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IN THIS ISSUE

Features
76 Master planning: A blueprint of the future
By Daniel Taylor
Undergoing the master planning process ensures facilities are designed to meet current and future demands.

82 Sizing automation to fit
By Jim Boston
Automation systems are not a one-size-fits-all proposition.

86 Timing in hybrid facilities
By Mike Betts
Timing remains a concern in digital and digital/analog facilities.

92 Salary Survey
By Jim Saladin
Have engineering salaries kept pace with an increasing digital workload?

94 Newstech: Sports production
By Bennett Liles
New technology offers endless options for attracting viewers and new revenue streams.

Beyond the Headlines

NEWS
14 Changes in the satellite landscape
16 New imaging technology
18 One billion pixels per second breakthrough

FCC UPDATE
22 New FCC rules for descriptive programming

EXPERT'S CORNER/VENDOR VIEWS
24 Transitioning transmitters to COFDM

Digital Handbook

TRANSITION TO DIGITAL
28 Audio synchronization

COMPUTERS AND NETWORKS
34 Bandwidth management

ASK DR. DIGITAL
38 Parts, parts, my kingdom for the right parts

(continued on page 6)
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ON THE COVER: Today's post-production suites often must incorporate a range of analog and digital signals. Successful implementations provide both flexibility and adaptability. Photo credit: Aker/Zvonkovic Photography, Houston.

ON THE COVER: Today's post-production suites often must incorporate a range of analog and digital signals. Successful implementations provide both flexibility and adaptability. Photo credit: Aker/Zvonkovic Photography, Houston.

SYSTEMS DESIGN SHOWCASE
40 XETV's interoperable newsroom system
48 Ackerley Group's centralized technology
58 Sveriges Television's networked media servers

TRANSMISSION & DISTRIBUTION
68 Antennas revisited

PRODUCTION CLIPS
72 Metadata

New Products & Reviews

APPLIED TECHNOLOGY
114 Studer D950S with VSP: How to surround

TECHNOLOGY IN TRANSITION
122 Video servers: Serving from a daunting menu

NEW PRODUCTS
126 Panasonic's AG-DV1000, plus other new products

BUSINESS WIRE
136 Business highlights from broadcast and production

Departments
8 Editorial
10 Reader Feedback
150 Classifieds
157 Advertisers' index
158 EOM

FREEZE FRAME
A look at the technology that shaped this industry.

Pre-DVDs
In May 1970, Broadcast Engineering carried an article on a new Panasonic device for video tape duplication. The article stated, "...one day soon (video tape recording) will become a practical home activity with pre-recorded video tapes being marketed economically because of the ______" What was this device called? Supplying the generic name is sufficient. Selected correct entries will receive a Broadcast Engineering T-shirt. Submit entries marked "Freezeframe" to: brad_dick@intertec.com. All entries due by Nov. 30, 2000.
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City of thieves – déjá vu

I’m back from IBC. Another trip to the City of Thieves—and it lived up to its reputation, but more about that later.

The IBC has become a truly international exhibition, one with a few attributes that NAB would do well to adopt. Not the least of which is a civilized exhibition schedule and refreshments in many of the booths. The show opens at 10 a.m. and closes at 6 p.m. Also, the IBC show organizers treat the press like human beings instead of like flies at a picnic.

The IBC isn’t a show that’s big on new product announcements. Much of what’s shown is the actual embodiment of products that were announced at NAB, but really weren’t real. By IBC time many are actually shipping. IBC has also turned into a show where deals are announced. You’ve probably heard about the acquisition of Pluto by Avid. Leitch bought DPS. Avstar became iNEWS, and the list goes on.

At NAB, the keyword was streaming. At IBC, the keyword was broadband. With Europe’s focus on digital television instead of HD television, the integration of data, and now broadband delivery, has been far less controversial. The result has been the development of a wide range of products, features and services. From simple media delivery to full interactivity via terrestrial, satellite and cable, Europe has gotten its collective act together with regards to datacasting. America would do well to follow suit or risk getting left behind.

I mentioned the City of Thieves in my introduction and Amsterdam again lived up to that reputation. By the way, lest my European readers be offended by the characterization, the term is what the Amsterdam Police Department uses. I know firsthand.

Many of you may recall my previous experience of being robbed in front of the Crown Plaza Hotel in Amsterdam a couple of years back. Well, this year wasn’t as catastrophic but infuriating nonetheless. I had hidden some gifts from my friends at Tektronix, SGI, Harris and the Grass Valley Group in our exhibit booth. The next day, I went back to the booth to pack them for shipping back home. Sure enough, I’d been ripped off. They left the IBC tote bags, guess they already had enough of them. They only took the good stuff! Other exhibitors had similar experiences.

Some local cab drivers were operating their own scam. Twice I found them instructing me on how a 20 guilder fare from a 50 guilder note equals 20 guilders change—always provided in two 10 guilder notes. New math, right?

On a more positive note, one characteristic that sets IBC apart from NAB is the party scene. Canal boat tours, trips to the beach and exquisite parties in impressive historical museums are often part of IBC. NAB’s version of culture is Plastic Paris, Cement Caesars and Naugahyde New York. However, nothing I’ve attended previously at IBC holds a candle to one soiree at this year’s convention.

To protect the guilty, I won’t mention the company’s name. Some said that clothing was optional, but that applied mainly to the hired female staff. Naked it wasn’t. Almost naked it was. Wild and crazy it was. And next time you’re thinking about serving fruit, you could consider (or not) how this company “served up its refreshments.” I can only leave this to your imagination. After all, this is a family magazine.

BTW, I’m looking for a full-time technical editor. Broadcast, video and web knowledge is required. And, you have to be able to communicate well. If you’re interested, drop me a note.

Brad Dick, editor
Solving the Digital Puzzle

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**Kill the 8VSB Frankenstein**

**Dear Editor,**

Right on! The defenders of 8VSB are rightly named as Zenith and politicians who have much to lose. The rest of the world is wrong, and the new obsolete ATSC tests are the last word.

The only way the FCC can make 8VSB go anywhere is to force cable to carry it and even then it will only reach the cable-attached sets. How many homes have a second or third or fourth set not on cable? Ubiquitous use of over-the-air requires simple set-attached antennas.

The only compelling problem I have heard is that the allocations are complicated by such a change. I would like to know how difficult that problem is. On-channel repeaters might be of interest to those with coverage problems.

And what really amazes me is that the set manufacturers have not realized that they can't sell DTV as it is.

**DAVID GLOVER**  
**CHIEF ENGINEER**  
**UNIVERSITY TELEVISION/CTN**  
**WANNI STATE UNIVERSITY**

**Save the beast!**

**Dear Editor,**

Your editorial seems biased enough that I almost believe Sinclair must have you on their payroll.

With over 150 stations broadcasting, and receivers and STBs in greater numbers than you wish to admit, a change now would have a significant impact on the industry. You say “consumers don’t want it.” All but a few consumers don’t even know the difference between 8VSB and COFDM. They care about getting a good picture, and the facts are that 8VSB is offering that for the majority of current users. You cite a “junkyard of technology,” but you fail to acknowledge that 8VSB is a modern technology, loosely based on an older technology. Like many other facets of modern digital technology, there will always be advances and improvements. If you wait for the “best” solution, you will always be one step behind the technology, and never able to commit to a standard, because there will always be something better on the horizon.

You should at least acknowledge that in most unbiased testing, the differences between 8VSB and COFDM are minimal. Perhaps 8VSB may require a bit more antenna tweaking than COFDM, but that is offset by 8VSB’s better immunity to certain interference sources. As far as mobile service, I wonder how significant the market share is of viewers who are in their cars. Besides when watching from a car, the reduced coverage of COFDM vs. 8VSB will make watching a show difficult even with the “better” technology, as the signal fades. When it comes to the fundamental purpose of television broadcasting, mobile service shouldn’t even be mentioned.

Is 8VSB perfect? No, but rarely is anything in life.

**PAUL STAVROU**  
**MANAGER**  
**TECHNOLOGY MARKETING**  
**MANNESMANN REXROTH**

**Freezeframe winners**

July's question: Name the two companies that introduced ¼-inch VTRs at the 1983 NAB. The answer is: Hitachi Densi and Bosch-Fernseh. If you’d like a copy of the entire article published in the June 1983 issue, e-mail me. The following readers each win a Broadcast Engineering T-shirt for their correct answers:

David Telles, Las Cruces, NM
Michael Nerenberg, CKAL-TV
Tom Alderson, KHQ-TV
Richard Greenstine, CBS, Los Angeles

Check out this month's Freezeframe question on page 6. Answers must be received by Nov. 30 to be eligible for the Broadcast Engineering T-shirt. You must include your affiliation and location.
Chances are, you’ve heard that digital technology can help produce news faster and easier. With an SGI Media Server, the evolution to digital can happen just as fast. The new SGI video server distributes media as data for browsing and sharing content over standard data networks, allowing you to leverage your existing infrastructure for repurposing content. Plus, our multi-format, resolution-independent solution delivers simultaneous input, serving, and play-out of video, eliminating the need for independent devices. These advantages — as well as 24x7 service and support — help make your transition to digital quick and easy. To learn more about SGI Media Commerce solutions, visit our Web site or call 1-800-800-7441.

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Changes in the satellite landscape

LARRY BLOOMFIELD

Recent indications that Hughes DirecTV may be on the market point to the growing interest in satellite service providers.

DirecTV is being courted by a number of DBS and other media companies, including EchoStar and ViaCast. Harry Pearce, chairman of General Motors, parent company of Hughes, said GM will decide whether to retain Hughes within the next few months.

Hughes is developing new satellite facilities that it hopes will create two-way transmission not only with television sets but also with personal computers and other devices. Becoming a part of the online revolution is not out of the question.

The key to all this is quality of service (QoS). One can expect to see the same quality program at lower bit rates, but there is the option of shipping better quality in the same bit rate over a period of time. That could extend up into the DTV and HDTV ranges.

A good indication of how this can happen is the significant number of local-into-local television services that have been added over the last several months since the implementation of the new Satellite Home Viewers Improvement Act. Also, don’t forget the recent announcements by Sprint and others to leverage the low-power television spectrum for all kinds of media (and Internet) services. There is no reason why TV content cannot run over that.

With consolidation taking place in cable, we can probably look forward to one DBS company and one cable company.

You’ve already seen the announcements by Gilat and others to provide bi-directional Internet services via satellite (watch your local Radio Shack this fall). Think of it as a broadband cable modem in the sky. This is certainly not for everyone, but just the ticket for some consumer segments, demographics and geo-specific locales.

As for cable competition with the above, it is strong and getting stronger.

The satellite guys won’t just sit back and bask in their newfound glory. They’ll be staying on their toes, and the consumer will be the beneficiary in terms of new products, programming, services and choice.

On the other side of this coin, if DirecTV and EchoStar merge, some see no chance of higher quality images or any other improvements in custom- er services or the control of price increases. The idea that cable is a real competitor only holds water in communities where both serve the market.

With consolidation taking place in cable, we can probably look forward to one DBS company and one cable company declaring the era of free market competition officially over.

Exit AOL

Antitrust officials may ask America Online to divest its $1.5 billion stake in Hughes Electronics as a condition of approving the online giant’s acquisition of Time Warner.

The FTC is concerned about AOL’s domination of high-speed access, whether through satellite or cable. During reviews of the merger proposal by various federal agencies, AOL has said it will open cable systems and high-speed lines to competitors.
THE TOUGHER YOUR PROBLEM, THE HARDER WE WORK.

Face it, many companies provide broadband solutions. Unfortunately, few of these solutions work the way they're expected to. Which is why more and more broadband service providers are bringing their architectural problems to Harmonic. Simply put, our solutions work, 24 x 7.

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Even the FCC is getting into the AOL/Time Warner act by demanding that America Online and Time Warner provide documents to back up claims the companies made at a recent FCC hearing.

The Commission sent a letter to the firms, asking that they produce any and all documents related to the issue of open access to Time Warner's cable lines and AOL's instant-messaging network.

The letter — the third time the FCC has asked for more information regarding the merger — comes soon after the chairmen of both AOL and Time Warner testified at a commission hearing.

Time Warner's chief Gerald Levin told the commission that his company had every intention of offering consumers high-speed access to multiple ISPs on its cable lines, just as soon as it could rework an exclusive agreement it has with the Road Runner Internet service.

The AOL eviction notice would certainly impact the Hughes/AOL alliance, which includes work with DirecPC. DirecPC is intended to help deliver AOL-Plus services and DirecTV, which is collaborating with the online company for its AOLTW interactive product.

**Gas and Internet**

Ever since DirecTV's lackluster DirecPC came onto the scene a year or so ago, there have been many different efforts to find out if anything was salvageable. Praise the gas pump and pass the dipstick; a use may have been found in, of all places, Germany. So if your Volkswagen, BMW or Mercedes comes away from the pump a bit melancholy, here's why.

A new service between HOT Telecommunications, the European unit of Hughes Network Systems, and United-Screens will offer an innovative service to gasoline stations through HNS' DirecPC service. During the four minutes it takes to pump an average tank of gas, German drivers will be entertained by TV screens with the latest audiovisual communications and advertising at the point of purchase. Programming will be supplied by United-Screens and transmitted via DirecPC. It will be installed at 800 Shell Select Shops and selected gas and convenience stores throughout Germany by autumn.

The reason for mentioning this here is that it would seem to be a possible profit center for a local digital television station to offer slow bit rate advertising via this method of display, distributing it terrestrially rather than via satellite into their own market. Why stop with gas stations?

---

**New imaging technology**

Many in Hollywood feel HDTV could someday replace film. Today, HDTV has almost two million pixels per frame in a 16:9 1920x1080 HD picture. You need at least 2000x4000 pixels to re-create the 35mm film experience for a typical movie theatre, to give answer print quality, and that's the minimum. That's about four times the resolution of today's HDTV.

In the latter part of August, Eastman Kodak announced a chip able to capture digital images with a resolution of 4096x4096 picture elements — or pixels — per square inch. That, by some measures, is about twice the resolution of 35mm film.

Not two weeks later, Foveon, a Silicon Valley pioneer chip designer, announced an image-sensing device capable of the same resolution as the Kodak chip, but made using a technique that could be much less expensive.

Carver Mead, Foveon's founder said: "We're headed to flat-out replace the film camera." Mead, a pioneer of the chip industry, became a Silicon Valley legend in the 1970s by helping develop techniques that for the first time enabled chip engineers to create circuits containing tens of thousands of transistors.

According to Eric Zarakov, Foveon's vice president of marketing, "The tests, to date, have been done using still photography. Since there is a bigger market for still cameras than television cameras, we're pursuing that market first." Zarakov did say television is certainly not out of the picture. What makes this device remarkable is that the 16.8-megapixel (4096x4096) image sensor represents resolution and quality advances that were previously seen as unachievable for CMOS sensors. It is the first CMOS-based image sensor that exceeds the resolution and quality of Charge-Coupled Device (CCD) sensors.

"Foveon has worked closely with National Semiconductor Corp., its principal investor and manufacturing partner, to achieve breakthroughs in image sensor resolution, CMOS image sensor quality and CMOS image manufacturing," Zarakov said. These technological achievements will have a profound impact towards bringing higher quality and lower costs.
Calling the DPS-475 and DPS-575 merely synchronizers is a bit of an injustice. We prefer the term “Audio/Video Synchronizer, Digital Noise Reducer, Bi-Directional Analog/Digital Transcoder, Framestore, Video Bandwidth Processor, Animated Logo Insertor, Linear Keyer, TBC, AGC, Audio/Video Test Signal Generator, VITS inserter and Serial Digital Audio Embedder/De-Embedder”. The DPS-475 (NTSC) and DPS-575 (PAL/NTSC) super synchronizers, with their incredible array of features, are the hands-down next generation leaders. Let’s talk facts. Proprietary DPS 12-bit adaptive 3D comb filter decoding and encoding ensure maximum signal transparency. Composite, Component, Y/C and SDI video I/O, optional 1394 (DV) I/O and available four-channel audio synchronizer modules provide unprecedented system interface flexibility. For signal taming performance, reliability and economy, the DPS-475 and DPS-575 are in a class by themselves.
According to Foveon, its 16 megapixel image sensor represents a leap ahead of the entire CCD and CMOS image sensor industry in both resolution and quality. The sensor is about three times the resolution and almost three times the data of the six megapixel CCD sensors found in today’s high-resolution professional digital cameras. It is also more than 50 times the resolution of the most commonly manufactured CMOS image sensors found in today’s low-end consumer digital cameras.

What has made this all possible is a breakthrough in CMOS process technology. Current CMOS image sensors are made with a 0.35 or 0.50 micron process, and it has been generally accepted that 0.25 represented the next round of product offerings.

What sets Foveon’s 16 megapixel sensor apart is that it is the first image sensor of any size to be manufactured with a 0.18 micron CMOS process technology. The use of 0.18 micron processing enables more pixels to be packed into a given physical area, resulting in a higher resolution sensor.

To bring this all down into familiar phototype specifications, the 4096x4096 sensor measures 22mm x 22mm and has an estimated ISO speed of 100 (similar to film with an ISO rating of 100) with a dynamic range of 10 stops. With proper lighting, there is no reason this device couldn’t be used for motion. It has shutter speeds of from 2 to 1/8000th of a second, using an integrated fully-electronic shutter that ensures the exposure for all 16.8 million pixels is terminated at precisely the same moment so there would be no lag between rows, columns or subset regions of the imager.

The new 16.8 million pixel device has seven active transistors for each pixel. The benefits include less interference, better focusing and more precise exposure times. “When the pixels get smarter,” Mead said, “that translates into better image quality.”

Mead said that because of fundamental size limits in the wavelengths of light, it is unlikely that future digital sensors will gain much additional resolution. Instead, shrinking semiconductor circuit sizes will make it possible for companies like Foveon to add more and more intelligence to their digital-imaging systems, perhaps simulating more of the image-enhancement functions of the human brain.

---

**One billion pixels per second breakthrough**

A Santa Clara, CA, company claims to have broken the one billion pixel per second barrier.

Huy Nguyen, product-marketing manager at NVIDIA, said, “Our company has introduced the most powerful 3D graphics processing unit (GPU) ever produced. Our chip is the first that will decode all 18 formats of ATSC digital television. You need to have video processing power to handle..."
The second you power up a Dveous, you'll feel quite at ease. The world's most widely-acclaimed DVE delivers the industry's most dazzling effects, yet is easy to use. That's why the Oscars, Olympics and the effects-crazed X-games use Dveous. And why Dveous OrbitalFX®, UltraWarp®, SurfaceFX® and more are what others imitate but cannot match. Bottom line, it's Dveously easy. Want proof? Get a demo.

www.accom.com/dveous. Find out why Dveous is simply the ultimate turn on.
high-definition resolution, which is two to five times larger than DVD resolution.

The heart of this device is a high-definition video processor (HDVP) that enables a variety of crystal-clear HDTV solutions when combined with a mainstream CPU and a low-cost DTV receiver. Don’t be surprised if these components are already included in the newer digital television sets. The HDVP allows mainstream high-performance processors to support all 18 ATSC formats with a simple, cost-effective DTV receiver card.

The transform and lighting engines provide over 31 million sustained

pixels per second, and two to three times the pixel processing power of any graphics processor.

Nguyen said his company has been working on high-definition displays for the past 12 to 18 months, and that “this latest development has the horsepower to handle and decode high-definition formats. It has all the required video scaling capability without degrading computer-centric television displays, it is not difficult to understand and look to this industry and all of its second cousins for developments within our own industry. Improved graphics means better quality display video from a technology that enables advanced per-pixel shading capability, permitting per-pixel control of color, shadow, light, reflectivity, emissivity, specularity, gloss, dirt, and other visual and material components.

The HDVP allows mainstream high-performance processors to support all 18 ATSC formats with a simple, cost-effective DTV receiver card.

NVIDIA’s new tuner chip can translate the 18 ATSC formats and may have applications in computer-centric displays.

**Presmaster 100 multi-channel master control switcher so much power: so easy to use**

![Image of Presmaster 100 multi-channel master control switcher]

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www.americanradiohistory.com
New FCC rules for descriptive programming

BY HARRY C. MARTIN

After five years of study, the FCC has adopted rules requiring all television stations to accommodate the needs of the visually-impaired audience.

Stations which report emergency information must ensure that information such as an emergency telephone number is accessible to people with visual disabilities. Also, stations which provide emergency information via a “screen crawl” or “scroll” now must accompany the information with an audible tone. Many newscasts already comply with these new rules by the nature of their reporting. However, these procedures are now a federal requirement.

Beginning in the second quarter of 2001, ABC, CBS, FOX and NBC affiliated stations in the top 25 markets will be required to broadcast video description during a minimum of 50 hours of programming per quarter. The most frequently used technology is a “closed” video description, similar in nature to closed captioning, that transmits on an additional audio channel accessible to viewers who own multiple audio channel television sets. It provides an audible description of events and visual elements during natural pauses in the regular programming audio.

All stations (not only those in the top 25 markets) must comply with new FCC video description rules if they are affiliated with any television network that broadcasts network programming containing video descriptions, provided their broadcasting and transmission equipment can process the information.

DTV closed captioning rules

To maintain service to hearing-impaired viewers during the transition from analog to digital television, the Commission has amended its rules to require manufacturers to build closed-caption compatible DTV sets by July 1, 2002. All programming prepared or formatted for DTV broadcast after July 1, 2002, must be closed-captioned no later than Jan. 1, 2006.

The FCC’s order updates rules adopted in 1991 governing closed captioning circuitry on analog television sets. Under the order, DTV must adhere also to the eight-year phase-in schedule for closed-captioned programming outlined in a 1997 order for analog receivers. The amended rules also require that 100 percent of non-exempt new programming have closed captioning by the Jan. 1, 2006, deadline.

The order adopts additional rules for digital receivers that do not apply to analog closed-captioned programming, including requiring that decoders support different caption sizes, fonts and colors. Cable providers and other multichannel video programming distributors must transmit captions in a format that will be understandable to this decoder circuitry.

The additional requirements sparked dissent from Commissioner Harold Furchtgott-Roth, who complained that imposing new rules for closed-captioning features exceeds Commission authority under the Television Decoder Circuitry Act of 1990 (TDCA). The TDCA requires that television receivers contain circuitry to decode and display closed captioning and requires the Commission to ensure that closed captioning service remains available to consumers as new technology is developed. However, the TDCA does not address whether the Commission may mandate additional features for closed-captioning services, and the new decoder rules exceed the industry’s recommended practices for decoder manufacturers.

These rules apply to digital television receivers with picture screens measuring at least 13 inches diagonally and receivers measuring 7.8 inches or larger vertically. Converter boxes used to display digital programming on analog receivers must continue to deliver the analog caption information to the attached analog receiver.

New registration number system

In July the Commission began implementing the Commission Registration System (CORES) to assign registrants a 10-digit FCC registration number (FRN) for use on all applications or payments sent to the Commission. The FRN eventually will be used in all Commission financial, authorization of service and enforcement activities. Right now, use of the FRN is voluntary.

Stations which filed auxiliary applications in the Wireless Telecommunications Bureau’s Universal Licensing System prior to June 22, 2000, will receive an FRN automatically by mail. Otherwise it will be necessary to use the CORES registration system. Instructions for registration were included on page 2 of the FCC’s FY 2000 Mass Media Regulatory Fees instruction packet or can be obtained from the FCC’s website www.fcc.gov (click on the CORES link).

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

Dateline

Biennial ownership reports will be due for commercial and NCE-TV stations in 2001, beginning on Feb. 1. The first group of states required to file (on Feb. 1) will be Arkansas, Kansas, Louisiana, Mississippi, Nebraska, New Jersey, New York and Oklahoma.

Send questions and comments to: harry_martin@interotec.com
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Transitioning transmitters to COFDM

BY JIM SALADIN, SENIOR ASSOCIATE EDITOR

With the continued debate over 8VSB and COFDM, making a transmitter purchase decision has become even more difficult. Perhaps it is time to take a minute to ask, “What if?” Can stations that have already invested in an 8VSB transmitter simply swap out an exciter and go about their business, or is there another shoe to drop? It’s important to know the longer-reaching effects of any possible change, especially one that comes at a make-or-break point for the entire industry.

Toward that end, we posed several questions to two industry leaders, Geoff Mendenhall, vice president of advanced product development for Harris Broadcast, and Don Markley, BE’s own Transmission & Distribution columnist and president of Markley and Associates. The questions were as follows:

“Suppose the FCC did allow COFDM, what effect would that have on transmitters already purchased? Can modern DTV transmitters be converted to COFDM operation? Will there be a power penalty? Are there other long-term issues to consider if a station needs to make the transmitter decision now? Should I wait or buy now?”

In light of the continued debate over 8VSB and COFDM, should I wait to order a transmitter? No. If you wait until the last minute, you may jeopardize your ability to meet the FCC’s mandated on-air date; making logistics much more difficult for your station, and end up paying more than you would by moving ahead on a realistic implementation schedule. To this end, we would recommend going ahead and getting on the air now with 8VSB. In the unlikely event the transmission standard changes, you can convert your transmitter to COFDM. We don’t believe there will be a standards change in the U.S., if you are concerned, you may want to size key RF components for the peak power required by COFDM as a precaution. This would support conversion to COFDM if necessary, with minimum risk, while preserving the major portion of the initial investment. The cost of replacing the DTV exciter will be small compared to the overall cost of the transmitting facility, and Harris transmitter architectures are scaleable.

Suppose the FCC did allow COFDM, what effect would that have on transmitters already purchased? If COFDM were permitted in the U.S., VHF and UHF transmitters already installed and operating with 8VSB could be converted by changing the 8VSB exciter to COFDM while maintaining the current peak RF power output within the ratings of the current transmitter. It may also be necessary to adjust some metering, control and power amplifier parameters of the transmitter.

Could today’s 8VSB transmitters be converted to COFDM operation? Yes, by replacing the existing 8VSB exciter with a 6MHz COFDM exciter and making other miscellaneous adjustments including the linearization of the RF power amplifiers for the different peak-to-average ratio of the COFDM signal. Harris is a leading supplier of COFDM transmission equipment to the European DVB-T market and has significant expertise in COFDM. All Harris solid-state and IOT DTV transmitters have been laboratory tested with COFDM modulation and are compatible with both 8VSB and COFDM modulation.

Would there be an RF power penalty in switching from 8VSB to COFDM? Yes. Assuming that it is important to replicate existing analog coverage, there will be a significant power penalty. COFDM has higher RF power peaks than 8VSB. Harris has confirmed that even after the application of aggressive crest factor reduction techniques, the peak-to-average power ratio is at least 2dB greater for COFDM. This means that a transmitter running at full power with 8VSB will deliver 2dB less average power after conversion to COFDM.

Using the same antenna, how much more RF power would a COFDM transmitter need to generate to replicate the same coverage as an 8VSB transmitter? Ignoring interference limitations, the transmitter size would have to be increased by four times (or +6dB) to maintain the same coverage in the fringe of the service area. The receiver noise threshold is based on average power and COFDM requires 4dB more average power near the receiver threshold than 8VSB. Changing out only the 8VSB exciter will result in 2dB less transmitter power output plus the 4dB threshold penalty, for a total receiver threshold loss of 6dB.

What about interference protection ratios? COFDM requires greater digital-to-digital and digital-to-analog interference protection ratios than 8VSB. The SET/ABFRT field test data supports the Harris analysis that co-channel COFDM-to-COFDM will require about 4.8dB more protection than 8VSB-to-8VSB. Co-channel COFDM into analog interference will require about 1.0dB more protection than 8VSB into analog. Considering the tighter co-channel interference protection ratios...
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required by COFDM, if the transmitter power was increased to provide the same coverage as 8VSB, the FCC table of channel allotments would have to change to maintain the current protection ratios. Even if the transmitter power was not increased, acceptable protection ratios cannot be met with COFDM. This will create large areas of interference where the signal cannot be received and could significantly delay the introduction of DTV within the U.S.

• Would changing to COFDM increase AC power costs?

If the FCC were to make the decision to change to COFDM from 8VSB, the final impact might make that perfect storm of recent fame look like a gentle summer zephyr.

In the simplest of scenarios, existing DTV stations would only have to replace their encoders and exciters. Not a trivial amount of cash, but nothing that would put them off the air. The only problem is that they would sacrifice a great deal of coverage if there were no additional change to the facility. First, look at the ratio of peak to average power for the two systems. For 8VSB, the ratio is 4.5 to 6.5. With current encoding/compression practices, the number of four has been found to be livable. For COFDM, we have been advised that the measured value is closer to 15. Even if this were to be held down to eight by improved encoding or compression methods, the transmitter would have to double in peak output power capacity to maintain the same average power.

Next, the carrier-to-noise ratio is different for satisfactory COFDM reception. This calls for another 4dB in signal level to maintain the same service area. The overall result is a necessary increase by a factor of at least five to maintain the same service area. If the station is now running a transmitter with 100KW peak power output, the increase would be to 500KW peak power output. The power bill would be interesting, but that big row of IOTs would be pretty.

Yes. The AC power costs for a 50kW 8VSB IOT transmitter operating 24hrs/day would typically be about $175K/yr. To replicate coverage, a 200kW COFDM IOT transmitter would be needed, with typical power costs of $586K/yr. The European approach to broadcasting, which uses many low power transmitters, is not impacted as much by the higher peak-to-average ratio required by COFDM.

• Are there other long-term issues to consider if a station needs to make the transmitter purchase decision now?

If the broadcaster wants to replicate analog coverage as the FCC planned for 8VSB, the digital transmission plant would have to provide about 6dB more peak effective radiated power (ERP) for COFDM. This could be accomplished by planning for a larger transmitter, a higher gain antenna, or a combination of both.

Geoff Mendenhall is vice president of advanced product development for Harris Broadcast Communications.

Don Markley is president of Markley and Associates, Peoria, IL.
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Maximize Your Camera's Performance.
Audio synchronization
BY MICHAEL ROBIN

Analog audio is difficult to handle. There are frequency response problems, distortion problems (harmonic and intermodulation), noise problems, and wow and flutter. Then there is the signal level monitoring with two opposing concepts: the VU meter and the PPM. Not surprisingly, analog video is also difficult to handle. There are linear distortion problems (poor frequency response, chrominance to luminance delay and gain inequality to name a few), nonlinear distortion problems (including luminance nonlinearity, differential gain and differential phase) and noise problems.

In the NTSC world, picture information is transmitted in a synchronized manner. Each picture requires precisely the same amount of time to be transmitted. The analog audio accompanying the NTSC video signal is continuous, and, like the analog video, is transmitted in real time.

Early television production had no lip-sync problems. They started appearing with the use of video frame synchronizers. These devices introduce a 33.3 msec, or more, video frame delay with respect to the accompanying audio. This is barely noticed by the viewer and was ignored by the broadcasters. Apart from lip-sync there were no audio synchronizing concerns.

Digital signal processing, recording and distribution eliminates many of the cumulative distortions affecting the analog audio signals. 20-bit digital audio equipment provides a 120dB dynamic range, guaranteeing excellent SNR and 20dB of headroom, allowing the use of any level indicator, including the infamous VU meter, while avoiding clipping. 48kHz sampling guarantees a 20kHz bandwidth without aliasing.

Digital audio equipment can consist of an assembly of digital black boxes connected using analog I/O ports. In this case, there is no need for synchronization of the digital equipment. This analog approach, however, results in multiple conversion artifacts and should be avoided.

The AES/EBU digital audio interconnect standard eliminates the multiple conversion problems and ensures faultless, secure and reliable equipment interconnections, especially when 75Ω coaxial cable is used. Digital interconnection of digital audio equipment in an audio studio, including the digital audio mixer, requires all audio equipment be synchronized to a common reference. With signal sources using sampling frequencies other than the standard 48kHz, audio standards converters are required. External digital audio signal sources need to be passed through an audio frame synchronizer locked to the local reference signal before further processing. These requirements are relatively easy to satisfy and problems are not normally encountered, other than learning the basics of synchronization, a topic unheard of in analog audio environments.

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ensures secure and reliable digital video equipment interconnections.

Using digital audio production facilities in a digital video studio requires that the 48kHz audio sampling frequency be coherent with the 27MHz 4:2:2 time division multiplexing frequency, i.e. derived from a common reference. This is required to allow the embedding of the digital audio into the digital video data stream. In addition to synchronizing the audio and video sampling frequencies, an additional problem occurs in North America. This has to do with the fact that an integer number of audio samples (8008) occurs only once every five video frames. Ideally, all digital audio sources have to be synchronous and timed according to the five-frame sequence. (See Figure 1.) This poses some problems when embedded audio signal sources have to be switched “live” using an embedded routing switcher. Because the five-frame timing sequence cannot be easily and inexpensively controlled, the live switching of non-timed embedded audio/video signal sources is often accompanied by audio clicks. The problem can be solved either by using a V-fade type switch or by routing video and audio digital signals separately.

Along with synchronizing and audio/video timing considerations, videoequipment latency also has to be considered. Digital video production switchers, especially in combination with a DVE, introduce video signal delays known as video latency. A concatenation of several digital-processing elements can introduce considerable delays, which manifest themselves as lip-sync loss. For instance, a frame-synchronizer-processed external video source passing through a DVE can acquire a video latency on the order of 66.6 msec. Currently, the lip-sync problem is treated in one of three ways:

- The signals pass uncorrected. This approach is used quite frequently and leads to significant video latencies.
- A fixed correction is applied, such as delaying the audio signal to match the video delay. This method can be used when the video signal path is unchanging and where the delay can be measured and is generally known. Alternately, when frequently changing operational configurations occur resulting in a variety of video latencies, a fixed audio delay may offer a compromise solution.
- The audio delay is caused to track the video delay. In this case, the audio delay tracks the difference in the timing of the input and the output video signals across an item, such as a frame synchronizer or a standards converter.

Several manufacturers offer video frame synchronizers and standards converters with slaved audio delay units. Clearly, the first approach is inadequate. The other two require the installation of many audio delay units. Unfortunately, these methods only compensate for the locally introduced video latencies and cannot correct for video latencies existing in the incoming signal. When the incoming signals exhibit time-varying lip-sync problems, operators may be assigned to manually adjust the audio delay. This is time consuming and costly.

**MPEG-2 and lip-sync problems**

In the compressed digital world the amount of data transmitted to represent I, P, and B pictures is variable depending on a large number of factors. The compressed digital television world lacks the concept of synchronization between display and transmission. To address this problem, MPEG-2 provides for the transmission of decoder timing reference information in

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**Figure 1.** Using digital audio in a digital video studio requires that the audio and video sampling frequencies be synchronized to the same reference using the five-frame sequence shown above.
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the adaptation headers of selected packets. The system clock is 27MHz, samples of which are transmitted in the Program Clock Reference (PCR) field. The decoder audio and video sample clocks are derived from the system clock derived from the PCR.

MPEG-2 features a timing model that guarantees the accumulated delay from the MPEG-2 encoder to the MPEG-2 decoder is kept constant. The decoder can thus be designed to compensate for this delay. The contributing factors are:

- the encoding process (DCT, VLC, RCL);
- encoder buffering;
- multiplexing;
- transmission;
- demultiplexing;
- decoder buffering;
- the decoding process; and
- presentation.

DTV contributes to the lip-sync problem because early DTV implementations require numerous video format conversions. The various types of format conversions may not always be predictable. Among the various scenarios will be HDTV to SDTV and SDTV to HDTV conversions including a variety of aspect ratio conversions. As each of these conversions will generally require a frame memory, the resulting accumulated video latencies, if not eliminated or at least reduced, will prove to be unacceptable to the viewing public. Additionally, the type of format conversion and the equipment used will vary from location to location. It is expected that network origination centers will use a limited and predictable number of format conversions and will thus be able to predict and control lip sync. The operational configurations and equipment used by network affiliates vary, so each location will have to apply specific means of lip-sync control. When you realize that a great deal of signal sources and destinations will still be analog for the foreseeable future, requiring a great number of ADCs and DACs, it is evident that DTV will increase the occurrence of lip-sync problems.

The DTV standards provide for the transmission of six audio channels (5.1). Current HDTV VTRs can handle only four discrete audio channels (two AES/EBU bitstreams). Handling six audio channels is quite a challenge. One possibility is to use compression to increase the carrying capability of one AES/EBU datastream. Another possibility is using a multichannel external digital audio tape recorder. This audio tape recorder will have to be slaved to the VTR using timecode. Consider the problems associated with locking a timecode generator based on NTSC 59.94 interlaced fields per second to a 1920x1080 HDTV VTR operating at 60 interlaced fields per second. It should be clear that it is quite impractical to operate a single teleproduction center simultaneously with 59.94 and 60 fields per second. Don't forget that we also have the choice of using the 1280x720 format featuring 60 progressive frames per second. Undoubtedly solutions will be found and this scenario will fade into oblivion. But, in the meantime, we will have to train our ear/brain mechanism to accept ever increasing lip-sync problems.

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

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Bandwidth management

BY BRAD GILMER

Bandwidth management is a relatively new topic for many of us. Routing a VTR to a monitor does not involve a calculation to determine if the router has sufficient bandwidth to make the connection. This is because, in an existing television facility infrastructure, the router guarantees a full-bandwidth point-to-point connection between any two points in the system. However, computers and their associated networking architectures are finding their way into the broadcast production chain. (See Figure 1.) Many computer networks do not guarantee a full-bandwidth connection from one place to another. This can be a problem if these computers are in mission-critical applications. Managing bandwidth in critical computer networks is something that will become more familiar as computers become more entrenched in broadcast facilities.

This month, we will explore issues surrounding bandwidth management inside a single broadcast.

What's the problem?

Most broadcast content moves around facilities using analog or perhaps Serial Digital Interface (SDI) routers. However, some video and audio content in your facility probably travels on computer networks. As network speeds increase, it becomes more and more feasible to send content across these networks. One might wonder why someone would choose to move video across a network rather than using a conventional broadcast router. One answer is that when using a Non-Linear Editor (NLE) connected to central storage, the network connection becomes the obvious choice for moving content. Another common network application is moving content between servers in a large server-based play-to-air system. In these environments, it is easier and quicker to move content using the computer network. As these systems become more common, the consequences of a bandwidth-starved network become more serious.

One way to head off this problem is to implement bandwidth management. Bandwidth management systems manage network bandwidth, avoiding network slow-downs and blocking. Bandwidth is allocated to applications as needed, if bandwidth is available. If bandwidth is not available, the application must wait. Various priority schemes are in place to allow a high-priority transfer to get the bandwidth it needs. This sounds like a great solution. There is only one problem — while bandwidth management systems and protocols have been developed, these solutions have not been widely implemented. Proprietary systems are available, but they do not work well (or at all) in mixed-vendor environments.

Bandwidth management today

The most popular high-capacity networking architectures in use today for moving rich media content are ATM, Gigabit Ethernet, Fibre Channel and 1394 Firewire.

Ethernet: The most likely solution to bandwidth management in Ethernet systems is the Resource Reservation Protocol (RSVP). RSVP is a network-control protocol that enables applications to obtain special qualities of service (QoSs) for their data flows. RSVP allows an application to specify three different traffic types: delay sensitive, best effort and rate sensitive. A device requesting a streaming transfer across Ethernet would specify both rate-sensitive and delay-sensitive, since streaming video is disturbed by changes in rate and changes in delay along the transmission path. Once a rate-sensitive session has been established, the RSVP protocol will not grant a subsequent RSVP request that would cause the network to provide less than the required rate to existing rate-guaranteed sessions. While RSVP would appear to be a solution, implementation has been slow and availability of equipment implementing RSVP is limited.

Fibre Channel: Fibre Channel networks can be set up as either point-to-point connections or as a switched fabric. Bandwidth is not an issue in point-to-point applications as there are only two devices connected to the network. However, bandwidth management is an issue in switched fabric networks. Fibre Channel has several classes of...
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operating modes. Class 1 is connection-oriented without acknowledgement, much like a router, offering a direct connection via a switch from one device to another. Unfortunately, Class 1 was not widely implemented. Class 2 is a connectionless service with acknowledgement, which is used primarily for tape devices. It is not generally used to move content between servers. Class 3 is connectionless without acknowledgement and is the most widely implemented version of Fibre Channel. In Class 3, a central switch customer requests a Constant Bit-rate (CBR) connection and the rate is success fully negotiated through the ATM switch or switches, then a guaranteed amount of bandwidth will be available. 

Potential solutions
Given that there are issues with many network technologies discussed above, this leaves users with several choices:
1) roll their own bandwidth management system;
2) buy all of their network-connected devices from a single vendor who has not allow for interoperability in a multi-vendor environment, many of these systems have been developed to meet specific use needs. Frankly, standards organizations have been somewhat slow to address this area, and proprietary systems are a response to user demand before appropriate standards are in place.
A third way for the user to deal with bandwidth is to build a load of overhead into the system and move on. This argument has its merits. First, high-speed hardware is becoming plentiful and

Ask Dr. Digital

Parts, parts, my kingdom for the right part
BY STEVE EPSTEIN

I enjoy reading your column each month. Often your advice has helped me find solutions and ideas for solving some of my own technical problems. In the past you have offered help locating a one-of-a-kind part—well, I need one. I have a Zenith front projection television, Model 865P. These units are often seen hanging in auditoriums or sports bars. I also have a VCR with an S-VHS output. The Zenith projector has an RGB high-definition input, but to use it with S-VHS you need a Zenith S-43 S-VHS adapter. This optional module converts the S-VHS input to RGB and is added to the front of the projector above the three CRT guns on a seven-pin edge connector. Zenith (now AOX) no longer has any of these. I have also come up empty searching the Internet. Would you or your readers know of any parts depot or AV shop which might have one of these living around?

Rick Garofalo
Staff Engineer
WGN TV

That one's going to be tough. It is likely that if someone has one, they already use it in its installation. I've done some searching, and haven't found anything other than another person's posts on the Internet looking for one. Maybe a local reader has one lying around or knows where to find one.

Short of finding one, it might be easier to simply convert the S-VHS signal external to the projector and use the existing HD-RGB inputs. There are several boxes on the market that provide scan conversion from manufacturers such as Communications Specialties and Extron. If your projector can accept and lock to external scanning frequencies, you could take advantage of that and likely convert the S-VHS signal to any frequency the projector locks to. I read your August 2000 column and can relate to the fact that there are still some 529s that haven't been modified. What would I like is a source for the CRTs used in the 528s and 529s. Tektronix no longer supports the product. The last one bought from them five years ago was $500. (I tried rejuvenating one but it didn't work.) Does anyone know someone in China that we could send one to so they could duplicate the product?

Lou Johnson
WGCL-TV

I am not entirely sure those tubes could be duplicated without Tektronix's permission but, considering that they are no longer supporting the scopes, I would think it should be fairly easy to get the rights to manufacture them. Unfortunately, almost all CRT production automobiles that continue to operate. I am currently researching a problem concerning another manufacturer that is no longer supporting a product that is of a much more recent vintage. I hope to have that ready to publish in the next issue. If anyone reading this has any additional information regarding either of these older parts, or other pieces of broadcast hardware that are no longer being supported (the newer the better, as that is where the strongest case can be built), please send it to me at drdigital@compuserve.com.

Steve Epstein is a freelance broadcast consultant based in the Midwest.
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XETV's live news and sports broadcasts are produced using integrated newsroom systems in the station's new San Diego facility, which houses the studio shown above, featuring five Hitachi SK-2700 digital cameras. The broadcasts are then transferred to master control in Tijuana.
XETV's Interoperable Newsroom System

By Stephen D. Rosen, Gus Allmann and Bob Anderson

XETV, a Fox affiliate owned by Televisa, provides English-language programming to the San Diego market, with transmitter and master control in Tijuana, Mexico.

Fox network feeds have landing rights to be downlinked by satellite directly to Tijuana, but syndicated programming and commercials are bicycled across the border from San Diego. The live news and sports broadcasts are uplinked by satellite to Tijuana to be integrated with commercials in the master control.

A live newscast such as XETV's — with fast-paced graphics, animation and sound effects — can only be done with tightly integrated systems. That is exactly what XETV has installed in its new facility, a brand new building constructed on its San Diego property.
as a virtual edit suite by assigning any combination of machines, video, audio, machine control and TBC control to that room. With the Profile servers set to BVW-75 control protocols, as many as 10 available channels of Profile can also be utilized in this capacity if desired.

Three Profiles with DV codecs are used— one for play-to-air of the finished news pieces, and another as a news edit and ingest Profile and as a mirrored backup of the first. Both of these have DVCPRO50 codecs and nine hours of recording storage. Another Profile, with a DVCPRO25 codec, is used to record satellite, microwave, fiber and off-air feeds on a 12-hour continuous loop. Before it reaches the end, the material is transferred to the editing system or moved to tape, depending on the material.

Manual Profile control is handled by a VDR remote control panel located with each Profile in the central equipment room and in News TOC.

The TOCs manage incoming and outgoing feeds from the facility. News TOC handles incoming feeds from ENG microwave, off-air, off-satellite, fiber and network. Sports TOC manages the sports feeds, while Operations TOC manages syndicated programs and incoming commercials.

Production Control Rooms A, B and C on the third floor are used for promotion/production and graphics and were relocated, expanded and re-integrated in the News TOC and recorded onto the newfeed Profile or DVCPRO50 and transferred to NewsCutter if needed. Feeds can of course be taken live as well.

In addition, San Diego is heavily wired for fiber optics, allowing feeds received in the News TOC and recorded onto the newfeed Profile or DVCPRO50 and transferred to NewsCutter if needed. Feeds can of course be taken live as well.

Additionally, the station was future-proofed, allowing for expansion without additions to the core infrastructure.

Integrated newsroom workflow

The second floor newsroom contains eight pods, each with four journalists' workstations. Additional iNEWS computers are located at the assignment desk, sports and weather offices, and in the news director's office. Adjacent to the newsroom, edit suites employing NewsCutter editing systems are used for news and sports.

The station's ENG trucks use Panasonic DVCPRO50 ENG camcorders for field acquisition. When feeds are microwaved to the station, they are to be sent to the station via fiber. ProChannel and cell phones provide IFB communications from the newsroom to the ENG trucks.

Tapes brought back to the station can be inserted directly into storage for editing or into the news edit Profile for low-res browse and then to storage. Voice-overs are usually done right in the edit rooms.

After a story is edited, the DV file is pushed to the play-to-air Profile via copper and optical Fibre Channel. At the same time, the clip name created in the editing system is carried through to the Profile and to the automation system, where it is available to be entered into and controlled by the show rundown.

Meanwhile, in the newsroom, the journalists write their stories on PC workstations running Windows NT, all connected via LAN to the news server, a Compaq Unix server and the automation server.

During the newscast, BCS is used to control the playback of the play-to-air Profile clips and maintains a dynamic link with the news rundown. If there are any changes in the rundown (including story deletions), the clips are automatically re-ordered.

While BCS can be used to control the Profiles to actually roll the clips, XETV employs a clip operator for that purpose. The clip

The audio control room features a Wheatstone TV-80 analog audio console with over 350 inputs available to 22 mono channels and 10 stereo channels.
We understand that the road to digital transition and integration for one station may be very different from that of another. Having been down a lot of roads in large markets and small, we bring a wealth of experience planning and managing the digital transition process, addressing the specific needs of the stations we work for and the unique markets they serve.

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So whether you're managing in Mayberry or maneuvering in Megalopolos, we can make the road to digital transition and integration straight and smooth. Give us a call before you begin your journey.
The central equipment room at XETV houses a Venus routing switcher which routes parallel video paths as one to allow easy transition between analog and digital in XETV's operations.

San Diego is heavily wired for fiber optics, allowing feeds to be sent to the station via fiber.

The Sunday Sports Show uses the same setup as news. The sports rundown and associated playlist are loaded during a 90-second break after news, facilitating a seamless transition into the sports show.
The live newscast is uplinked by satellite to the Tijuana master control room, where commercials are inserted. During the news, XETV uses the intercom to make an international telephone call between the news control room and master control room to coordinate commercial insertion. The ENG/SNG truck is being used for the satellite uplink until other arrangements can be completed.

Expansion plans
The functionality of the iNEWS system will be expanded with the addition of Media Browse 2000 and new NewsCutter software later this year. This will allow the journalists’ workstations to function as cut-only editing stations for simultaneous browsing of incoming feeds, raw footage and field coverage in real time. An upcoming Media Browse release will allow XETV to stream edited news packages to the Web.

The success of the integration of XETV's newsroom systems has allowed the station to expand its news offerings. Additionally, the station was future-proofed, allowing for expansion without additions to the core infrastructure.
Although most of XETV's news staff have had no previous experience with server-based newsroom and nonlinear editing systems, their creativity and the flexibility of the overall systems and design enabled them to quickly start pushing the system capabilities.
The system's flexibility and interoperability continues to result in the creation of exciting and unique newscasts.

Stephen D. Rosen is president, and Gus Allmann is executive vice president of TV Magic, Inc. Bob Anderson is operations manager of XETV.

Project team and equipment list

Barbrow, Thomas and Associates (TBA), Architects
BYCOR, Building Contractor
TV Magic, Inc., Systems Integrator and Project Management
Stephen D. Rosen, President/CEO and Project Manager
Gus Allmann, Executive Vice President and Director of Engineering and Design and Project Engineer

Major Systems/Equipment
iNEWS NRCS
Compaq newsroom servers
iNEWS BCS
4 Avid NewsCutter editing systems
Philips Venus router
5 Hitachi Sk-2700 cameras
Philips DD35 news production switcher
Pinnacle DV Extreme DVE
Pinnacle Lightning still store
Pinnacle FX Deko CG
3 Profile video servers
9 Panasonic AJ-D950 VTRs
Sony BVE-2000 Edit controller
Sony BVM series digital monitors
ENG
Panasonic AJ-D910WA camcorders and AJ-LTB5 laptop editors
A few years ago, Digital System Technology (DST) developed its "Station In a Box" methodology, which defined a consolidated, multi-channel, automation-based content delivery system. Soon after, DST presented this concept to the Ackerley Group, a broadcast group that operates 17 television stations in California, Oregon, Washington, Alaska and New York. Interested in the concept from the start, the Ackerley Group adopted some of DST's philosophies in this area and added its own angle: regional broadcasting that would link any number of stations to one central server through what they branded "Digital CentralCasting."

This strategy, first deployed at Ackerley's New York Station Group hub WIXT-TV in Syracuse, NY, and then Central
The champ went down in 1 minute, 25 seconds.....
California Station Group hub KGET-TV in Bakersfield, CA, was more recently implemented in the master control room at KCBA-TV and KION-TV in Salinas, CA. Both stations are housed at one facility in Salinas, which utilizes a central server for Ackerley’s North Coast Regional Station Group. This group of stations includes KVIQ-TV, Eureka, CA; KMTR-TV, Eugene, OR; and KFTY-TV, Santa Rosa, CA. While KION-TV’s master control room houses a Digital CentralCasting server, its program material is controlled through the CentralCasting hub in Bakersfield.

DST completed the integration within KCBA and KION in November 1999. While the building itself is not new, the broadcast capabilities are vastly different in comparison to its previous broadcast environment. To confirm the system would work, DST integrated and tested the system in its Irwindale, CA, headquarters prior to delivery.

The biggest technical challenge of installing the new Digital CentralCasting system, which involves switching from analog to digital master control, was keeping the on-air integrity of the existing manual analog master control online with the traditional cart machine and VTR delivery system during the integration of the system. One of the benefits of the system is the small footprint needed in relation to a traditional system. Only one-fifth of the space of the existing analog master control operations is needed to operate a single Digital CentralCasting channel.

Once installation was complete, the regional stations were gradually added to the central server, officially called Ackerley’s CentralServer+. With the system in place, the Ackerley Group

Only one-fifth of the space of the existing analog master control operations is needed to operate a single Digital CentralCasting channel.

KCBA utilizes Sundance Digital automation, DPS A/D converters and a SeaChange Broadcast MediaCluster for short-form programming.
Unfortunately, the signal went down in 1 minute, 23.

If something can go wrong, it will. And at the worst possible time. You either plan for it - or hope for the best.

RollCall, the network management system from Snell & Wilcox helps you avoid such disasters. Not only does it provide the most versatile and advanced control capability for broadcast TV stations, it also offers a number of unique functions designed to give you maximum operational confidence.

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A comprehensive logging facility records every event on the network, however minor, for subsequent analysis. So potential faults can often be diagnosed before they become catastrophic.

Using RollCall, you can even create your own multi-level, schematic view, with live information showing everything that's happening on your network.

With virtually no constraints on physical layer or software platform, RollCall provides all the tools you need to monitor and control your network, no matter how large or complex, from wherever you are in the world.
new technology, unexpected challenges arise and solutions must be provided. As with most hardware expansions, the corresponding software must also be upgraded to accommodate the additional channels.

As part of our turnkey services, DST also provided Ackerley with all the necessary equipment for the Salinas, Syracuse, and Bakersfield facilities. These complete turnkey solutions, which included equipment selected by the Ackerley Group through discussions with DST, were chosen due to cost effectiveness and interoperability. While the final call for equipment rested within the Ackerley Group, it was our job to help guide them to what we believed would best meet their application needs. Ackerley uses a SeaChange Broadcast MediaCluster MPEG-2 digital video server, chosen for its ability to store automation, considered the “brains” of the system, allows for automated or manual control of any or all stations within a Regional Station Group and imports traffic, billing and scheduling information into the system via its VCI traffic software. DPS A/D converters convert analog material to digital video and embedded audio for storage, eventually to be used for playback within the system.

After evaluating a number of competitive products in all product areas, this turnkey solution was considered the best all-around choice for the Ackerley Group’s needs. Beyond the equipment installation, we provided the system’s connectivity. At the Salinas facility (as well as within the Syracuse and Bakersfield facilities), all commercial and local insertion, as well as network programming are delivered to the regional stations via Digital CentralCasting through fiber. KCBA in Salinas is unique because it is extremely accessible to local fiber, which allows for a

Because of the open architecture of the server, expansion is simply a matter of adding more encoders, decoders and additional storage to the system’s automation package.

Ackerly’s CentralCasting employs a TiltRac V-300 Video Library Manager for its long form and archived program for its regional stations.
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wide range of connectivity solutions. Because the most expensive part of using fiber can be the cost of the last mile, KCBA is one step ahead with its proximity to an abundance of fiber, therefore further reducing overall costs.

The fiber optic link transports all digital programming material from the Salinas hub at KCBA to each of the stations in its Regional Station Group for airing, also integrating bi-directional video, audio, transmitter telemetry, monitoring, data networking and sales reporting. The news departments at each station in the Regional Station Group can cross-feed news material.

Connectivity issues caused a few snags when Digital CentralCasting was officially launched at KCBA. The company providing the fiber hook-up was not used to dealing with broadcasters and didn’t quite have everything set up as needed. This raised some issues, mostly in the area of redundancy. In the event a backhoe accidentally dug up some of the fiber, what contingency plans were in place? Issues such as these necessitated further education from the Ackerley Group and DST to the company providing the fiber connection.

One of the jobs of the systems integrator is to be the customer’s advocate and make sure the equipment is designed specifically to meet the needs of the facility. Some of the products designed for the Salinas facility needed to be customized. DST worked closely with the manufacturers to perform the necessary changes. Full diagnostics are remotely controlled, with everything IP addressable, providing easy access into the server, automation system and archival units.

Of course, the biggest challenge isn't always technical. While integrating an automation system into a previously non-automated master control room is a very large task, it is even more of a challenge to alter the mindset of the people within the organization from a non-automated environment to an automated environment. DST, along with Point B, a solutions group that serves as a consulting firm to assist clients in closing projects, worked with the Ackerley Group in implementing the workflow at KCBA, as well as WIXT in Syracuse and KGET in Bakersfield.

By designing the Salinas facility to handle Digital CentralCasting through a central server, the Ackerley Group has essentially eliminated master control at all North Coast regional television stations. Through KCBA, the Ackerley Group delivers digital programming to six television stations for the price of slightly more than one complete digital system, thereby reducing costs across the spectrum.

Mark Siegel is vice president for DST, Washington.

KCBA uses fiber optic links to transport digital programming to its regional group stations.
Better SDI from Analog Sources.

Eliminate quantizing errors and comb filter artifacts from your digital production and transmission with the new comb filter technology of the DEC-312S 12-bit Decoder/Synchronizer. Analog transmission may mask the deficiencies of the old comb technology in conventional decoders but digital transmission won't.

Dual Band Processing and Dynamic Threshold Modification (DTM™) increase the chroma bandwidth, reduce chroma crawl and reduce hanging dots on vertical transitions, while preserving luminance detail in the difficult areas of the picture. Continuously variable percentages of 2-line, 3-line, field and frame combing ensure the best possible YC separation under all conditions. And, with its unmatched noise immunity, the DEC-312S will lock to just about anything, even when the signal to noise ratio approaches 0 dB.

This new comb filter technology makes conventional combs obsolete. See the white paper on www.forteldtv.com for details and call today to arrange a side-by-side demonstration and see for yourself just how clean a decoded signal can be.
A key enabler of Ackerley's Digital CentralCasting strategy is SeaChange's Broadcast MediaCluster multichannel MPEG-2 server system. A third-generation video server architecture, Broadcast MediaCluster combines multiple Windows NT-based video servers, or 'nodes,' into one 'virtual' server, enabling Ackerley to gain significant new efficiencies in the management of its video assets.

Introduced in 1998, the Broadcast MediaCluster eliminates the replication and caching of media files between multiple machines to achieve fault-resiliency and multichannel I/O.

As a network of directly connected nodes requiring only a single file copy of any asset to serve multiple streams, the Broadcast MediaCluster acts as one computer. But unlike a single large computer, the MediaCluster nodes can fail independently, thereby increasing fault resilience. With its ability to scale in both storage and I/O capacity, it allows many channels to be recorded or played from one machine.

With up to 12 disk drives in each server node, a seven-node Broadcast MediaCluster can store more than 4.2TB of video. It supports up to 42 I/Os each delivering 30Mb/s MPEG-2 4:2:2 long-GOP video, with two 24-bit uncompressed AES audio channels. Or, alternatively, it can deliver 28 I/Os at 50Mb/s MPEG-2 4:2:2 1-Frame video, with each output providing four 24-bit uncompressed AES audio channels.

SeaChange's MediaCluster architecture provides access to videos as data objects in the same way a file server provides files to network clients. Because MediaCluster members manage their own file systems and export access only to the data objects, each MediaCluster member can read, write and delete files from its local RAID-5-based file system without disrupting other servers in the cluster. Furthermore, data objects are fragmented and written to all members of the cluster using well known RAID-5 striping and parity techniques. This ability to perform 2D RAID-5 striping, first across the disks within each server and second across the servers within the cluster is referred to as RAID$. A number of beneficial properties result from the MediaCluster architecture, principally load-balancing, single-file copy, linear scaling of both storage capacity and I/O bandwidth and fault-resiliency, among many others.

The core feature of the MediaCluster is the unique level of fault resilience. Data is striped across all nodes in the cluster. In addition, the system generates parity blocks. Think of parity blocks as the total sum of all the data in a stripe (normally one rotation around the cluster). If a block of real data is lost, the parity data is used to regenerate the lost data by calculating the partial sum all of the other data and subtracting the partial sum from the total sum (the parity data). An exclusive-or (XOR) function is used for this purpose. This technique is done in real time so that it does not appear that any data (or node or link) was lost.

MediaCluster storage and service bandwidth capacity can be scaled while the system is operational, that is, recording and playing media streams. Storage capacity can be added by adding disks to each node's chassis, adding additional expansion chassis to nodes, or by adding additional nodes to a MediaCluster. Bandwidth can be increased by adding nodes to a MediaCluster. As each new node is added, any content in the cluster is striped onto the newly added node.

**Broadcasting gets networked**

For broadcast facilities that have very large storage or I/O channel requirements, one or many Broadcast MediaClusters and other critical broadcast components such as off-line data tape archives, nonlinear editors or Web browsers can be networked together using the high-performance LAN-based Networked Storage Architecture model (shown here). This places the broadcast plant of the future squarely in the realm of a data storage and network facility based on open standards and commodity-based solutions.

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SeaChange's Networked Storage Architecture.

The Broadcast MediaCluster, coupled with the Networked Storage Architecture, radically reduces the capital cost for a multichannel video server. The combination is so effective that the channel/expense ratio becomes inverted. That is, instead of many operators required to operate a single channel, a single operator can now originate many channels.
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By C. Jason Mancebo

Sveriges Television's networked media servers

When Sweden's Sveriges Television (SVT) launched SVT24, the first 24-hour news service in Sweden, it needed a fast, efficient and cost-effective distribution and contribution system to interconnect its diverse regions throughout the country with its headquarters in Stockholm.

SVT24 is required by its charter to broadcast over half of its news content from outside of Stockholm, from regions as far away as beyond the Arctic Circle. Using its existing microwave links as the primary means of distribution would be cost-prohibitive for a 24-hour service, as SVT24 would be charged for each transmission. Also, there was not enough capacity in the microwave network for the needed 10 feeds at once.

SVT looked for other options and chose the innovative approach of installing 15 SGI Media Server systems for production and broadcast in Stockholm and the remote regions and connecting them over a computer network that comprises local area networks (LANs) linked with an E-3 34Mb/s microwave wide area network (WAN).

This solution, which has resulted savings of both time and money, allows news stories and programs to be transferred as DVCPro25 .dif data files at 95 percent to 105 percent real time, and offers low-resolution browse streaming and server control.
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Wired for the future
Facility

The facility to house SVT24 and the Stockholm regional digital channel was built from scratch by Sony in an existing office building in Stockholm. This was actually phase one of a greater plan to convert all of SVT’s news facilities to digital and to house them under one roof in the year 2001.

The facility includes a studio that also serves as the newsroom, a control room with combined production and master control capabilities, edit suites, a machine equipment room, and a media management room.

The single control room contains two video switchers: A Sony DVS-7250 production switcher with DME7000 and a Sony DMX-B4000 digital audio mixer are used for traditional news productions. At most other times of the day, a Sony DVS-M1000 master control audio follow video switcher with DME3000 handles production, especially when airing the regional news rebroadcasts or the daytime newswheel.

Two channels of this server are used for air production, and one channel is dedicated to the media management room. The media manager can record and play back to the server, controlling it from a standard PC with Media Control Panel software. Edit suites include seven existing Macintosh OS-based Avid NewsCutter nonlinear editors tied into an Avid Media Server residing on an SGI Origin 2000 server and 16 Beta SP videotape-to-tape edit suites.

Three Media Recorder clients and three Airplay clients also use material from the Avid media server. Currently, two of the Airplay channels are used to play edited clips to air. The third Airplay feeds the SGI Media Server (via serial digital video) that is used as the backup play-to-air server. SVT expects to use the SGI server as the main play-out server in the future.

The server is also used to transfer .dif files to a robotic data tape archive system — a Tape Storage 3494 using 3590 Model E tape drives and IBM RS/6000 UNIX server with 6000 hours of .dif file storage. Individual clip material from all of the regions plus SVT24 is stored in the archive.

SVT24 currently uses two low-resolution proxy browse systems. One is located in the city of Växjö where a production and broadcast server under special software control checks the other high-resolution servers on the network to see if any new material has been added. If so, it automatically

Using its existing microwave links as the primary means of distribution would be cost-prohibitive for a 24-hour service.
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transfers those files via the E-3 WAN and then feeds one channel of its SDI digital video and audio outputs to a Minerva VNP MPEG-1 (1.5Mb/s) encoder to create the low-resolution proxy. This, along with metadata, is stored on a server for broadband with Kasenna MediaBase. Any PC or workstation on the local or wide area network can search and retrieve low-resolution clips. The second browse system, an IBM cache disk for a tape library file server located in SVT24, is used only for finished stories on the Avid server.

The network is the key
Making all this connectivity and productivity possible is the network backbone.
To handle the increased traffic from the server systems on its existing microwave WAN, SVT upgraded it from 2Mb/s to a 34Mb/s E-3 TCP/IP Fast Ethernet 100BaseT network provided by Teracom. SVT connects its various LANs to the WAN by Teracom-delivered Cisco routers.
This network is used not only for handling the broadcast and production needs of SVT, but also for its entire enterprise system, including accounting, payroll and e-mail.

The ability to share media files over a standard IP WAN was crucial.

The rest of the district contribution system (DKS), which became operational in the summer of 1999, consists of an SGI server for production and broadcast in SVT24 in Stockholm, each of 10 regions (including the Stockholm region) and five local offices.
The systems used for SVT24 use DVCPRO25 compression and create a .dif file that remains in the data server as an Internet gateway for contributions outside of Sweden. This was tested together with other broadcasters such as CNN and TV2 Norway. SVT was then able to share .dif files over the Internet — not in real time but at an acceptable speed.

Automation and control software
SVT developed its own automation software, called Hawrys, which is used in the regions and SVT24. Hawrys reads rundowns, looks for production marks and presents the list to the on-air producer, who uses it to select and play clips from the servers. Hawrys communicates to the servers via open telnet-based multi-unit video control protocol (MCVP).
The on-air producer is one of the new roles created for SVT24 to select clips to be played and operate the video switcher. Editing and scheduling becomes a simple process with Hawrys. The numerous files received for a newscast can be edited or reordered as necessary and broadcast immediately.
Hawrys is also used to start the countdown clock with “final word” prompting, obtain timings from the rundown, activate the subtitling system if needed and send metadata to the tape archive notifying it that a clip has aired. It also controls the Chyron Maxine CG, Inscriber, a Quantel still store, the Avid Airplay and Tektronix 10X1 switches.
SVT’s automation system is as automatic as possible to allow their small staff to work efficiently and to manage operating expenses. To that end, Hawrys automatically archives a clip after it has been played out and controls the creation of the browse copies.
SVT uses other self-developed software to create HTML Web pages that allow access to the low-resolution server. The moment an edited piece from a region is stored on its local server, a browse copy is made, allowing viewers in other regions or in Stockholm to view it. This allows the journalists and producers to concentrate on the content and not worry about how they will get the video feeds.
Users can utilize the Web pages to search for clips using key words, retrieve low-resolution clips streamed from the browse server, and select and transfer desired high-resolution clips from any server or tape archive on the network. The software also allows the
If you produce, mix, or master audio for DTV or DVDs, the Dolby DP570 will make your life much easier. It lets you monitor multichannel audio, check downmixes, re-assign channels, and—best of all—quickly create Dolby Digital metadata and hear its effects in real time. In conjunction with Dolby E and Dolby Digital codecs, the DP570 gives you unprecedented control over what consumers hear at home, while simplifying production and eliminating a host of separate components. For more information on this all-in-one tool for multichannel audio production, and the name of the dealer nearest you, please visit our website.

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Dolby DP570 Multichannel Audio Tool
Sveriges Television's networked media servers

user to view rundowns from other regions. All of this is made possible by SVT's network architecture.

Phase two plans

SVT plans on expanding its server system next year when it moves all of its news, sports and current events programming units into a new all-digital facility in a different building in Stockholm.

The system installation will be handled by Sony and will be built in stages to keep all the services on the air during the transition. The new facility will have new studios and four control rooms, two with totally new equipment and two with existing equipment relocated from SVT24 and elsewhere.

The new system will also employ two ingest servers with a total of 12 video/audio-pair I/Os for real-time video from linear tape editing suites and news services such as Reuters and AP. The ingest servers will feed real-time video and audio to MPEG-1 encoders for the low-resolution browse server, which will be relocated from Växjö to Stockholm.

Each control room will have a pair of mirrored media server systems assigned to it for playout to air. The Hawry software will be updated to include mirroring functions, not only between servers in a single control room but for servers in all the control rooms. Servers in every control room will have clips for all the programs loaded in to allow the production crew can quickly move to another if a control room fails in the middle of a program.

Anticipating greater use of the IBM tape library, SVT plans on changing the type of tape used so that the total archive storage time will be doubled to 12,000 hours. A new and extensive media management system will be used for content cataloging, metadata creation, and browse search and retrieval.

SVT has been able to do more than it ever thought possible with SGI Media Servers. In just a short time, many of the regions have expanded the use of their local servers above and beyond their original function of automatically recording and transferring daily news programs. SVT believes that all broadcast facilities will be migrating to the type of network and server architecture employed at SVT24, not only for the advantages of flexibility, efficiency and quality, but to handle the possible melding of TV and the Internet into a whole new entity.

One of the purposes of SVT24 was to find a way to move forward with the new digital production technology for news. The strong combination of SGI Media Servers, Avid News Cutters and Sony's control rooms made it possible for SVT24 to enter into the IT way of news production and leave the video way. It's as big a technology leap as leaving the film way of news production 20 years ago.

C. Jason Mancebo is manager of Applied Engineering, Technical Marketing, DTV and Professional Media Technologies for the Telecommunications & Media Group at SGI.

Design team

Niklas Krantz, Tomas Rapp, Henrik Andersson, John Glimberg, Ulf Helge, Magnus Åkerlund, Per Einarsson, Marie Valund and Olle Sopranii.

SVT24 key equipment:

Studio:
4 Sony BVP-550 cameras

Production control room:
Sony DVS-M1000 master control switcher with DME1000
Sony DVS-7250 production switcher with DME7000
Sony DMS-B4000 digital audio mixer
Chyron Maxine 601 CG
Quantel Picture Frame still store
Screen subtitling system
3 Avid Airplays connected to an Avid Media Server
1 SGI Media Server
2 Hawry control stations

Routing switchers:
Sony DVS-V64464B, 64x16 with embedded audio
Sony DVS-V64464B, 64x32 with embedded audio

Archive:
Tape Storage 3494 using 3590 Model E tape drives and an IBM RS/6000 UNIX server

Satellite receivers:
1 NEC MPEG 4:2:2
7 NEC MPEG 4:2:0
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Antennas revisited

BY DON MARKLEY

Now that more antennas have been delivered as part of the DTV buildout, it would seem timely to look at the trends that seem to be developing.

The use of panel antennas is more widespread than in past years. The traditional television antenna in this country has been a single channel, top-mounted radiator. For UHF, slot antennas have predominated while the bat-wing has been used for the majority of VHF stations. The need for more antenna space has driven many stations to leave the traditional approach and join into broadband antenna systems with other broadcasters. The panel meets all the requirements for such use. Panels have been installed with up to 150kW average power rating that can accommodate both NTSC and DTV stations. The VSWR on those antennas can be adjusted to below 1.1:1 over all of the channels in use. Panels can also be easily directionalized, although the final pattern will vary somewhat for the different channels in use. Finally, vertical plane patterns are relatively easy to control but will again vary somewhat with channel.

Panels in multistation applications

The problem with a multiple user panel antenna is that it requires a compromise between the users. Normally, the antenna isn’t optimized for one given station, unless that station is paying for the system. Rather, it is designed to meet everyone’s needs as well as possible. While this may seem to be a problem at first, it is amazing to find out just how little difference a dB here or there will make in the actual service from an antenna on a tall tower. Another problem with panel antennas is that they are somewhat larger than slot radiators with a resulting increase in windload and weight.

The panel antenna has also found use in multiple station standby systems. For example, two panel antennas have been installed on the Sears Building in Chicago for standby use by multiple stations, including both NTSC and DTV facilities. Those antennas are located on the less desirable areas of the building where their patterns are affected by the existence of the main towers. Current plans are for one antenna to be shared by a total of seven stations and the other to be used by five stations. The antennas have been heavily used during the installation of new main DTV antennas. The service from those antennas has been found to be quite good, even though nulls exist in some directions due to the main towers. The biggest problem hasn’t been in the performance of the antennas but in adjusting the transmission lines from the combiners to the antennas for a flat response over the entire UHF band.

Use of panel antennas for standby applications brings up a good point. Standby antennas can be located in less desirable locations, freeing up the more desirable spots for main antennas. No station would consider the standby antenna locations of the Sears Building for a main antenna due to the unwanted pattern nulls. However, it should be remembered that a standby antenna is intended for use only when the main antenna must be shut down. That is usually only during periods of maintenance on the tower or, in rare occasions, when the main antenna fails. The
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total failure of a main antenna doesn't happen often, but the need for workers to be in the vicinity of that antenna occurs regularly. It would be nice if the standby antenna could be so located as to provide the same service area as the main antenna, but that usually isn't realistic. It is more reasonable to consider the auxiliary antenna as being better than being off the air while maintenance is performed. Other than during periods of construction, stations will normally use the standby less than one percent of the time.

Alternatives

With the onset of DTV, the most desirable tower top location often isn't available without a lot of work. Some stations have removed their existing top-mounted antenna and replaced it with stacked antennas for NTSC and DTV use. However, a greater number of stations have added a side-mounted antenna for DTV. While it is then necessary to accept the distortion in the pattern caused by the tower structure, a new family of antennas becomes available for use. First, side mounting an antenna requires much less in the way of structural strength than for a top mount. Obviously, that is because it is possible to brace the antenna to the tower, as needed, along its length. Rather than using a steel pylon as the basis for the antenna, an aluminum pipe can be used with a great reduction in weight and cost. While those antennas usually don't show up in the catalogs, all of the major manufacturers have them available. The performance is the same as for the steel-masted antennas.

While no one usually wants to make an issue of it, the fact is that the antenna pattern submitted to the Commission is usually for the antenna alone. There will be an impact on the antenna pattern caused by the tower. Regardless of just how the antenna is presented to the FCC, a complete pattern analysis should be performed by the manufacturer to determine exactly what the overall performance will be, including the tower and everything on the tower in the aperture of the antenna. Just as has been done for years for FM antennas, the effects of the pattern distortion can often be minimized by the manner in which the antenna is mounted or oriented on the tower. It is even possible to use the pattern distortion to the station's advantage by placing the lobes over the more desirable parts of the market.

Finally, don't even think about hanging a new antenna and line and then firing up the transmitter without first having the system swept and, preferably, tuned. If everything turns out to be all right, you will at least have documented proof of the original values of VSWR across the band and of the performance of the transmission line system. If everything is not initially correct, the tuning can be performed and the problems corrected before you have to explain to the management just why the new antenna system has a very noticeable ghost in the picture. That would be the good part. The bad part would be dancing IOT's as the system tried to feed a split bullet. Measure first—not after you have turned expensive components into carbon lumps.

* Don Markley is president of Markley and Associates, Peoria, IL.

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Metadata is simply information about something else. In the rich media environment, metadata is usually information about essence. Essence is broadly defined as that thing we work so hard to get on the air: a television program, a commercial or a movie. Essence is usually contained on physical media: videotape, hard disk or film. Metadata is usually contained on physical media, typically a 3.5" floppy, a hard disk, DVD or some other computer-oriented storage medium. Increasingly, essence and metadata are transported via a network rather than using physical media.

Here is an example of how essence and metadata are generated. An editor edits an incoming feed of news conference into a one-minute piece while a writer produces a script to go with the edited video and audio. At the end of the process, the producer receives the completed script from the writer, and the edited video and audio from the editor. The producer inserts the package into the news rundown; and at the appropriate point in the evening newscast, the news anchor introduces the story according to the script and the technical director plays the tape. The story is closed captioned in real time as it plays to air.

What is the role of metadata in this workflow? As the news conference is being recorded, time-of-day timecode provides information about when events on tape occurred. The Edit Decision List (EDL) from the edit session describes how the story was composed and lists other material that may have been used to create the story. The rundown contains the script and voiceover cues. Closed captioning provides a text record. All of this metadata is associated with the video and audio essence that make up the news story.

Limits on space for metadata

Videotape has always allowed us to convey a limited amount of metadata along with the essence. Timecode and closed captioning can be embedded in videotape. However, when it comes to carrying title information, scripts or formats, this information almost always rides either on a label stuck to the tape or box, or on a piece of paper stuck inside the box. This has worked in the past, but frankly it has been a bit awkward and forces operators to re-key data as the receiver may join a stream even though playback at the source began earlier and a monitor can display the output of a router within a fraction of a second of the time the router is switched to a particular source. What about the case where the essence is compressed digitally? These two simple functions may not be available unless essential essence is repeated. Why? Let's look at an example.

Determining the appropriate essential metadata repetition rate is a key part of the overall system design.

Let's assume that a signal consisting of one video and two audio channels is compressed using MPEG. A decoder may not be able to decode original pictures and sound without key information about how the signals were compressed. If this essential metadata is sent only once at the beginning of transmission, receivers will not be able to join the transmission once it has started. If essential metadata is repeated throughout a program, the problem described above is solved. Finding the correct rate for the repetition of metadata is critical. If the repetition rate is too low, a decoder will have to wait a long time to receive and decode essential metadata. This interferes with channel surfing. If the repetition rate is very high, the decoder can join a program much more quickly, but bandwidth for the program is reduced. Determining the appropriate essential metadata repetition rate is a key part of the overall system design.

It might be assumed that all essence and metadata should be preserved as far as possible throughout the broadcast chain. However, some metadata types may intentionally be destroyed after they have served their useful purpose.
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Examples of transient metadata (with "short" permanence) include rights information, machine control and encoder control. However, some permanent metadata would be expected to remain with the content, including such things as UMIDs and program titles.

To finish our discussion of metadata types, there is the concept of static metadata and variant metadata. Static metadata is metadata that remains the same throughout the duration of a piece of essence. A movie title is an example of static metadata. Variant metadata is metadata that changes during playback of the content. Timecode is the most obvious example of variant metadata.

Moving metadata

The two most common ways of moving metadata in a facility today are the piece of paper in the tape case and a 3 1/2" diskette. Neither of these methods works very well in a networked facility. Newsrooms, graphics facilities and large playout facilities often employ high-speed networks to move content within and between facilities. Several groups are working to create standardized ways to exchange metadata among systems in networked facilities. The European Broadcast Union (EBU) has a number of ongoing projects focusing on the user requirements for metadata in various applications including archiving, air playback and authoring. The Pro-MPEG Forum and the Advanced Authoring Format Association have been working jointly on developing a metadata exchange format that would allow for the exchange of metadata in networked environments between various manufacturers. The AAF Association is also working on developing specifications and a software SDK that will provide a solution for the exchange of metadata in the rich media authoring environment.

The concept of a standardized file interchange format is simple. Essence and metadata are put together in a wrapper. The content is then transferred between systems over an interconnect, such as SDTI. In a computer environment, the transfer could happen across conventional IP computer networks. This is a powerful concept. Imagine being able to transfer a post-production project, movie or commercial using whatever infrastructure is appropriate — a conventional broadcast digital router, a computer network, streaming tape or removable hard disk. Furthermore, imagine being able to transfer just the essence but the metadata as well, in a standardized way from one vendor's equipment to another. This is the thrust of the current collaborative effort between the AAF Association, the Pro-MPEG Forum and the EBU.

User requirements

File transfer can be divided into the following categories. Authoring interchange is the interchange of content within the authoring environment. An authoring environment might include video and audio editing tools, graphics rendering workstations and font creation tools. Finished interchange is the interchange of content within the air playback environment (sometimes called the production environment in Europe). Content repository interchange is the interchange of content between other areas of a television facility and an archive. Publication interchange moves content through the emission chain. Metadata user requirements are different in each of these areas. For example, it may be appropriate in an authoring interchange format to exchange a metadata file that has references in it to a reel of tape on a shelf somewhere. It is the general view that such an "external reference" would not be appropriate in the Finished Interchange environment. A file transfer format in the Finished Interchange environment should guarantee that both the metadata and the essence are received at the other end. A file that says, "go find the essence on the shelf over there" is not good enough for the air playback environment.

Another key concept in the exchange of content is that of operational patterns. Operational patterns determine how complex the metadata and essence are allowed to be in a given file interchange. For example, an operational pattern for finished interchange (used in the air playback environment) should not allow a user to send a bunch of separate clips that need to be edited together before they are ready for air. Why? Because programs in the air playback environment should be ready to go. They should not require additional editing, effects or other operations. However, in the authoring interchange, it is totally appropriate to send a number of different pieces of content along with metadata instructions for how these pieces are to be assembled into a finished product.

Figure 1 shows the flow of essence and metadata through a facility from commissioning to consumption. The different-colored backgrounds show areas where user requirements differ and where it would be appropriate to use different operational patterns. Brad Gilmer is president of Gilmer & Associates Inc., and the executive director of the AAF Association.
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Most television stations in the United States were constructed between the 1940s and 1960s. Over the years, these stations have undergone many structural and equipment modifications, often within the confines of the existing building. The result is all too familiar to the owner, general manager and staff: an overcrowded facility with overtaxed and inefficient mechanical and electrical systems, a warren of old wiring beneath the floors and a poor functional layout.

This situation is especially unworkable today, as news branding is becoming crucial to revenue and digital is replacing analog broadcast equipment. The need is clear: a broadcast television station must have more space, properly configured and operationally effective, with the flexibility to accommodate new and emerging technology.
Developing a master plan ensures new or renovated facilities meet current and future demands. A satellite feedroom is shown here. Photos by Aker/Zvonkovic Photography, Houston.
But there are many questions: Do we expand and upgrade the existing facility or build a new one from the ground up? How much time and money will each option cost? How do we get there from here? The master planning process provides the answers.

What is master planning?

Master planning, when undertaken before design of a renovation or new facility, allows owners to make solid business decisions about their broadcast facilities and equipment. It is an information-gathering process in which a team comprised of a project director, architect, mechanical and electrical engineer and systems integrator conduct interviews and a building walk-through with a station owner, general manager and other personnel who are part of the station's facility planning project team.

The project design team interviews station executives to learn general requirements including cost and timing, as well as their perspectives about other issues, including station image, corporate culture, growth, change and design. The project design team combines this information with statistical data to develop the size and adjacency requirements for space and infrastructure.

While the final design may take many forms, the master planning process addresses the common goals of broadcast facilities:

- promote communication within the organization;
- enhance adjacencies and production workflow;
- provide flexibility necessary to adapt the workplace to future staffing and technical requirements;
- provide for the desired image of a quality, professional organization;
- provide the necessary tools and amenities to accommodate functional requirements; and
- reduce costs and increase production reliability.

Programming: The first step

The first step in the process of developing a master plan is programming — asking the station to define who it is and what it does. The project design team will do a building walk-through and interview members of the owner's project team to identify the overall project requirements: staffing, technical, electrical/mechanical, and site requirements; the owner's overall vision for the project; arrangement of and among departments; and cost and timing issues.

Both general and technical questions will be asked, such as: What is your mission, your culture? How long can you afford to be off the air in case of a power interruption? How many newscasts do you do? How many control rooms do you need? Do you do post-production? Where do you see your station in five to 10 years? If the owner has a preference or need to remain in the existing facility, the project design team also will survey existing conditions.

From this the team will develop a preliminary program, which will have the following elements:

- Overall production workflow analysis;
- Program matrix listing, which includes department/functional areas, overall square footage, number of personnel, UPS, generator requirements, and the estimate of BTU and wattage requirements per square foot;
- Architectural space program, which includes the rooms/area/technical space, sizes of rooms, furniture requirements and equipment requirements;
- Preliminary design and construction schedule; and
- Mission statement defining overall project goals and vision.

Development of the preliminary program requires about three weeks to complete, on average. The results provide a rough guide to the size of the facility, as well as mechanical/electrical system requirements — no small item...
A broadcast television station must have the flexibility to accommodate new and emerging technology.
Many successful renovations of existing broadcast facilities have been completed.

Electrical systems: Broadcast facilities also have unique electrical needs: large amounts of kilowatts, a reliable transformer or two, a large UPS system, larger than average generators and fuel tanks, reliable switchgear designed without a single point of failure, lightning protection, and a new grounding system. Most existing non-broadcast structures were not designed to meet these types of critical reliability needs, and if they are present they are often nearing the end of the effective use and must be replaced.

Fire protection: Most existing buildings have wet pipe fire protection systems, which must be retrofitted with a dry pipe system or chemical systems to protect digital equipment.

Construction process: Because in complete renovations every hard system (mechanical, electrical and plumbing) and, potentially the structural system, must be modified or replaced, the building is virtually stripped in large areas to its core and shell. In existing broadcast facilities this type of renovation must be carried out in several phases, adding additional time and cost to the project. It also produces strain on the staff and interferes with the production process. This, in turn, affects the bottom line. In existing non-broadcast structures, often all you gain is a minimal core and shell that is not ideally suited for broadcast. In either case, at best, the process is not fun.

Furthermore, all existing structures run the danger of encountering unforeseen construction costs, and usually do. Bids from contractors are often higher in existing structures because of unforeseen conditions and “out of sequence” construction patterns. In new construction, unforeseen conditions are almost non-existent and construction sequencing is in a logical linear pattern.

Insurance costs: An underwriter often will give a more favorable insurance rate on a new building that clearly meets its requirements than an existing building that just comes close.

However...

Many successful renovations of existing broadcast facilities have been completed. Often, the owner must remain in existing facilities for one reason or another, and it is the architect’s job to make it work. The master planning process helps make this possible. In the best situations, the owner has adequate land to build a sizable addition for technical production functions — the newsroom and central broadcast plant — leaving the original space to be renovated for “soft” functions like conference rooms, lunchrooms and administrative offices.

After the project design team and owner meet to review the preliminary program, adjustments and modifications have been made, and unresolved issues have been further defined, the
site due diligence

As part of the master planning process, the A/E team will perform a site due diligence study on the existing site or provide a "Site Requirements" statement for use by a real estate acquisition team. A caution about real estate brokers: All too often, a broadcast television owner will contract with a broker to find a suitable piece of property for a new broadcast facility — sometimes even completing a purchase — before even consulting with a qualified A/E firm to perform due diligence. This can be a disaster. The following items must be addressed in the site due diligence process:

- Traffic study;
- Utility locations and quality;
- Available power (redundant grids);
- Zoning analysis;
- Environmental study (Phase 1);
- Special restrictions;
- List of site assets;
- Aesthetic potential of site;
- Satellite uplook;
- Microwave path;
- News platform views;
- Helipad restrictions;
- Security problems;
- Deed restrictions (from owner);
- Employee amenities;
- Construction cost issues;
- Soils report;
- List of potential problems and possible remedies; and
- Complete building code analysis.

Schematic design

At this point, the A/E will produce site test plans and schematic floor plans for each of the desired schemes. Alternatives to these schemes also will be produced. Each scheme should reflect the A/E's keen eye on the issue of production and workflow. The pros and cons of each scheme from a design, construction, technical and production flow point of view will be addressed.

Modifications and additional test plans will be developed as required by the owner's review. A final report will be produced with a complete due diligence report for each scheme, and a final design scheme recommendation will be made. A cost-benefit analysis for each scheme will also be part of this phase. A preliminary construction schedule will also be developed.

Final presentation report

Finally, the A/E will produce a final executive presentation report customized to the needs of the client. It will reflect the prime scheme, or a comparison of schemes, as required. The report will include, but is not limited to:

- Image statement describing aesthetic design goals;
- Statement of overall project goals;
- Flexibility statement describing proposed needs for flexibility and future expansion;
- Space standards;
- Department summary;
- Architectural space program;
- Digital renderings of proposed building;
- Schematic site plan;
- Schematic floor plan;
- Building design concepts;
- Planning concepts;
- Site review statement;
- Preliminary zoning and code analyses;
- Description of structural specifications;
- Description of mechanical/electrical specifications;
- Schedule;
- Cost estimate; and
- Cost analysis.

A blueprint

The result of the master planning process is a document that summarizes the findings and, after review and revision by the owner's team, establishes the proper direction for design of a facility. Whether it is a renovation, expansion or new facility, the master planning process ensures that the facility will be designed to serve the broadcast television station well into the future. The master plan is a working plan that remains a resource for all those involved in the further development of the project, in essence, a blueprint of the future.

Daniel Taylor is vice president of broadcast for Carlson, Chicago.
No one automation system is right for all broadcast facilities. Broadcasters should determine their needs and find a system that is efficient and fault resistant. Ackerley Group’s KCBA in Salinas, CA, uses Sundance Digital FastBreak automation system as part of its Digital CentralCasting program.
In this day of widespread computer networking, most of us know about the OSI software stack. This allows an application, for example an Internet browser, to not have to be concerned with how to communicate over a given network. The operating system the application is riding on top of knows how to use each particular communications scheme that might be required. All the application needs to be able to do is to call on the services of software layers below it. The services required for reliable communications over an intranet or Internet have undergone stratification. The most common way to ensure dependable communications between two computers is via TCP/IP. The application requiring the communications calls on the services of the TCP layer, which provides notification that the sent data has successfully arrived at the desired location. It does this by wrapping chunks (packets) of your applications data with information to enable successful recovery at the receive end and rules for feedback to the sender if something has gone awry. The TCP layer hands your wrapped data to the IP layer. The IP layer adds another layer of wrapping; this time the address of the destination is added. These two layers are referred to as the Transport and Network layers respectively. The IP layer hands this doubly wrapped data off to the Datalink layer below it. This layer knows how to negotiate the physical network that your computer is connected to — the most common LAN in use being the Ethernet. Below the Network layer is the Physical layer. This is the coax, or twisted pair, hubs, AUI boxes, etc. that comprise the local LAN. An application running on one
PC requiring communication with another application on another PC would call on the services of the layers below it. The application, which resides in a layer known as the "application" layer would call upon the layer below it, which calls on the layer below it, etc. The layer below the application layer is the Presentation layer. This layer invokes other applications needed to present data to the user. Such as video/audio players, and browsers if the data being received requires these services. The next layer down is the Session layer. This is the layer that sets up a communication layer between applications residing on separate PCs. This layer tears down the session when it is complete. This layer can conduct multiple sessions at once, assigning each one a virtual port number. Some applications like FTP, and Web browsers use assigned port numbers, whereas other port numbers are dynamically assigned as needed. Next is the Transport layer. This layer makes sure that data sent from one application to another arrives in tact. This layer is where the TCP part of TCP/IP resides. The next layer down is the Network layer. It adds the addressing necessary to get the data to its intended destination. This layer houses the IP portion of TCP/IP. The next layer is the Data-Link layer. This layer is specific to the local network connection that the PC has. This layer knows the protocol required to communication on the LAN the PC is connected to: such as Ethernet, Token Ring, FDDI, ISDN, Frame Relay, etc. The bottom layer is the Physical Layer. This consists of the electrical drivers and receivers connected to the actual port on the back of your PC. The cabling, hubs, and other physical items that comprise your local network are all considered part of the physical layer.

This layering approach to dividing up the chores used in software is used in the average television station also. The major tasks that must be carried out in a commercial television station include selling the commercial time, making sure that the clients' spots are successfully scheduled to run and running the correct spot at the right time. Finally, there must be the necessary hardware to air the commercials and some programming as well. We have names for these tasks: Sales, Traffic, Operations, Engineering. Of course, there are other departments, but these four make up the direct conduit from sales to cash flow. We can conceptualize these entities as a stack of layers. At the top would be sales. Sales activity is funneled into traffic. As most of us know, traffic takes sales orders and contracts along with the shows the station airs and determines when every item is played. The output of the traffic department is a program log. Traffic departments are faced with filling every second of commercial inventory while getting the most money to be had for that particular commercial slot. This means that sponsors and their accompanying media (the spot) are often in a game of musical chairs right up to the day of air, and often up to the hour of air.

The program log, also known as an event list, is handed off to operations. Until recently, operations had to manually locate the programming and commercial spots and load them into the appropriate playback device. If the spot or program was not in house, it had to be bicycled in, recorded off satellite or obtained by some other手段.

The name of the game is to minimize the number of discrepancies. That it controls the ingest of material into a server and maintains the database that organizes the media for the human operator and the rest of the automation system. Some vendors split this function up into separate applications - one for ingest and preparation, and another for management of the material on the server(s) or tape playback system. As you probably already know, the Event Manager needs to communicate with the traffic layer above it. But the Media Manager must also exchange data with traffic. Either traffic or automation, and often both,
At least one vendor requires your software to be modified and re-compiled if devices are added.

between the traffic and automation layers to either the Media Manager or the Event Manager. You might wonder how the traffic system and the automation talk. The traffic vendors publish Automation Interface Protocols that the automation systems speak. Early protocols were batch-like in nature. They sent information to the automation or received feedback from the automation layer only when instructed to do so. Newer protocols have continual dialog between the two layers as needed.

The next component is the Event Manager. This software receives the playlist from traffic. The playlist can come straight from traffic in some systems, or can be sent first to the systems server and stored as a database that can be accessed by the Event Manager. Some systems have the playlist and Master Control operators GUI on the same PC. Other systems separate the two. The playlist is sent to a PC called a machine or device server. This is the third basic automation component. Once the playlist is in the device server, the rest of the system could be taken offline and the list could simply run on its own as long as the event list didn’t need editing and the required devices were connected to that device server. Some device servers can control as many as 64 devices, mainly via RS-422. Most local television stations don’t require half that many controlled devices. If more controlled devices are required, then additional device servers can be added. Some systems don’t send the event commands to the device server until shortly before the event happens. Although most installations require only a single device server, vendors allow for two device servers to run in parallel, one acting as a backup. A single device server is a single point of failure that will have immediate impact on your operation.

Additional playlists and the number of controlled devices are purchased as needed. The basic system usually comes with at least the on-air playlist, but often you must purchase the capability of using more than one playlist at once. Additional playlists are needed for multichannel operations. Other uses would be for automated satellite operations. Some device controllers can run multiple playlists at once. Some vendors allow devices on one

Continued on page 118
Timing in hybrid facilities

By Mike Betts

The Weather Channel, Inc., based in Atlanta, is seen in more than 75.2 million homes nationwide, and is the world's only 24-hour international weather network. Shown above is a routing/DA room for master and studio control at the facility's Atlanta installation. Photo courtesy of MCSi.
Timing requirements within broadcast facilities have changed from the days when analog NTSC was the only game in town. Now digital and analog reside side by side, and if you’re lucky enough to have a completely digital facility, timing problems are a thing of the past ... or are they?

**Analog timing review**

In most broadcast and production facilities, video timing of the various video sources is required so that switching between video signals does not cause a disturbance to any receiving equipment.
Timing in hybrid facilities

monitors, VTRs or at the transmitter. It also maintains the NTSC signal as a valid RS170C waveform.

Analog NTSC facilities typically have a master sync pulse generator (SPG) to provide the main reference for every piece of equipment that needs to be synchronized. This reference is usually an NTSC "color black" signal. Most equipment, such as cameras, VTRs and graphics systems, can "gen-lock" to this signal and provide the engineer with timing adjustments to allow the output waveform to be correctly timed to the timing reference. The timing reference location is usually at the input to a routing switcher or production switcher, as this is both an easy place to select and measure many signals and the place where the signals need to be in time. The typical delays incurred within an analog facility are fairly short and are in the order of a microsecond for a production switcher down to a few tens of nanoseconds for a distribution amplifier. Signals passing through different paths encounter varying delays which are compensated for either by adjusting the cable length if possible when the delays are short or using adjustable delay amplifiers when more delay is needed.

The process becomes more complicated in larger facilities when a source, such as a camera, has to be timed to many locations at the same time. Some sophisticated systems have been employed to automatically re-time a source as the final destination changes and the source's timing has to change to keep it in time. It is more usual to add delays in the various paths to provide the correct timing requirements simultaneously at the various locations.

Timing simply means synchronizing the three basic parameters of the signal to match a reference. First is vertical sync or field timing, second is horizontal sync or line timing, and the third is color sync or subcarrier timing. In addition to these parameters the correct subcarrier-to-horizontal relationship should be maintained, especially if any editing is required. Timing is most often measured by externally referencing a waveform monitor to the house reference and adjusting the waveform monitor/vectorscope to display the appropriate parameter to be measured using the timing reference (usually color black). The source to be timed is then selected and adjustments made to make the new waveform match the reference. Care needs to be taken when making adjustments to allow for amplitude, width and shape differences between analog waveforms, plus make sure these parameters themselves are within specifications.

NTSC signals include the basic parameters to easily measure or compare two video signals. The first of these parameters is the vertical sync sequence, which includes the pre- and post- equalizers and the serrated vertical pulse itself, plus the remaining lines in the vertical blanking period. The next parameter is the horizontal blanking period that includes the horizontal sync pulse, the front and back porch, and the color burst. The last parameter to check is the color subcarrier. The subcarrier burst phase is viewed in the vector display mode, along with the decoded video information plotted as R-Y against B-Y. The burst phase is adjusted to be coincident with the reference axis (-B-Y). The phase of the color burst to video color information is also a critical measurement to prevent color errors at the decoder. The position of video within the line and field is also important but does not itself disqualify

Timing Simply Means Synchronizing The Three Basic Parameters Of The Signal To Match A Reference.

Figure 1. Serial digital video vertical blanking waveform with SAV/EAV enabled.
video (CAV). Frame synchronizers are sometimes used to re-time video within a facility, especially when a production switcher output is needed to feed back its output as a source into a routing switcher or into a master control location. This is normally acceptable unless many frame-delayed paths are used when lip sync between video and audio becomes a problem. (Normally one or two frames of video to audio delay are not noticeable, but a delay of three or more frames is noticeable to the average viewer.) New frame synchronizers can include an identical delay in a companion audio channel to help reduce the lip sync problem, but this may require additional audio routing to use it.

Analog audio timing on its own is not a problem as delays are short. In fact, it is difficult to measure the timing delays as there is no absolute reference in an analog signal to provide a means of measuring the delay. As the audio delays are short compared with the frequencies involved, path delays are not usually critical when compared to the related video signal. Stereo channels necessitate monitoring of audio phase between the two channels, but comparing timing between two individual signals is typically not needed.

CAV facilities also deserve a mention as they have the same vertical and horizontal requirements of NTSC facilities but trade off the need to time three video paths (R, G and B or Y, R-Y and B-Y) against the need to perform subcarrier timing. The tradeoff is usually worth it because component processing preserves the color bandwidth and removes the losses incurred during NTSC encoding and decoding. Component analog equipment such as routers, production switchers, DAs and cabling, though, does cost more to purchase and install.

Digital timing requirements

Frame synchronizers and DVE equipment started the digital video revolution and provided features not otherwise available with analog equipment. Early equipment was analog both in and out and sometimes composite digital within. This equipment was treated in the same way as analog equipment as far as timing was concerned.

The early adoption of digital composite as a video format initially made sense. However, this was soon overtaken by the cost reduction of LSI circuits that could just as easily process component digital as composite digital. As component digital offers higher bandwidth and component signals and incurs none of the losses introduced by NTSC encoding and decoding, it has become the de facto standard for most production and television broadcast facilities around the world. Referred to by the standards of CCIR 601 or SMPTE 125M, it is also sometimes referred to as 4:2:2 or incorrectly as D1 (D1 is a tape format).

In order to discuss the requirements of digital timing, a quick review of the component digital signals is in order. The luminance and band limited chrominance components are sampled at 13.5MHz at 10-bit resolution. The 720 luminance (Y) samples and the 720 co-sited color difference chrominance samples of B-Y (Cr) and R-Y (Cr) are time multiplexed into a parallel stream at 27MHz. The output then becomes a serial stream at 270Mb/s with the sequence of Cr, Y, Cr, Y, Cr, ... (These parameters are the same for both 525 and 625 systems.) This sequence is repeated for all active lines in the picture. The sampling sequence is also maintained through the horizontal and vertical blanking intervals so as to maintain compatibility with the timing of analog signals.

To synchronize the video sample streams of each line, a sequence of four synchronizing bytes is added to define the start and end of the video line. This sequence is referred to as SAV and EAV (start of active video and end of active video) and each four-byte group consists of the hexadecimal sequence 3FF, 000, 000, XYZ. The XYZ byte provides additional data bits to define the start or end of line, Field 1 or Field 2, and the start of an active or vertical blanking line. This is all the synchronizing data that is sent or needed.

Checking digital video timing

Let's look at what this means for digital timing measurements. First, a digital video waveform monitor often offers the option of suppressing or
Timing in hybrid facilities

Aiming the SAV/EAV bytes. When displayed this sequence appears as large positive pulses on either side of the horizontal blanking period and gives a visual reference for H timing. (See Figure 1.) The pulses appear with some associated ringing due to the single byte of 3FF producing an illegal rise-time signal in the analog domain (74ns) which causes the analog reconstruction filters in the waveform monitor to ring. Digital H timing can be performed in the same way as analog H timing by using the SAV pulse as the point of reference.

Other than the visual SAV/EAV reference pulses during vertical blanking, no apparent information is provided on vertical timing. If we examine the vertical blanking period, all that is visible is the series of SAV and EAV pulses of the H blanking periods and a DC level corresponding to reference black (040 Hex) (See Figure 2). There are no vertical reference pulses. The initial thought might be to look at the first line of video as the timing reference, but this can cause measurement errors if the video information itself has been delayed by a line and is not in the correct vertical location within the digital stream. In addition, the digital signal does not provide any visual clue as to which field interval that you are looking at. (The digital standard does not include half lines, so if you see video with a half line it usually means that the signal was converted from analog.)

Luckily there is a solution to this dilemma. Most waveform monitors include readout of the field and line that is selected (in-line select mode). The waveform monitor obtains this information from the SAV and EAV data by decoding the 'Field' and 'Active' bits within the XYZ byte of SAV. The extracted information is then used by the waveform monitor to determine which line and field to indicate in the display.

How then do you compare the vertical timing of two signals? First, adjust the signal for the first line of video on a signal, say Field 1, Line 20 (or a vertical interval line if VITS or other data is present) and note the location on the display using external reference. Then switch to internal reference and determine if the display changed. If it did not, then the signals are in vertical time. This method does not work with a black signal unless there is some VITS present, as all of the lines will look the same. Some waveform monitors (such as the Tektronix WFM 601 M) provide another way to look at the SAV/EAV information directly as data. (See Figure 3.) In this mode the data bytes are displayed as binary, decimal or hexdecimal values with the field, line and sample number indicated. The active and blanking lines are also indicated allowing the top line of any picture (even color black) to be determined. Examining this data compared with external sync does allow the vertical timing to be checked, but does not provide an easier method of finding the vertical relationship between two signals.

Digital equipment offers both pluses and minuses when it comes to timing a facility. The plus with digital is that most production switchers have automatic timing circuits that will keep signals timed to the switcher's reference as long as it arrives at the input within the capture window. This window can be from a few microseconds to a full line. The minus with digital is the need for vertical timing due to the delays encountered with digital processing. It is also possible that vertical timing errors are completely ignored by some equipment and that video is passed through and synchronized horizontally with new sync (SAV/EAV) added from the switcher's external reference. If the information coming into a switcher is one line off vertically going into a switcher, it will be one line off coming out. In addition to this, the video at the output of the production switcher itself is also delayed by about one line from the reference because of the processing delays and auto-timing circuits used within the production equipment. This can produce signals that are both one line late in time and have the video position off by a line as well. Careful consideration of the delays involved and keeping both vertical timing and video placement correct will allow a facility to produce video without information shifts when switching between sources.

Hybrid complications

The problem of vertical delays becomes even more of a concern in a hybrid facility. When converting analog NTSC to digital component video, the main concern is the decoding delay. A notch filter decoder adds little delay and can usually be accommodated by the auto-timing circuits of digital production switchers. To provide better NTSC decoding, a comb filter is usually chosen. Depending on the type of comb filter employed, either one or two lines of delay can be introduced to the digital output relative to the input. This poses a significant problem if the analog source must also be timed into analog equipment at the same time as it is available for digital equipment.

Figure 4 shows a facility with a camera source being used by an analog system and a digital switcher simultaneously. The delays encountered can quickly add up. In this example, two lines are incurred in the NTSC decoder plus one more line through the production switcher. In this case there is a solution to the dilemma. Replace the

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Figure 3. Data display showing the start of active video on line 20 of field 1.
NTSC-to-component serial digital converter with an RGB-to-component serial digital converter. This has short delays when compared to the NTSC decoder and uses the full bandwidth of the RGB signals to produce the serial digital video without incurring NTSC losses. As a rule always use the component analog outputs (when available) of a device for conversion to digital for the best results and fewer timing problems.

A blanking test signal that produces a half-amplitude pulse on the first and last vertical lines in the picture and two parallel lines on both the left- and right-hand edges of the picture helps with timing checks and video placement problems. (See Figure 5.) The outside lines define the exact edge of the digital signal and should not be lost when passing the signal through a digital video channel. The inner lines on the left- and right-hand sides are the edges of the NTSC analog picture. Digital pictures are wider than analog pictures by a few samples on each side (six samples in 525/60 systems). This difference in active line width causes black edges on analog-originated pictures. A problem related to these black edges on a digital picture is that they should be black and not “lower than black.” When an NTSC signal is converted to digital a black clip should be employed to remove the blanking level step from the converted luminance signal. (See Figure 1.) As there is no setup in digital, the setup step on the edges of the analog signal becomes a negative pulse if not clipped when the conversion to digital is made. Another solution would be to reduce the horizontal blanking width of the source to remove the black edges from the original signal prior to conversion to digital. This can be achieved with existing source material by a small amount of picture expansion through a DVE device to fill in the black edges.

A hybrid facility can consist of many different paths, and these should be timed to match the longest path. This is typically the “NTSC-to-digital” path. The example in Figure 5 is one example to illustrate the problems involved.

Video networking timing requirements

The advent of video networking does offer solutions to audio and video timing problems. Video and audio information stored in file servers has corresponding tags to indicate the correct video to audio relationship of the files to each other. As video file servers do not store sync information, the video file server simply has to play out the audio and video correctly synchronized to each other when needed with the correct sync inserted. Any processing required is performed either directly on the data or by playing out the video and audio to a production suite for combining and processing then re-recording. All equipment used should maintain the correct relationship between signals during the play and record processes so timing problems should be few. The timing problem with file servers is normally more one of file transfer bandwidth than of individual signal timing.

Timing an entire facility as it changes from analog to digital and then to a networked facility can be overcome, provided all of the problems are understood from the outset.

Figure 4. NTSC vs. component implementation where a camera source is simultaneously used by an analog system and a digital switcher.

Figure 5. Serial digital video picture timing signal.
Broadcast television's transition to digital has translated to many things for engineers — a steep learning curve, long hours, new equipment and new ways of doing old jobs. But with a great deal of the responsibility for that transition placed squarely upon their shoulders, have industry professionals seen monetary gains in balance with their increased workloads?
There's a lot of experience in this little box

From the 20-year industry veterans who forged the development of the early analog routers ... who led the way into digital routing ... and HDTV ... now comes ... a very clever little box: the UTAH-200. Handling both analog and digital signals, both video and audio signals, the UTAH-200 gives you the routing flexibility you need in today's environment. And all in the space of a bread box.

The UTAH-200 ... the answer for all your small router needs.

- Compact, two rack unit frame, up to 32X32
- Internal eight-level control system
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- All-in-one capability for analog or digital, audio or video
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- Top quality and cost competitive

To find out more about the UTAH-200 and our other routers (like the UTAH-1500 HDTV and UTAH-300 large scale system), visit our website at www.utahscientific.com

Circle (138) on Free Info Card
That's the question Broadcast Engineering set out to answer in its 2000 Salary Survey. 2750 surveys were mailed out to randomly selected readers spread across three different segments of the television industry (broadcast, cable and production) and four different job titles (VP/DOE, chief engineer, staff engineer and operations management). To further stratify the results, they were divided by market rank, either Top 50 or Below Top 50, and presented in context with earlier surveys from 1997 and 1998. In addition to querying our readers about salary status, we also asked some interesting questions about implementation budgets, the replies to which yielded some insight to the industry's support of the digital transition.

The salary results

Vice presidents and directors of engineering are, logically, the most likely to see wage increases in the first waves of the transition to digital. They are the individuals largely responsible for fashioning a station's plan of attack and for implementing staff structures to smooth what is inevitably a bumpy ride.

That logic is not borne out by the results of the survey. Respondents in the Broadcast Top 50 saw only minimal gains since 1998, moving to $76,000 from $75,000, while Below Top 50 saw a marked downturn, to only about $51,250 from a high of $61,666. Both cable and production segments saw healthy gains over the last two years, with the average Cable VP/DOE increasing to $65,000 from just under $55,000 and production executives making an even more substantial gain — to $70,000 from $50,000.

The numbers for chief engineers provided a little better news for small market stations, with Below Top 50 increasing about 10 percent to $50,278. However, Top 50 took another hit, decreasing from a high of $70,000 to just under $68,000. Salaries for cable CEs made a healthy move to $47,500 from $39,444.

Results for staff engineers were mixed as well. The cable segment showed another strong rise, to $50,800 from

A dramatic upward salary trend has not materialized for most of the broadcast industry. Most segments have seen little increase, while others, like small market VPs/DOEs, have seen marked declines.
Remember, your digital signal is only as strong as its weakest link.

Don’t fall for the idea that any old BNC will work for your DTV signal. Use the only true 75 Ohm BNCs on the market specifically designed for DTV applications—ADC BNCs. They’re capable of outstanding electrical performance up to 3 GHz. They’re equipped with positive locking center conductors and precision molded insulators to eliminate impedance mismatch. They’re ZBER Certified. And they’re only available from the people who have DTV down to a science. ADC.

To learn more about ADC BNCs, call 1-800-726-4266 in North America, or (952) 946-3000 worldwide. Or visit www.adc.com/broadcast.
$38,750, and Top 50 saw a solid 8 percent increase to $54,642 from $50,555. A relatively flat 3 percent increase was reported in the Top 50 segment.

Contrary to returns from the three other job title categories, operations management saw strong increases in all categories. Median salaries in broadcast increased 11 percent in larger markets to $70,000 and 14 percent in smaller markets to $48,571. Cable and production segments saw similar gains, to $45,625 and $55,000 respectively.

The question of certification

Is it worth the effort to gain SBE certification? The answer to that question depends largely upon where you currently reside in the engineering hierarchy.

Overall, the percentage of engineers holding SBE certification has moderately increased since the 1998 survey, to 28 percent from 23 percent, with the most significant change occurring among chief engineers (to 36 percent from 26 percent). If you are a VP/DOE, SBE certification is something you should look into. Those holding some level of certification reported a 19 percent higher salary, $73,571 vs. $61,666. However, salaries for chief engineers and staff engineers held consistent regardless of SBE certification status. So from a salary standpoint, SBE certification does not necessarily translate into a salary advantage.

Other indications

A great deal of information not specifically related to the salary numbers above was collected, and it presents a more fully realized picture of the status of the broadcast industry and those who work in it. For example, an overwhelming majority of broadcast and non-broadcast professionals received salary increases over the last 12 months. In broadcast, the percentage seeing increases remained consistently above 80 percent regardless of job classification. The numbers for non-broadcast were not quite as high, though still firmly in the majority — between 72 percent and 85 percent. Regardless of job title or industry segment, professionals received, on average, a 4 percent increase. Staff engineers in broadcast facilities received slightly lower salary increase (3 percent), while non-broadcast VPs/DOEs received 5 percent increases.

Age also plays a part in the wages of industry professionals. Average salaries can be expected to continually rise until the 50 to 59 age range, where they level off. Salaries for those 60 and older can be expected to drop marginally but remain in the mid- to upper $50,000s.

A surprising number of respondents also participate in part-time or freelance work within the industry. Operations managers in cable or pro-

Salaries for chief engineers and staff engineers held consistent regardless of SBE certification status.

While SBE certification proves to be a boon to executive level positions, its influence is negligible for the other job segments, with certified and non-certified salary levels registering as virtually equal.

Estimated Median Salaries for SBE Certified Engineers

- VP/DOE of Engineering: $73,571
- Chief Engineer: $61,666
- Staff Engineer: $54,444
- Certified: $54,285
- Not Certified: $50,000
- Additional 6,625

For 2000, only 12 percent of small market stations had dedicated $1 million or more to the transition and...
Inside every SeaChange Broadcast MediaCluster™ server is patented architecture and innovative software that specifically supports the new multichannel business models for broadcast. We'll help you take control of your growing television enterprise and streamline your operation.

Make a SeaChange. And cut your total server investment in half.

SeaChange servers can deliver hundreds of hours of MPEG-2 storage at bit-rates of up to 50 Mbps with four 24-bit AES channels. Our open standard IP network interfaces offer high-performance interoperability with existing systems — from archives to editing systems to satellite uplinks. And only the SeaChange Broadcast MediaCluster offers total fault resilience without costly mirroring — to cut your total server investment in half.

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only another 10 percent clocked in between $1 million and $500,000. Of large market stations, only 22 percent were planning to spend at least $1 million for digital implementation. Another 18 percent came in between $1 million and $500,000. Given the obvious expenses related to going digital, it is hard to imagine that even those spending up to $1 million are giving serious consideration to an immediate, meaningful digital signal.

On the flip side of those numbers, 19 percent of large markets and nearly 40 percent of small markets had budgeted less than $75,000 toward the digital conversion - hardly enough to buy a digital VTR. With a May 1, 2002, deadline looming, that $75,000 hardly translates to a real commitment. The lack of investment by large markets is less shocking when you consider that a number of them have already made the digital conversion and are budgeting less for equipment. However, the question of small markets, those stations that should be in the full swing of digital production, the results for broadcast, whether in small or large markets, are mixed. Though this survey provides an accurate snapshot of the broadcast industry in 2000, the picture of where we'll stand remains out of focus.

A lack of budgetary support for DTV implementation is readily apparent with a significant portion of both large and small markets planning less than $75,000 for their digital transitions.

19 percent of large markets and nearly 40 percent of small markets had budgeted less than $75,000 toward the digital conversion.
It would take a lengthy scientific explanation to describe how "Pipeline" affects time. So let's stick to a subject we all understand: Money.

Sure. We could trot out our technical types to clue you in on the aspects of quantum physics and relativity theory that allow "Pipeline" to do its thing. (Which is delay both audio and video— together or separately, in the same or different amounts, for anywhere from one to ten seconds, in any worldwide standard, without data compression.) But that would soon become tedious.

However, when we say that it does so for a fraction of the cost of any device with comparable capabilities, your interest (and your ears) will perk right up. The Pipeline is currently being used to correct today's overprocessing problem of audio/video delay offset; multi-path transmission audio/video delay offset; censorship; and large screen sports and entertainment lip sync.

Call Prime Image for more information—the only company going that gives you top-of-the-line digital video equipment and improves your bottom line. We'd tell you more. But it would take some dry economics professor and lots of arcane financial language to explain it.
O
def all the formats of television production, sports coverage is unique both in the types of personnel required and the equipment and configuration of the production truck involved. The only script is the game schedule and rulebook. The outcome is rarely predictable and the crew has to be ready for anything.

Primarily, sports coverage is a numbers game. There are scores, player numbers and statistics to be organized and presented in a dynamic view on demand. Multichannel character generators and fast operators are a must. Success here often depends on careful pre-game or prer-game-date assembly and storage of names and player stats. CG and tape are the most heavily involved elements during the pre-game production where ten-things-at-once displays are made to happen with the push of a button during the game. A recent addition to the already heavy graphics load in sports has been the introduction of real-time relay and display. In football, this would include the hang time of a kickoff presented as a running stopwatch. In baseball, the speed of a pitch and the speed of the batted ball can be shown as a dynamic cell in a corner bug where the ball/strike count and base runner graphic is often included. At Turner Field in Atlanta, this information comes from six laser guns mounted at strategic points. The speed data is sent to the truck, into the CG and through the video switcher. Instantly, viewers know how much wear and tear the game is putting on Greg Maddux's arm, in one mile-per-hour increments. The stadium also has a robotics op position from which a battery of robotic roof cams and announcer cams are run. These individual video lines are also fed to the truck via the stadium breakout panel. This is a massive eight-foot wall of audio, video and camera connectors bringing signals to the truck area from all points in and around the stadium.

Also busy on pre-game vignettes are the tape operators. While some trucks have the replay ops in the production room with the director, the more typical plan is for all these people to be seated in a row in the tape room. Each has a slo-mo controller with speed lever and a video switcher to select input sources independently. Usually, each replay op is assigned one or two cameras to capture and play back. A fairly recent addition to the tape room
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is the EVS or “Elvis” as it has come to be known by its operators. This is a digital hard drive video controller for storage and playback, and it can handle multichannel play and record operations simultaneously — a valuable feature during pre-game production. The operator sits in front of a quad split monitor that shows the two inputs at the top and the two outputs at the bottom. While a field interview is being recorded with manager Bobby Cox on one channel, video replays of game moments to which he is referring can be searched on the other channel and tagged with labels like “Chipper Jones big hit!” or “A-Jones game save catch.” The simultaneous building and recording can be done by a single operator.

Many systems are now equipped with the “ad cam.” In baseball coverage, this graphic tool puts an ad banner behind the batter as seen from any chosen camera. This is often the outfield camera that shoots over the pitcher’s shoulder as the pitch is thrown. The ad, only seen by television viewers, can be changed at any time and shown for the entire game or just for certain innings as previously arranged between the sales department and clients.

The main production benefits of digital trucks are delivered to viewers in the

With hard drive video, a single operator can simultaneously record and build.

The audio section needs a large, fast mixer with conventional knobs and faders.
this tool makes the most notable difference between a super show and a host of viewers reaching for the remote.

At the camera end of the cables, there are features that make life much easier for directors and camera ops alike. Instant replay is king in sports production, and while the replay operators are individually switching various cameras as into their replay machines, the camera people can know instantly if they are serving on a replay camera through the use of “iso tallies.” These small green lights are located on the back of each camera, next to the red line tallies. The camera op can instantly know not only if the camera is on the line live, but also if their camera is being isolated for instant replay without requiring extra chatter on the intercom. As soon as a replay operator selects a camera for input to a replay machine, the green iso tally informs the camera operator. For arena sports like football and baseball, 1:70 lenses get in close at great distances, but lesser zoom ranges may be used for tennis and other more close-in events. Experienced operators are needed with these focal lengths as the action is fast while the depth of focus is razor thin.

Even though effects returns are now standard equipment, sometimes this is a feature that is left inactive or uninstalled. For sports, the effects returns (hopefully two) must be in good working order. The graphic-heavy nature of this format means that names and stats will frequently be keyed over cameras. When renting a truck for sports, it is vital to make sure that the effects returns are installed, configured and actually work when the truck rolls in.

Listening in

One less obvious but very effective area where sports production has dramatically improved is in the realm of sound. Where once a single crowed mic hung over the announce booth railing was standard, now we must have the crack of the bat, the growl of the umpire and the smack of the shoulder pads. For effects, shotgun mics have been augmented with parabls. This is an area in which TV sound learned from radio. For sports of almost any type, these two mic types should be in abundance on any production truck, and they should be capable of both RF and cable linking to the mixer. Frequency agile RF mics are basic due to the fluid and often uncontrolled situation with RF coordination. For the sound people, an RF spectrum analyzer can spot RF coordination trouble sprouting like grass on its display. Particularly in auto racing, RF management is serious business because the competitors themselves rely on it so heavily. With digital sound mixers, setups
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can be saved and control of routing and input channel EQ is virtually infinite. Some trucks have gone a little too far with this, installing sound boards with an array of starship-like touch screens that must be navigated for every adjustment. This works in the recording studio, but on sports production the audio board must be fast. For most adjustments made during production, conventional knobs and faders still work best in the trenches for sports sound. Good compressors are an essential element usually found lacking at the game's first big play when the announcers begin shouting. These should also be isolated on the announcers' mics to avoid having the crowd sound "pumping" up and down with the commentary. For the sound op, a variety of different sizes and types of monitor speakers are needed, including a strong cue speaker that can be operated at a fairly high volume level. A handy routing feature, regardless of the game, is talent-to-director talkback. That is, a way for the booth announcers to talk at will to the director even when their mics are not on the program line. Discussions need to occur during commercial breaks and other tape segments. This pre-fade announcer mic signal can be brought to a separate speaker at the director position to allow someone who can help. This enables a tape operator to work privately with announcers beforehand in producing pre- and post-game segments. Up in the booth, heavy-duty sound isolating headsets with wind-screened boom mics are standard issue for talent who generally operate in a high ambient noise environment. Dynamic headset mics prove to be the most rugged yet full-ranged type for the close-mic shouting of play-by-play talent. Most announcer units come as a small box with a cough switch and headphone volume control. Many sports announcers prefer to have an uninterrupted line feed in one side and the IFB interrupt on the other. The same sound sources usually apply to the camera positions. The line feed on one side and intercom on the other will allow camera people what they need to follow the action.

The real challenge in designing, building or contracting for sports production is in balancing versatility with simplicity and reliability. This often involves equipment that is complex to set up but simple to operate.
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Fiber for sports

BY MARY ADOCX AND JAMIE SILVA

Virtually every major city in the U.S. is outfitting its sports stadiums with hybrid broadcast camera cables that take advantage of fiber optic technology. With the advent of HDTV and other high-speed digital audio/video transmissions, the amount of data being routed to the broadcast truck is continuously increasing (multiple gigabits per second).

Fiber optic cable must be considered in order to properly “future proof” the infrastructure. Multimode fiber is best suited for applications in which links have many connectors that run less than two kilometers. However, the bandwidth of the fiber is limited due to modal dispersion. Conversely, single-mode fiber is best suited for longer distance applications (greater than one to two kilometers) and high data rate applications. Because the fiber is single-moded, modal dispersion is not a limiting factor and much higher data rates can be achieved.

Single-mode fiber is the fiber of choice to enable high data rate transmission, such as the non-compressed 1.5Gb/s HDTV signals.

Optical fiber must be utilized in order to transmit a fully uncompressed 1.5Gb/s SMPTE 292M HDTV signal for distances greater than 100M. For distances less than 100M, enhanced triax and coax cable can be used to transmit the serial digital data streams. However, care must be taken when installing these types of cables to avoid degradation of the signal.

Because optical fiber is immune to both grounding problems and crosstalk from other cables and does not radiate energy, planning a new facility is less complex. With fiber optic cable, distance or placement no longer limits cable runs from the camera-to-camera control unit (CCU). Unlike enhanced triax and coax cable, the fiber cable can be run next to transformers, high intensity light sources, motors and other sources of “noise” without fear of signal interruption. Fiber cable can be run along rafters, up the side of the stadium, and/or through control rooms, without fear of damage or signal loss.

Powering the camera with the CCU at lengths greater than 1500M has been demonstrated in trials with major camera manufacturers. SMPTE standard 311M, “Hybrid Electrical and Fiber-Optic Camera Cable” gives minimum performance requirements for the cable: two copper conductors for power, two control conductors and two fiber optic strands for video and audio transmission. The copper power components allow the HDTV fiber-based camera systems to operate like the older triax systems, where the cable actually provides power to the camera. This is a big advantage when no local power sources are available for the camera.

Due to the distances and data rates required to broadcast sporting events in HDTV format, fiber is an essential element of the system. The standard fiber optic interface enables efficient and flexible datacasting, resulting in a higher quality image that can be stored digitally and recalled instantly with exacting detail time after time.

Mary Adocx is a sales engineer for Corning Inc. Janne Silva, RCDD, is a cable design engineering manager for Mohawk/CDT.
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The Choice For Digital Video.
BY LARRY DORMAN

ESPN's newest star debuted on Aug. 13 and has quickly established the kind of hip, formidable presence associated with the sports cable network's best-known names. A stylish yet completely functional place that Chris Berman, Dan Patrick and other ESPN anchors and analysts can call home.

"It was time for a change," said Kevin Stolworthy, vice president of studio production and technical operations. "The idea was to get our different shows working off each other to create the sense of a single environment — what we call 'seamless' programming. The goal was to achieve one feel, but with unique and distinctive elements."

ESPN's studio overhaul — its first since 1994 — was more than a year in the making, from its conception last summer through the recently completed construction phase. The impetus for change was quite simple, according to the people who were intimately involved in the project: make some changes or risk appearing stagnant.

"In television, sets and set design are very cyclical," said Rick Paiva, senior coordinating director at ESPN. "The time had come for us to take a fresh look at our set design and catch up technically and electronically with what's going on in the industry."

The results of a rigorous self-examination can be seen in a fully revamped studio that features a new set for SportsCenter, as well as in the new homes for programs such as Sunday NFL Countdown, NFL PrimeTime, College GameDay and Baseball Tonight.

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ESPN unveils new studio

that created sets for Good Morning America, Dateline NBC, Meet the Press and 48 Hours to create the new studio.

The design components include three specific show areas with desks seating from two to four anchors; an interview area with set anchor desk that also serves as a demonstration area for expert analysts; and a single anchor stand-up/interview area. These sets allow for more movement and diminish the sense of an overcrowded sports desk by comforting allowing for more reporters and analysts to stretch out, walk around and use a telestrator if needed.

The new studio environment also embraces the latest technological innovation, particularly with the use of plasma and LED screens for SportsCenter and the NFL set. The 16:9 plasma screen is a thin display monitor that provides vertical graphic support alongside the anchor, instead of traditional over-the-shoulder graphics. The LED screens are used as background accompaniment allowing scoring and other statistical information to be displayed while sports anchors report the news.

The result of the collaboration between ESPN and PDG are impressive thus far. What was once a more stolid and functional set has been reinvented as a more action-oriented and information-driven arena teeming with the latest in sports news and analysis.

“We have loyal viewers. What we want them to take away from the new studio is a sense of ESPN as the center of their sports universe,” Paiva observed. “We want them to subconsciously ask themselves, ‘Why would I go anywhere else for sports information?’”

At the same time, ESPN is not trying to subvert the sports television medium by placing function (studio design and technological applications) over form (sports news and analysis). “Design for design’s sake is useless,” Noubar Stone, ESPN’s creative director, pointed out. “We haven’t reached our objectives if viewers only talked about the new set. We want people to appreciate the scenery and graphics as part of a more pleasurable way to see the whole news and information package that we present.”

Said Stolworthy, “People watch us foremost for information. We don’t want something that’s gaudy or distracts for our viewers. We want people to feel the changes we’ve made, but ultimately it’s all about the latest sports news and highlights.”

ESPN also realizes that a fresh studio environment will not by itself increase viewership, ratings and revenues. However, an updated studio environment that further stimulates the information delivery process can only help to reaffirm ESPN’s place in the ever-crowded mind of the 21st-century sports fan.

Larry Dorman is a sports and media writer based in Farmington, CT.

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Surround sound vastly increases the spectrum of creative mix-down options. The extra channels can be put to different uses, some of which highlight limitations of the mixing technology that severely hinder efforts to create a high-quality listening experience. This article will demonstrate a promising creative approach by examining the physical prerequisites and providing examples of practical surround mix-downs.

**Surround today**

There are two approaches to using the additional surround channels:

- Sound source imaging to the rear and sides. This may be considered an effect to be creatively deployed by the recording engineer.
- Creation of the impression of a genuine acoustic event, with so-called "envelopment" to give the listener a heightened sense of involvement.

A realistic-sounding envelopment is achieved by feeding the surround loudspeakers with signals corresponding to what would be heard from a given direction, including crucial side reflections generated within the perceived space. The most natural way to create an envelopment is to use an array of five microphones positioned similarly to the five loudspeakers and route their playback signals directly to the corresponding speaker channels. In most cases, though, the recording engineer has to create an artificial mix incorporating sonic corrections.

In order of arrival, the sounds reaching the human ear may be classified as direct sound, early reflections and late reflections (reverberation). Generating all three components as faithfully as possible for each of the loudspeakers requires knowledge of the sound source position for direct sound and early reflections. Realistically integrating a monophonic sound source (e.g. a single spot microphone or one track of a multitrack recording) in a surround image with envelopment requires generating these dependent on the panner position. The simplest place to achieve this is in the panner itself.

**Surround mixing techniques**

Surround mixes may be roughly classified as follows:

- The surround channels are used simply as effects. Although arbitrary and flexible, this technique is unlikely to deliver long-term listening satisfaction.
- Impressive surround effects may be generated using a battery of delay lines, reverbs and other effects units with output routed to the various playback channels. Mixing is time-consuming.
- Surround music mixes can be made, preferably made from material that already contains dedicated surround signals such as ambience microphones positioned close to the live audience. Once a rough mix is established, the problem is surround fall-off as more monophonic signals are added, caused by a lack of envelopment matching these signals. The fewer mono signals a surround mix contains, the better the surround image. This means compromising between acoustic balance and the overall surround impression.

Virtual Surround Panning (VSP) technology in the D950S can be used to solve this problem. In conjunction with reverb, it is a complete room simulation and parameterized audio positioning tool that allows mono sources to be realistically imaged. One advantage over conventional panners is the ability to generate early reflections within a simulated acoustic space from the correct direction and at the correct time depending on the pan position. It also offers better directional imaging (left-right panning) by adding phase and frequency spectrum information to the customary amplitude difference between left and right loudspeakers. The newest version also provides for late reflections (reverb).

The technology was utilized in the November 1999 mixes of live recordings of the Proms using a D827 DASH Multitrack and D950S digital console. The sound engineers began by establishing an enveloping surround image derived from the main and ambience microphones. Surround was perfect, but the balance and tone of individual instruments was unsatisfactory. Spot microphones were then added to the mix. Balance and tone were now right, but the good initial surround was swamped by the two-channel mix between the front loudspeakers. The logical corrective step was to increase the level of the surround channels and add a touch of ambience from the side between the front and rear channels. The surround loudspeakers were audible again, but in place of seamless surround were two separate sound images emanating from the front and rear speakers. Even with additional reverb treatment, the new surround image was significantly inferior to the original.

Starting from the previous mix, VSP
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Virtual Surround Panning (VSP) technology in Studer's D950S, shown above, is utilized in mix-downs to create a realistic-sounding envelopment by integrating monophonic sources. It was activated in the spot microphone channels. First, the simulated room model was tuned to match the Royal Albert Hall as closely as possible. Then these reflections were subtly added to the respective pre-panned microphones. Despite the spot mics, the surround effect and envelopment returned. It was no longer necessary to compromise between the front sound-stage and the surround effect. Subtle early reflections brought another bonus: The spot microphones could be inserted at the correct distance -impression in the sound image. It also eliminated the need to use a few external effects units, making the mix even clearer and more transparent.

Spatial perception hinges on positional reflections. Using surround to create a better image of the acoustic space clearly means paying more attention to these reflections. For the mixing desk panner to function as an effective positioning tool, it must also take into account position-dependent reflections. VSP in the D950S does precisely this and addresses many of the recent problems associated with surround mixing. Recording engineers can begin assembling a mix using a conventional stereo approach and experiment from there. VSP offers new creative freedom.

For more information on Studer's D950S with VSP, circle (450) on Free Info Card.

Stefan Ledergerber, el. ing. ETH, is project manager and hardware engineer at Studer Professional Audio AG in Switzerland.
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device to be controlled by playlists on other device servers. Some also let the same device be shared by multiple playlists. Some systems have elaborate software that will automatically search the system for media not already loaded which is needed by a playback device, and will then copy the required material when found. The philosophy in selling device control is different among the various vendors. Some simply sell port capability, while others charge per device controlled. Plus, at least one vendor requires your software to be modified and re-compiled if devices are added. While on the subject of additional costs and fees, most vendors charge a yearly software and support fee. Plus, automation systems require a substantial amount of installation and training time at your facility. You get to pay for that also. Also, there are other costs associated with implementing automation. If you have a media management database for your commercial server already, can that database be converted for use by the automation database or must the inventory be reloaded back onto the server to create a new database? Although different databases will use the same server file format, you might have to reload media just to create an external database usable by the new media manager.

It is not unusual for even a small automation system to be comprised of four or five PCs. As mentioned already, many systems require not only a server PC but also PCs supporting media management, on-air (controlling the air playlist), and one or more device servers. For the sake of operating efficiency and human ergonomics, additional PCs will often be required for various options, such as an installation running various event or playlists. The required PCs usually are connected via an Ethernet. This local LAN usually sits off by itself away from the

Automating an analog vs. a digital station

RICHARD TYRRELL-EAD

Digital television transmission produces new management challenges for stations. Multicasting, datacasting, electronic program guides (EPGs), and selectable subtitles and language audio tracks are only a few of the options digital transmission affords station operators. Yet, how does automation manage this transition from analog to digital and enable a station to optimize its resources?

Equipment

The difference between analog and digital automation starts with the equipment used for information management and transmission. While analog automation can work with tape and tape machines and requires no transmission information, digital automation stores material in video servers and can require CD/digital tape players along with control information for encoders/decoders. For transmission, analog requires no forward control of the transmitter, while digital transmission can require extensive control and information for the encoding and transmission process. Digital transmission can be transmitted terrestrially via ATSC signal, or can take advantage of Fibre Channel/ATM, WAN, LAN, and satellite allowing for centralization and reuse of material.

Asset Management

An analog automation system works with a database - tracking where a program or commercial resides (e.g. tape 1, 2 or 3). Digital automation requires a much larger, more complex database that coordinates encoding and transmission information for the program/commercial's metadata (e.g. multilingual names, descriptions, synopses, credits, V-chip information, CA and categorizations) between the business side (traffic and program control) and material management. Digital video servers provide a second copy of the metadata to be stored with the clips and programs.

A database that centralizes transmission information is essential for digital transmission. Transmission information that resides in a common database synchronizes all of the transmission equipment with the information required for every piece of material transmitted. By centralizing these instructions (playlists) changes can be made once and all transmission components will follow.

Bandwidth

Analog allows broadcasters to deliver one channel per transmitted signal (pipe) to viewers. Digital compression allows a station to make choices. A broadcaster can choose to have one high-definition channel or choose to segment spectrum in a multicast environment (implement multiple channels). To keep overhead from going up, the station's automation system must provide the capacity for one operator to run these multiple schedules.

The Next Step

While you're counting the benefits of digital automation - improved productivity from integrating databases; simplifying a more complex operation than analog; providing a system that allows last-minute changes, reduces errors, and improves monitoring — look ahead to the next step in the progression of automation. As the availability of more customer-specific content increases, automation systems will provide broadcasters with more opportunity to re-purpose material into different pipelines of distribution including digital transmission, Internet, intranet and beyond.

Richard Tyrrell-Ead is director of operations and engineering for Columbine JDS DAL.
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LAN for the rest of the facilities. The gateway between the two is usually via the automation systems server. Some systems use high level communications schemes such as TCP/IP, but others use lower level schemes such as NetBEUI (NetBIOS Extended Use Interface). NetBIOS is a simple protocol that allows quick messaging between PCs. It provides session communications over a LAN without a lot of overhead. NetBEUI resides on the Session and Transport Layers. NetBEUI provides a standard frame format for packets. Philosophies differ as to which communications schemes make sense when trying to control real-time events. Some get around any real-time delay problems by storing the event or playlist in the device server. That way the device server doesn't need real-time triggers from another PC via LAN. Others use lower level communications protocols that don't have the overhead that higher level protocols have. A drawback to the low-level approach is that you can't build an automation system over a WAN. If the automation network requires routers or switches, some low level communications schemes won't be able to negotiate those items.

Vendors also differ on operating systems used. While most use Windows of some flavor (often NT) on some computers, most do not for PCs acting as servers. Some feel that Windows has too much overhead for a real-time environment. These vendors argue that variants of Unix such as QNX or even O/S/2, which allows loading only modules of the operating system required, are better choices. They further argue that real-time machine control needs a leaner OS geared towards real-time events. Most agree though that "business" type apps, which comprise a major portion of automation system software, do make sense running on Windows. That said, there is at least one automation vendor that has been successful building systems that ran totally on DOS, and now on Windows.

The mix of OS can affect how a system handles real-time commands such as starting events or commercial breaks, on the fly. Some handle these situations better than others.

So besides a bunch of server- and client-type PCs, plus a chunk of LAN, automation systems are a collection of software applications often running on a couple of different operating systems. This software is often centered around one or more databases, and a messaging system to let the applications distributed on various PCs stay in sync. The user applications manipulate the database(s), and the database are used to create activity (event) lists that end up in device-server PCs that drive RS-422 (or GPI) ports that command the physical layer to do the bidding of the operation and business layers above. Automation needs to act as a component, albeit a large one, that is part of the larger station system. Automation systems promise two things: efficiency and fewer mistakes in your operation.

Jon Burton is an engineer with The Lyons Group, San Jose, CA.

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Video servers: Serving from a daunting menu

BY JOHN LUFF

Since the invention of the hard disk there have been predictions that linear media, including video tape, will eventually disappear. Not even a decade ago, Tektronix heralded the arrival of what we now call video servers with a demonstration of the Profile. The Profile was a platform that Tektronix intended others to use for their own software and hardware, with the device acting as the video recorder in a variety of uses.

Initially, the video server market was severely constrained by limited capacity and the high bit rates necessary to produce quality reproduction of video. As a result, the applications that were the first targets were quite limited as well. In an interesting twist of technical progress, the first video server applications were often as cache recorders on the outputs of large robotic linear tape libraries. Until disks attained high capacity and became cheap, it would be a narrowly applied technology. Early servers could only store a couple of hours of quality video, about the same as videotape.

Soon 4GB drives arrived, followed quickly by 9GB drives, 18GB drives and larger. Today, servers are delivered with at least 50GB drives in arrays that can quickly reach terabyte sizes. Within the next year, drive sizes will exceed 100GB in commercial use.

Clearly, servers have penetrated areas that few would have thought of 10 years ago. Professional video servers play music videos in clubs, and they are used in homes to timeshift programming under the control of sophisticated automation systems. The last 18 months have seen the introduction of the PVR (personal video recorder), a consumer video server with embedded applications that allow timeshift recording of hours of media MPEG encoded and stored on a hard disk in what can best be described as an appliance.

A review of the technology quickly shows that servers are simply computers with:

- relatively conventional operating systems (NT, Unix, VXWorks and Mac);
- relatively conventional hard drives from a range of manufacturers;
- disk I/O controllers for RAID and non-RAID arrays (or single drives); and
- I/O cards supporting analog and digital interfaces.

There was a sentiment openly touted by more traditional server manufacturers that the computing industry did not support the unique requirements of real-time, isochronous delivery of video that broadcasters need. In truth, it may well have been true to a degree at one time. Now a number of familiar names in the computing industry are supplying hardware with superior networking capabilities and the deterministic delivery that replicates the performance of a VTR or a more traditional video server. It remains to be seen how fast these computer industry companies will learn how to market to the video industry, but their scale will enable them to be formidable competitors.

At one time there was a distinct division between video servers and editing systems. Now, as the market has begun to recognize that the need to store final product on videotape is less important for some applications, the lines between the two principal market segments that use digital video on disk have begun to blur. Server manufacturers have begun to supply editing applications for news. With cross-platform compatibility between the compression used in editing systems and that used in video servers, it is entirely practical to look at the interconnected web of servers and edit stations as a seamless whole. Unfortunately, there are still barriers to implementing such cross-application systems without significant expertise and likely a healthy dose of assistance from the manufacturers involved or specialists in integration.

As part of an editing environment, video servers can offer some features that simple editing systems cannot easily replicate. Servers are optimized for recording and playback of high-quality pictures. But if two copies are recorded, one at high bandwidth and one at low bandwidth, it is easy to see how both full-quality playback and low-quality browsing can be done on one integrated database of video clips. If the server ingests remote feeds, for instance, producers can view those assets immediately from network-attached workstations. Decisions about cutting a news story can be passed on as an e-mail or cut list to an editor who can assemble the cut story in a nonlinear playlist without destruction of the original media. It is likely the media does not need to be copied but rather played from the original clips in fragmented nonlinear media. Perhaps a cut copy will be made, and a low-resolution proxy copy, so that the large quantity of ingested but redundant material does not need to be kept for archive purposes. Just as the outtakes from a motion picture may well be 12 to 20 times the final cut of the movie, broadcast news creates a similar shooting ratio. In broadcast sports production, it is common to make a "melt" reel with the few minutes of truly important archive material copied off to a source tape for future use. In the same manner, the archive in the tapeless facility may only contain a few minutes of useful material, and delete the hours of video shot on the courthouse steps without any useful action happening.

Servers consume storage space voraciously. There are a number of methods of attaching storage to the I/O engines. One could build a disk array that is separate from the operating system's storage and let a special purpose controller have exclusive access to the media disks. Or, as is sometimes the case with DV I/O cards, the media...
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may well be part of the space the operating system directly controls. Giving the operating system access may increase the range of capabilities for archive and networking of stored media.

Many manufacturers have created shared storage concepts where the media is placed in a pool of network-attached storage. The media drives might be on the same network as other network resources and workstations or on a separate and distinct media-only network where only appliances that need to access the media files directly are resident. Making the media available to a broad range of applications and hardware enables play-to-air and editing stations to share the resources in a peer-to-peer configuration. Management of the media may well become complex in such an environment.

When the media is no longer needed in the near-line and online operations, it can be pushed to an archive device under control of software that keeps track of the location of the assets and facilitates calls to the media library. Often called asset management, this process is one of the least understood of the pieces of the growing universe of server and media management devices. In an interesting twist of fate, the cheapest storage for the data that represents the media is again a linear tape-based media, but not one designed for linear playback. They are cousins of linear videotape but distinct in that they offer none of the stunt modes, editing features, control panels or monitor outputs of more conventional digital video recorders. Rather, these computer "back-up tapes" are intended for random access of file-based media. Indeed it is a useless device unless under the control of software needed to load and access files.

Another topology for server storage is termed by one manufacturer as clustering. In this approach, media and I/O are distributed in a homogenous network that allows a server network to extend into the wide area network (WAN). Control of the network of clusters can allow local automation of an I/O and network manipulation of the location and use of the media at the same time. The output in one city could, over the WAN, well be playing media located in another city.

With the ability to build huge and inexpensive arrays of disks with protection from the failure of a single drive, we now see server implementations with hundreds of hours of high-bandwidth video online. Archives have dropped in cost and are rising in storage density as well, with tens of terabytes quite normal in small archives (a terabyte of disk space would be just twenty 50GB disk drives, costing perhaps $25,000). Petabytes are commercially available (a petabyte is a thousand terabytes, or a million gigabytes). At 8MB/s, a terabyte could represent over 200 hours of content, and a petabyte of video would play for 22 years. It is not difficult to see how this impacts the decision to build facilities with huge online libraries. It is also not hard to see how this moves video into the province of the computer manufacturers, who have vast experience in controlling these complex arrays of devices, which provide access to data online.

John Luff is president of Synergistic Technologies in Canonsburg, PA.
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<td>✓</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* Call Leitch for availability and help in configuring a system to meet your requirements

www.americanradiohistory.com
The Leitch Via32® routing series sets new standards for performance and affordability. These compact, modular routers can be combined to create sophisticated, multi-level routing systems in almost any format (i.e. SDI, ASI, AES, analog video, analog audio, DS-3, E3, etc.).

**Compact Modular Design**
The Via’s compact design easily fits any operation, and its front- and rear-loading modules make it simple to service. All video and audio I/O modules and power supplies plug into the mounting frame, allowing you to easily access any component.

**Expandable Configuration**
The Via’s modular architecture lets you select a router design that supports not only your current demands, but also your upgrade needs. You can expand a serial router from 4x4 to 32x32 and an analog video or audio router from 32x16 to 32x32 in the same mounting frame. Even the control circuitry is designed on a removable module to accommodate design changes.

**Redundant Power**
To make your Via router even more reliable, add a redundant power supply with a fan assembly. This allows you to replace the power supply and fan without interrupting your operations.

For telecom applications, 48 VDC power supplies are also available.
**Alarm Capabilities**
The Via32 series detects failure in any of the key modules, including the X-Y communications bus, power supply or fan. Every model is equipped with standard LED error and operation indicators to make monitoring effortless. To supplement the LED indicators, an external contact closure is provided, and alarms are repeated in the control system.

**Flexible Control System**
See the control section of this brochure for more information on powerful, flexible control options, including RS-232/RS-422 serial control ports.
**X PLUS SERIES**

**Xplus** is a series of modular router matrices, that economically address most small routing requirements. This series features generic 1RU and 2RU mounting frames that accept a wide range of modules. Module sizes include 32x4, 16x16, 16x8, 8x8, 4x4, 16x2, 16x1 and 2x1, with expanded multi-bus configurations up to 64x8 and expanded single-bus configurations up to 256x1.

The Xplus series provides routing switchers for NTSC, PAL and SECAM analog composite; RGB and YUV analog component; SDI digital video; monaural, stereo and multi-channel analog audio; and RF and IF frequency standards. DVB-ASI, DS3 (45Mb/s) and E3 (34Mb/s) data standards are supported as well.

**Flexible Power Supply Configuration**
Xplus frames can be configured for AC or DC operation, and the 2RU version can be supplied with redundant power.

**Powerful Alarm Capability**
An optional local alarm panel indicates power supply voltages and fan failure. To supplement these indicators, the alarm option also provides a set of external contact closures.

**Flexible Control**
See the control section of this brochure for more information on powerful, flexible control options including RS-232/RS-422 serial control ports and X-Y ports, as well as the ability to attach local control panels.
## Reference Table — XPLUS Series Modules

<table>
<thead>
<tr>
<th>Modules</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSM-32x4</td>
<td>32x4 Analog Video, DS-3 or E3, expandable to 64x4</td>
</tr>
<tr>
<td>ASM-32x4</td>
<td>32x4 Analog Audio or Timecode expandable to 128x4</td>
</tr>
<tr>
<td>VSR-16x16</td>
<td>16x16 Serial Digital Video (SMPTE 259M) or ASI</td>
</tr>
<tr>
<td>ASR-16x16</td>
<td>16x16 AES Audio</td>
</tr>
<tr>
<td>VSM-16x16</td>
<td>16x16 Analog Video, DS-3 or E3</td>
</tr>
<tr>
<td>PSM-16x16</td>
<td>16x16 Pulse</td>
</tr>
<tr>
<td>ASM-16x16A</td>
<td>16x16 Analog Audio or Timecode</td>
</tr>
<tr>
<td>VSR-16x8</td>
<td>16x8 Serial Digital Video (SMPTE 259M) or ASI</td>
</tr>
<tr>
<td>VSM-16x8</td>
<td>16x8 Analog Video, DS-3 or E3</td>
</tr>
<tr>
<td>ASM-16x8A</td>
<td>16x8 Analog Audio or Timecode</td>
</tr>
<tr>
<td>VSR-8x8</td>
<td>8x8 Serial Digital Video</td>
</tr>
<tr>
<td>ASM-8X8</td>
<td>8x8 AES Audio</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modules</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSM-8x8</td>
<td>8x8 Analog Video</td>
</tr>
<tr>
<td>PSM-8X8</td>
<td>8x8 Pulse</td>
</tr>
<tr>
<td>ASM-8X8A2</td>
<td>8x8 Dual Channel Analog Audio or Timecode</td>
</tr>
<tr>
<td>VSR-16x2</td>
<td>16x2 Serial Digital Video (SMPTE 259M) or ASI</td>
</tr>
<tr>
<td>VSR-16x1</td>
<td>16x1 Serial Digital Video (SMPTE 259M) or ASI</td>
</tr>
<tr>
<td>VSR-16x1CS</td>
<td>16x1 SDI “Clean Switch” for SMPTE 259M signals, expandable to 32x1</td>
</tr>
<tr>
<td>ASR-16x1</td>
<td>16x1 AES Audio</td>
</tr>
<tr>
<td>ASR-16x1SQS</td>
<td>16x1 AES Audio with Synchronous Quite Switching</td>
</tr>
<tr>
<td>VSM-16x1</td>
<td>16x1 AES Audio</td>
</tr>
<tr>
<td>VSM-16x1</td>
<td>16x1 AES Audio</td>
</tr>
<tr>
<td>ASM-16x1A2</td>
<td>16x1 AES Audio</td>
</tr>
<tr>
<td>AVS-4x4</td>
<td>4x4 Analog Video</td>
</tr>
<tr>
<td>AVS-4x1</td>
<td>4x1 Analog Video</td>
</tr>
</tbody>
</table>

### SPECIAL APPLICATION ROUTING

#### Serial Digital Clean Switch

The VSR-16x1CS (expandable to 32x1) offers clean, glitch-free switching of SMPTE 259M video signals for digital television master control applications.

#### AES Quiet Switch

The ASR-16x1SQS offers clean, pop-free switching of AES audio signals using an adjustable cross fade at the switch point while maintaining AES frame during and after the switch. Use in live and post-production applications or in conjunction (same frame) with the VSR-16x1CS module to provide a perfect combination for master control applications.

### Hundreds of Router Configuration Options

For ordering convenience, the Xplus routers are generally ordered as complete systems, but they can also be ordered as individual module(s) with frame(s). Some examples of complete systems are as follows:

#### Examples:

- **X+256x1S**: 256x1 Serial Digital Router
- **X+64x1AES**: 64x1 AES/EBU Router
- **X+32x2V2**: 32x2 YC (or Video and Key)
- **X+48x1VA**: 48x1 Video and Mono Audio
- **X+16x8V3**: 16x8 RGB (or YUV)
- **X+8x8VA2**: 8x8 Video and Stereo Audio
**12x2 Wide Bandwidth Series**

The 12x2 Wide Bandwidth series of routing switches provides 12x2 switching of almost all serial digital video formats, from SMPTE 259M (143, 177, 270 and 360 Mb/s) to SMPTE 292M (1.485 Gb/s). Automatic cable equalization is provided for all formats. Re-clocking is automatic on 1.485 Gb/s signals with all other formats passing through without re-clocking. Two separate channels of 12x2 AES (unbalanced/coaxial) are also routed in the same 1RU frame. Two copies of each of the two outputs are provided for the HD/SDI video signals. The compact 1RU design makes it easy to mount and use this switcher in many places, including trucks. As this product offers two separately controllable outputs, it is ideal for inexpensive master control operations or for back-up to your existing master control. Use one output for the “on-air” signal and the other as a “review” or “quality assurance” output. A local control panel is provided with the unit, and remote control panels are available as an option. The serial control port supports both the standard Leitch ASCII and GVG-TEN-XL protocols. GPI contacts may be added as an external option to allow mechanical contact switching of any one of the sources to either of the two destinations.

*Available ordering options include:*

<table>
<thead>
<tr>
<th>12x2HD</th>
<th>12x2 HD high-definition serial digital video and 2 channels of AES coaxial audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>12x2HDAEC2</td>
<td>12x2 high-definition serial digital video</td>
</tr>
<tr>
<td>12x2AEC2</td>
<td>12x2 2-channel AES coaxial video</td>
</tr>
<tr>
<td>RCP-12x2p</td>
<td>Remote control panel tailored for remote control of any of the above routing switches (NOTE: any Leitch control panel applicable)</td>
</tr>
</tbody>
</table>

---

**Xpress 12x1 Monitoring Routers**

The Leitch Xpress® series is a cost-effective solution for monitoring routing switches in a 12x1 matrix size. Formats provided are serial digital video, AES/EBU (110Ω and 75Ω) digital audio, and analog video and audio signals. Available in video only, audio only and video with audio packages, the Xpress series accommodates most production, broadcast or telecom monitor-switcher applications.

**Comprehensive Control**

Control choices include local and remote pushbutton panels, GPI, and optional RS-232/RS-422 serial interface. The local and remote pushbutton control panels can provide AFV or breakaway switching. The GPI port allows contact closure control, as well as joystick override (camera control) for use with or without pushbutton control panels.

The optional serial port can be factory installed or field retrofitted. This enables computer control using a Leitch-specified protocol. The Xpress routers also emulate the Grass Valley Group® TEN-XL protocol.

**Expandable Configuration**

Multiple Xpress routers can be linked together for multi-level switching. All Xpress routers provide four outputs, eliminating the need for a downstream distribution amplifier.

**Built-In Monitoring**

The serial digital video and AES/EBU Xpress routers feature optional analog video and analog audio monitoring outputs. This unique option eliminates the need for external video and audio digital to analog converters in installations where the Xpress is used to feed a monitoring station.
**Mix Box and Card Routers**

Leitch's Mix Box® and card routing switchers are small stand-alone units ideal for very small routing and monitoring requirements. Matrix sizes include 4x1 and 8x4 in all versions and 8x1 and quad 2x1 in audio versions only. Signal types that can be switched are serial digital video, analog video and analog audio.

Modules are housed in a stand-alone 1/3-rack-width package and are available with local and/or remote pushbutton-type control panels. Their control signal, which is the same type used for the Integrator™, Via® and Xplus™ series, allows for the various control options explained in the control section.

The card routers plug into frames that have other functions associated with them as well. For instance, a 4x1 serial digital video switcher can be housed with any 6800 or 7000 series digital product. Or you can choose to have an analog video or audio switcher housed with an NTSC sync or test generator in any 1302/2602 series product.

**Large Router Systems**

Leitch offers routing switchers in any size, from 2x1 to 512x512 or larger. Our unique frame and control system architecture provides many advantages when building larger systems. Our building blocks allow the use of the same hardware (input modules, output modules, crosspoint modules, power supply modules, logic cards) throughout a system, regardless of the size of the system being built. This helps in both the system maintenance and in the stocking of spares. In addition, all modules are front-loading and hot-swappable.

The distributed nature of our control system means there is no "single-point of failure" (i.e. all communications are NOT required to go through a single controller frame). Each frame provides either a single or redundant control logic card and power supply. Communications in a system can be wired as a simple coaxial loop-through or in a star network with ethernet hubs and/or redundant switches for further redundancy. The configuration of a system is distributed to each device so that if a particular device goes off-line, the rest of the system is still operational. Configuration information can be downloaded to each device or frame without affecting the remainder of the system, thereby resulting in no down-time. Soft: matrix partitioning, logic mapping of sources and destinations, automatic path-finding via tie-lines and other control system features provide a wealth of possibilities in meeting your system's requirements.

Leitch's world-wide sales and service presence allows us to offer 24-hour support almost anywhere in the world and on-site help with the commissioning of systems. Please call our trained technical staff for more information or help in defining and configuring a solution to meet your specific requirements.
## Reference Table—Leitch Routers

<table>
<thead>
<tr>
<th></th>
<th>HDTV</th>
<th>SDI/ASI</th>
<th>AES/EBU</th>
<th>Analog Video</th>
<th>Analog Audio</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Integrator</strong></td>
<td>16x16 to 32x32</td>
<td>32x32 to 512x512</td>
<td>32x32 to 512x512</td>
<td>32x32 to 512x512</td>
<td>32x32 to 512x512</td>
<td>32 port to 128 port</td>
</tr>
<tr>
<td><strong>Via32</strong></td>
<td>4x4 to 32x32</td>
<td>32x16</td>
<td>32x16</td>
<td>32x16</td>
<td>32x16</td>
<td></td>
</tr>
<tr>
<td><strong>Xplus</strong></td>
<td>16x1, 16x2 to 64x8</td>
<td>16x1 to 256x1</td>
<td>8x8, 16x8</td>
<td>16x1, 16x16</td>
<td>16x1, 16x16</td>
<td>16x16 (separate, unique frame required)</td>
</tr>
<tr>
<td><strong>Xpress</strong></td>
<td>12x2</td>
<td>12x1</td>
<td>12x1, 12x2</td>
<td>12x1</td>
<td>12x1</td>
<td></td>
</tr>
<tr>
<td><strong>Mix Box &amp; Card Routers</strong></td>
<td>4x1</td>
<td>N/A</td>
<td>4x1</td>
<td>4x1</td>
<td>4x1</td>
<td>8x1</td>
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</table>

## Reference Table—Leitch Control Options

<table>
<thead>
<tr>
<th>Ethernet</th>
<th>Integrator</th>
<th>Via32</th>
<th>Xplus</th>
<th>Xpress</th>
<th>Mix Box &amp; Card Routers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (direct to frame)</td>
<td>Optional (requires PC as I/F)</td>
<td>Optional (requires PC as I/F)</td>
<td>Optional (requires PC as I/F)</td>
<td>Optional (requires PC &amp; SPT as I/F)</td>
</tr>
<tr>
<td>Serial Control Port</td>
<td>Yes (2)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Optional (using SPT)</td>
</tr>
<tr>
<td>Remote Control Panels</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Local Control Panels</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Application software for Configuration, Control &amp; Monitoring</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Control from Remote Location</td>
<td>TCP/IP (LAN/WAN/Internet) or Modems for dial-up and leased lines</td>
<td>TCP/IP (requires PC &amp; LAN/WAN/Internet) or Modems for dial-up and leased lines</td>
<td>TCP/IP (requires PC &amp; LAN/WAN/Internet) or Modems for dial-up and leased lines</td>
<td>TCP/IP (requires PC &amp; LAN/WAN/Internet) or Modems for dial-up and leased lines</td>
<td>TCP/IP (requires PC &amp; SPT for LAN/WAN/Internet) or Modems for dial-up and leased lines (requires SPT)</td>
</tr>
</tbody>
</table>

### Contact Information

**Canada**
Tel: +1 (416) 445-9060
Fax: +1 (416) 445-0595

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Fax: +1 (757) 548-4088

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Fax: +55 (11) 3159-0770

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Fax: +852 2776-0227

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Tel: +1 (757) 548-2300
Fax: +1 (757) 548-4088

**Australia**
Tel: +61 (2) 9939-3305
Fax: +61 (2) 9939-3300

**www.leitch.com**
ZOOM LENS

Angenieux Extreme Tele Zoom: completes the high resolution broadcast ENG family of lenses, offering the largest focal length and a weight of 4- to 5kg; 973-812-3858; fax: 973-812-3858; www.angenieux.com.

Circle (372) on Free Info Card

GRAPHICS SYSTEMS

SGI Onyx 3000 series: line of servers utilizing NUMAflex modular technology and the IRIX 64-bit UNIX operating system for the ability to scale graphics, CPU, storage and I/O components independently; offers users the graphics capability and compute power to visualize large, complex volumetric data with interactivity and realism; features include clip-mapping, volume rendering, multistreaming technology and multichannel output; compatible with Onyx2 graphics and the Series 2000 systems; 800-800-7441; 650-960-1980; fax: 650-933-0819; www.sgi.com/go/broadband.

Circle (373) on Free Info Card

HD 720P CAMCORDER

Panasonic AJ-HDC27A: dual frame rate camcorder is based on a newly developed 1 million pixel 2/3-inch IT three-CCD imaging system; offers a sensitivity of F11 at 2000 lux; provides 46 minutes of recording in 720 progressive at either 30fps or 60fps, with two channels of 16-bit/48kHz digital audio; other features include HD-SDI output for full-color live and tape playback, an 8MB multimedia card, and low power consumption; uses standard 2/3-inch bayonet lenses; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast.

Circle (375) on Free Info Card

DIGITAL AUDIO ROUTER

ADC Broadcast Envy 7256: 100Mb/s wideband digital audio and timecode router can handle up to 256 inputs including AES3, Sync AES3 and SMPTE/EBU-format timecode through up to 256 outputs including AES3, Sync AES3, timecode and TDM AES3; provides crosspoint routing of 512x512 mono channels by allowing access to individual AES subframes; 800-366-3891; 952-938-8080; fax: 952-946-3292; www.adc.com/broadcast.

Circle (376) on Free Info Card

RAID STORAGE

Storage Concepts FibreBlock: redundant 240GB device features multistreaming technology in a compact package; system is capable of handling a combined transfer rate of 80- to 85MB/s for multiple datastreams running simultaneously through a single port; features scalability and compatibility with all host bus adapters; 800-525-9217; 949-852-8511; fax: 949-852-8930; www.storageconcepts.com.

Circle (384) on Free Info Card

FIBER OPTIC LINK

International Fiber Systems VT/VR RGB+5 020: transmits high resolution RGB video signals over fiber optic cables, for a bandwidth capability of 600MHz; applications include computer graphic workstations and video projection systems; features a digitally controlled optical Automatic Gain Control and several different signal synchronization options; three video configurations of RGB, RGBS and RGBHV will be available, with planned optional data and two-channel audio capabilities; 203-426-1180; fax: 203-426-3326; www.ifs.com.

Circle (377) on Free Info Card

WIRELESS VHF INTERCOM

Telex Communications Radiocom BTR-300: offers increased frequency band availability; improved front-end filtering increases resistance to interference; up to four base stations and 16 beltpacks can be used simultaneously; compatible with RTS TW, Audicom, RTS ADAM and Matrix Plus systems; Nickel Metal Hydride batteries and a plug-in charger for longer use are available as options; 800-392-3497; 612-884-4051; fax: 612-884-0043; www.telex.com.

Circle (378) on Free Info Card

COMPACT SPEAKER

Westlake Audio Lc5.75: two-way mini-monitor offers precise imaging and impressive low-frequency response for mobile recording environments, project studio and quality control stations; 6.5-inch-wide, 14-inch-high, 9-inch-deep unit weighs 18 pounds and can be purchased in pairs or individually; employs a 5-inch woofer with a 3/4-inch soft dome tweeter in a single port enclosure and has a frequency response of 60kHz to 18kHz; 805-499-3686; fax: 805-498-2571; www.westlakeaudio.com.

Circle (379) on Free Info Card

WIRELESS MICROPHONE

Azden 5GM-2X: shotgun microphone system includes an integrated shock-mount with camera shoe-mount and mic stand-mount and two foam windscreens; comes with two barrels — an omni (8.11 inches long) and an extension barrel that can be added to the omni to make a supercardioid (15.75 inches long); both configurations offer -50dB sensitive low-noise, wide-bandwidth signal and balanced, low-impedance XLR output; 516-328-7500; fax: 516-328-7506; www.azdencorp.com.

Circle (387) on Free Info Card

October 2000 broadcastengineering.com 130m
FIBER OPTIC TALK SETS
GN Nettest OVS-6000: designed for voice communications over a fiber optic cable; full-duplex 6000 series talk sets will replace the existing OVS-5000 series; transmits an analog signal at 1310 nm; available in 30dB or 50dB of dynamic range; features super polish ST, FC or SC connectors; 508-435-3800; fax: +45 72 11 22 10; www.gnnettest.com.
Circle (380) on Free Info Card

DIGITAL MONITORING SYSTEM
Magni Systems SDM-560M: multistandard, serial digital monitoring solution offers a new suite of automated measurement screens, in addition to features of the SDM-560 such as the ability to measure and depict signal strength, jitter and EDH status; expands on the AVM-510, providing composite, S-video and SD 601 display outputs for monitoring Serial Digital 601 or Composite analog signals; features on-screen display of picture, waveform, vector, audio and digital readouts; also includes a “bright-up” feature depicting picture areas that exceed gamut limits; 800-237-5964; 503-615-1900; fax: 503-615-1999; www.magnisystems.com.
Circle (385) on Free Info Card

ROBOTIC PAN/TILT CAMERA
ParkerVision Digital CameraMan: digital camera/robotics/ lens package available in fixed 4:3 aspect ratio; features three CCDs and 380,000 effective picture elements, horizontal resolution of 850 TV lines, and 65dB signal-to-noise ratio; digital SHOT Director allows the camera to be controlled from as far away as 2500 feet, and a single operator to control as many as 16 Digital CameraMan cameras through an RS-485 networking port; also features controls for linear matrix, white balance and shading compensation, and 125 camera presets to allow automatic pan, tilt, zoom, focus and change of camera settings; 800-532-8034; 904-737-1367; fax: 904-733-3587; www.parkervision.com.
Circle (386) on Free Info Card

TRANSPORT STREAM PLAYER
Wavetek Wandel Goltermann WWG DTS-P: offers layout capability in the lab or in production for set-top box manufacturers and digital TV broadcasters; users can test channel hopping and get multiple sources from a single instrument with the unit’s Dual Play option; plays MPEG-2 ATSC/DVB transport streams across a SMPTE-310M, DVB ASI or DVB SPI interface; Continuous Loop Mode replays the output file continuously to provide a constant datastream and permit segment concentration; the unit also resizes 204- and 208-byte Reed Solomon packets in real time and allows users to upload files via Ethernet or CDROM; 800-854-2708; 858-279-2200; fax: 858-627-0146; mpeg.wwgsolutions.com.
Circle (382) on Free Info Card

DV CAMCORDER
Panasonic AG-DVC200: 1/2-inch 410,000 pixel IT three-CCD DSP camcorder utilizes large DV cassettes; can record 270 minutes; offers an interchangeable bayonet mount lens that allows any 1/2-inch lens to be used; features 800 lines of horizontal resolution, an IEEE 1394 interface, signal-to-noise ratio of 62dB and very low smear; capable of shooting at F11 in lighting as low as .5 lux; also features four-position ND/CC filter, User Scene memory and a six-speed shutter with synchro scan that allows flicker-free shooting of CRT displays; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast.
Circle (381) on Free Info Card

AUTOMATED FIELD STRENGTH ANALYSIS SYSTEM
Z Technology S5007GPS: utilizes the R-507 Field Strength Meter for accurate high-speed measurement under PC control; provides a comprehensive facility for NIST traceable RF power measurement and documentation of digital or analog signal coverage when used with a calibrated antenna; features the Drive Test Version 2.0 automated measurement program to integrate data collection, dot plotting and swept spectrum analysis applications; operators can switch between applications or use the R-507 in stand-alone mode; 503-614-9800; fax: 503-614-9898; www.ztechnology.com.
Circle (383) on Free Info Card

www.americanradiohistory.com
SERV E R S
Quantel Clipbox Power: provides embedded editing, allowing multiple editors to directly edit all material held within the server simultaneously and without copying; runs non-compressed MPEG or DVCPRO; can support up to six edit seats, two real-time ports, six faster-than-real-time ports and two 50Mb network connections simultaneously; can be controlled by any automation system; features up to 200 hours of storage; 800-218-0051; 203-656-3100; fax: 203-656-3459; www.quantel.com. Circle (388) on Free Info Card

AES-3 M U LTIC HANN E L A U D IO INTERFACE
Leitch ACE-1600/ACD-1600: enable encoding and decoding of up to eight audio channels into or from one AES compatible signal in multichannel or 5.1 surround sound broadcasting; used in conjunction, the systems allow a stereo infrastructure to carry multichannel audio; chassis for the systems are 1RU; 800-231-9673; 757-548-2300; fax: 757-548-4088; www.leitch.com. Circle (389) on Free Info Card

P O W E R S U P P L Y
Lambda Z-up Series: high-power programmable system provides guaranteed accurate voltage and current programming stability between test equipment and the power supply; system is power factor corrected; RS232 or RS485 communication ports allow the power supply to be configured into a programmable power system of up to 31 DC outputs; available in 200W, 400W and 800W; features low ripple and noise, an “up-programming” time of 50mS at 0 to 100 percent load, and over-voltage, over-temperature, over-current and foldback output protection; 631-694-4200; fax: 631-293-0519; www.lambdapower.com. Circle (390) on Free Info Card

F I B E R O P T I C C A B L E S
Chromatic Technologies Field Deployable Cables: available in single- and double-jacket configurations; abrasion-resistant polyurethane outer jacket is capable of withstanding more than 250 pounds/inch of force; cables include single- and multimode fiber optic constructions and conform to IEEE 802.3z gigabit Ethernet standard; sizes range from 4.75mm to 7.49mm O.D. for up to 600 pounds pull strength; 888-541-7100; 508-541-7100; fax: 508-528-9950; www.drakausa.com. Circle (391) on Free Info Card

D I G I T A L M E D I A M A N A G E M E N T
A.N.N Systems Inc StarDRIVE 3.0 Suite: manages and synchronizes low-resolution newsroom computer assets with high-resolution assets in the broadcast domain, from ingest through production to playout; can be integrated with the A.N.N OpenMedia newsroom system and AP's ENPS newsroom system via the MOS2 Protocol to provide complete production capability and digital integration; 818-879-0000; fax: 818-865-1421; www.ann.com. Circle (392) on Free Info Card

C O N T R O L P A N E L
Sierra Video Systems SCP-200: flexible, fully programmable and compatible with the Tahoe, Shasta and Yosemite routers; features programmable control buttons, virtual mapping, single button takes and presets, level breakaway, salvos and macros in addition to standard crosspoint selection; system includes Windows program to adjust these functions to fully customize the panel for a specific facility; 530-478-1000; fax: 530-478-1105; www.sierravideo.com. Circle (393) on Free Info Card

V I D E O / A U D I O D E M U L T I P L E X E R S
VideoTele.com M2-VMX/M2-AMX: M2 series now features ProSelect channel customization; service providers can use the added capability to handle a combination of 12 streams from up to three satellite transponders; provides video and audio processing, demultiplexing, and packetizing in a compact, single-vendor chassis; other new features include a graphical user interface for mapping onto the equipment of emission technology vendors, as well as the ability to perform all functions remotely over an Intranet, a Virtual Private Network or over the Internet; 503-594-1400; www.videotele.com. Circle (394) on Free Info Card

L I P - S Y N C C O R R E C T O R
Altinex Sync Doctor: allows correction of lip-sync error through manipulation of the signal characteristics; designed for installation at the end of a cable run, before the input to a large screen projector or monitor; provides adjustments for pulse, trigger threshold, smoothing, aligning and polarity reversing; also features built-in ground loop isolation; Red, Green and Blue video channels with 16-position equalization controls allow compensation for signal attenuation over cable lengths of up to 250 feet or more; 800-ALTINEX; 714-990-2300; fax: 714-990-3303; www.altinex.com. Circle (395) on Free Info Card

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**VIDEO MONITORING SYSTEM**

**BARCO iStudio**: single module contains a high-resolution display, a graphic controller and Web-based operating software for complete video and audio monitoring, as well as advance warning and alarm handling; can monitor embedded audio for up to 30 video windows or 112 external audio channels simultaneously; also monitors real-time view-associated information such as computer data, clocks, animated logos or source identifications; allows graphical control of all source types, including composite, S-video and SDI video on PAL, SECAM and NTSC in 4:3 and 16:9 aspect ratio; 800-992-5016; 770-590-3600; fax: 770-590-3610; www.barco.com.

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**IEEE 1394 PACKET SWITCH**

**Omneon Video Network MPS1016 switch**: serves as the primary component for scaling in Omneon’s Video Area Network, to allow collaboration of resources across the system; the content-aware switch connects and routes IEEE 1394 data packets and carries real-time isochronous data and asynchronous data simultaneously; provides 400Mb/s and 800Mb/s IEEE 1394 capability; 408-585-5000; fax: 408-585-5090; www.omneon.com.

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**ROUTING MANAGEMENT STRATEGY**

**Grass Valley Group Routing Strategy**: spans a low-cost, PC-based, scalable system to a high-speed, networked full-function facility control system; provides a step-wise, affordable path to full facility control; the line includes multiple new, low-cost Ethernet-interfaced control panels that connect with master central processing unit (MCPU) control systems to provide distributed control throughout their facilities; routing control system is Windows-based and uses the real-time VX Works hardware platform to enable the support of multiple networking formats; 800-998-3588; 800-547-8949; fax: 503-627-7275; www.grassvalleygroup.com.

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**DELAY ERROR CORRECTOR**

**Tektronix AVDC100**: provides in-service monitoring and correction of A/V delay errors that occur during compression or other processing; allows user to reliably deliver video of definable quality; uses digital watermarking technology to embed audio time reference signals into video programming near the point of audio/video content creation, so lip-sync error can be detected by analyzing the watermark later in the distribution chain and corrected by adjusting the audio delay; 800-835-9433; 503-627-7111; fax: 503-222-1542; www.tektronix.com.

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**NT WORKSTATION**

**Post Impressions SpiRINT**: workstation uses a dedicated video sub-system with separate processing and a high-bandwidth bus architecture to handle HD video I/O and storage, allowing true random access of HD I/O; the sub-system is connected at bus level to the NT computer for fast internal data transfers, leaving the multiprocessor NT computer to run applications such as Tremor compositing software from Nothing Real; 310-287-0210; fax: 310-287-0211; www.postimpressions.com.

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**COMPOSITING SOFTWARE**

**Nothing Real Tremor**: features real-time I/O in 601 and HDTV, tracking/stabilizing, keying, color correction and 3D compositing; also provides CakeS asset management, distributed rendering and EDL support independent of resolution and bit-depth; can be run on Post Impressions’ SpiRINT workstation; 310-664-6152; fax: 310-664-6157; www.nothingreal.com.

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**VIDEO LOGGING SYSTEM**

**OmniBus SceneChange**: developed by AVS Graphics and Media, a division of Omnibus, the PC-based system uses a simple low-cost video capture card to introduce images onto the system from video tape or video fed; images represent scene changes that are then logged and displayed on the screen; the operator can set the sensitivity threshold of video to enable more frequent logs to be taken of an action film sequence in which the scene is constantly changing; will be available as a stand-alone system or with AVS Graphics and Media’s Multi-Browse solution; 530-470-1700; fax: 530-470-1718; www.omnibusystems.com.

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**VIDEO SERVERS**

**SGI Media Server**: two new versions of SGI Media Server, one designed for broadband and the other for production and broadcast: both feature the Origin server in an integrated solution; the broadband version utilizes Kaesenna MediaBase media streaming software to deliver content over the Internet, enterprise and virtual private networks to multiple client platforms; this version can deliver 100,000 high-quality MPEG streams daily; the production and broadcast version supports DVCPro news format and is available in four-channel and eight-channel configurations; it manages video as data, distributing it over the existing LAN/WAN infrastructure in a facility; 800-800-7441; 650-960-1980; fax: 650-933-0819; www.sgi.com/go/broadcast.

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HIGH-OCTANE WORKSTATION
SGI Octane2: visual workstation features an optimized crossbar architecture, a high-performance MIPS RISC processor, and two VPro graphics configurations for IRIX — V6 with 32MB graphics memory and V8 with 128MB memory; also features full hardware acceleration of the OpenGL 1.2 core feature set and imaging extensions on a single chip; 800-800-7441; 650-960-1980; fax: 650-933-0819; www.sgi.com/go/broadband.

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INTEGRATED CG CLIP OPTION
Pinnacle Clip Deko: available for standard-definition systems Deko500, Deko2000 and FXDeko; offers users the ability to record digital video clips with audio, and play them back synchronized with Deko graphics and sequences; can store and playback key signal at the same time as video; 650-526-1600; fax: 650-526-1601; www.pinnaclesys.com.

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Pinnacle HD Deko 500: provides real-time, no-render effects, including rolls, crawls, dissolves, cuts, pushes and wipes; provides unlimited font effects, type on a curve, fit-to-fill and real-time typing to air in HD, as well as texture on character faces; allows manipulation of font characteristics including font size, shadow blur and direction; uses same user interface as SD Deko products; permits live composition of CG pages directly onto the HD output; supports commonly used HD formats; 650-526-1600; fax: 650-526-1601; www.pinnaclesys.com.

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Optibase MGW-2000: now shipping; 19-inch multichannel streaming server is rack mounted and modular, with field-upgradeable slots for new modules; features an embedded operating system and a variety of network interfaces for business TV, distance learning and video over DSL; 800-451-5101; 408-260-6760; fax: 408-244-0545; www.optibase.com.

Circle (396) on Free Info Card

PLAYOUT SERVER
InnovaCom TransPEG Storage Playout Server: now available; server with optional Translock Encryption software provides back-to-back playout of MPEG audio and video; features removable hard drives for continuous playout of up to 40 hours of jitter-free MPEG-2 program content encoded to disk at 6Mb/s; allows playlists to be downloaded via modem or other network interface; 888-464-6734; 408-727-2447; fax: 408-727-6625; www.transpeg.com.

Circle (397) on Free Info Card

GRAPHICS SOFTWARE

Inscriber TitleExpress: plug-in for Adobe Premiere allows users of the Matrox RT2000 MPEG-2 nonlinear editor to create video titling; offers over 170 templates and over 150 custom fonts; allows editors to import a background image, credit rolls and crawls; now shipping bundled with Matrox RT2000; 800-363-3400; 519-570-9111; fax: 519-570-9140; www.inscriber.com.

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MONITORING SOFTWARE

Grass Valley Group NetCentral: now shipping; SNMP-based software allows for remote diagnostics and monitoring; ships as an option for the Profile XP Media Platform; provides centralized error reporting for network connected systems; sales have exceeded the $1 million mark; 800-998-3588; 800-547-8949; fax: 503-627-7275; www.grassvalleygroup.com.

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Avid announced its acquisition of Pluto Technologies International, a provider of video storage and networking solutions. The acquisition will enable Avid to provide an end-to-end broadcast solution for ingest, editing, storage and playback.

Inscriber’s Qscribe is seamlessly integrated with Quantel’s new iQ platform to allow editors to access its text generation capabilities directly from iQ. Quantel and Imagine Products have integrated the Imagine Mine asset management system with Quantel’s ClipNet gigabit Ethernet fibre network. The first stage of the integration features an Image Mine workstation digitizing offline video for transfer via ClipNet to Quantel systems. Future phases of the Image Mine/Quantel system will allow management of online media assets as well.

WGTE-TV 30 in Toledo, OH, chose Ikegami HDK-79D cameras for digital broadcast of documentaries and its weekly series, "The Editors."

NBC used Tektronix’s test and monitoring equipment to evaluate compression technology under consideration for use in NBC’s satellite distribution systems.

CBS affiliate WCAX-TV 3 has installed a System 5 high performance digital console from Euphonix for use on four major daily news programs, as well as pre-records.

North Texas Public Broadcasting in Dallas has reached an agreement with ADC Broadcast to test ADC’s new Bandwidth Enhancement Technology on its digital broadcast channel KERA-DT. ADC’s technology seeks to solve interference problems and protect services outside the channel by allowing more aggressive RF filtering to be used on the DTV signal.

Tandberg reached a non-exclusive agreement with Triveni Digital to resell Triveni’s PSIP Builder Pro AE-10 system as part of its ATSC system configurations.

Telecast Fiber Systems’ fiber optic interface systems were chosen by Times Square Studios to link their facilities with the ESPN Sport Zone restaurant. The production house will use the link to broadcast ESPN’s programs from the restaurant each week.

NASA also awarded Telecast a multiyear contract for up to 230 Viper II fiber optic systems to modernize the Operational Television Video at Kennedy Space Center.

Telex’s corporate headquarters is now located at 12000 Portland Ave, South, Burnsville, MN 55337. The main telephone number is the same, but with a new area code: 952-884-4051.

POP Sound installed a Logic 2 digital mixing console from AMS Neve in its newly upgraded Studio H for mixing television and radio commercials, documentaries, and music specials.

The new Logic 2 console is the ninth AMS Neve console installed in the audio post facility.

The Associated Press’ Electronic News Production System (ENPS) was used by KPMO-TV24 and KFAA-TV51 for the stations’ relaunch of their local news broadcasts. The systems will be utilized to gather and produce news, sports, weather and community programming.

DST created a centralized, automated design for the Ackerley Group’s Syracuse, NY, station, WIXT. The station serves as a Digital Central Casting hub transmitting digital signals for six stations located throughout New York state.
An interface between Video Networks Inc.'s (VNI) Newstracker and Grass Valley Group's Profile XP play-to-air servers will provide broadcasters with a tapeless news environment. Editors will be able to move material directly from a VNI server to a Profile platform or digital hard news production systems and edit it without dubbing the content to tape first. The new capability will improve time to air and allow multiple users access to the same media.

VNI also announced an agreement to connect their Newstracker system with Leitch's video servers to allow broadcasters to receive, manage and send content directly to air without tape. It will also simplify processes such as content search and retrieval and the management of scripts, synopses and rundowns.

BARCO has announced that BARCO Communication Systems will become an independent company called BarcoNet. The new company will focus on four main application areas: headends for integrated multimedia services (including digital TV), high-speed fiber optic backbone systems, network management and digital TV distribution.

Pixel Power and Vertigo Multimedia recently announced an alliance enabling Pixel Power to distribute Vertigo's Producer On-Air and Producer Interactive integrated with Pixel Power's Clarity, Graphite and Collage graph systems.

PBS Network used Pixel Power's Clarity HD graphics platform for their nationwide live-definition broadcast of the Milwaukee Circus Parade. The Clarity HD was used in HD Vision's new HDV-5 multicamera HD production mobile unit.

Fox affiliate XETV in San Diego launched its newscast with an i-NEWS (formerly Avstar) Newsroom Computer System (NRCS) and Broadcast Control System (iBCS), Grass Valley Group Profiles, and Avid NewsCutter nonlinear editors.

Continued on page 143
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iNEWS also announced plans to integrate the iNEWS newsroom computer system and Media Browse 2000 with Grass Valley Group’s Vibrant NewsEdit, Profile XP Media Platform and Content Share software platform to create a complete newsroom solution.

CNN International purchased ClipMail Pro from Telestream to provide digital delivery of commercials from CNN’s international bureaus to its on-air operations center in Atlanta.

SBC Communications has reached a $1.308 billion deal giving SpectraSite Communications the exclusive right to lease 3900 communications towers. SpectraSite will also gain 800 new towers over the next five years.

Leitch has acquired DPS in an $86.5 million transaction. The acquisition will enable Leitch to strengthen its core video processing technology and expand it into new markets.

Teranex recently announced that it has raised an additional $30 million to develop products and services for broadband Internet video.

NBC affiliate WFLA is using three AutoCam robotic camera systems from Vinten in their new facility. Two of the systems are in use in the WFLA Weather Center, with a third in the Tampa Tribune newsroom.

**PEOPLE**

Michael D. Patten, age 53, recently passed away due to a stroke.

Patten left Grass Valley Group to form Graham-Patten Systems in 1980 and was recognized by the Academy of Television Arts and Sciences in 1991 with a Technical Emmy for the D/ESAM product. Patten was active in SMPTE and AES.

CPI Wireless Solutions appointed Mike Cheng president of the Eimac Division.

Ray Stephens was named president and general manager of Professional Communications Systems.

John Andrews was appointed to broadcast development director for Solid State Logic.

Robert Hansen was appointed senior vice president of sales for Leitch’s U.S. operations.

Wilbur Brann was appointed southeastern regional sales manager for ParkerVision.

Ed Burakowski was recently appointed vice president of strategic sales for NDS Americas.

**ScreenShot**

Fujinon outfits Déjà Vu

Soljay Productions’ new 50-foot expando truck, Déjà Vu, includes twelve Fujinon lenses on its Philips cameras.

Déjà Vu is used to cover business meetings, concerts, and sporting and religious events, as well as more demanding remotes.

The truck was recently used to shoot a concert by artist Mandi Moore at the Houston, TX, Six Flags theme park. It was also used by RJ Productions for the SPCA Telethon in Hurst, TX.
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- LCD touch screen. LCD touch screen makes the DSR-250 extremely portable.

- Internal camera focus allows for extended image storage.

- Camcorder -type focus in the digital picture mode. The DSR-250 is also equipped with 4K-DLS and 8K-DLS stills, allowing for extended image storage.

- Time code on the LCD touch screen to easily locate extended image storage.

- Multi -task image capture for extended image storage.

- The DSR-250 is also equipped with 4K-DLS and 8K-DLS stills, allowing for extended image storage.

- Standard single chip CMOS sensor with extended image storage.

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- LCD touch screen. LCD touch screen makes the DSR-250 extremely portable.

- Internal camera focus allows for extended image storage.

- Camcorder -type focus in the digital picture mode. The DSR-250 is also equipped with 4K-DLS and 8K-DLS stills, allowing for extended image storage.

- Time code on the LCD touch screen to easily locate extended image storage.

- Multi -task image capture for extended image storage.

- The DSR-250 is also equipped with 4K-DLS and 8K-DLS stills, allowing for extended image storage.

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SONY

UVW-1200/UVW-1400A
Betacam SP Player + Player/Recorder

The UVW-1200 and UVW-1400A are equipped with two longitudinal audio channels and can be used as a Betacam SP tape recorders. They are fully compatible with each other, and can be used interchangeably to provide high quality broadcast and recording technology. RGB- and Y/C-1 components, as well as analog signals, can be output and input to a variety of devices.

- Audio: Two longitudinal audio channels can be output and input.
- Video: Two longitudinal audio channels can be output and input.
- Cell: A large number of functional parameters can be preset.
- USB: A large number of functional parameters can be preset.
- Remote: A large number of functional parameters can be preset.

The UVW-1200 and UVW-1400A are equipped with two longitudinal audio channels and can be used as a Betacam SP tape recorders. They are fully compatible with each other, and can be used interchangeably to provide high quality broadcast and recording technology. RGB- and Y/C-1 components, as well as analog signals, can be output and input to a variety of devices.

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UVW-1600/1800 Betacam SP Editing Player + Betacam SP Editing Recorder

- Two types of channel output: via three BNC connectors or a Betacam SP tape recorder.
- Optional: Two types of channel output: via three BNC connectors or a Betacam SP tape recorder.
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Avid / IBM

Xpress DV On IntelliStation

Pro Audio

ES-3 EditStation

Videotape recorder (VTR) and digital video editing system. The Sony ES-3 Editstation is an extremely flexible, powerful and high picture quality non-linear video editing system. It is particularly suitable for professional and advanced home users. The ES-3 EditStation is designed to be easy to use even for non-users to the non-linear editing world. Its open architecture also supports more than 25,000 graphical, paint, text, and effects. The Sony ES-3 EditStation also offers a full-featured Sony DVD link interface allowing you to transfer only the clips you want to edit. The Sony DVD-3000 can mark the exact point of each clip and the time code of every frame. The “index picture” is recorded on the cassette memory of the DVG tape.

The video and audio files stored on the disk drive of the ES-3 system can easily be edited by the add-on DVD link format. Free use of the Sony DVD link interface allows you to transfer only the clips you want to edit. The Sony DVD-3000 can mark the exact point of each clip and the time code of every frame. The “index picture” is recorded on the cassette memory of the DVG tape.

Audacity

The Audacity Editor, an audio editor, allows owners of any audio editing software to record, play back, and edit audio files stored on a computer. The Audacity Editor is a free software package that allows you to record, play back, and edit audio files stored on a computer. The Audacity Editor is available for Linux, Windows, and Macintosh operating systems.
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TELEVISION ENGINEER. KOAM-TV, Channel 7, a CBS Affiliate in the Joplin/Pittsburg market is searching for a full time engineer with diagnostic skills in analog and digital video/broadcast studio systems with knowledge of RF transmission and IS. Minimum of 2 years experience in related work and SBE certification or degree in broadcast engineering helpful. KOAM-TV is a dominant VHF facility utilizing DVC-Pro gear, on-site Doppler Radar and non-linear editing. Receive exceptional benefits and 401-K with this fast growing Television/Radio Group. Please forward resume and salary history to Larry White, Chief Engineer, KOAM-TV, P.O. Box 659, Pittsburg KS 66762. KOAM-TV is an Equal Opportunity Employer.

ENGINEERING SUPERVISOR: Responsible for supervising news department ENG operations, maintaining analog and digital television production systems, and repairing ENG/studio equipment. Need a team leader with good communication skills. Strong ENG background preferred. 5 yrs broadcast experience, 2 yr technology degree or equivalent SBE Certification preferred. ClearChannel Television, Attn: GM 2701 Union Ext. Memphis, TN 38112

TECHNICAL EDITOR: Intertec Publishing, a nationwide leader in the trade publishing industry, seeks a Technical Editor for Broadcast Engineering and World Broadcast Engineering magazines. Position located in Overland Park, a suburb of Kansas City, MO. This individual will be responsible for writing and editing broadcast television, video and computer video materials for both publications, along with verifying technical details and preparing articles for production. Will work with manufacturers, corporate users and broadcasters on the coverage of TV/video and other technology issues. Some traveling required for industry trade shows, technical conferences and editorial trips. Requirements: Must have solid technical writing skills and knowledge of video and television technology. 4 years of work experience of a technical nature with a newspaper or magazine is preferred. We offer a competitive benefits/compensation package, which includes 401k, retirement plan, a stock purchase program and casual work environment. Please send resume with salary requirements (mandatory for consideration) to intertec Publishing, HR Dept., Attn: GH-TECH, 9800 Metcalf Ave., Overland Park, KS 66212. FAX: (913) 967-1846. Email: gail_halverson@intertec.com. EOE. Please visit us: www.intertec.com.

FOR SALE 640 feet of RCA 3 1/8 inch, 51.5 OHM transmission line; good condition. $5,000 or best offer. As is, where is. Contact: Duhamel Broadcasting Enterprises; Att’r: Director of Engineering; P.O. Box 1760; Rapid City, SD 57709-1760; Phone: 605-342-2000, ext. 600.

FOR SALE 300 feet of guyed tower with 2 feet face. Guy cables included. Make offer. As is, where is. Contact: Duhamel Broadcasting Enterprises; Att’r: Director of Engineering; P.O. Box 1760; Rapid City, SD 57709-1760; Phone: 605-342-2000, ext. 600.
ENGINEERS

Turner Broadcasting System has career opportunities for experienced television engineers. These career positions demand an extensive background in equipment maintenance, digital video and audio, and knowledge of computer systems and networks. Please mail or fax your resume and cover letter to:

Jim Brown
Assistant Vice President of Engineering Services
Turner Broadcasting System, Inc.
One CNN Center
P.O. Box 105366
Atlanta, GA 30348-5366
Fax: 404-827-1638 Phone: 404-827-1835
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In return for your professional abilities, we offer an attractive compensation and benefits package. For immediate consideration, please send or fax a cover letter along with your resume and salary history to Galaxy Latin America, REO# A20003.
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Direct and manage operations of satellite broadcasting company's full range of telecommunications, including computer hardware, software, network, databases, and desktop tools. Oversea all engineering and technical staff related to MIS functions. Interface with all levels of organization, customer and vendors throughout Latin America. Bachelor's degree in Systems Engineering, MIS or Computer Science and five (5) years related experience; fluency in Spanish and Portuguese languages required.

In return for your professional abilities, we offer an attractive compensation and benefits package. For immediate consideration, please send or fax a cover letter along with your resume and salary history to Galaxy Latin America, REO# A20005.
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Proven success in an IT/Networking and/or broadcast technology business environment. Ability to address technical issues quickly, while not losing perspective of the overall project. Any previous field support experience and customer exposure is a strong plus.

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**TELEVISION ENGINEER**

AARP is currently seeking a professional to join our Television & Radio studio team in Washington, DC.

The selected candidate will maintain technical equipment (component level repairs); adjust video and audio levels; produce AutoCAD and Visio drawings; install audio, video, and control equipment per schematics; manufacture and/or repair audio, video, computer, telephone, and computer cables; and assist radio engineers and other production personnel as needed.

Requires an Associate’s degree in Electronics, Television, Satellite Operations, or related discipline (Bachelor’s degree preferred), and 2-4 years of experience in technical operations at a television station, network, cable facility, or business/educational television facility. Knowledge of radio technology is preferred.

AARP offers excellent benefits including a matched 401(k), paid pension, and much more. Please forward your resume and salary requirements, referencing Job Code EW559-WC, to E-mail (ASCII): resumes@aarp.org, Fax: (202) 434-2809, or Mail: AARP, 501 E Street, NW, Washington, DC 20049. Visit our website at www.aarp.org/jobs. We are an Equal Opportunity Employer that values workplace diversity.

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**Contact:**

Harris Corporation, Broadcast Communications Division, 4393 Digital Way, Mason, OH 45040-7604; FAX: (217) 221-7062.
E-mail: eagard@harris.com
EOE

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**COMPUTER TECHNICIAN - KUSI-TV**

KUSI-TV has an opening for an experienced computer technician to join our engineering team. Duties will include installation, service and repair of our computer network, along with other broadcast operations. Successful candidate must name a solid understanding of computers, software, networks and server technology, with a “can-do” work attitude. Minimum of two years hands-on electronics training required. Excellent career opportunity with one of the finest technical facilities in the country.

EOE - Send resumes to: KUSI-TV, HR. P.O. Box 719081, San Diego, CA 92171.
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ENGINEER
We are seeking a dedicated and motivated professional who is able to design, install and maintain broadcast systems and related equipment. Utilize your ability to work independently and quickly in high pressure situations as you instruct staff in proper operation and maintenance of newly designed systems.

Familiarity with TV and radio broadcasting equipment including cameras, robotics, VTRs, digital recording, routing equipment, production switches/mixers, computer control systems and power distribution systems is essential. Excellent computer skills, including a good understanding of PC hardware and software operations is required. As is the ability to maintain/construct wire and cable assemblies. At least 2 to 3 years experience in broadcast television or related field is a must.

Please send your resume to: Bloomberg, Attn: D. Maloney, 499 Park Avenue, New York, NY 10022. E-mail: operations@bloomberg.com Fax: 917-369-6201. No phone calls, please. EOEW/IV

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DIRECTOR OF ENGINEERING. KVBC-TV, Las Vegas, is just completing an all-digital, fully automated facility and is seeking an experienced technical manager to oversee all broadcast operations and maintenance. Applicants should possess substantial experience in broadcast engineering including maintenance, production, operations, design, and installation. Knowledge of physical plant construction and systems as well as applicable laws and regulations necessary. Interested applicants should possess excellent verbal and written communication skills and should have prior experience in budgeting and capital planning. We offer a competitive wage and a benefits package. Apply in person at, mail resume to, or email resume: KVBC Channel 3, 1500 Foremaster Lane, Las Vegas, NV 89101. NO PHONE CALLS PLEASE. HR@kvbc.com. E.O.E.

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MAINTENANCE ENGINEER: Multi-channel Television facility has an immediate opening for an experienced Broadcast Engineer. Must have a minimum of 2 years in broadcast maintenance, including installation, systems troubleshooting and repair of studio video and audio equipment to component level. Computer and networking skills highly desirable. XAN-TV/LIN Television is an Equal Opportunity Employer. Send resume to: Assistant Chief Engineer, XAN-TV, PO Box 490, Austin, TX 78767. Fax (512) 482-4330 employment@xan.com
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Move to Phoenix before winter begins! Join the AVR team and work for the fastest growing dealership in the southwest Mon. thru Fri. 8-5. We are looking for a candidate with the right attitude to repair and maintain broadcast level vtr's, cameras, and associated equipment. Experience should include 5 years in a station or dealership environment preferably with factory training on Sony, JVC, and Panasonic equipment. Generous salary, benefits, & 401K. Drug test required. Fax resume to (602) 274-7416 Attn: J.L.

SO. CALF. MAINTENANCE ENGINEER
Orange County, CA. Immediate opening for an experienced television broadcast maintenance engineer. Previous experience desired in systems, installation and component level troubleshooting of analog and digital audio and video studio equipment. Computer/networking, RF and SBE certification a plus. Send resumes to: Ben Miller, Vice President, Engineering, Trinity Broadcasting Network, Inc., 2442 Michelle Dr, Tustin, CA 92780, Fax (714) 730-0661, E-Mail: bmiller@tin.org

BROADCAST ENGINEER
Duties include maintenance of two TV transmitters and interconnecting microwave systems. FCC General Radiotelephone License required. Salary commensurate with experience. Contact: Doug Coonrod, Corporate Director of Engineering, P.O. Box 1346, Beverly Hills, CA 90213. Fax: (11) 404-3321. E-Mail: Doug_Coonrod@primedia.com

BROADCAST MAINTENANCE ENGINEER:
Broadcast Engineer needed for National News Network in Washington DC. Extensive background in broadcast equipment maintenance. Team leader, minimal supervision, good communication skills, min 5 yrs experience. Digital knowledge a plus. Competitive salary and excellent benefits. Fax resume, letter c/o Eng. Manager 202-515-2187. Email John.Cunha@turner.com

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Be a part of a team of engineers responsible for, but not limited to, the preventative and corrective maintenance of all television equipment within the Television Center. Requires a minimum of 3 years television/broadcast systems experience, including significant experience in a digital environment; the ability to diagnose to the component level; and familiarity with test signals and equipment. This is not an IS position. SBE certification and FCC general class license and knowledge of Spanish and/or Portuguese is a plus.

Please send your resume to: Discovery TV Center/Randstad Human Resources, 6605 Blue Lagoon Drive, Miami, FL 33126: FAX: (305) 507-1583; e-mail: bobby_owens@discovery.com

**EQUAl OPPORTUNITY EMPLOYER**

**TRANSMITTER ENGINEER:** KTRK-TV, the ABC owned station in Houston, has an immediate opening for a Transmitter Engineer. Working with other members of our engineering staff, this person will be responsible for preventative and corrective maintenance on our VHF and UHF transmitters, as well as ancillary support equipment. This position requires prior experience with high-power RF transmitters, an ability to work with and train other technical personnel, and the discipline to work effectively with minimal supervision. Qualified applicants should send their resumes to: Jim Stanley, Director of Engineering, KTRK-TV, 3310 Bissonnet, Houston, TX 77005. Fax: (713) 663-8755. E-mail: james.w.stanley@abc.com. No phone calls please. Equal Opportunity Employer. M/F/V/I/D.

**MASTER CONTROL OPERATOR:** Master Control Operator needed immediately at Univision O&O station. Must have related experience. Formal video/television technical training preferred. Will oversee all on-air operations, including switching, programming CG and system automation computers. Experience with Windows 98 or NT. Working knowledge of Spanish a must. Competitive pay and excellent benefits. Please apply at: Master Control, KXII-TV 45, 9440 Kirby Drive, Houston, TX 77054. FOE.

**BROADCAST MAINTENANCE ENGINEER:** Broadcast Engineer needed for National News Network in Washington DC. Extensive background in broadcast equipment maintenance. Team leader, minimal supervision, good communication skills, min 5 yrs experience. Digital knowledge a plus. Competitive salary and excellent Benefits. Fax resume, letter c/o Eng. Manager 202-515-2187. Email John.Cunha@turner.com

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The importance of an exit

BY PAUL MCGOLDRICK

As we look around the broadcast industry, we see a number of dominant suppliers who control the vast majority of the dollars that are spent. But whether they advertise or not, whether they have a small presence at NAB or no presence at all, this industry is dominated by smaller suppliers, in some cases very much smaller. They enjoy the niches that smaller companies everywhere have had to find when the superstore moves into town. In many of these cases the companies invented the niche, and many dominate their arenas.

The really small companies are normally safe from predatory corporations and are unlikely to come to the attention of the larger operations — which often could compete with the company’s products quickly by simply turning a little of their resources in that particular direction, but do not, having bigger fish to fry.

When a small company needs an exit plan, all bets are off.

Fatigue is a major reason why people divest themselves of what they have built up. One example that is close to home for me is a company that happens to be in the broadcasting market. Well established in its niche, internally the company had suffered business decision disagreements between the closely-related principals. The partners had taken over 20 years to build their business and they wanted out. It was clearly both a wrench for them and a necessity.

A buyer was found at the opposite end of the country and a deal was completed. Most of the principals decided not to stay, but a few key players did. After so much work, so much grind, over so many years, one cannot feel anything but joy for them for getting out in one piece with sufficient funds for their old age. But the rest of us also have to look at what is the inheritance of the sale — for the employees, the town and for a company put in the same position halfway across the country.

One other locally-acquired company (not in broadcasting) has seen the local CEO give up and leave town, making the future of what was a superb organization tenuous at best. The broadcast company I mentioned has not been left in good hands and is now incapable of defending the company’s local interests. The head of R&D saw the corporate light, liked it not, and left.

So I’m watching a company with some fine individuals — not all, of course — who are rudderless. The hand on the helm is far away, as I can gauge by counting the number of neckties seen in our town. It is usually few: ministers, the mortician, the postmaster, and for some reason the appliance store owner. A tie coupled with a rental car stands out as a very obvious sight. At the beginning of this acquisition, they were in town thick and fast; now they are rarely seen. To me that says they have lost interest. I can foresee a szeizing of the talent in the company, continual pressure on reducing expenses, and a continuous worsening of morale.

It is sad to see talented, confident and honest employees increasingly having to ask themselves whether they should be looking for jobs somewhere else. It is even sadder that things could have been entirely different; that the problem should have been how to recruit even more talented people to the town. With an exit strategy in place in earlier years, everybody would have benefited and the founders could have continued to enjoy what they had accomplished.

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