euphonix Max Air offered all the quality and expertise that we were looking for. We are very pleased with our decision."

Euphonix Enters One of Latin America's Most Important TV Markets

It should come as no surprise that the most highly regarded broadcast television channel in the Argentina market, Canal 13 in Buenos Aires, will be installing an all digital audio console. The television station has selected the Euphonix Max Air digital audio mixing console for their studio. The 32-fader console will be used for popular Latin American shows such as *Caiga Quien Caiga*, *Pulsaciones*, *Fútbol de Primera* and *Telenoche Investiga* along with various dramas, game shows and talk shows.

Technical Manager of Canal 13, Eduardo Bayo commented on the decision to purchase Max Air, "The Euphonix Max Air was the most user friendly and flexible console we could find on the market. We were looking for a product to fit our present needs and leave room for future expansions; the Max Air does it all."

Euphonix System 5 at KNBC in Los Angeles—one of five Euphonix consoles on the NBC Burbank lot.

Euphonix Max Air Digital Mixing Console Captures Royal Wedding of the Century

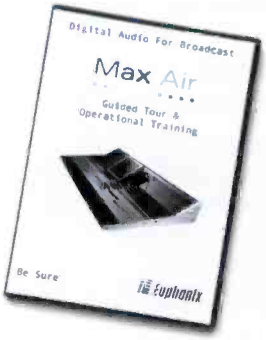
Royals from across Europe gathered in Madrid to celebrate the wedding of Prince Felipe this year. The event was noted as the 'wedding of the century' and TVE was able to capture it all with the help of the Euphonix Max Air digital mixing console.

The audio program feed for the royal wedding was mixed on a 32-fader, 96-channel Max Air broadcast console, supplied by Eumovil. In front of the console were TVE's operators Alfonso M. Arahuetes, Gabriel Solsona and Javier Llorente, who commented afterwards, "The Max Air mixing console worked exceptionally well for this important event. The console has an analogue like control surface and great EQ which we really enjoyed using. Most importantly, it was extremely reliable and easy to learn and use." All three operators began learning how to use the console just a few days prior to the event. The continuous six hours of programming was sucessfully transmitted to an estimated 1.2 billion people worldwide.

Training and Information

Learn More At: www.euphonix.com

Max Air Training & Overview DVD



Check out the latest DVD from Euphonix. The Max Air Tour DVD takes a close look at the Max Air all-digital broadcast console. It includes a 15 minute video guided tour of the Max Air system covering all the main features. Also included is an operational tutorial, which can be used as a hands-on introduction to working with Max Air, as well as a reference for those already familiar with the console.

System 5-B & Max Air Guided Tour Booklets

Two recently published 36 page high resolution pdf documents take an in-depth look at these popular and powerful on-air audio mixing systems. Go to the broadcast section of the Euphonix Web site and then to the Max Air or System 5-B pages.

Max Air Broadcast Tour Heads to Europe

Following two years of demonstrations in over 100 cities in the USA, the Max Air Broadcast Tour crosses the Atlantic for a four month tour of Europe passing through 11 countries in the EU. The European tour will kick off at the IBC convention in Amsterdam.

This specially-commissioned truck is outfitted with a 96-channel Max Air mixing system and is set-up to simulate a local TV station digital audio control room. The truck can come directly to your station so that operators, technicians, and management can get a hands-on demonstration of the Max Air digital audio mixing console.

If your station is located in one of the cities and you would like the Tour to stop by your facility, please contact our Euphonix Europe Administrator, Jenny Langridge, at +44 (0) 20 7267 1226 [jlangridge@euphonix.com] or contact your local Euphonix distributor.

About Euphonix

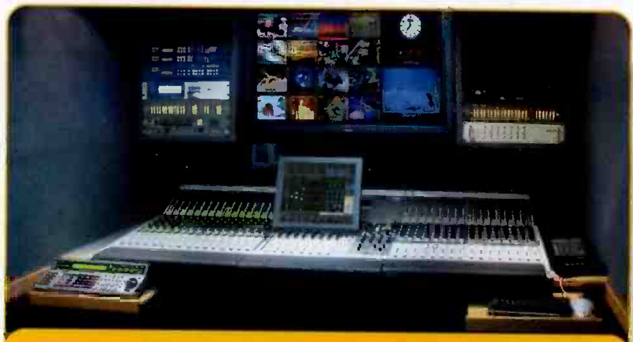
Euphonix is a leading manufacturer of large format digital audio mixing consoles, converters and routers for live broadcast applications. This year Euphonix celebrates 16 years of success and innovation in the professional audio industry. Founded in 1988 in the Silicon Valley, Euphonix has satisfied more large format digital console users worldwide than any other manufacturer.

The Euphonix broadcast product line includes the all-digital System 5-B and System 5-BP mixing consoles, and the powerful new Max Air mixing system designed to make the transition to digital affordable for all stations. Euphonix maintains direct sales and service facilities around the world together with an extensive network of distributors.

With over 150 audio mixing systems installed in on-air TV broadcast facilities, Euphonix has a strong and loyal client base including ABC & Seven Network Australia, Canal + France, CCTV China, CBC Canada, NHK Japan, Television New Zealand, and in the US, NASA, CNN, Harpo (Oprah), Lakewood Church, KCBS, KNBC, National Mobile Television, NBC Network News, NBC (Tonight Show), Paramount Pictures, Telemundo, Tribune Broadcasting, TUTV Puerto Rico, WCPO (ABC), KQED (PBS), and WFLD (Fox).

Euphonix

digital emotion



European Max Air Broadcast Tour Dates

2004 - 2005

The Max Air Tour will be passing through the following countries in Europe:

Netherlands – Euphonix Europe +44 (0) 20 7267 1226

Poland – Polsound +48 (22) 751-84-87

Czech Republic – Mediatronik Professional sro +420 224 310 929

Hungary – Euphonix Europe +44 (0)20 7267 1226

Austria – Euphonix Europe +44 (0)20 7267 1226

Croatia – Euphonix Europe +44 (0)20 7267 1226

Slovenia – AVC group d.o.o +386(0) 1 530 78 70

Italy – Feel Communications +39(0) 49 8701075

France – 44.1, +33 1 4246 0186

Spain – Telco Electronics S.A. +34 91 531 7101

Portugal – Euphonix Europe +44 (0)20 7267 1226

United Kingdom – Euphonix Europe +44 (0)20 7267 1226

Ireland – Euphonix Europe +44 (0)20 7267 1226

Visit the Max Air Tour at the following exhibitions in Europe:

Fri Sep 10 – Wed Sep 15, IBC – Netherlands

Wed Oct 13 – Sat Oct 16, IBTS – Italy

For tour dates and the most up-to-date tour news and international listings, please see our Web site at: www.euphonix.com/tour

Tour Sponsors

The companies listed below have provided audio and video equipment that interfaces with Max Air to help create a realistic state-of-the-art digital broadcast environment.

Main Sponsors:

- ***Miranda – Kaleido-K2 Monitor Wall Processor***
- ***Pioneer – PDP-433CMX 43" plasma display***

Co-Sponsors: ***360 Systems • Clear-Com • DK-Audio America • Dolby Laboratories • Genelec • NVISION • TC Electronic • TerraSonde • Wohler Technologies***

Euphonix Contact Information

Headquarters:

Palo Alto, CA, USA (650) 855-0400

(Pacrim Sales Distribution, Tech Support, Manufacturing, and R&D)

Local Sales & Support Centers:

West USA & S. America - Los Angeles, CA, USA (818) 766-1666

South & Central USA - Nashville, TN, USA (615) 327-2933

North East USA - New York, NY, USA (212) 889-6869

Europe - London, UK +44 (0)20 7267-1226

Japan - Tokyo, Japan +81 (0)3 3288-4423

www.euphonix.com

The snows (and ice) cometh

BY DON MARKLEY

Winter is approaching rapidly, and stations in many states must deal with its perils. That includes wind, snow, ice, freezing rain and cold that makes tower work miserable.

To prepare for this annual onslaught, stations must inspect the tower, paying careful attention to the lighting system and transmission line hardware. Smaller hardware items experience more trouble in cold weather. Ice tends to build, creating higher wind loads, more vibration and higher-than-normal component failure. And repairs to this hardware are likely to cost significantly more during the winter. It takes more time to get the work done, weather delays are more likely, and the hourly rate for climbers may go up. It's far better to get everything fixed during the summer when working conditions are easier.

The presence of ice changes things in a really big way. First, and perhaps least consequential, is that it makes working on the tower virtually impossible. When ladders and tower members become covered with ice, no matter how thin, it is extremely dangerous for tower workers. Problems that occur during those conditions will probably stay unfixed until nature decides otherwise. A second and much more serious problem is simply the weight associated with a heavy ice buildup.

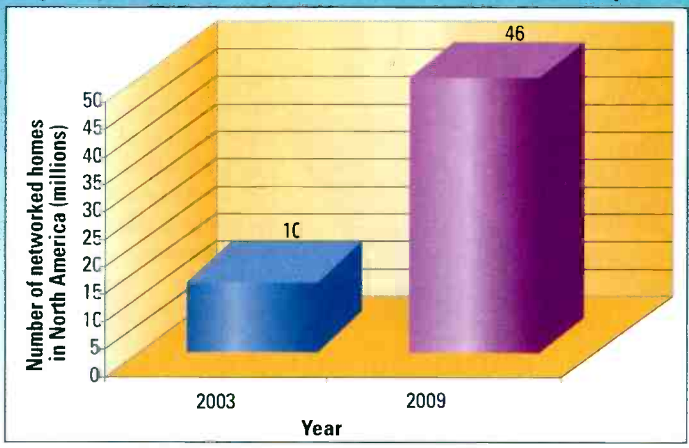
There are areas where significant ice becomes a problem, and those areas aren't necessarily where one would expect. For example, there seems to be a belt across northern Missouri, central Illinois and central Indiana that calls to the ice gods. In 1964, a storm across that belt caused towers to fall, including an 1800-foot stick in Illinois, a 500-foot tower in Champaign, IL, and a 1500-foot tower east of Urbana, IL. The 1800-foot tower fell only due to the weight of ice involved. Pieces of ice more than a foot thick were falling off the tower before the legs simply collapsed. The legs seemed to telescope for about 200 feet near the top before guy wires failed and the tower collapsed. The other two big Illinois towers that fell in that storm came down when the ice built up to a really significant depth and then the winds arrived. In 1977, the same problem repeated in the same area, bringing down several towers including a tall television tower in Decatur, IL.

When dealing with calculations for wind load on towers, stations in some colder areas routinely take ice into account. They assume that either thick ice or wind will occur at any given time. Both usually don't occur at the same time. But when they do, it rains steel. A good tower will stand a lot of ice or a lot of wind. But when a freak storm with both wind and ice hits, it can quickly exceed the tower's design specifications. Look at it this way: When an 80mph wind hits a 2-inch-diameter tower leg, the wind load on the leg is about 18.5 pounds per square foot or 3.1 pounds per foot of element length. Add a 2-inch thick coating of ice and that load increases to 9.3 pounds per foot of element length. This is based on the force being equal to $0.0044 \times V^2 \times 0.67$ pounds per square foot, where the value 0.0044 is an empirically derived constant, V is the velocity of the wind in miles per hour, and the 0.67 term converts the load on a flat surface to

It's far better to get everything fixed during the summer when working conditions are easier.

FRAME GRAB
A look at the consumer side of DTV

North Americans plug in
Big leap in the number of networked homes expected by 2009



SOURCE: Consumer Electronics Association www.ce.org a curved surface. And, before the e-mail starts to arrive, no, the calculation isn't exact, but it's close enough for the point of this article. The tower that was designed to withstand that 80mph wind with no problem now presents a significantly larger surface and has to stand the subsequent load increase.

In the absence of wind, an extreme buildup of ice can simply weigh a tower down to the point that the legs can't possibly support the load. That was the problem with the 1800-foot tower in Illinois in 1964. Also, several years ago, a really freak ice storm loaded two 2000-foot towers at Raleigh, NC. They were first-class towers from Kline that were built to support multiple antennas. That is to say, they were mammoth structures built to strict standards. They survived the ice buildup until the next day. Then, the sun was so inconsiderate that it shone on one side of the towers more than the other. As the ice started melting on the sunny side, the load on the towers became progressively less symmetrical. Finally, the unbalanced load caused a leg to blow out, bringing the tower down like a gut-shot cat. The staff from stations at the first failed tower called the other site and suggested that they might want to leave the immediate area of the tower base. Shortly after everyone was clear, the second tower joined its brother on the ground.

The problem in those failures wasn't wind at all. In fact, those failures all occurred during conditions of little wind. Moreover, they were conditions for which you can't reasonably design. The load conditions were far beyond the terms of any version of RS-222 — they were freaks. Just as one does not normally design for the wind loads involved in tornados, designs don't normally plan on ice thickness of a foot or more.

The last problem that ice presents is that ice falling all by itself, unaccompanied by the tower, can pose a danger to people and property. Falling ice is always one of the points raised in zoning battles concerning towers. The persons who bring up the point about falling ice usually support their argument with an article from a 1936 copy of *Mechanics Illustrated* or some other high-level text.

Several years ago, a careful study of falling ice was made for a zoning hearing in Iowa. It determined several things that seem to be well supported by discussions with operators of several high towers. First, the really heavy stuff will almost always fall within the inner guy points. Second, falling ice reaches its terminal velocity after about 100 feet. The horizontal distance the ice travels away from

the tower depends on a number of things, including the geometry of the piece of ice and the wind speed. Thin ice sheets can sail out beyond the guy points. But the mass of such ice is so slight that it poses little or no danger to persons or property.

So, what can the station do to protect itself. Stations have done lots of neat things to shield buildings, transmission lines, etc. from the force of falling ice. An excellent protective device is a heavy grade of expanded metal grating supported by a frame over the transmitter building, outside heat exchangers or air handlers, etc. This works great but it is expensive.

A less expensive technique involves covering a flat roof with concrete pavers. You can purchase the pavers at discount home-supply stores and easily replace them if and when they break. This gives the building some material to sacrifice to the energy of the falling ice. When the ice hits the blocks, the force is spread out over a relatively large area of the roof. The force may well shatter the paver, but the cost of the repair is minor and the waterproof part of the roof is undamaged. This same concept applies to thick rubber slabs. You don't need to replace rubber slabs as often, but they are considerably more expensive.

Your author has seen stations that have constructed a steel frame over the entire building and covered the frame with a layer of used railroad ties. The ties are relatively inexpensive, they last a long time and they protect the building well. The only two drawbacks are the cost of a strong steel frame to support the heavy ties and the fact that the ties are butt ugly.

But you need to protect not only the building but any microwave dishes on the tower as well. You can protect these with ice guards. The facility should also have a protected parking area for staff cars. It's terribly hard to keep staff when they periodically find that a portion of their car roof, holding enough ice for a summer picnic, has collapsed into their front seat.

So, for falling ice, avoid costly damages by using protective structures to deflect the ice or absorb the energy. It will also help to keep the local idiots off the site when ice chunks – with or without steel in them – are falling. For massive ice buildups or for extremely heavy ice accompanied by very high wind, get a really good insurance policy. **BE**

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

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

Facilities like those at ESPN and Turner Entertainment employ HD infrastructures and offer HD production values similar to those restricted to SD producers just a year or two ago. Photo by Andy Washnik, courtesy Thomson Grass Valley.

HD systems

BY JOHN LUFF

Broadcasters have been infatuated with HDTV since the '70s. In 1987, they asked the FCC to carve out spectrum for HDTV. But, back then, practical hardware just did not exist. Nevertheless, SMPTE slowly and methodically plugged away at creating standards that would eventually allow manufacturers to create compatible, interconnectible systems. By the time the FCC created its Advisory Committee (ACATS), SMPTE had published key scanning and hardware-interconnect standards. But implementation was elusive. And, even just a few years ago, HDTV production and broadcast systems were exotic and expensive. Cameras and lenses cost upwards of $250,000, and an hour of videotape cost the equivalent of several house payments.

How far we have come since then. This year, Sony introduced an industrial camera for less than the cost of many electronic field production (EFP) lenses. JVC is offering HD camcorders for consumer applications. Other camera manufacturers are sure to follow this lead. HDTV broadcasts are widely available and often compelling. Facilities like those at ESPN and Turner Entertainment offer no-holds-barred production and transmission in HD, with production values similar to those available to producers in standard definition just a year or two ago.

Catalysts for change

Several catalysts prodded the change. A handful of manufacturers deserve significant credit for their dogged

pursuit of the market. In 1981, Ikegami showed the first HD camera at an NHK presentation during a SMPTE winter Television Conference in San Francisco. At that conference, HDTV production was a technological oddity. Twenty years later, the tools have matured and made video recording of motion picture production not only possible but highly desirable.

While manufacturers have done a wonderful job of creating the tools of the new industry, the members of the production community who faithfully pursued the Holy Grail may deserve the most credit. In the early years, they demonstrated creative use of a rough and immature technology. The productions they created made viewers lust for the depth and clarity of the images they produced, despite severe limitations of the early hardware. Francis Ford Coppola, George Lucas and other high-profile directors worked their craft at financial peril, when editing rooms were barely capable of dissolves and DVE was only a wistful wish.

The FCC also deserves credit for nudging, cajoling and finally mandating fundamental change. It is true that, in 1987, more than 50 broadcast entities initiated the first push for HDTV by requesting spectrum for it. But it was not until the FCC finally granted their wish nearly a decade later that broadcasters began to realize the unprecedented and fundamental change it would bring to television. Behind the scenes in the FCC, the ATSC took action. Despite all the flack the committee has taken for 8-VSB, the arrival of the fifth-generation set-top boxes now seems to have vindicated its belief that HDTV can work.

Making it work

But, for any technology to work, there must be a fundamentally simple and affordable approach to systemization, and HDTV is no exception. SMPTE and ATSC have provided the hardware and software interoperability to make DTV — and especially HDTV — work in the real world. SMPTE 292M-1998 defines the serial digital interconnection that applies universally for all HDTV standards. As one might expect, due to HDTV's high bit rate of 1.485 Gb/s, 292M is usable on copper only to about 100 meters, though the standard also established an optical interface that should be usable more than two kilometers.

> **For any technology to work, there must be a fundamentally simple and affordable approach to systemization.**

Table 1 shows the SMPTE standards and the HDTV formats they define. The table contains a data-rate divisor that may substantially complicate HDTV implementation. All of the standards establish scanning and interconnection for both 60Hz and 59.94Hz. Conveniently, or inconveniently, they are related by the divisor 1.001. If both rates coexist in the production and transmission worlds, that 0.1 percent difference in frame and line rates has pernicious effects on systemization. For example, a production might incorporate 720p cameras at both rates, since pixel counts in the image format are the same. But the time domains don't match, so one of the signals must be converted — much like standards conversion — before the two signals can be combined.

Thus, in SMPTE's early internal-committee discussions, especially in a committee called the Working Party on Advanced Television Production, members strongly recommended that all HDTV signals be generated using a clock locked to the NTSC subcarrier. This helps upconvert 525-line signals for HDTV productions, and helps downconvert HDTV material for NTSC systems. Neglecting this would result in two signals deviating in time by an amount that is precisely the same as drop-frame time code (108 frames per hour; refer to SMPTE 12M section 4.2.2). Clearly, this is not just a frame-sync issue.

Source format parameters													
Reference SMPTE standard	260M		295M	274M								296M	
Format	A	B	C	D	E	F	G	H	I	J	K	L	M
Lines per frame	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	750	750
Words per active line (each channel Y CB/CR)	1920	1920	1920	1920	1920	1920	1920	1920	1920	1920	1920	1280	1280
Total active lines	1035	1035	1080	1080	1080	1080	1080	1080	1080	1080	1080	720	720
Words per total line (each channel Y CB/CR)	2200	2200	2376	2200	2200	2640	2200	2200	2640	2750	2750	1650	1650
Frame rate (Hz)	30	30/M	25	30	30/M	25	30	30/M	25	24	24/M	60	60/M
Fields per frame	2	2	2	2	2	2	1	1	1	1	1	1	1
Data rate divisor	1	M	1	1	M	1	1	M	1	1	M	1	M

Table 1. SMPTE standards and the HDTV formats they define

SOLUTIONS YOU CAN TRUST

Whether it's a transmitter, translator, antenna or complete RF system, you can count on DMT USA to provide solutions tailored to your needs. Our broad range of products, customer care philosophy and professional staff give clients the options to make educated decisions.

BROADCAST
Analog and Digital TV Transmitters
Analog and Digital TV Translators
DAB Transmitters
FM Transmitters
STL Systems
Broadcast Antennas
Remote Monitoring Systems
Passive Components

SYSTEM INTEGRATION
Develop
Design
Install
Train
Support
Third Party and OEM Products
Turnkey Projects

AUTOMATION
Integrated Supervisory Systems
Multi standard Playout Systems

TELECOMMUNICATIONS
Microwave Links
Radio Base Systems

SPECIAL PROJECTS
Military RF Applications
Scientific Applications

DMT USA

1224 Forest Parkway, Unit 140
West Deptford, NJ 08066
+856.423.0010 tel, +856.432.7002 fax
sales@dmtonline.us, www.dmtonline.us

subsidiary of the DMT GROUP

Of formats and bit budgets

Everyone knows that modern HD is generally produced in one of two formats: 1080i30 or 720p60. The debate over which one is better may be as irrelevant as the debate over how many angels can dance on the head of a pin. The truth is that neither format is clearly superior in all respects. The 720p60 format has 88.9 percent as many active pixels per second as 1080i30. You can say that 720p60 puts more energy into accurately displaying temporal samples (twice the number of frames per second), while 1080i30 has more static spatial resolution. The most specious contention in this debate is that consumer monitors cannot yet display all 1920x1080 pixels. This may be true, but it also may be irrelevant. The fact is that MPEG-2 satellite broadcasts (and most terrestrial broadcasts) throw away detail that viewers cannot perceive, and they replicate temporal sampling using motion-estimation techniques. H.264 and WM9 may, at equivalent data rates, significantly improve the decoded picture quality. But broadcasters will almost certainly use the extra bit budget to gain coding efficiency to decrease the bits per pixel instead of

H.264 and WM9 may significantly improve decoded picture quality.

raising picture quality. In our industry, digital has allowed increased capacity, and that is what programmers are asking of technology. Make no mistake; quality goes up as coding becomes better. But the drive to reduce bit rates will win over increased quality for the same cost.

Aspect ratio issues

HDTV is much more than esoteric numbers. It's about wider aspect ratio, better sound quality, improved color accuracy and wider gamut. The most obvious of these improvements is probably the wider aspect ratio. Here also, technology must deal with a world in transition. Nearly all legacy material coming from 525 and 625 production continues to retain the 4:3 (1.33:1) aspect ratio that evolved in the transition from film to electronic production. The 16:9 (1.77:1) ratio is a better match to modern film than 1.33:1. But, with filmmakers shooting in aspect ratios as high as 2.35:1, HDTV can only claim to be a more modern match to today's film productions. Remember that, about a decade and a half ago, SMPTE debated 16:9 production. The result was an extra standard-definition format and data rate that was intended to

increase the quality of recorded and transmitted pictures. SMPTE 259M includes both 270Mb/s and 360Mb/s data rates. The intent was that 360Mb/s using 18MHz sampling would permit widescreen production with the same quality as the 270Mb/s rate using the13.5MHz sampling with which we have grown quite comfortable. But, after some real-world tests using images captured both ways, the industry decided that the difference in quality was not worth the resulting complication. Keep in mind that, back then, memory costs were higher, processors slower, and the cost of digital recorders much higher. We can only wonder what would happen if the same consideration took place today.

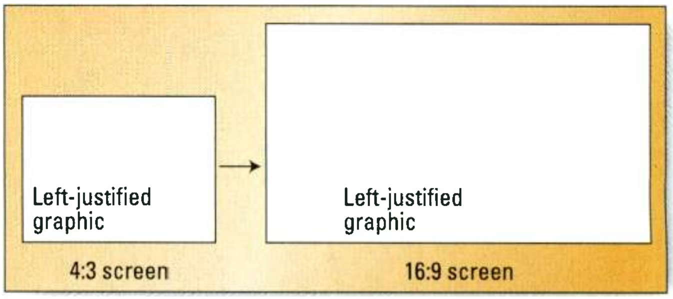


Figure 1. When a left-justified graphic created for a 4:3 image is displayed on a 16:9 screen with side panels, it appears near the middle of the picture.

In any case, the result of that decision is that, for standard-definition imagery, the aspect ratio issue remains in the optical domain. Equipment compliant with SMPTE 259M optically (anamorphically) converts 16:9 images to work in 720 horizontal samples. Here, hardware that is aspect ratio-aware (production switchers, DVEs, graphics processors) process the images. Finally, the display equipment converts the images back to 16:9. Fortunately, HDTV has been designed exclusively to be a widescreen environment. The images are native widescreen throughout processing and distribution. Only at the boundaries where legacy material is incorporated into or cut from an HDTV image do we face the inevitable technical and production issues. Formatting graphics often presents the most thorny problems. For example, a left-justified graphic created for a 4:3 image, when displayed on a 16:9 screen with side panels, appears near the middle of the picture (see Figure 1). And a lower-third graphic created for a 4:3 image, if displayed with the left and right sides justified to the edges of the frame, disappears on a 16:9 screen.

One solution in dual-format productions is to mix graphics after reformatting for display. Productions created in 16:9 HDTV might have a "center cut" drawn out and then graphics overlaid.

UTAH-400

It Just Keeps Getting Better ...and Better

The UTAH-400 High-Density Digital Routing Switcher, already the world's most advanced switcher, now offers even more:

Automatic crosspoint redundancy in all matrix sizes
The UTAH-400 allows you to protect your critical signal paths against interruption with *AUTOMATIC* internal redundancy.

Three Frame Sizes -- 64x64, 144x144, and 288x288
You can use the UTAH-400 for any digital router application from the smallest utility router to the largest central matrix.

In any size, all UTAH-400 systems offer the same set of world-class features -- and the industry's lowest prices:

- Full time Input / Output Signal Monitoring
- Reduced Power Consumption and Rack Space Requirements
- SD/HD Compatibility

US UTAH SCIENTIFIC

New Directions in Digital Switching

4750 Wiley Post Way, Suite 150, Salt Lake City, UT 84116 USA
Ph: 801.575.8801 • Fax: 801.537.3099 • Email: sales@utahscientific.com

This type of production will likely continue for years, perhaps decades, so we will just have to get used to either formatting graphics that are pleasing in both displays (not likely), or spend the capital to switch and mix twice. One might envision a future video switcher designed to handle exactly this problem by sending crosspoint outputs to two mixers, one or both of which contain aspect ratio converters and separate keyers to handle the two formats.

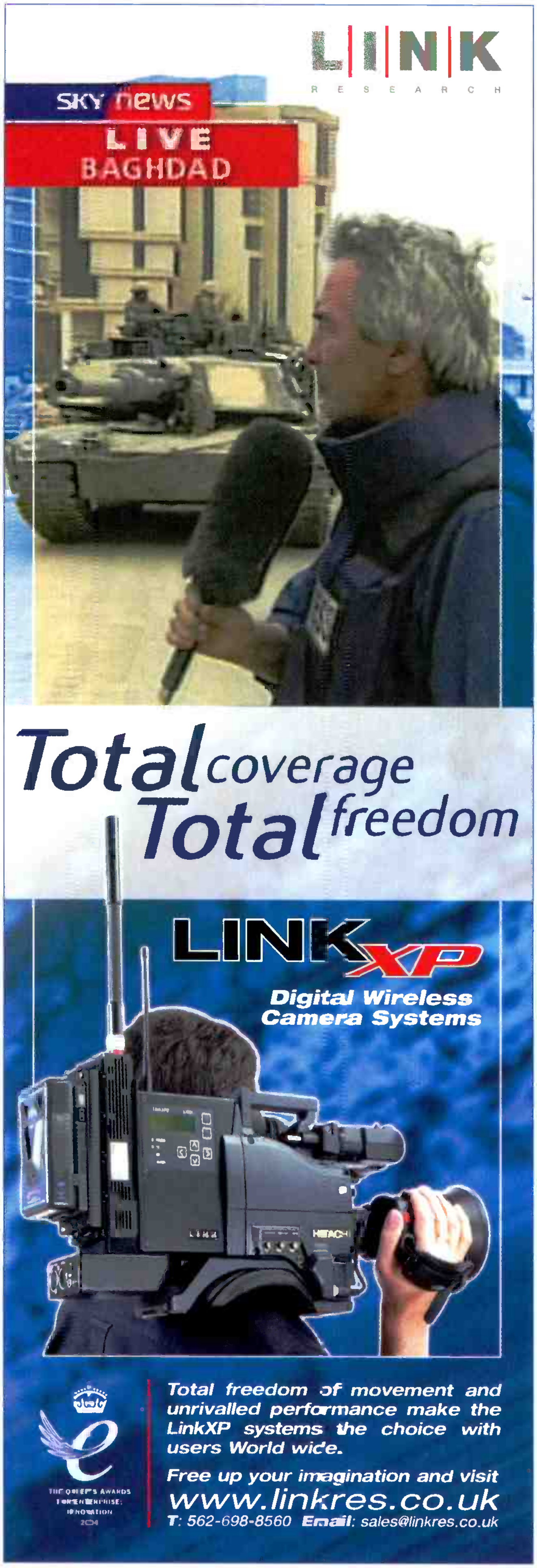
Cover the gamut

Gamut and color primaries are system issues only at the interface points. Like aspect ratio, color standards for HDTV were designed to be consistent worldwide (well, almost anyway) at the time the standards were established. Image processors, like upconverters and downconverters, usually can convert between the different color spaces, in addition to performing spatial and temporal conversions. (For a detailed explanation of these issues, see Poynton, "Technical Introduction to Digital Video" and "Digital Video and HDTV; Algorithms and Interfaces.")

Audio issues

As for audio, HDTV does not always involve surround sound, although many people assume that it does. A surprising number of homes are equipped with surround-sound equipment. Dolby estimates that, by the end of 2001, over nine million U.S. households had surround-sound receivers. The company says that, worldwide, over 100 million households are equipped with Dolby Pro Logic II and Dolby Surround decoders. That does not necessarily mean that these households have full surround-sound speaker setups. Nor does it mean that television receivers, or even DVD players, were connected to them. Nonetheless, this number constitutes a significant portion of the market. Jupiter Research found that 24 percent of U.S. online households now have digital surround-sound systems. The research firm says that extremely low-priced home-theater-in-a-box systems have expanded the market and made surround-sound systems broadly affordable (although not necessarily profitable for manufacturers). As a result,

Twenty-four percent of U.S. online households now have digital surround-sound systems.



many program producers have opted to provide full 5.1-channel surround service.

This home market penetration has had a dramatic effect on audio systems in production and broadcast plants. The most obvious effect is the need to establish calibrated 5.1-channel monitoring for quality control and mixing for air. Dolby offers white papers to guide and assist designers in planning the mixing environment and is happy to support implementation as well (because that sells hardware and increases the penetration of licensed decoders). Discrete 5.1-channel sound can be easily transported on three AES pairs (one pair, if AC-3 encoded). Keep in mind that anything you do to one channel you must also do to all channels because of material that overlaps single channels. A minor time misalignment can produce some pretty strange effects. Network distribution to your station might arrive on three AES pairs, requiring switching and mixing on all three. Keeping channel assignments straight and aligned is critical. Mixing in master control is not difficult if the hardware is designed to do six channels for every input. There is, however, the dreaded metadata question.

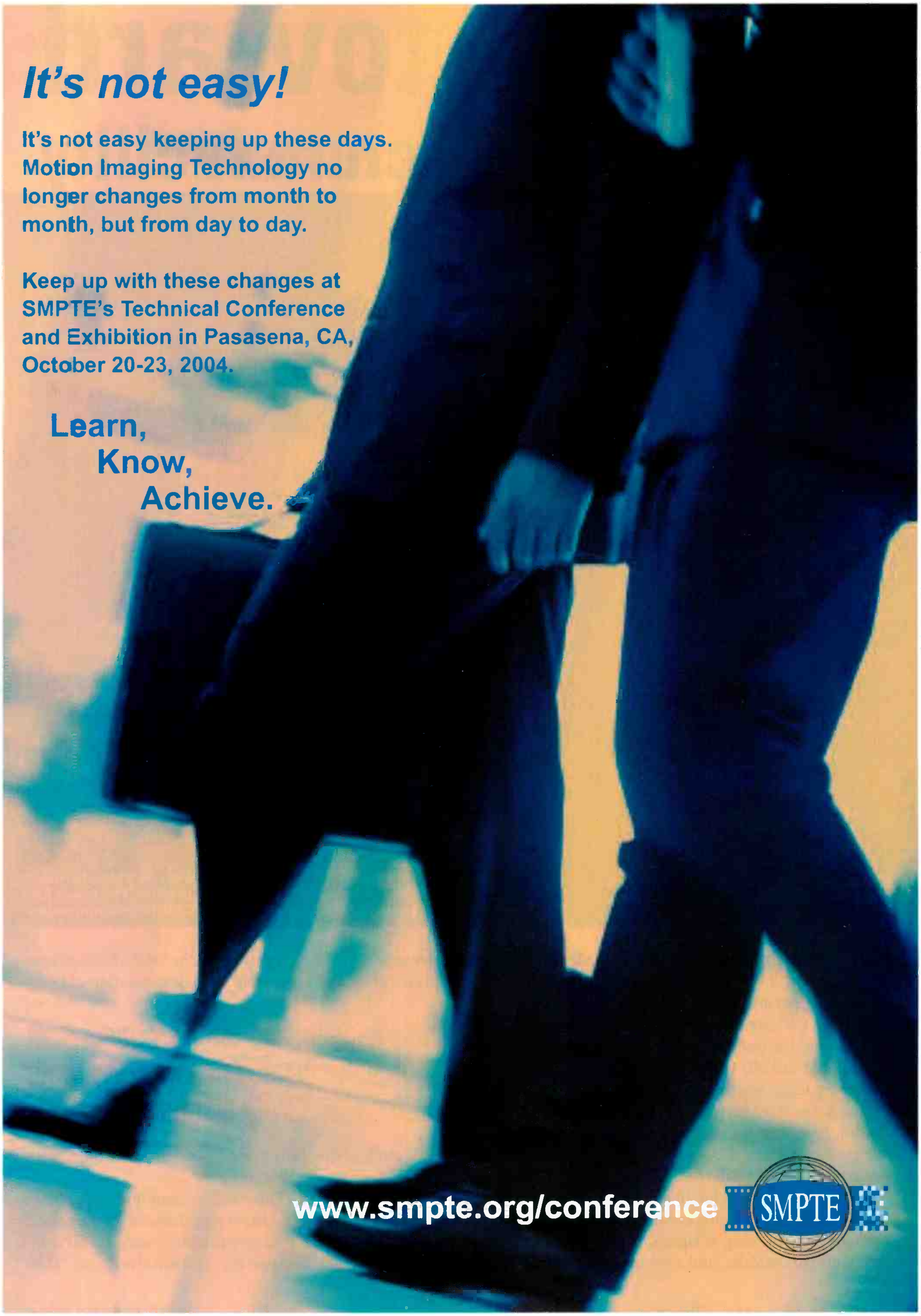
Dolby AC-3, established by the ATSC as the format for DTV audio, carries several chunks of metadata that allow the home receiver to reproduce the sound as the producer and mixer intended. This metadata can be carried with the audio in the AC-3 stream, and on some VTRs as well. The proper handling of AC-3 is a subject beyond the scope of this article. Dolby offers excellent white papers on mixing and metadata and other surround sound issues on its Web site (www.Dolby.com/tech/).

Another way to transport multichannel audio is to use Dolby E. It permits up to eight channels of good quality audio, along with metadata, in one AES carrier. But encoding or decoding Dolby E is a (precisely) one-frame process. This can require some careful mapping of the video and audio processing to maintain lip sync along the way. At least two master control switchers now contain an internal Dolby E decoder, which is particularly useful for networks that deliver Dolby E to the station. The lip-sync question has the greatest potential to confound an otherwise successful implementation plan.

The good news

The good news for broadcasters is that a rudimentary knowledge of 525-line digital video systems will go a long way to help them understand HDTV system implementation. The tools are remarkably similar. Surround audio is a bit more mysterious. But, with some care, it can be understood easily. The best advice to those implementing HDTV in a station or elsewhere is to read extensively, invite experts to your facility to educate you, and use common sense. HDTV is still composed of pictures and sound — it's just a whole lot better. BE

John Luff is senior vice president of business development at AZCAR.


It's not easy!
It's not easy keeping up these days. Motion Imaging Technology no longer changes from month to month, but from day to day.
Keep up with these changes at SMPTE's Technical Conference and Exhibition in Pasasena, CA, October 20-23, 2004.
Learn,
Know,
Achieve.
www.smpte.org/conference
SMPTE

Moving toward a dual-infrastructure facility

By Stan Moote, Steve Sulte, Todd Roth and Nabil Kanaan

Station WJLA-TV uses two compressed video formats: DV25 for editing and MPEG-2 for playout. The News Edit Suite shown here uses native DVCPRO25 compression.

In today's multiple-stream transmission environment, broadcast designers and system integrators must find the best way to integrate the processing, distribution and transmission of SD and HD content.

In preparing for this integration, broadcasters must first consider bandwidth. Baseband transmission to the home isn't practical because of the storage and bandwidth requirements. Fortunately, today's technology allows broadcasters to handle broadcast-quality programming at significantly reduced bandwidths, and compression can be visually lossless.

But, as the HD rollout continues, stations will discover that quality is the critical issue — to both viewer and advertiser. With a more visually educated audience, the assumption that the average viewer cannot tell one compression scheme from another may no longer be valid. Artifacts happen, and the new generation of home monitors can display them with alarming precision.

Artifacts happen, and the new generation of home monitors can display them with alarming precision.

These factors combine to challenge engineers to handle compressed streams in an environment that is intrinsically baseband-oriented. How

can broadcasters maintain SD and HD quality through multiple encode/decode cycles along the signal path? And how can a facility do so in the most economic manner, i.e., without adding staff and operational complexity?

Rather than integrating baseband and compressed signals, perhaps broadcasters should consider creating two types of infrastructures: one for each of these signal types. The chief engineer's task is then to strengthen each processing path and build the necessary bridges between the two.

Coping with quality issues

Meeting the bandwidth mandate without delivering the associated quality would be pointless. So, as the use of compressed content has increased, the chief engineer has become both a bandwidth manager and a quality-of-service (QoS) manager.

Facilities that are migrating to an integrated SD/HD environment are either upconverting some or all of their programming, or are purchasing (or originating) HD content, or receiving it from the parent network.

Within each group, the methods of receiving SD and HD content run the gamut from analog to digital to compressed — with compressed taking the forefront. At some point, content reaches uniformity, allowing local switching and insertion. Currently, that uniformity is baseband. The entire content path (from compressed network transmission to local decompression, production, re-encoding and retransmission) presents multiple cycles of encoding and decoding, which have a detrimental effect on image quality.

Facilities today (and for the foreseeable future) need to ingest and support content in multiple formats. If iterative encode/decode cycles are required, consistent codec behavior throughout a facility's infrastructure can lessen any degradation. But the best approach to eliminating the quality loss from these iterative encode/decode is to avoid them altogether. And the right workflow can preclude them.

The uncompressed workflow, centered on the tools for live production, is still a necessity, .

The second workflow is clearly a compressed one. There is a general impression that ASI streams (and the programs within) are untouchable and that, once they've been created, you can't do anything with them — except point them to the transmitter. Not true. Provided that you recognize some caveats, remarkable new technologies enable a facility to work within the compressed domain, which offers great advantages in terms of quality and economy for both HD and SD content.

Inside the compressed workflow

Figure 1 compares compressed and uncompressed workflows, showing the equipment and processes associated with each. Until recently, the only feasible way to mix and switch has been in the baseband domain using traditional tools such as routers, master control switchers, DVEs, logo inserters, etc. Unfortunately, when a facility moves content in and out of the compressed domain (for example, for spot insertion and branding), the process can degrade the signals and introduce artifacts and noise.

By using a compressed workflow, a facility can keep content in compressed form from ingest to output and maintain image quality. In a multicast environment, this idea has great appeal, particularly when only a few local processes are required. Compressed workflow can help a facility manage its bandwidth to a much higher degree (perhaps to the point where the facility could launch new channels or services).

Functions offered by new compressed workflow tools include the ability to open ASI streams and perform image manipulation entirely in the compressed domain without decoding and re-encoding. This means that, with both HD and SD formats, users can switch streams, insert logos and crawls, and display emergency alerts. Several manufacturers also offer servers that can ingest and play out in the ASI domain, while some provide more sophisticated mux, trim and remux functionality. Together, these processing and server tools provide a powerful compressed backbone. The savings in equipment, operational complexity and multiple decode/encode passes can be significant.

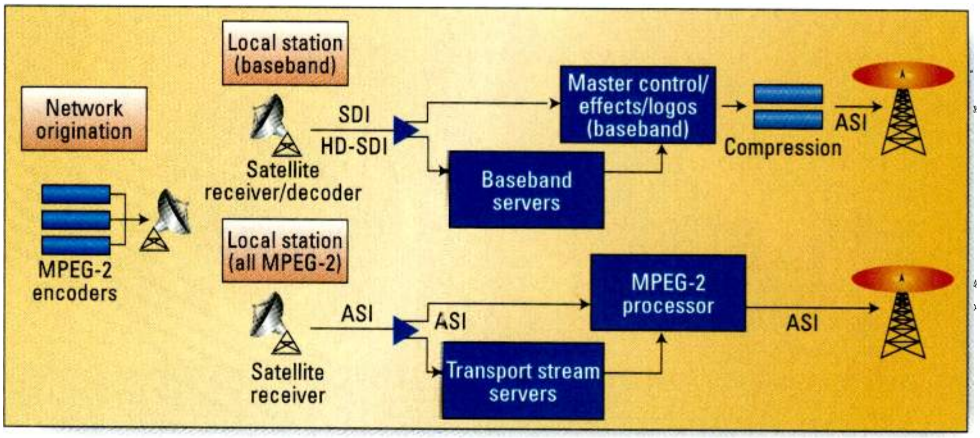


Figure 1. This block diagram shows the equipment and processes required for compressed and uncompressed workflows.

When considering a compressed workflow, there are two important caveats:

1. As a prerequisite, the MPEG-2 processing equipment requires emission-level coding formats such as MPEG 4:2:0 encoded video and Dolby AC-3 encoded audio. There are now several devices on the market that provide this type of processing functionality. If your facility has 4:2:2

encoded video, MPEG Layer 2-encoded audio or Dolby E-encoded audio, then baseband transcoding is the way to go.

2. If the production requires voice-overs that mix new and/or existing audio, or if it requires over-the-shoulder effects, baseband is the correct path.

Caveats aside, facilities can open new opportunities to preserve quality across the transmission path and reduce the amount of equipment required by organizing the processes according to compressed and uncompressed requirements and then adapting to the trade-offs,

WJLA-TV relies on 12 Leitch NewsFlash II NLEs.

Infrastructure metrics

Linking the compressed and uncompressed infrastructures together through a signal environment comprising shared storage, metadata and format conversion can optimize the interoperability of the two cores. This linked environment benefits the distribution and management of SD and HD content.

When considering this kind of environment, keep in mind three fundamental metrics: storage, metadata and codecs. Attention to these areas will lay the foundation for current technologies and future developments.

Storage — Determining storage requirements is an exercise in bandwidth and capacity management, with many points to consider:

- Ensure that the facility's storage fabric supports the maximum simultaneous bandwidth requirement, and that it can store an appropriate amount of online content. This metric is complicated by multiple compression standards and formats, including HD and proxy quality.
- Consider ASI as a storage fabric component, requiring the same real-time QoS as baseband.
- Reserve an appropriate amount of bandwidth for non-real-time activities such as IP-based file interchange.
- Consider multiple compressed formats used for different purposes within the same storage (e.g., DVC25 for news editing and MPEG-2 for transmission).
- Ensure that there is a method to track and catalog assets. This ties in directly with the next metric.

Metadata — Now is the time to consider using metadata on a facilitywide scale. The facility must identify content (SD, HD and compressed) at ingest and normalize it across the entire organization. By bringing those threads together under a common metadata umbrella through the use of unique material identifiers (UMIDs), facilities can realize new cataloging, searching and reporting functions. Yes, this represents a lot of up-front work, but understanding the metadata workflow is a prerequisite to managing assets successfully. Some newer MPEG-2 processing devices actually require a set level of metadata to properly identify and manipulate the program streams.

Codecs — Instead of second-guessing the industry in terms of what compression standard or video format will dominate, consider migrating toward an infrastructure that is codec-aware. The graphics community has worked in such an environment for years using programs that easily convert files between the various formats. Why not incorporate that same flexibility into your facility's video infrastructure? If an architecture supports plug-in codec capability, users can handle anything that arrives at the ingest port. Within the industry, there is movement in this direction. And if Moore's law has anything to do with it, the required processing speed will be there.

Equipment decision points

To gain the advantages of a compressed infrastructure, consider using several categories of equipment that operate in parallel, each with value-added support potential for compressed content.

HDTV

Time for an update...

HA22x7.2ESM

HA26x6.7ESM

HA26x only

NO ONE DELIVERS MORE CHOICES THAN FUJINON!

- Digital control system
- Focus breathing compensation
- *Advanced backfocus
- *Focus fader
- "FIND" diagnostics system
- New EBC coatings
- One shot preset
- RS-485 compatible

FUJINON

Broadcast and Communications Products Division

FUJINON INC. 10 High Point Dr., Wayne, NJ 07470-7434 Phone: (973) 633-5600, FAX: (973) 633-5216
FUJI PHOTO OPTICAL CO., LTD. 1-324 Uetake, Kita-Ku, Saitama City, Saitama 331-9624 Japan Phone: 81-48-668-2152

www.fujinon.com

Routers — Consider a scalable router with a modular architecture in which ASI signals can work side-by-side with standard SDI and baseband signals. This is a cost-effective way to route multiple program streams on single crosspoints.

Servers — Consider a server architecture that enables the facility to store content in the same compressed format in which it will be transmitted. Ensure that the architecture supports distributed storage and simultaneous access from multiple devices. As the compressed workflow increases in scope, more peripherals will be requesting ASI or file-oriented content.

Master control — Consider a master control switcher that can function as a program manager for multiformat routing switcher ports (HD, SD and ASI). Moving to a modular architecture would be ideal and economical, where all of the input processing is offloaded to the upstream switching fabric. The industry is moving in this direction and, here again, metadata will play a vital role. With this kind of sophistication, content and data awareness, automation can properly orchestrate master control functions.

WJLA-TV uses 26 channels of DV25 for news editing and more than 16 channels of MPEG-2 for playout. Shown is a Leitch SAN architecture storage system.

Editing — For both news and production, consider editing in the same format in which the material is ingested. Remaining in the native acquisition format avoids additional decode/encode passes prior to transmission. To minimize artifacts, a facility that ingests in DV should avoid editing in MPEG.

Following the trends

Several industry trends underscore the need to recognize the importance of the compressed workflow.

Networks are now providing member stations with multiple SD and HD programs in ASI format. The affiliates have a choice: convert to baseband and risk adding artifacts, perform a pass-through in the compressed domain without branding, or use MPEG-2 processing devices for real-time manipulation within the ASI stream.

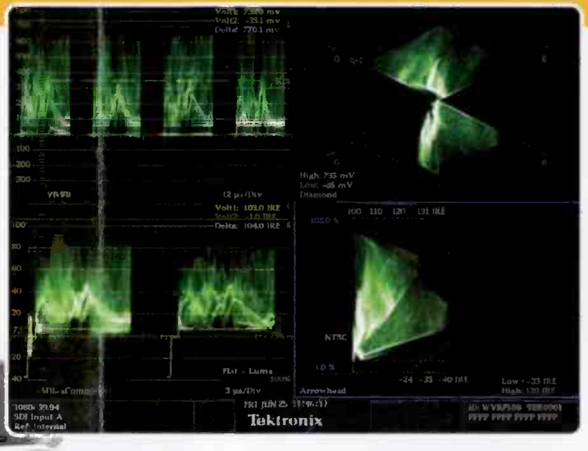
Program assembly is occurring later in the transmission chain, even to the point where intelligent set-top boxes are compiling the final user experience. These new STBs enable a more personalized experience that includes the program's soundtrack, commercials based on demographics, extended data services, selectable camera angles and storage. Compression and multistream delivery make this environment possible.

This is where the technology is going, and there's no viable argument for a comparable scheme in baseband. Thus, the driving force behind a move to strengthen a facility's compressed infrastructure is not simply economic, and not exclusively to comply with an integrated SD/HD mandate. Facilities that follow this path can realize tangible quality benefits and will be positioned for technology's next advance. BE

Stan Moote, Steve Sulte and Todd Roth lead Leitch's CTO group. Nabil Kanaan is a product manager at Leitch.

▲ Broadcast monitoring with video, audio, picture and gamut displays.

Now Monitoring HD, SD or Composite Analog Signals Couldn't Be Any Easier, Any Faster and Anything Other Than From Tektronix.



▲ Ensure gamut compliance of RGB and composite signals with Tektronix Diamond and Arrowhead displays.

▲ Displays of video and audio with sessions screen provide quick signal monitoring of the signal.

With a touch of a button, you can now see instantly if your video content meets industry specifications. Thanks to its intuitive user interface and true digital architecture, the WVR7000 Series provides you with the ease, accuracy and stability to make you feel confident about any of your monitoring applications.

These all-digital instruments eliminate worry about calibration drifting in ambient temperature over time. Which means consistent measurement results time after time, year after year.

For more than 56 years, the Tektronix faceplate has been synonymous with high-performance and ease-of-use capabilities.

Maximize application flexibility with Tek's FlexVu™ technology

With the FlexVu display, you can choose from a number of displays to speed and simplify your monitoring and measurement tasks. Configure the WVR7100 to display waveform, vector, gamut, picture, alarm screens, error log, audio signal levels and lisajour–in four difference tiles.

Because the analog-like appearance of the rasterized trace appears so crisp and sharp, you will think you're looking at an analog CRT.

The WVR7000 Series: No other 1RU rasterizer offers HD and SD passive loopthrough inputs.

Pick an application, any application. With support for 2 passive loopthrough, autodetect SD and HD SDI video inputs, the highly-reliable, the WVR7000 Series helps you measure what needs to be measured.

What's more, you install the WVR7100 in your signal path so the signal that you're monitoring is the actual signal being transmitted, not a sample from a test point. No need to worry about power loss; the signal is passed through intact.

World-class support from the true leader in video production and broadcasting means complete confidence in your facility's instruments.

Of course, you'll find flexible purchase or lease options. The same can be said for service options that meet your technical and budgetary requirements.

Reply today for more information about the premiere name in production and broadcasting, and we'll send you "A guide to Standard and High-Definition Digital Video Measurements," filled with useful reference standards and troubleshooting tips.

ACT NOW IN ONE OF THREE FLEXIBLE WAYS to get your "A guide to Standard and High-Definition Digital Video Measurements." For quickest delivery, just visit the web address indicated above the reply card, Otherwise, return the attached reply card or call toll-free 1-800-426-2200, press 1 (request code 2007)

YES!

Tektronix®
Enabling Innovation

Please send me "A guide to Standard and High-Definition Digital Video Measurements."

For fastest delivery and instant downloads, visit us online at the address below, call the toll-free number or return the pre-paid reply card.

- ☐ Send me the Product data sheet for the WVR7000
- ☐ Send me the FREE application note "A guide to Standard and High-Definition Digital Video Measurements."

Also send me information on:

- ☐ WFMNLE software only Waveform Monitor
- ☐ WFM700 Series Waveform Monitors
- ☐ WVR600 Series Waveform Rasterizers

Which answer best describes your current status?

- ☐ I plan to purchase test and measurement equipment within six months.
- ☐ I plan to begin evaluating test and measurement equipment within six months.
- ☐ I am interested in literature only.

☐ Please have my account manager contact me.

Telephone ....

Email me relevant measurement information ☐ Yes ☐ No

Email Address..............................

Name ....

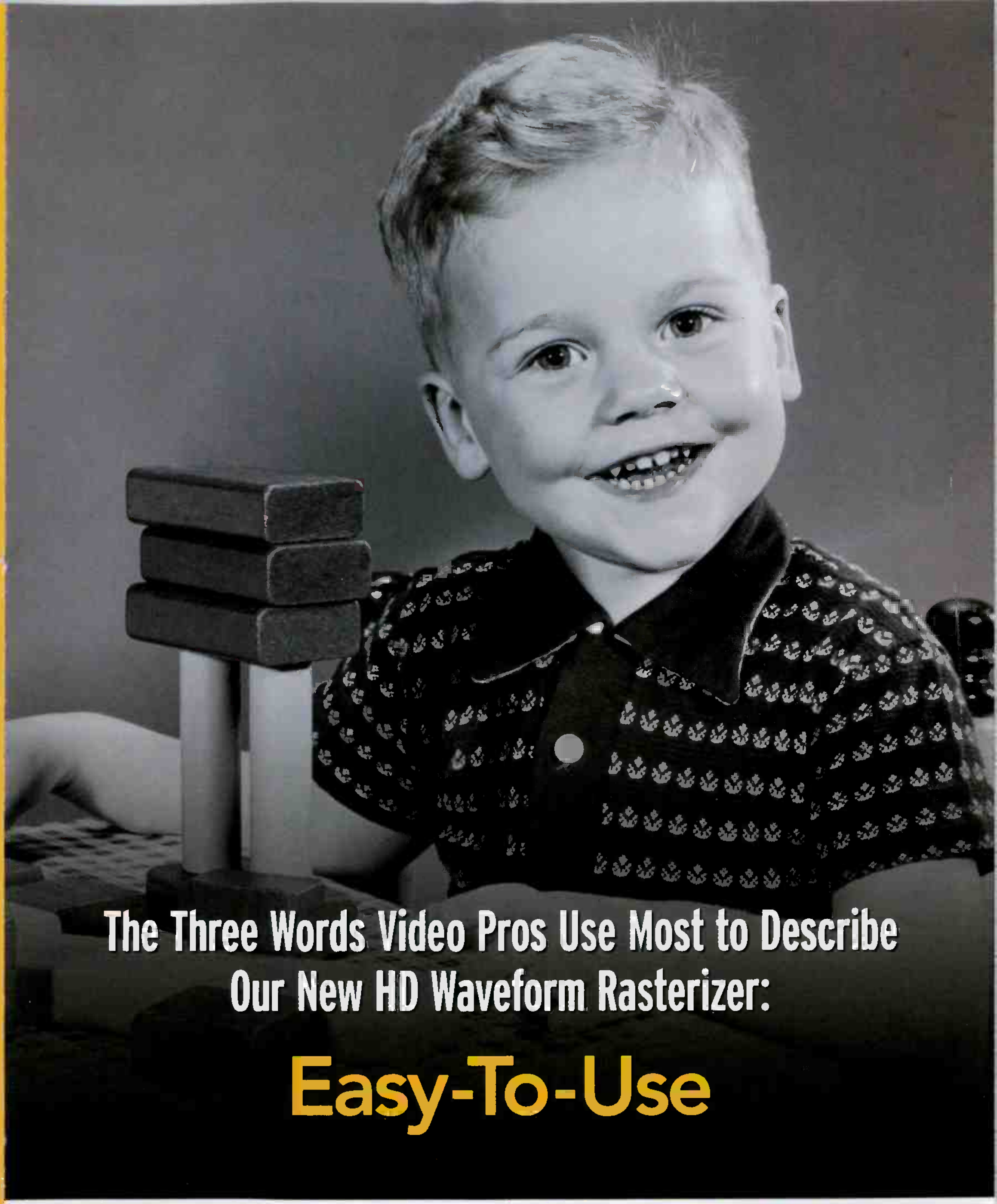
Title..............................

Company ....

Address ....

City/State/Zip..............................

Priority Code ....



– Introducing –

TEK'S WVR7000 SERIES:

UNPARALLELED ACCURACY AND RELIABILITY FOR BROADCASTERS AND PRODUCTION HOUSES.

[DETAILS INSIDE.]

Tektronix®
Enabling Innovation

Get your **FREE COPY** of "A Guide to Standard and High-Definition Digital Video Measurements."

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 1 BEAVERTON OR

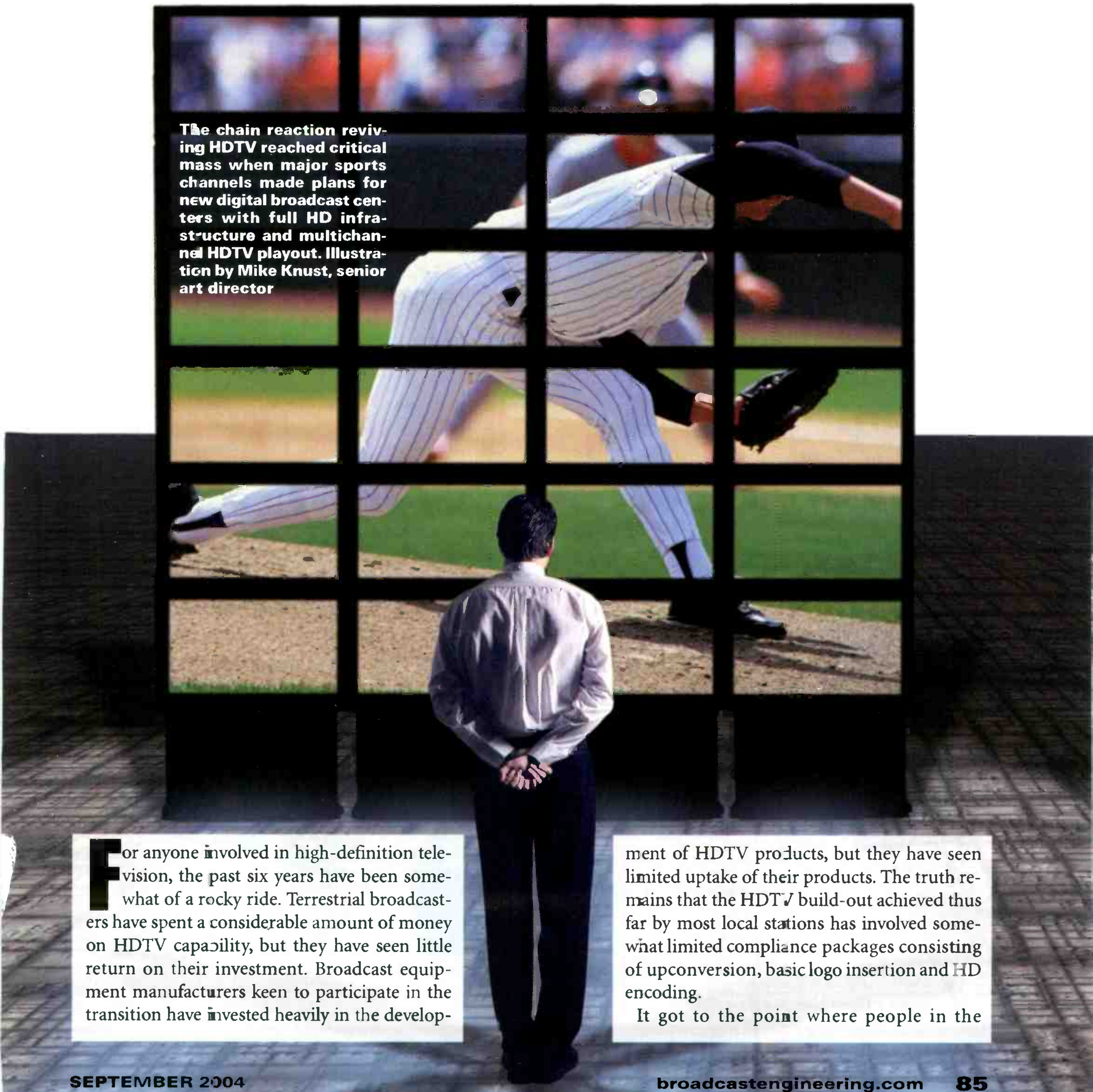
POSTAGE WILL BE PAID BY ADDRESSEE

TEKTRONIX INC
P O BOX 4029
BEAVERTON OR 97076-9917

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

Chain reaction:
The revival of the HDTV transition

BY MICHEL PROULX



The chain reaction reviving HDTV reached critical mass when major sports channels made plans for new digital broadcast centers with full HD infrastructure and multichannel HDTV playout. Illustration by Mike Knust, senior art director

For anyone involved in high-definition television, the past six years have been somewhat of a rocky ride. Terrestrial broadcasters have spent a considerable amount of money on HDTV capability, but they have seen little return on their investment. Broadcast equipment manufacturers keen to participate in the transition have invested heavily in the development of HDTV products, but they have seen limited uptake of their products. The truth remains that the HDTV build-out achieved thus far by most local stations has involved somewhat limited compliance packages consisting of upconversion, basic logo insertion and HD encoding.

It got to the point where people in the

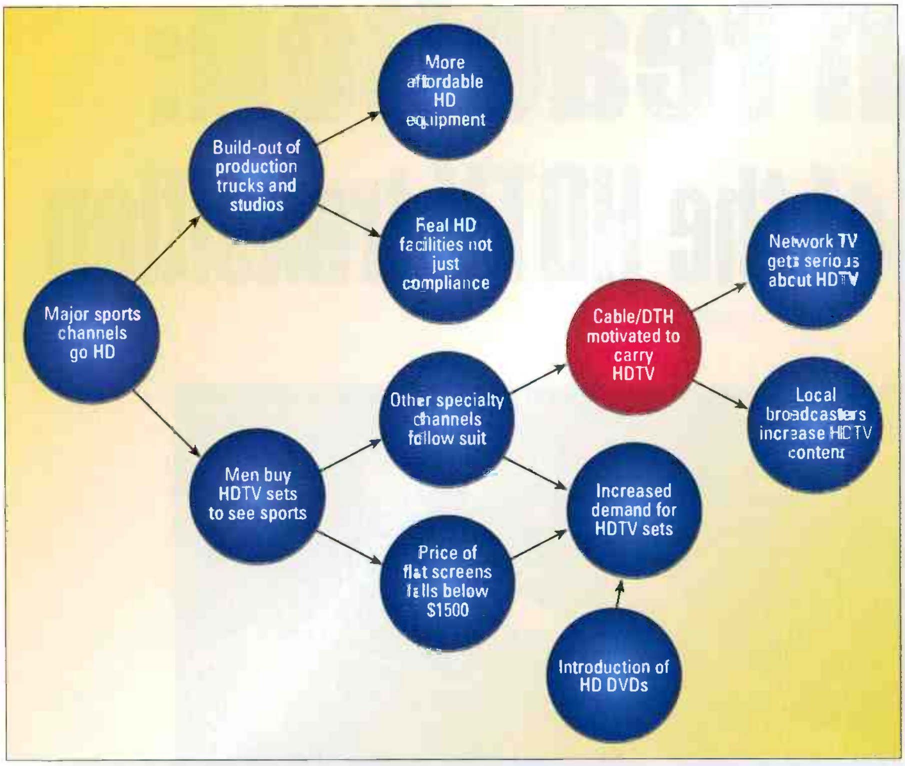


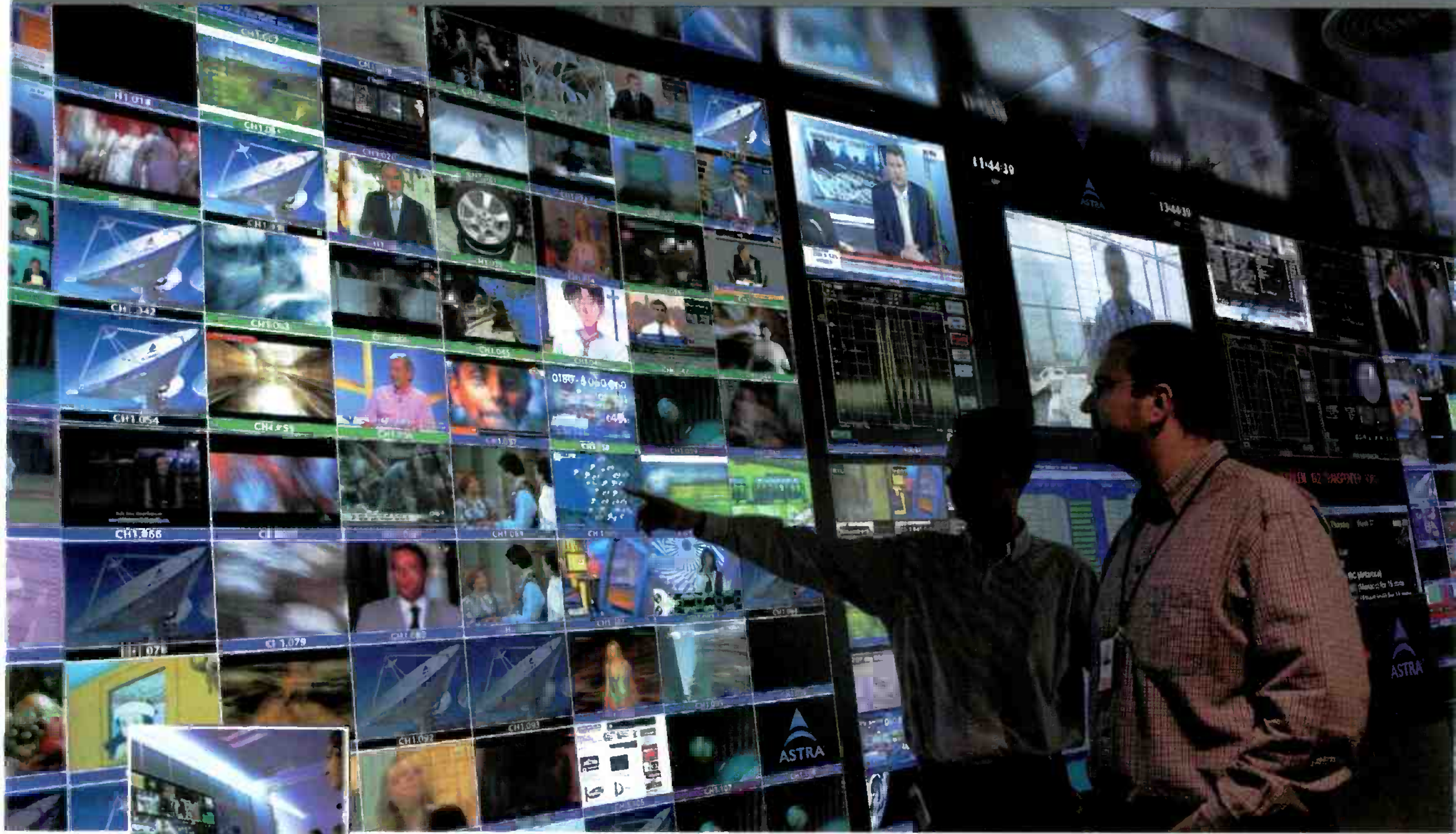
Figure 1. This diagram illustrates the chain reaction, and the many forces driving the current HDTV transition.

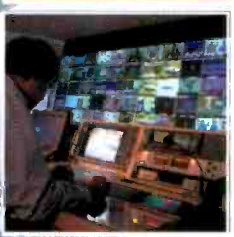
industry were embarrassed to talk about HDTV because the HDTV ramp-up was going so poorly. But just when we were about to give up hope, HDTV reached critical mass, setting off an unstoppable chain reaction. It is now obvious that HDTV has finally taken off and will take its rightful place in broadcasting history.

This article describes this chain reaction and the many forces driving the strong HDTV transition now underway. Figure 1 provides an illustration of the chain of events that has begun and is likely to continue. The following paragraphs describe these events:

Major sports channels go HD. The chain reaction reached critical mass in late 2002 and early 2003, when we began to see plans in the sports broadcasting world for the playout of multiple channels in HDTV, and the build-outs of new digital broadcast centers

Managed monitoring for broadcast and distribution





- Efficient solution to display analog, digital & High Definition video, audio, alarms, network load and computer generated data.
- Autonomous or multi-screen display to monitor up to 60 windows simultaneously.
- Perfect control room design offering the best possible combination of display technology, hardware and software for 24/7 operation.

Barco Control Rooms
Noordlaan 5, B8520 Kuurne - Belgium
Phone: +32 56 36 82 11 • Fax: +32 56 36 82 48
email: sales.bcd@barco.com

Barco Projection Systems
3240 Town Point Drive, Kennesaw, Georgia 30144 - United States
Phone: +1 770 2183200 • Fax: +1 770 2183250
email: bpsmarketing@barco.com

BARCO
Visibly yours

www.barcocontrolrooms.com

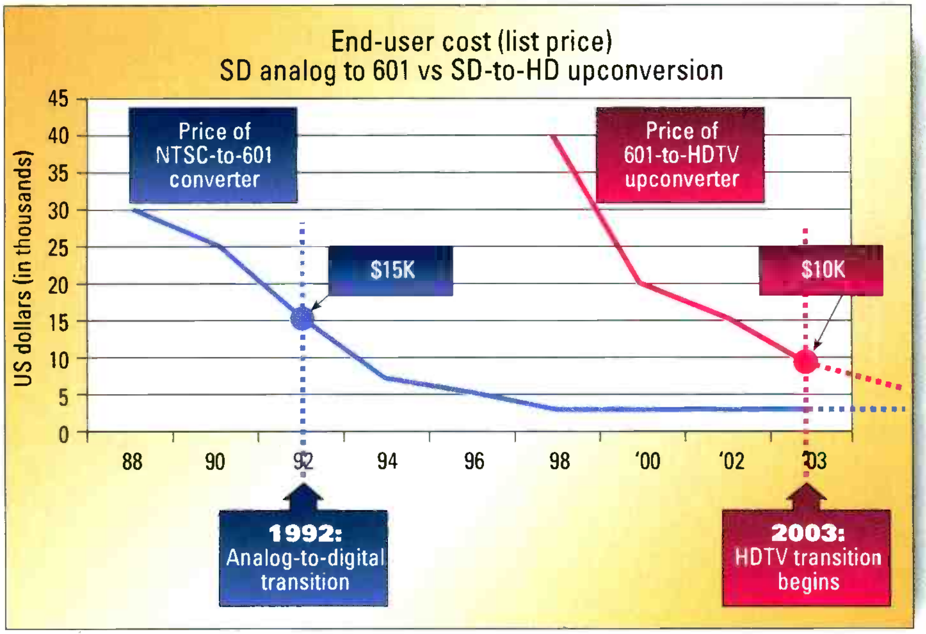


Figure 2. This graph shows a price-curve comparison between HD upconverters and NTSC-to-601 converters.

featuring full HD infrastructure, production studios and master control.

Build-out of production trucks and studios. One of the first impacts of sports broadcasting getting serious about HDTV was a sudden and large build-out of HDTV production trucks and other production facilities. Sports programming has been a particularly powerful driver for the creation of new production facilities because so much content is live. No other content would have caused such a rapid build-out across such a wide geography.

More affordable HD equipment. For broadcasters who follow the sports channels, and for other early adopters, the result has been a broader range of more affordable broadcast equipment. The increased volume and competition has resulted in a reduction of the pricing of typical HD products of 25 percent to 40 percent, depending on the function. Figure 2 illustrates the reduction in price of HDTV upconverters over a six-year period. It is interesting to

Chain reaction

note that the price of an HDTV upconverter today is less than the price of an NTSC-to-601 converter 10 years ago, the basic block of the transition to 601 inside facilities.

Real HD facilities, not just compliance. The build-out of the production trucks and production studios required to feed this new HDTV sports programming has been significantly more important than the impact of early DTV deployments. Production trucks and studios involve more complex systems, featuring a much broader range of equipment. The average production studio or truck represents $3 million to $4 million of audio and video equipment, as compared to $500,000 to $700,000 for a typical HDTV-compliant master control (excluding transmission equipment).

Men buy HDTV sets to see sports. For years, retailers of big-screen TVs have always sold the highest number of units just before a big sporting event. It's a well-known fact that sports fans buy big TVs. The rollout of HD sports programming naturally has led to typical sports fans buying large HD televisions, just like those they enjoy watching in the sports bars.

Other specialty channels follow suit. Although there were other specialty channels that had begun broadcasting HDTV before the sports channels, many more first- and second-tier channels have since announced their intentions or are discreetly working on their HDTV plans.

Price of flat-screens falls below $1500. Display technology, particularly flat-screen display technology, has been evolving at an astonishing pace. It has been driven not only by TV display applications, but also by applications such as computer display and electronic signage. Newer, larger and higher-resolution displays appear every few months. Prices are decreasing at an average rate of 4 percent to 5 percent per month. By the time this article goes to print, large LCD and plasma displays will have fallen below the $1500 price point.

Not only are these displays capable of displaying HDTV images of increasing quality, but also they are also attractive and trendy. They are quickly becoming sought-after décor items in homes. It has come to the point where a conventional 4:3 TV set now looks odd and out of place. Soon, on the day of the next community yard sale, the 4:3 set will be out in the driveway,

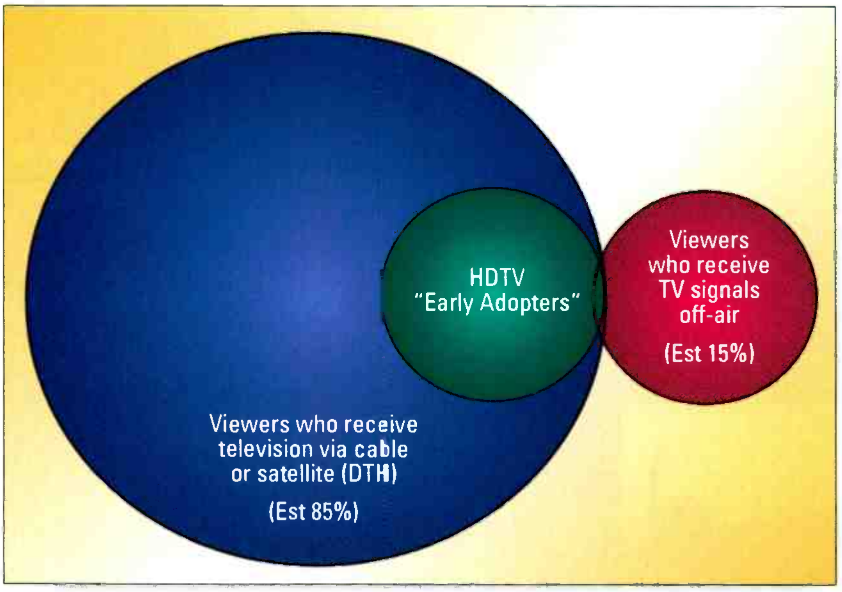


Figure 3. The demographics of cable/DTH versus free over-the-air television reveal that early adopters of HDTV are likely to be cable/DTH subscribers.

Chain reaction

along with those white appliances that were removed from the kitchen to make room for the shiny new stainless-steel ones. A new flat-screen TV has achieved the rare distinction of being a purchase that the sports fan and the home-decorating guru can both fully agree upon.

Cable/DTH motivated to carry HDTV. Many have argued that the element missing from broadcasters' early HDTV-over-DTV rollout was cable carriage. Cable and satellite subscription rates in the United States have risen from approximately 65 percent 10 years ago to better than 85 percent today. More importantly, the demographics of cable/DTH versus free over-the-air television are such that the typical early adopter of HDTV is more likely to be a cable/DTH subscriber. (See Figure 3.)

The availability of specialty channel programming in HDTV, such as sports and other channels, is now driving cable carriage. Indeed, HDTV has become part of the core proposition from many satellite and cable providers and is often used to promote services with competitive deals. For instance, in early 2004, one provider was offering a package featuring a dish, an HDTV receiver and an HDTV flat-panel display, all delivered to your home for $1000.

Introduction of HD DVDs. The DVD player is widely recognized as having the most rapid adoption rate of any home electronics product. Some maintain that the DVD has redefined the way consumers think of picture quality, and the DVD is often credited with driving the purchase of larger displays, new sound systems and the demand for subscription to digital services.

Soon, HD DVDs will become available, and they will likely stimulate consumer demand for HDTV content. Home viewers who have experienced HDTV DVDs will no longer find SDTV adequate, particularly if they have purchased high-resolution displays also.

Network TV gets serious about HDTV, and local broadcasters increase HDTV content. Once HDTV cable carriage is well established and specialty channel HDTV programming has broadened, then there will be increased pressure for traditional networks and their local affiliates to provide more HDTV programming. This will complete the cycle and allow broadcasters to leverage and expand the HDTV infrastructure they first installed as part of their DTV initiatives.

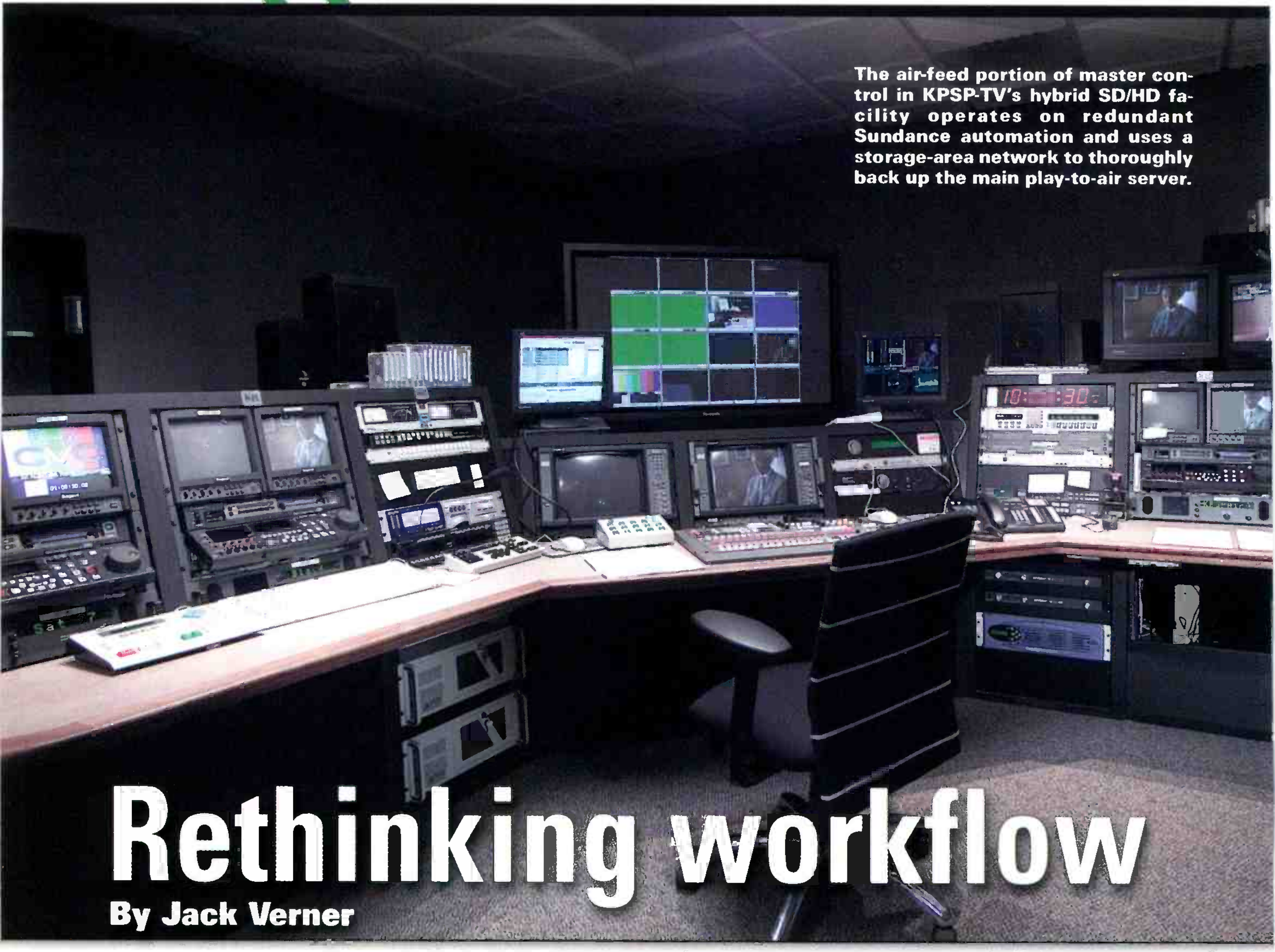
> **The key to the chain reaction now underway is that it is driven by consumers.**

Consumers are key

The key to the chain reaction now underway is that it is driven by consumers — more specifically, their appetite for HDTV content and their desire to purchase the equipment necessary to view it. This represents the positive market environment so desperately needed by our industry.

Some will argue that it is unfair to credit sports broadcasters with starting the chain reaction that has brought the industry this new health and excitement around HDTV. Perhaps they didn't start it. But, even if they didn't, they deserve a great deal of credit for the important role they have played in breaking the content logjam, helping push cable and satellite system providers to carry HDTV, and for breathing new life into broadcast equipment manufacturers' HDTV R&D programs. BE

Michel Proulx is vice president of product development at Miranda Technologies.



The air-feed portion of master control in KPSP-TV's hybrid SD/HD facility operates on redundant Sundance automation and uses a storage-area network to thoroughly back up the main play-to-air server.

Rethinking workflow

By Jack Verner

Digital technology, with all its complexities, has thoroughly altered the thought and workflow processes and procedures stations use. While the technology is an important piece of the answer, a successful transition also affects financial considerations through improvement in workflow efficiency.

Unlike the transition to color, transitioning to digital broadcasting has become a government mandate for most countries and must be completed over a much shorter time frame, forcing broadcasters to change their financial strategies. This mandate has bled all but the most affluent stations of capital by requiring internal improvements, moving resources to new encoders, and the purchase of digital transmitters, antennas, towers and other necessities to establish the digital signal. Because that capital expense does not bear an immediate return in efficiency or ratings, the transition can be difficult. Fortunately, once the facility completes its transmission investments, it can implement budgets for other digital technology and strategies that can improve quality and efficiencies and positively affect the bottom line.

Automation

Automation has a major impact on workflow and is the key to managing costs and infrastructure more effectively. Introducing automation impacts virtually every part of station, from ingest to traffic and billing. Among the many changes are new modes of master control switching and the mandate for on-screen logos or on-air channel branding. The new digital channels also have required engineers to apply servers in different ways: for recording satellite feeds, program preparation, clips and archiving. The latest development is the need to tie servers to additional demands to support back-office applications. With these added technical complexities comes the additional risk of mistakes and failures if a station adopts the new processes too rapidly.

The advantage to the bottom line is a consolidation of workflow processes that reduces operating cost. Multitasking becomes more prevalent within technical operations. Where a master control operator previously created verification logs, automation enables a master control

Learn From The Experts...

Strategies for a Successful Fiber Upgrade

You're invited to join *Broadcast Engineering* and ADC in a FREE, live Webcast on Deploying and Managing Fiber: Strategies for a Successful Fiber Upgrade

Tuesday, October 19th, 2004
11 AM Eastern Standard Time
Cost: Complimentary

Register at: www.broadcastengineering.com/webcast/fiber

What You Will Learn at This Webcast:

- The differences between fiber and other media and why it's important
- Gain a better understanding of the benefits of fiber versus other media
- Technology and business trends driving fiber deployments
- Lessons on how to protect and manage the fiber in your network
- Peer-to-peer experience on best practices and lessons learned from those who have already deployed fiber

Brad Dick
Editorial Director,
Broadcast Engineering

With over 27 years of experience in TV/radio engineering and a certified SBE PBE, Brad brings his award winning, cutting edge television industry knowledge to the arena. Brad is the author of the three-part series of *Broadcast Engineering* articles "Building Fiber Optic Transmission Systems"

Jeff Peters
Sr. Product Manager
ADC

Jeff serves ADC as a Senior Product Manager in its Broadcast and Entertainment product group. Jeff joined ADC in 1996 as a Product Manager for the company's industry leading professional audio and video products.

Tom Voigts
VP of Systems Integration
Roscor Corporation

As the Vice President of Systems Integration at Roscor, Tom manages the Systems Integration business unit and oversees all aspects of project and system integration. Tom Voigts brings over 20 years of experience in the broadcast and video industries.

PLUS... You'll also gain access to related white papers, training seminars, and web sites.

Organized and Moderated by:

BroadcastEngineering ADC

To find out more information or to sign up today, visit
www.broadcastengineering.com/webcast/fiber

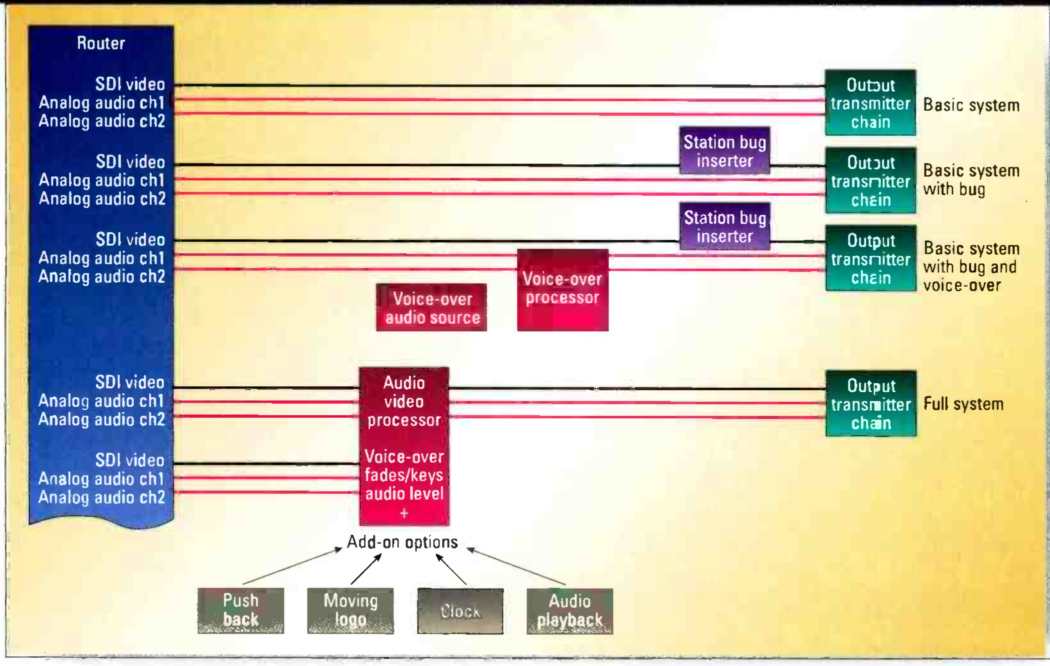


Figure 1. A basic block diagram of master control options for today's workflow environment. The diagram shows four options from router to output transmitter across the digital master control chain.

operator to monitor multiple streams, confirm those streams on the automated playlist, manage satellite record feeds and even prep programming for air. Over time, automation can reduce errors and produce a quieter, and even less chaotic, environment within the station's technical operations areas.

Adding automation also brings multichannel considerations to the forefront. In Europe, centralized broadcast centers are common. But digital terrestrial television (DTT) provides each terrestrial broadcaster the opportunity to broadcast multiple program streams. The requirements for multicasting include a wealth of programming and a large-enough audience capable of receiving the broadcasts. With proper planning, the costs of including multichannel capability as part of a digital conversion should be incremental. But the question remains when such a system would become commercially viable, especially without necessary must-carry rules for secondary channels.

The BBC in the UK and PBS in the United States are currently large investors in multicasting. Not only do these networks have access to enough program material to offer multiple streams; their public-service mandate justifies multicasting for distance learning and other community needs. Unfortunately, commercial broadcasters won't have the opportunity to earn revenue from digital multicasting until there is a substantial viewer base. Automation also enables centralcasting, which carries financial considerations different from those of multicasting.

A properly designed facility can easily build out to support multicasting with only incremental increases in hardware. The costs of adding a second and third program stream is substantially lower than the investment in automation and servers required for

Make the jump to the brave new world of high definition

Take off with the first all format multi camera HD Fly-pack from Gearhouse Broadcast.

Fully engineered and pre-configured to meet the most challenging requirements. It's the perfect solution for sporting events, episodic and reality television, live broadcast coverage and film applications.

The fly-pack can be used as a short or long term solution in studios and is an ideal addition for mobile trucks.

Make the jump and take your production to the next level, with this state-of-the-art high definition broadcast and film solution.

818 955 9449

www.gearhousebroadcast.com

The worlds first all format multi camera HD fly-pack from Gearhouse Broadcast

GEARHOUSE BROADCAST

LONDON | LOS ANGELES | SYDNEY

EQUIPMENT RENTAL   FLY-PACK SOLUTIONS   EQUIPMENT SALES the initial channel. A single operator can monitor perhaps as many as five to 10 streams simultaneously using automated alarms.

The required on-air look of each channel determines whether the facility needs additional switchers, graphics systems and other equipment. Often, these subchannels don't demand the transitions and promotions featured on the main channel, so the graphics and transitions between programs can be simpler. This often means it is feasible to use one large server with multiple automated outputs. And although automation vendors typically charge on a per-program-stream basis, the facility can address additional program streams cost-effectively with additional software licenses and inexpensive computer hardware.

The HD picture

High definition is another wild card in the big picture. Local production of HD programming today has few to no practical short-term revenue benefits. With the exception of some HD news production in special markets, most stations will simply pass through a network HD feed or upconvert their SD signal. As with the transition to color, most stations will not make a major leap toward HD until competitive pressures require it.

That's not to say that a station should ignore HD during the digital conversion. Many stations choose to install HD infrastructures — typically wiring and routing systems — now in anticipation of future requirements. Building an HD backbone today does not significantly raise costs. The cost premium comes in the creation of a front-to-back HD facility. One argument against going fully into the HD realm now is that the technology is more expensive today than it will be in a few years. Because the price of commercial inventory typically is based on ratings rather than lines of resolution, producing local spots or providing HD programming in dayparts other than prime time is not yet practical because it is revenue-neutral. By the time the market dictates a switch to HD, stations will be able to do so at a lower capital cost while maintaining revenue.

Start with baby steps

Let's now look briefly at what components are key to a successful improvement in station workflow. While technology is not necessarily the cornerstone of the transition, the equipment solutions you put into place will enable new efficiencies. A broadcaster should design the overall broadcast system by defining functionality, workflow, on-air look and future plans, then carefully selecting the best

The technical operations center at Atlanta's WGCL-TV combines master control operations with news support to establish smooth workflow between the two operations.

technology to fit the vision. Along with automation and video servers come new storage, monitoring and other solutions that are radically different from the analog world.

For the majority of stations, the traditional video infrastructure remains intact when converting to digital. While file distribution is becoming more common in the largest facilities, the audio/video router is still the heart of most stations. Unfortunately, except in large facilities with many channels, standards and cooperation among manufacturers have not reached the point where a data network can replace the router. Baseband is still the most cost-effective and efficient means for routing today.

Planning for the routing system is critical during the transition to digital. (See Figure 1 on page 96.) The addition of new core components and the possibility of additional program streams both affect the planning process. Predict the maximum router size you need based on the long-term plan for additional program streams, even though initially it will be loaded only for current demands. This approach means you can easily expand the router as the facility grows, which is much more cost-efficient and less disruptive than a forklift upgrade. Considerations for maximum size also should include the number of production control areas and edit bays within the facility. There are a lot of factors that affect the size of the router, so don't shortchange this part of the design process.

Efficiency is again the key word when selecting a storage solution. As the price of hard drives falls, the industry consensus is to eliminate tape in favor of servers.

A facility can handle commercials and repeated syndicated programming more efficiently if it ingests programming once and plays it from the server repeatedly, without any additional handling. Nearline storage units such as a DVD-RAM device or a data tape robot, can store media that is not on the active playlist. Though tape becomes less important as facilities become more automated, it is still the most inexpensive way to store media long term. An SAIT-based tape robot can store an entire month's programming in less than one foot of linear space.

The technical operations center at Atlanta's WGCL-TV combines master control operations with news support to establish smooth workflow between the two operations.

technology to fit the vision. Along with automation and video servers come new storage, monitoring and other solutions that are radically different from the analog world.

For the majority of stations, the traditional video infrastructure remains intact when converting to digital. While file distribution is becoming more common in the largest facilities, the audio/video router is still the heart of most stations. Unfortunately, except in large facilities with many channels, standards and cooperation among manufacturers have not reached the point where a data network can replace the router. Baseband is still the most cost-effective and efficient means for routing today.

Planning for the routing system is critical during the transition to digital. (See Figure 1 on page 96.) The addition of new core components and the possibility of additional program streams both affect the planning process. Predict the maximum router size you need based on the long-term plan for additional program streams, even though initially it will be loaded only for current demands. This approach means you can easily expand the router as the facility grows, which is much more cost-efficient and less disruptive than a forklift upgrade. Considerations for maximum size also should include the number of production control areas and edit bays within the facility. There are a lot of factors that affect the size of the router, so don't shortchange this part of the design process.

Efficiency is again the key word when selecting a storage solution. As the price of hard drives falls, the industry consensus is to eliminate tape in favor of servers.

A facility can handle commercials and repeated syndicated programming more efficiently if it ingests programming once and plays it from the server repeatedly, without any additional handling. Nearline storage units such as a DVD-RAM device or a data tape robot, can store media that is not on the active playlist. Though tape becomes less important as facilities become more automated, it is still the most inexpensive way to store media long term. An SAIT-based tape robot can store an entire month's programming in less than one foot of linear space.

Revenue-generating material such as commercials should still be archived to a standard tape format rather than data tape, in the event of system failure.

Streamlining monitoring

Monitoring for digital sometimes requires rethinking the master control monitor wall. Digital conversion has enhanced the popularity of multi-image displays because the windows can be reconfigured according to time of day, type of program material, aspect ratio and number of channels being handled.

Simple Network Management Protocol (SNMP) for facility-wide monitoring is growing in popularity. Implementation is most practical when building a new facility, or a new subsystem within an existing facility. SNMP allows engineers to monitor and troubleshoot hardware issues from a central location. The protocol displays when and where the equipment has failed, allowing an engineer to pinpoint problems quickly and protect against potential revenue loss. Investment in SNMP monitoring makes the most sense for larger facilities, where the possibilities for signal loss are more complex.

New thinking required

Whether planning for a one-channel digital system, multicasting or high definition, the underlying theme is how to manage the workflow most effectively. This often requires an entire culture change that cuts across all departments. To be effective, that change has to be mandated and managed from the top down. A strong will from all departments and a reasonably enthusiastic effort from the entire staff will result in fewer problems.

Be sure to start by involving the staff in the process of defining what the facility is to be. The systems integrator does its part by interviewing the staff and presenting the most effective options for implementation to the technical and management teams. Following these guidelines allows everyone at the station to have ownership in the transition and sparks interest in making it succeed.

The benefits of a fully digital infrastructure may be hard to measure, but they do result in new efficiencies and improved workflow. When this is combined with improved signal quality and new opportunities for revenue generation through additional channels, the impetus to move forward should be strong. Those stations that do so by planning carefully will reap the benefits first, making them strong competitors in the race for viewers. BE

Jack Verner is vice president of engineering and chief technology officer for Digital System Technology.

Hamlet
tests the digital age

BY STEVE NUNNEY

The migration to digital has brought about a complete change in the broadcast world. Nowhere is this more keenly felt than in engineering, which as a career has changed beyond all recognition.

An all-analog system, needing a routine alignment for each piece of equipment and constant monitoring of levels, called for a team of engineers and technical supervision of all but the simplest of operations. Digital technology has brought a degree of stability to the equipment and eliminated this tedious supervision. The result is a need for fewer engineers, allowing those that remain to be mobile around the facility, focused on preventive maintenance and path checking, and able to respond to arising problems.

Hamlet's Flexiscope provides a complete range of test and measurement functionality with appropriate connection modules and software.

Yet, digital broadcasting has not eliminated the need for quality monitoring tools; it has simply changed the way they are used.

Signal levels are still an issue. It seems that every piece of equipment nowadays has a built-in color corrector, for instance, an open invitation to the inexperienced to create out-of-gamut signals. And digital equipment can still generate faults, meaning the signal path needs to be traced.

Whether it is digital or analog, the facility has to deliver a clean, accurate signal with the right audio and video levels. This requires checking everything with precision test and measurement equipment. For mobile engineers in digital facilities, portable devices that don't sacrifice quality can be used.

An analogy can be made to the PDA. The platform is a palmtop device, completely self-sufficient in itself, but capable of linking to a PC to download data and take on the latest software. Ultimately, it will be capable of providing the complete range of test and measurement functionality simply by adding the appropriate connection modules and loading the right software.

Hamlet's Flexiscope is a multiformat waveform monitor, vectorscope and picture monitor, with facilities for embedded audio. It is capable of working in HD as well as SD.

The monitor looks like a slightly oversized PDA. It has a 3.5-inch diagonal TFT screen at the top, a set of soft keys below and a keyboard at the bottom. A speaker and headphone socket are provided for audio confidence monitoring. The TFT display shows the picture in correct (4:3 or 16:9) aspect ratio.

Digital broadcasting has not eliminated the need for quality monitoring tools.

The display can show SD or HD waveform displays or vectorscope, audio bar graphs (with digital, PPM, VU, nordic scales and simulated ballistics), and phase display. Data analysis also is included for digital streams, including EDH, stuck bit and color gamut. Digital cursors are provided for accurate timing and level measurements. Internal processing is digital for maximum stability and accuracy.

To meet the portability requirement, the device is battery powered, running for more than two hours on a charge. A power adaptor is supplied for use in a fixed location.

The system is built around a custom chipset, designed solely with the purpose of audio and video test and measurement in mind. The launch model of the Flexiscope will meet the most common needs of the engineer in the digital facility and is provided with a single BNC input for SDI or HD SDI with embedded audio.

Future Flexiscope products will have multiple inputs, analog inputs or be audio-only devices. Should new formats that require real-time monitoring come along, these can be added.

The digital revolution has changed the way engineers work, but certainly not eliminated the need for careful quality control. Test and measurement manufacturers need to react to this change with products that are stable and accurate, but portable to reflect the new engineering workflow; simple to use without compromising precision; and, above all, cost-effective.

The Hamlet Flexiscope is a new platform with plenty of room to grow with new applications as they become needed. **BE**

Steve Nunney is managing director for Hamlet Video International.

Fiber management in broadcast networks

BY JOY MCKNIGHT

For years, television broadcasters have relied on coax cable to route video and audio control signals and RF around their facilities. Coax has proven itself to be easy to work with and reliable.

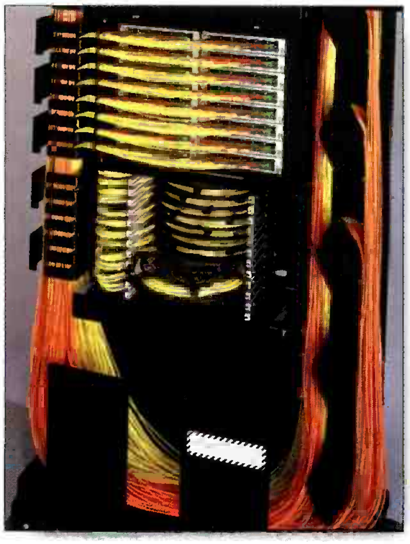
However, as the television broadcast business evolves from a single analog channel to a digital world, the industry is re-evaluating the role of coax. In its place, fiber-optic cable is emerging as a logical solution for next-generation television signal routing, where greater bandwidth is needed to accommodate HD signals and multicast SD channels.

As these applications drive fiber into more networks every day, many broadcasters' deployment strategies overlook one major consideration. Good cable management practices are the key to an effective fiber network, allowing for flexibility, fluid change, easier network maintenance and configuration and, most importantly, growth. When a broadcaster uses good cable management from the start in its fiber network, the network grows more quickly. Good cable management practices also ensure that the fiber networks of today will be ready for the higher-bandwidth applications of tomorrow.

Guiding the way

ADC's family of fiber infrastructure solutions for broadcasters was engineered with these concepts of efficient cable management in mind. They make fiber networks less susceptible to accidental damage or network problems, quicker to install, less expensive to own and operate over the long haul, and easier to expand as needs grow.

The infrastructure systems address



Good cable management ensures that the fiber networks of today are ready for tomorrow's higher-bandwidth applications. Pictured: ADC's FL2000 fiber management system.

the following items, each critical when deploying a fiber network in a broadcast environment:

- *Bend radius.* At turns in fiber runs, maintain a 1½-inch bend radius. Tighter bends may cause microbending of individual fibers that allows light to escape the signal path, resulting in signal attenuation. More severe bends can break fiber strands completely, resulting in signal loss.
- *Cable troughing.* Used to route fiber-optic cable, troughing systems provide a protected pathway for fiber to traverse spans between rooms and equipment racks. Troughing systems such as the ADC FiberGuide system keep fiber separate from coax cable; protect it from out-of-tolerance bends; and promote neat, easily accessible runs.
- *Vertical cable protection.* Allowing fiber to hang unprotected from the back of equipment can be a recipe for disaster. Exposed cables are easy to snag accidentally with a wandering hand or foot, which can result in damage to the connector or fiber itself. Additionally, over time, the weight of hanging fiber can cause bends outside the acceptable limit and damage the fiber. Proper vertical cable management in panels or equipment bays provides adequate support, cable protection and a transition from the vertical run to the back of the equipment that does not damage the fiber.
- *Slack storage.* Besides the ability to tidy up the look of a facility, the proper storage of slack patch cords allows station engineers to work in equipment racks free from the fear that a false move might accidentally do harm. Also, having a dedicated slack storage system for patch cords enables users to specify a single patch cord length for the entire plant. Proper slack storage means engineers can use a 5-meter patch cord without fear that dangling excess fiber will be damaged. Proper slack storage also alleviates worries about the patch cord being too short if changes need to be made quickly. Slack storage systems can take many shapes – from integral storage compartments in stand-alone termination

Fiber-optic cable is emerging as a logical solution for next-generation television signal routing.

cabinets to 19-inch, 1RU trays, such as the ADC Fiber Management Tray. But the common thread among all of these systems is that extra patch cord lengths are stored neatly, protected from damage and aren't exposed to accidents that can negatively impact the ability of a station to earn revenue.

- *Cable pile-up.* In horizontal fiber runs, it is unacceptable to allow a pile of fiber cable exceed two inches. Beyond that point, the weight of the bundle will surpass the crush tolerance limit of the fiber at the bottom of the stack, and result in microscopic damage and signal attenuation. Look for products that have horizontal routing paths that ensure cable pile-up is not an issue.
- *Labeling.* Develop good labeling practices. Know where fibers originate and terminate by using products that have adequate designation space. Doing so will reduce maintenance time and the likelihood that a maintenance tech will make hasty decisions on fiber routing that can lead to a rat's nest of cable and patch cords.
- *Future proofing.* When planning rack configurations with a given number of terminations to accommodate a relatively low number of fibers for today's requirements, don't forget the future. A fiber path that easily supports 12 fibers today may be inadequate to support the 200 fibers that will be needed in a couple of years. Planning up front for the future can save the expense of ripping out outgrown capacity down the road.

Tying it all together

Proper cable management is critically important to the successful conversion of television broadcasters from coax to fiber. The fact that a single fiber may transmit mission-critical signals, such as revenue-generating commercials and programming, underscores the importance of taking the steps necessary to manage fiber's installation and use. BE

Joy McKnight is a product manager for ADC.

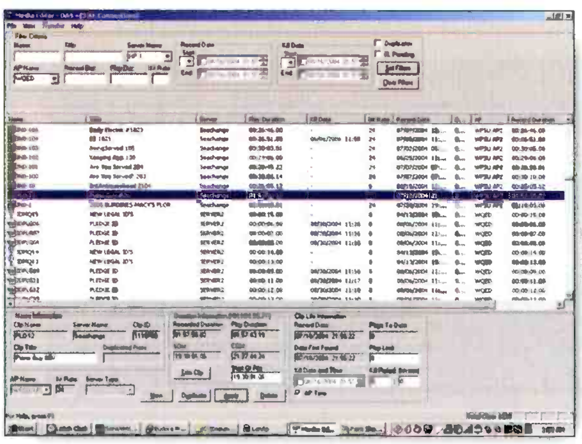
KVAL automates with MicroFirst

BY STEVE NORDBY

KVAL-TV phased in centralized programming with its first Media Pool multichannel video server in 1995. By 2000, it was feeding five zones covering most of western Oregon from one control room. All station breaks are fed from the central location's video server, as are hourly five-minute news cut-ins on a cable news channel and a time-shift with different commercial content for the evening news on a different channel.

As its old server neared retirement age, the station considered modern automation solutions.

With a high volume of daily local spots and live programming and a commitment to serving advertisers promptly with last-minute traffic changes, the station opted to remain a



As its old server neared retirement age, KVAL chose MicroFirst's Digital Automation system to provide increased functionality.

mostly hands-on operation, and automate only those areas where there was a significant advantage.

KVAL approached MicroFirst for operator-assist functions for a new Omneon server. The station needed to be able to start playing each server source instantly from independent GPIs, as well as re-cue from GPI in case of a false start. Other needs included end-of-station-break GPI outputs, the ability to place comment text in a playlist, and an automatic refresh of durations and titles if clips were replaced.

As its old server neared retirement age, the station considered modern automation solutions.

Because the manual control room "take" switch is the break cue (with no preroll), there was concern about avoiding dead air while waiting for the server to respond. Automation usually starts events at the top of the second; however, the station wanted to start immediately from the cue and have tight back-to-back play. The MicroFirst system offers an immediate start feature to keep the station looking clean on air, even through tight network breaks and cut-ins.

Several of MicroFirst's features helped to improve workflow, especially the ability to switch directly between current air schedules and plain text files, and the ability to filter imported schedules to a specific time. When coping with a late-running event, it's easy to delete individual spots, drag and drop individual commercials or entire breaks for make-goods, and skip forward in the schedule to any point. The interface can display four schedules tiled vertically. In edit mode, an edit panel occupies the lower part of the screen. The user interface was easy to learn because of its Windows-like drag-and-drop functionality.

The MicroFirst Media Editor program displays the server's database with faster and easier to use sort-and-filter options than the station's old system. The station also can export the database to a text file to share on the intranet with remote traffic and sales departments. It takes only a few clicks to copy a clip, and users can easily trim clips by clicking "trim clip" to load a clip in the dub/trim window. Also, with multiple stations and departments responsible for managing server inventory, building, importing and executing a single daily clip deletion list saves the staff from mind-numbing and error-prone one-at-a-time deletions.

After dealing with huge numbers of playlist changes during the 2000 election season, the station knew it had to streamline that process. The operator now simply uses the time-filter function to import changes directly into the on-air schedule. This lets the staff respond to advertiser's needs with error-free control.

Initially KVAL was not concerned with the ability to automate a recording schedule, but with about 2500 spots in active inventory, it would have taken an operator working full time a month to record them all to the new server manually. MicroFirst recommended using a recording schedule with GPI control to roll a matching playlist on the old server. Transferring the entire inventory took about 20 hours. BE

Steve Nordby is software projects coordinator for KVAL-TV.

Routing switchers

BY JOHN LUFF

Routing switchers seem to be a simple-minded lot. What could be simpler than taking a unidirectional signal in and passing it on unchanged? How can something so fundamentally uncomplex be so important to our industry? The answer lies in the complexity that is under the covers.

The routing switcher began life as a simple crossbar switcher, much like a telephone switch. Many inputs could be connected to many outputs but, unlike a telephone switch, one input could be replicated to all outputs at the same time, a kind of super-flexible distribution amplifier.

NVISION's NV8256-Plus router features a high-density 256x256 crosspoint module. Its frame has provisions for an additional crosspoint module to serve as a hot standby, eliminating the crosspoint module as a single point of failure in the system.

Early incarnations were usually two switchers under strict parallel control, with one audio level and one video level married together on a one-for-one basis. Breakaway was possible, but without the ability to map crosspoints to logical pairings like we see today.

What could be simpler than taking a unidirectional signal in and passing it on unchanged?

As time passed, it became clear that the switcher needed more capability. Signal paths became much cleaner as the requirement to circle through the system many times became increasingly important. Stereo audio levels were added, as were machine control functionality, RS-422 matrices, tally, and sophisticated control systems that allowed multiple levels for key signals and other functions. Input mapping became virtual, allowing system reconfiguration without rewiring a plant around one piece of equipment. Reliability increased, and one manufacturer offered a 10-year warranty. (And still does!) Control systems went from embedded real-time systems to reprogrammable software systems with redundant processors.

Today, all of this seems like the dark ages. Routing has taken such a key position in mission-critical operations that some manufacturers have taken a fresh look at how to best protect their clients. Careful planning for eventual failure once enhanced reliability. For instance, signals were dispersed among physical I/O cards to ensure that one random board failure could not take all inputs to the MCR off the air. While this strategy is quite effective, as blocks of crosspoints have climbed from 10x10 to as high as 128x128, it is no longer practical to "work around" a significant failure. Both NVISION and Utah Scientific have developed internal redundant cards that can seamlessly replace crosspoints and I/Os. Utah Scientific has built-in signal presence detection that can allow the control system to sense a lost input and automatically replace it with an alternate signal, a copy of the main signal or a suitable replacement. NVISION put a redundant crosspoint into the frame that allows for potential failure of a large block of crosspoints and their replacement, with no effect on any output.

Control systems are embracing TCP/IP for distribution of control to panels and for communication to other devices. This facilitates some of the more important changes. Web-based monitoring and configuration has begun to be a valuable and simple way to interact with control systems. NVISION, with its Envy control system, has pioneered a new Web interface — featured in products from Thomson Grass Valley, Utah Scientific and others — that permits more flexible maintenance and operational features. Remote monitoring and diagnosis can now be done from anywhere, including from a manufacturer's plant. As systems become more complex, and labor budgets get even tighter, this will increasingly be a valuable tool.

This movement to IP control also facilitates wide-area connection of virtual control systems. The European Broadcasting Union, has connected a Thomson Grass Valley Encore control system between Washington and New York, with software control panels distributed in 10 cities across Europe over private data bandwidth. Though not for the faint of heart, the same thing could be done using VPN connections over the public network for temporary or low usage control.

Control panels are becoming highly configurable. With programmable button legends being offered, it is not hard to see how the entire button set can be flexible, allowing buttons to be assigned to special purpose functions or macros.

The contents of a router frame remained remarkably the same until recently. For many years, stereo audio routing switchers have been capable of channel summing or track reversal. A few years ago, wide bandwidth routing became available. The ability to mix HDTV signals with digital 525/625 signals was an important change. But this year, a more important evolution occurred. Several manufacturers now offer analog-to-digital conversion (and the reverse) for audio and video signals. In some cases, these are special purpose I/O cards. In the case of the Thomson Grass Valley Concerto audio router, the standard audio cards (analog and digital) can be mixed in one frame, allowing flexible I/O with internal conversion both directions.

But more exciting is the inclusion by Quartz and others of new functionality in routing. Keyers have shown up in Quartz's Xenon router. It is easy to see how a routing switcher could become a simple master control switcher. For DTV multiplex this is particularly appealing. It is easy to feed all the signals to one box and take out combined or individual signals. Functionality could be distributed via IP if a few other simple features were added, such as a simple mix multipler with key and 2-D squeeze, full-featured master control, or a small production control room. Install a virtual monitor wall processor, a VGA level to the router, and voilà, you have instant control rooms. With streaming processors like H.264, a control room could be located anywhere, with the router acting as an intelligent signal processor on a grand scale. **BE**

John Luff is senior vice president of business development for AZCAR.

Send questions and comments to: john_luff@primediabusiness.com

REAL-TIME 3-D VIRTUAL SET

Darim VS2000: System combines keying of live actors or video feeds with full 3-D to produce live studio broadcasts; virtual cameras can be moved within the 3-D graphics environment or zoomed in/out while the physical camera remains still; features real-time 3-D rendering engine; advanced users can tweak keying parameters manually using the special control panel; uses 3-D studio max for set creation, composite, S-video, YUV, RGB and SDI I/O.
888-GET-MPEG; *www.darim.tv*

OPEN FORMAT

SGT Interoperability Services: Includes a series of products — DBOS traffic interface, DBOS NRCS interface, DBOS NLE interface — each optimized for a particular type of application; products operate with a DBOS MXF interface.
+33 1 64 73 74 74; *www.sgt.fr*

CAMERA

Ikegami HDL-40HS: Equipped with CMOS sensors; operates at 120fps capture rate, and sampling at 1280x720; has 720/120p via dual-link HD SDI that supplies the high frame rate needed and sends it to the server for slow-motion replay; standard 720p output is available for live use; can also operate at 1080/60p; precision HDTV SloMo is achieved in conjunction with the HD LSM-XT server from EVS.
201-368-9171; *www.ikegami.com*

TIME SCALING PROCESSOR

Dolby Model 585: Provides pitch correction; processes PCM audio from any multichannel system, with special consideration for supporting decoded Dolby E and Dolby Digital audio and their associated metadata; eight audio channels can support multiple individual audio programs such as 5.1 +2, four stereo pairs or eight mono channels, and all other Dolby E program configuration modes.
415-558-0200; *www.dolby.com*

DVD/DVR ARCHIVER

Baystor BK-2500: Record and burn industry-standard MPEG-2 DVDs; preserves SMPTE time code, closed captioning and other vertical interval info on the DVD; can also record and retrieve video in DV25, AVI and QuickTime format to DVDs; hard disk can store 10 hours of DV25 quality video and audio; can be used as a desktop or rack-mountable unit.
813-645-6666; *www.baystor.com*

TELEPHOTO LENS

Cooke S4/I: The 180mm lens offers contrast and resolution through focusing distance and T2 up to 10x MOD; is thermally compensated; designed for use with any PL-mount camera body and with LDS-equipped cameras; uses an S4/I data display unit built by various companies.
+44 116 264 0700; *www.cookeoptics.com*

DSP-BASED VIDEO ENCODER

EGT Professional Video Encoder: Built on a digital signal processor (DSP) platform; MPEG-2 encoder incorporates advanced video algorithms; provides transition to future HDTV and MPEG-4 compatibility; lower bit rates allow up to 30 percent more channels per slot; has simultaneous ASI and IP outputs; supports legacy and fast Ethernet networks; dense package includes two channels per rack unit to relieve space constraints.
404-591-4800; *www.egtinc.com*

SHORT SHOTGUN MICROPHONE

Audio-Technica AT897: is an 11-inch compact line+gradient condenser microphone; stays out of frame on wide shot when the camera is mounted; controlled off-axis response; its line+gradient polar pattern ensures signal rejection from the side and rear; operates on phantom power or internal battery; features a low frequency roll-off switch; includes a foam windscreen and stand adapter.
+44 113 277 1441; *www.audio-technica.co.uk*

TAPELESS WORKFLOW SYSTEM

Cinegy News: Has full MOS protocol workflow integration for real-time support of solutions such as The Associated Press' ENPS system and the Avid iNEWS newsroom computer system; includes real-time on-air playout of rundowns created in MOS protocol-based applications; features ActiveX plug-in for seamless integration directly into applications; can integrate fully with Cinegy Archive for digital asset management and archive.
408-333-9127; *www.cinegy.com*

TWISTED-PAIR RECEIVER AND TRANSMITTER

ALTINEX DA1930CT and DA1931CT (shown): Transmit and receive video and audio signals over twisted-pair CAT-5/6 type cable; can be used together or in combination with other ALTINEX CAT-5-type products; supports VGA-UXGA computer video resolution, S-video, or composite video with stereo audio signals over CAT-5/6 or no-skew twisted-pair cable; maximum distance up to 700 feet.

800-Altinex; *www.altinex.com*

HD RASTERIZER

Tektronix WVR7100: Monitors HD, SD, composite analog signals, and digital and analog audio; access to key functionality is available with the touch of a button; users can control and access the system from up to 100 feet with a new remote front-panel capability; supports two passive loop-through HD-SDI inputs of the HD formats (720p, 1035i, 1080i, 1080p and 1080sF) at a variety of frame rates.

800-426-2200; *www.tektronix.com*

HD MEDIA SERVER

Omneon Spectrum HD: Delivers integrated native playback of HD MPEG media; includes two new media interface adapters: the MultiPort 4000 series for one or two channels of HD MPEG playback and the MediaPort 4010 for material acquisition; interface units can store and play back SD and HD content simultaneously; existing Omneon systems can be upgraded.

408-585-5000; *www.omneon.com*

HDTV UPCONVERTER

Leitch HUC-3901: Supports 1080i and 720p outputs; offers either quick selection from five preset common aspect ratios or fully scalable output aspect ratio and picture position; can remap one group of embedded audio with matching delay into the output HDTV signal; perform last-stage upconversion of SDI signals prior to DTV transmission, bridge existing SDI content into an HDTV island, upconvert existing CG video and repurpose existing key/fill signals for master control.

859-371-5533; *www.leitch.com*

A/V FILE SHARING SOFTWARE

Studio Network Solutions iSANmp: Built on the iSCSI protocol; designed for audio and video file sharing over Ethernet; IP-based storage networking standard that enables rapid and efficient transport of block-level I/O data over high-speed Ethernet; works with Windows and Mac OS X systems.

877-537-2094; *www.studionetworksolutions.com*

COMBINED SYNCHRONIZER, TRACKING AUDIO DELAY AND EMBEDDER/DE-EMBEDDER

Crystal Vision SYNNER144: Times audio and video to the local syncs; synchronizes video feeds; synchronizer and tracking audio delay works with two groups of audio (eight mono channels); when used as an embedder, audio can either be added to an existing group to partially overwrite it, or a complete second audio group can be added.

+44 1223 497 049; *www.crystalvision.tv*

CONNECTIVITY SYSTEM

Thomson Grass Valley XML-Gateway: Provides complete network connectivity for the Grass Valley Andromeda tally and GPI management system and Nennos signal management software; allows information to be exchanged between several Andromeda systems, Nennos systems, and between both systems on any WAN or LAN; offers customizable labels that describe the content of signals and can be assigned to router inputs in each production area.

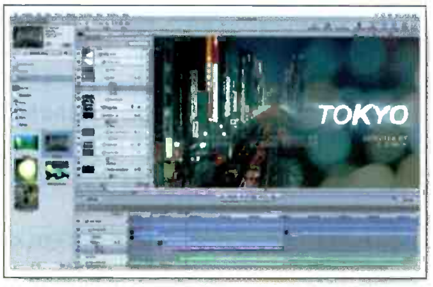
530-478-3000; *www.thomsongrassvalley.com*

COMPACT CARDIOID STEREO KIT

DPA Microphone DPA 3521: Features two 4021 compact cardioid microphones carefully matched within 2dB on frequency response, sensitivity and self-noise; is supplied in a sturdy carrying case and includes the combination XY/ORTF holder, two gooseneck mounts and two magnet bases for mounting on metal surfaces; is pre-amplified using a built-in miniaturized thick-film mounted FET-amplifier.

+45 4814 2828; *www.dpamicrophones.com*

NOW SHIPPING



MOTION GRAPHICS SOFTWARE

Apple Motion: Create natural simulations with behavior procedural animation techniques; automatically generate simple or sophisticated fluid motion effects and make changes spontaneously; features an advanced particle engine that enables users to quickly and easily apply realistic particle presets, with instant previewing of multiple filters and particle effects; integrates with both Final Cut Pro HD and DVD Studio Pro 3.

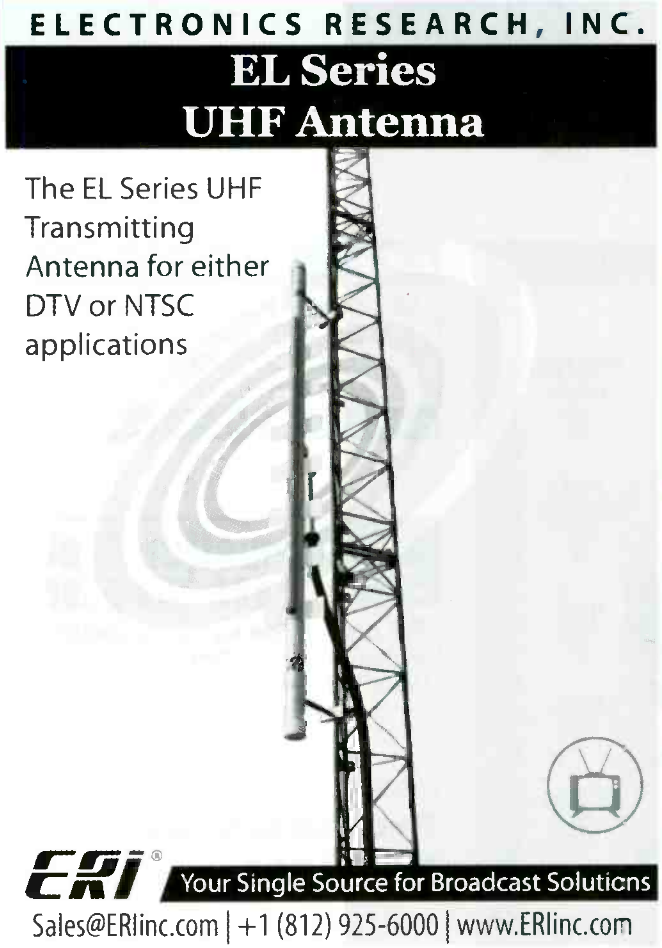
408-996-1010; *www.apple.com*

SD RECORDER

Accom APR•ClipStore: Has more than an hour of uncompressed video, key and audio recording capacity within a 3RU chassis; provides a versatile interfacing with a network of graphics rendering computers, uses NetPanel browser-based interface and Windows Media 9 export encoding; has built-in import/export capability; can record and play an associated key signal; provides an automated solution to stream digitized video, key and audio into computer systems.

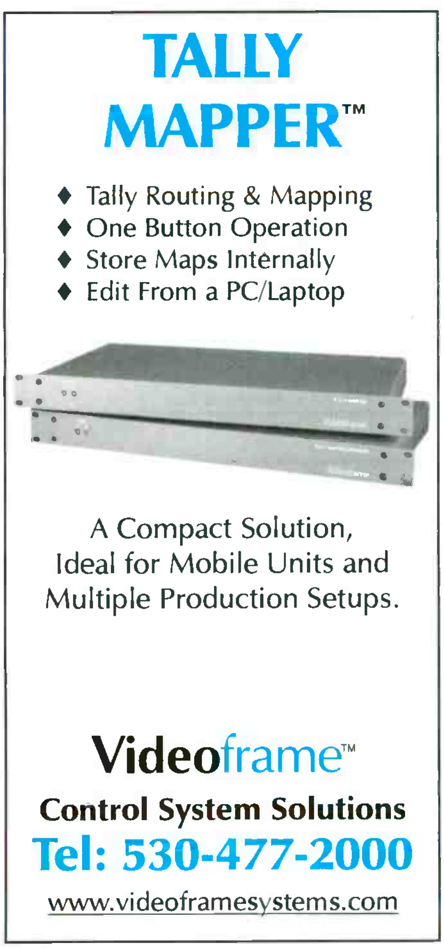
650-328-3818; *www.accom.com*

Gallery


ELECTRONICS RESEARCH, INC.
EL Series
UHF Antenna
The EL Series UHF Transmitting Antenna for either DTV or NTSC applications
ERI
Your Single Source for Broadcast Solutions
Sales@ERIinc.com | +1 (812) 925-6000 | www.ERIinc.com


The HD Maestro™
Real-time, PC-based High-resolution (1080i) HD MPEG Encoding Workstation
Input HD-SDI, output DVB-ASI
Based on the LSI Logic DoMiNo™ chipset
Perfect for post production HD content distribution
PC platform provides flexibility and connectivity
For more information on the HD Maestro or any DVEO products, call 858 613-1818. Or visit www.dveo.com
DVEO
Pro Broadcast Division
by CMI


Time
to advertise in Broadcast Engineering magazine
contact:
Jennifer Shafer
800-896-9939
jshafer@primediabusiness.com


TALLY MAPPER™
Tally Routing & Mapping
One Button Operation
Store Maps Internally
Edit From a PC/Laptop
A Compact Solution, Ideal for Mobile Units and Multiple Production Setups.
Videoframe™
Control System Solutions
Tel: 530-477-2000
www.videoframesystems.com


BROADCAST VIDEO Over IP
Broadcast Quality at 1.5 Mbps
Contribution Feeds
Live News Gathering
Portable ENG & SNG
Advanced Error Correction
Realtime Store & Fwd
Multi-Network T1, E1 & IP
NEW! 4:2:0/4:2:2 Video Profile
ACT-L3 Video Transport
Streambox
Call or visit our website today!
www.streambox.com • sales@streambox.com • 206/956-0544 x222


ATTENTION advertisers
Call to advertise in Broadcast Engineering magazine
Jennifer Shafer • 800-896-9939 • jshafer@primediabusiness.com

Classified

For Sale

SONY

DSR390L
DVCAM Camcorder with Studio Capability

- New Type 1/2 inch Power HAD CCD's
- F13 at 2000 lx sensitivity
- 65 dB S/N ratio
- 0.4 lx min illumination (F1.4)
- TrueEye process
- DyanLatitude
- Skintone Detail
- Black Compress and Stretch

SONY Authorized Professional Reseller

BRAND NEW
PRE OWNED
BUY
SELL
TRADE

The leading broadcast video sales company on the west coast!

Studio Exchange

818.840.1351

email for quotes **Paul@studio-exchange.com**

816 N. Victory Blvd. Burbank, CA 91502 FAX 818.840.1354

SKYLINE BROADCAST

QUALITY REFURBISHED BROADCAST EQUIPMENT

- **BUY**
- **SELL**
- **TRADE**

CALL: 866-804-1184 FAX: 866-804-1179

www.SkylineBroadcast.com

ELECTROXS.COM

* BROADCAST * POST * PRODUCTION *
* TEST * BUY / SELL / TRADE *
* SCOPES * EQ. RACKS * VTRS *
* & MORE! *

CALL 800-542-0646

AcousticsFirst™

Toll-Free Number: **888-765-2900**

Full product line for sound control and noise elimination.
Web: http://www.acousticsfirst.com

Professional Services

JOHN H. BATTISON P.E.
CONSULTING BROADCAST ENGINEER,
FCC APPLICATIONS AM, FM, TV, LPTV
Antenna Design, Proofs, Fieldwork
2684 State Route 60 RD #1
Loudonville, OH 44842
419-994-3849 FAX 419-994-5419

D.L. MARKLEY
& Associates, Inc.
CONSULTING ENGINEERS
2104 West Moss Ave.
Peoria, Illinois 61604
Phone (309) 673-7511 • FAX (309) 673-8128
www.dlmarkley.com
Member AFCCE

GILMER & ASSOCIATES, INC.
TECHNOLOGY / MANAGEMENT CONSULTANTS

BRAD GILMER
PRESIDENT

2207 RINGSMITH DR
ATLANTA GA 30345
TEL (770) 414-9952
FAX (770) 493-7421
EMAIL bgilmer@allnet.com

TO ADVERTISE
contact....
Jennifer Shafer • 800-894-9939
jshafer@primediabusiness.com

Companies Wanted

COMPANIES WANTED

A newly formed group headed by the former CEO of a broadcast equipment manufacturer is interested in purchasing companies with niche products and sales of 3 to 10 million dollars, the company does not have to be profitable. If your company meets this criteria please respond with some initial information which will be held strictly confidential. Please respond to PO BOX 281, Bloomfield, MI 48303-0281.

Employment

EMPLOYERS/EMPLOYEES
Click On
KeystoneAmerica.com
NO. 1 TECHNICAL / ENGINEERING EMPLOYMENT SERVICE

Chapters

Get plugged in to an SBE chapter near you!

Who you know can make all the difference

SBE

(317) 846-9000, x23
www.sbe.org
SOCIETY OF BROADCAST ENGINEERS

Help Wanted

TURNER STUDIOS

Turner Studios, the state of the art digital television complex serving the production needs of the Turner Entertainment Networks in Atlanta, Georgia, is seeking highly motivated, client service oriented Engineers to join our team!

We are currently accepting resumes for:

- Engineering Mgr - IT Infrastructure
- Network Specialists
- Render Administrator
- Production Engineers (all shifts)
  - Audio
  - Editorial
  - Effects
  - Router
  - Studio

Successful candidates will be motivated self-starters, detail and deadline-oriented team players, with strong interpersonal, communication and customer-service skills. Minimum 3-years industry experience with strong background in television engineering and cutting-edge post-production technology. Flexible work shifts are required.

Please send resumes to:
Jeff Sharpe
Director of Engineering
Fax - 404-878-4014
Email - jeff.sharpe@turner.com

For more information, please visit:
http://www.turnerstudios.com
http://www.turnerjobs.com

THE WEATHER CHANNEL®
weather.com

DIGITAL VIDEO ENGINEER

We have an opportunity for a top notch Digital Video Engineer. This person will be responsible for digital video activities associated with the development, creation, testing and implementation of key initiatives for our company.

We are seeking a person with proven experience in video signals, digital video technologies and compression technologies. It is highly preferred that the individual has experience maintaining a post production facility. This person will be a key player in maintaining the company's digital cable lab as well as participating in key strategic projects for the broadcast engineering department. The engineer must have experience working in cross functional teams and meeting priority deliverables. This person will be involved in communicating and presenting company technological contributions in the area of digital video technology to the cable industry.

Come join our team! Candidates must apply online at www.weather.com/jobs

The Weather Channel, 300 Interstate North Parkway, Atlanta, GA 30339

For advertising questions, please contact...
Jennifer Shafer • 800-894-9939
jshafer@primediabusiness.com

A PRIMEDIA Publication

BroadcastEngineering

www.broadcastengineering.com

Editorial Director: Brad Dick, bdick@primediabusiness.com
Technical Editor: Donald Keller, dkeller@primediabusiness.com
Sr. Assoc. Editor: Susan Anderson, sanderson@primediabusiness.com
Sr. Assoc. Editor: Laura Dixon, ldixon@primediabusiness.com
Asst. Editor: Chevonn Payton, cpayton@primediabusiness.com
Asst. Editor: Heidi Hueseman, hhueseman@primediabusiness.com
Sr. Art Director: Michael J. Knust, mknust@primediabusiness.com
Assoc. Art Director: Robin Morsbach, rmorsbach@primediabusiness.com
Technical Consultants: Computers & Networking – Brad Gilmer
Antennas/Radiation – John H. Battison
Digital Video – Michael Robin
Transmission Facilities – Donald L. Markley
Legal – Harry C. Martin
New Technology – John Luff
Industry Watcher – Paul McGoldrick
New Media – Craig Birkmaier

Sr. VP: Peter L. May, pmay@primediabusiness.com
Group Publisher: Dennis Triola, dtriola@primediabusiness.com
Marketing Dir.: Christina Heil, cheil@primediabusiness.com
Online Sales & Marketing Dir.: Samantha Kahn, skahn@primediabusiness.com
Vice Preisdent of Production – Lisa Parks, lparks@primediabusiness.com
Sr. Ad Prod. Coord.: Kathy Daniels, kadaniels@primediabusiness.com
Classified Ad Coord.: Michelle Hooper, mhooper@primediabusiness.com
Dir., Audience Marketing: Barbara Kummer, bkummer@primediabusiness.com
Group Show Director/LDI: Sharon Morabito, smorabito@primediabusiness.com

PRIMEDIA
Business Magazines & Media

COO: Jack Condon, jcondon@primediabusiness.com
Executive Vice President: John French, jfrench@primediabusiness.com
Corp. Comm/Mkg.: Karen Garrison, kgarrison@primediabusiness.com

Primedia Inc.: 745 Fifth Ave., NY, New York 10151
Chairman: Dean Nelson: dean.nelson@primedia.com
President and CEO: Kelly Conlin, kelly.conlin@primedia.com
Vice Chairman & General Counsel: Beverly Chell, beverly.chell@primedia.com

MEMBER ORGANIZATIONS
Sustaining Member of:
• Society of Broadcast Engineers
Member, American Business Media; Member, BPA International

BROADCAST ENGINEERING, ISSN 0007-1994, is published monthly (except semi-monthly in June and December) by PRIMEDIA Business Magazines & Media Inc., 9800 Metcalf Ave., Overland Park, KS 66212 (primediabusiness.com). Current and back issues and additional resources, including subscription request forms and an editorial calendar, are available on the World Wide Web at broadcastengineering.com.

SUBSCRIPTION RATES: Free and controlled circulation to qualified subscribers. Non-qualified persons may subscribe at the following rates (Prices subject to change): USA and Canada, 1 year, $70.00, 2 years, $135.00, 3 years, $200.00; Outside USA and Canada, 1 year, $85.00, 2 years, $165.00, 3 years, 245.00 surface mail (1 year, 155.00, 2 years, $295.00, 3 years, $440.00 airmail delivery). For subscriber services or to order single copies, write to *Broadcast Engineering*, 2104 Harvell Circle, Bellevue, NE 68005 USA; call 866-505-7173 (USA) or 402-505-7173 (outside USA); or visit www.broadcastengineering.com.

ARCHIVES AND MICROFORM: This magazine is available for research and retrieval of selected archived articles from leading electronic databases and online search services, including Factiva, LexisNexis and Proquest. For microform availability, contact ProQuest at 800-521-0600 or 734-761-4700, or search the Serials in Microform listings at proquest.com.

REPRINTS: Contact Wright's Reprints to purchase quality custom reprints or e-prints of articles appearing in this publication at 877-652-5295 (281-419-5725 outside the U.S. and Canada). Instant reprints and permissions may be purchased directly from our Web site; look for the iCopyright tag appended to the end of each article.

PHOTOCOPIES: Authorization to photocopy articles for internal corporate, personal, or instructional use may be obtained from the Copyright Clearance Center (CCC) at 978-750-8400. Obtain further information at copyright.com.

PRIVACY POLICY: Your privacy is a priority to us. For a detailed policy statement about privacy and information dissemination practices related to Primedia Business Magazines and Media products, please visit our Web site at www.primediabusiness.com.

CORPORATE OFFICE: Primedia Business Magazines & Media, 9800 Metcalf, Overland Park, Kansas 66212 • 913-341-1300 • primediabusiness.com

Help Wanted

MAINTENANCE TECHNICIAN - WATE-TV6 has an immediate opening for a Broadcast Maintenance Technician. Applicant must be a graduate of an accredited electronics school or college with 10 years experience in broadcast maintenance. Must be capable of troubleshooting analog and digital broadcast electronic equipment to the component level in cameras, videotape machines, switchers, microwave, transmitters, and associated terminal equipment. Must have an understanding of computers and microprocessors as they apply to broadcasting equipment. VHF and UHF transmitter experience a plus. Must have a General Class FCC license and SBE certification. Interested parties send resume and salary requirements to: WATE-TV6, ATTN: PERSONNEL, ENGINEERING JOB #04-18, P.O. BOX 2349, KNOXVILLE, TN 37901. No beginners and no phone calls, please. EEO Employer.

WDSI FOX61TV seeks Assistant Chief Engineer: experience with UHF Transmitter preferred, ability to maintain studio equipment, analog and digital tape recorders and DVC Pro equipment required. Good communication skills a must. Send resume and cover letter to: WDSI FOX61 Attention Christene Ramsey, 1101 East Main Street, Chattanooga, TN 37408, email to wdsijobs@pgtv.com or fax to 423-265-3636. NO PHONE CALLS PLEASE. WDSI FOX61 is an equal opportunity employer and a drug free workplace.

A BROADCAST MAINTENANCE ENGINEER is needed in Salt Lake City, Ut. Applicant must be proficient in Autocad, computers and networking technologies, analog and digital video tape recorders, digital audio/video systems, microwave, satellite, and TV transmitter systems. Applicant must have good verbal and written communications skills and work well in fast paced stressful environments. Requires five years experience broadcasting. SBE certification is preferred. Please submit resume to: Ronda K. Porter, KUTV Human Resources, 299 South Main, Suite 150, Salt Lake City, UT 84111, Or fax to 801-973-3173. Email: porterr@kutv2.com, No phone calls please.

MAINTENANCE ENGINEER - JOB REQUIREMENTS: A minimum of 3-5 years broadcast maintenance engineering experience as well as thorough knowledge of electronic maintenance for broadcast television required. Requires an in-depth knowledge of television station operation. Live news experience, strong a plus. Must be able to read schematic diagrams and troubleshoot analog and digital equipment to the component level. Familiarity with all FCC rules, regulations as well as test equipment operation for diagnosis of all digital and analog signals. Experience in server technology a plus. **LANGUAGE/SKILLS:** Bilingual Spanish/English helpful. Must be able to troubleshoot and respond timely to maintenance needs for live broadcast. **TO APPLY ONLINE VISIT US AT:** http://nbcjobs.com.... Key word is Maintenance Engineer... OR FAX TO HUMAN RESOURCES AT: 818-840-3528 EOE

FOX O&O in Memphis is seeking an engineer to maintain and repair studio and transmitter equipment with emphasis on Beta SX VTR and RF systems repair. Troubleshoot to the component level. Serve as designated FCC Chief Operator. Must be well versed in FCC and OSHA rules and regulations. Must be self-motivated and able to work independently with little supervision. Requires ability to lift 50 lbs., occasionally work on ladders or in confined spaces, and available to work nights/weekends/holidays for emergency calls. Must have valid driver's license. Requires five years experience in commercial broadcast television and transmitter maintenance. SBE Certification is preferred. Please send resume to: Human Resources, WHBQ-TV, 485 S Highland, Memphis, TN 38111.

	Page #	Advertiser Hotline	Web site Address
ADC Telecom Inc	59, 95	800-366-3891	adc.com/broadcast
AJA Video	96	800-251-4224	aja.com
Anton Bauer	46	203-929-1100	antonbauer.com
Anystream	91	888-ANYSTREAM	anystream.com/anywhere
Avid Technology	4-5		avid.com/broadcast
Azden Corp.	66	516-328-7500	azden.com
Barco Projection Systems	87	770-218-3200	barcocontrolrooms.com
Calrec Audio Ltd.	93	615-871-0094	calrec.com
Canon USA Broadcast Lenses	29	800-321-HDTV	canonbroadcast.com
Chyron Corp.	20		chyron.com
Clear-Com Intercom Systems	75	510-496-6666	vitecgroupcomms.com
Dielectric	69	800-DIELECTRIC	dielectric.com
DK Audio	76	+45 870 241 4118	dk-technologies.com
DMT USA	63	856-423-0010	dmtonline.us
Dolby Labs Inc.	21	415-558-0200	dolby.com/dolbye
Ensemble Designs	56	530-478-1830	ensembledesigns.com
ERG Ventures Co. Ltd.	68	949-263-1630	erg-ventures.com
Euphonix	51-54	650-855-0400	euphonix.com
Evertz Microsystems Ltd.	IBC	905-335-3700	evertz.com
Fischer Connectors	73	800-551-0121	fischerconnectors.com
Fluke Corporation	42	800-490-2361	pomonaelectronics.com/75ohm
For.A Corp. of America	61	714-894-3311	for-a.com
Forecast Consoles Inc.	107	800-735-2070	forecast-consoles.com
Fujinon Inc.	77	973-633-5600	fujinon.com
Gearhouse Broadcast	97	818-955-9449	gearhousebroadcast.com
Gepco	78	800-966-0069	gepco.com
Hamlet Video	48	866-4-HAMLET	hamlet.us.com
Harris Corp./Broadcast Div.	3	800-4HARRIS	broadcast.harris.com
IBIS	88	877-541-IBIS	ibis.tv
Inscriber Technology	33	800-363-3400	inscriber.com
Inter BEE 2004	45		bee.jesa.or.jp
Laird Telemedia	92	800-898-0759	lairdtelemedia.com
Leitch Inc.	BC, 27, 101-102	800-231-9673	leitch.com
Link Research Ltd.	70	562-698-8560	linkres.co.uk
Marshall Electronics Inc.	58	800-800-6608	lcdracks.com
Maxell Corp	9	800-533-2836	maxell.com
Microwave Radio	65	978-671-5700	mrcbroadcast.com
Miranda Technologies	13	514-333-1772	miranda.com/intuition
Network Electronics	109	800-420-5909	network-electronics.com/us
NVISION	86	530-265-1000	nvision1.com
Omneon	34	408-585-5000	omneon.com
Panasonic Broadcast	7	800-528-8601	panasonic.com/broadcast
Pesa Switching Systems	17	800-328-1008	pesa.com
Pixel Power	90	954-943-2026	pixelpower.com
Prime Image	25	408-867-6519	primeimageinc.com
Pro-Bel	64	631-549-5159	pro-bel.com
Production Hub	105		productionhub.com
QTV	100	203-406-1400	qtv.com
Quantel Ltd.	19	203-972-3199	quantel.com
Quartz USA	50	888-638-8745	quartzus.com/xenon
Radyne ComStream	47	602-437-9620	radn.com
Richardson Electronics Ltd.	70A-D	800-737-6937	rfengineeredsolutions.com
Ross Video	41	613-652-4886	rossvideo.com
Sachtler Corp. of America	23	516-867-4900	sachtler.de
Salzbrenner Stagetec Media	40	+49 9545 440-0	audiorouting.de
Scopus Network Technologies	18	609-987-8090	scopus.net
Screen Service Italia	49	+39 030 3582225	screen.it
Sennheiser Electronics Corp.	32	860-434-9190	sennheiserusa.com
SMPTE	71		smpte.org/conference
Snell & Wilcox Ltd.	36-37	800-827-4544	snellwilcox.com/kahuna
Solid State Logic	57	212-315-1111	ssl-broadcast.com
Sony Business Systems	10-11		sony.com/xdcam
Sony Business Systems	31		sony.com/hdcx300
Sony Business Systems	39		sony.com/luma
Stratos Lightwave LLC	28	708-867-9600	stratoslightwave.com
Sundance Digital	98	972-444-8442	sundancedigital.com
Systems Wireless	89	800-542-3332	hmepro850.com
Tektronix Inc., Measurement Business	79-84	800-426-2200	tektronix.com
Thomson/Grass Valley	15		thomsongrassvalley.com/routers
Thrane & Thrane	35	+45 39 55 88 00	tt.dk
Utah Scientific	67	801-575-8801	utahscientific.com
Videotek, Inc	43	800-800-5719	videotek.com
Vitec Group Communications Inc.	75	510-496-6666	vitecgroupcomms.com
Wheatstone Corporation	IFC	252-638-7000	wheatstone.com
360 Systems	99	818-991-0360	360systems.com

US/CANADA

WEST
George Watts III
(360) 546-0379; Fax: (360) 546-0388
georgeww3@aol.com

EAST
Josh Gordon
(718) 802-0488; Fax: (718) 522-4751
jgordon5@bellatlantic.net

EAST/MIDWEST
Joanne Melton
(212) 462-3344; Fax: (913) 514-9249
jmelton@primediabusiness.com

INTERNATIONAL

EUROPE
Richard Woolley
+44-1295-278-407
Fax: +44-1295-278-408
richardwoolley@btclick.com

EUROPE
Tony Chapman
+44-1635-578-874
Fax: +44-1635-578-874
ARCintect@aol.com

ISRAEL
Asa Talbar
Talbar Media
+972-3-5629565; Fax: +972-3-5629567
talbar@inter.net.il

JAPAN
Mashy Yoshikawa
Orient Echo, Inc.
+81-3-3235-5961; Fax: +81-3-3235-5852
mashy@fa2.so-net.ne.jp

CLASSIFIED ADVERTISING OVERLAND PARK, KS
Jennifer Shafer
(800) 896-9939; (913) 967-1732
Fax: (913) 967-1735
jshafer@primediabusiness.com

REPRINTS
Wright's Reprints
(877) 652-5295;
International inquiries, (281) 419-5725
jbanda@wrightsreprints.com

LIST RENTAL SERVICES
Marie Briganti, Statlistics
(203) 778-8700 x146
(203) 778-4839
primedia@statlistics.com

Customer Service: 913-967-1707 or 800-441-0294

BROADCAST ENGINEERING September 2004, Vol. 46, No. 9 (ISSN 0007-1994) is published monthly and mailed free to qualified persons by Primedia Business, 9800 Metcalf Ave., Overland Park, KS 66212-2216. Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canadian Post Publications Mail Agreement No. 40597023. Canada return address: DP Global Mail, 4960-2 Walker Road, Windsor, ON N9A 6J3. POSTMASTER: Send address changes to *Broadcast Engineering*, P.O. Box 2100, Skokie, IL 60076-7800 USA. CORRESPONDENCE: Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2216 Phone: 913-341-1300; Edit. fax: 913-967-1905. Advert. fax: 913-967-1904.

The soul of an engineer

BY PAUL MCGOLDRICK

A while back, I was offered the opportunity to rebuild an AM transmitter station that I had originally installed. It was destroyed accidentally when an ammunition dump, inexplicably positioned right next door, blew up. I was offered extremely attractive compensation, but I declined the work. It was in a Middle East location to which I had no desire to return. And, besides, there's really no challenge in doing something you've already done successfully. (I always wonder why golfers keep playing again and again after they've proved they can get the little white ball down the hole.)

My decision not to take the job got me thinking about what an engineer is and what he does. To most people, we are locomotive drivers or underpaid public employees doing jobs that require little or no skill. And the impression that engineers are makers or attendants of engines is probably equally popular.

The word engineer originates from the Latin word ingenium, meaning skill. This root word also has given us the word ingenious. Engineers are at their best when they are being ingenious — solving new problems, applying their experience and knowledge to solutions that serve a great number of people. We are, above all, practical people — at least in the field in which we specialize. Scientists investigate phenomena; engineers solve problems. Scientists measure, engineers calculate. (In some languages, such as Arabic, the same word is used for engineering and geometry.)

I grew up knowing that I wanted to be an engineer (even worse, I knew I wanted to be in broadcasting). My fellow students did not understand why I had no desire to pursue a career in science, such as physics or chemistry, as they all did. But the world I saw was one where invention was key to humanity's future. All the great inventors were engineers (many of them never formally trained but no less brilliant). It's a wonder that so many people see engineering as a dry profession filled with nerdy types. There are certainly nerdy people out there, but most seem to be in arenas such as software, where the title engineer is almost certainly a misnomer because the profession relies on rigid rules that leave little room for imagination.

People also compare engineering to the practice of medicine, using adjectives like pragmatic or worldly. But all the physicians I know have been less than practical. Just watching my next-door neighbor, a family practice physician, spreading lawn fertilizer/weed killer directly from a box, without measurement, with his young barefooted son trailing after him, was enough to make me scratch my head. And, when talking with physicians, you find a level of indecision that you don't get talking to an engineer. We're used to taking action immediately to solve a problem, more like an emergency room physician.

But, in broadcasting, how much engineering do most of us do on a daily basis? How many times do you get out your calculator (or even your slide rule) to make a calculation about something? Such occasions probably are few and far between, unless you're actively involved in facility or equipment design. That's not to say that there is no ingenious work going on in your area, although in older facilities it may involve using duct tape until the budgets improve. The engineer in us identifies the constraints we are under, along with the resources that are (or are not) available, solves the immediate problem and moves on to the next crisis.

> **Engineers are at their best when they are being ingenious, solving new problems, applying their experience and knowledge.**

In addition to being ingenious, most engineers are also ingenuous — frank, honest and open (often too open) — about the problems they encounter in doing their job. This is one of the reasons why it's so easy for general management to stall any but the most urgent of equipment upgrades and changes. We ourselves create the impression that it takes a lot of ammunition to trump the ever-practical, resourceful engineer. But, then, we are also ingenious enough to know that when someone moves that ammunition dump next door, it's time to move on. **BE**

Paul McGoldrick is a freelance industry consultant based on the West Coast.

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


[What's Your HD Strategy?]