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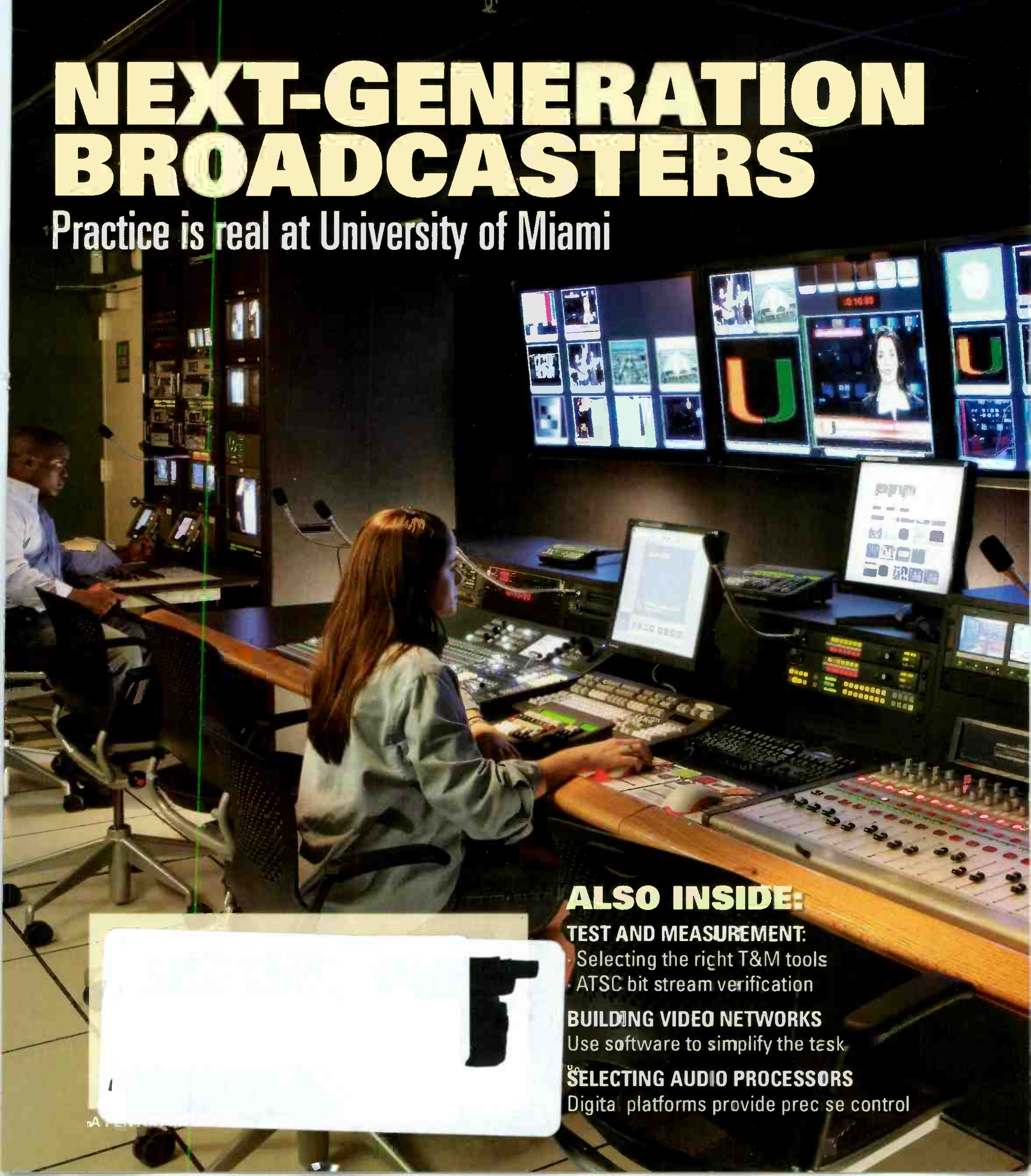

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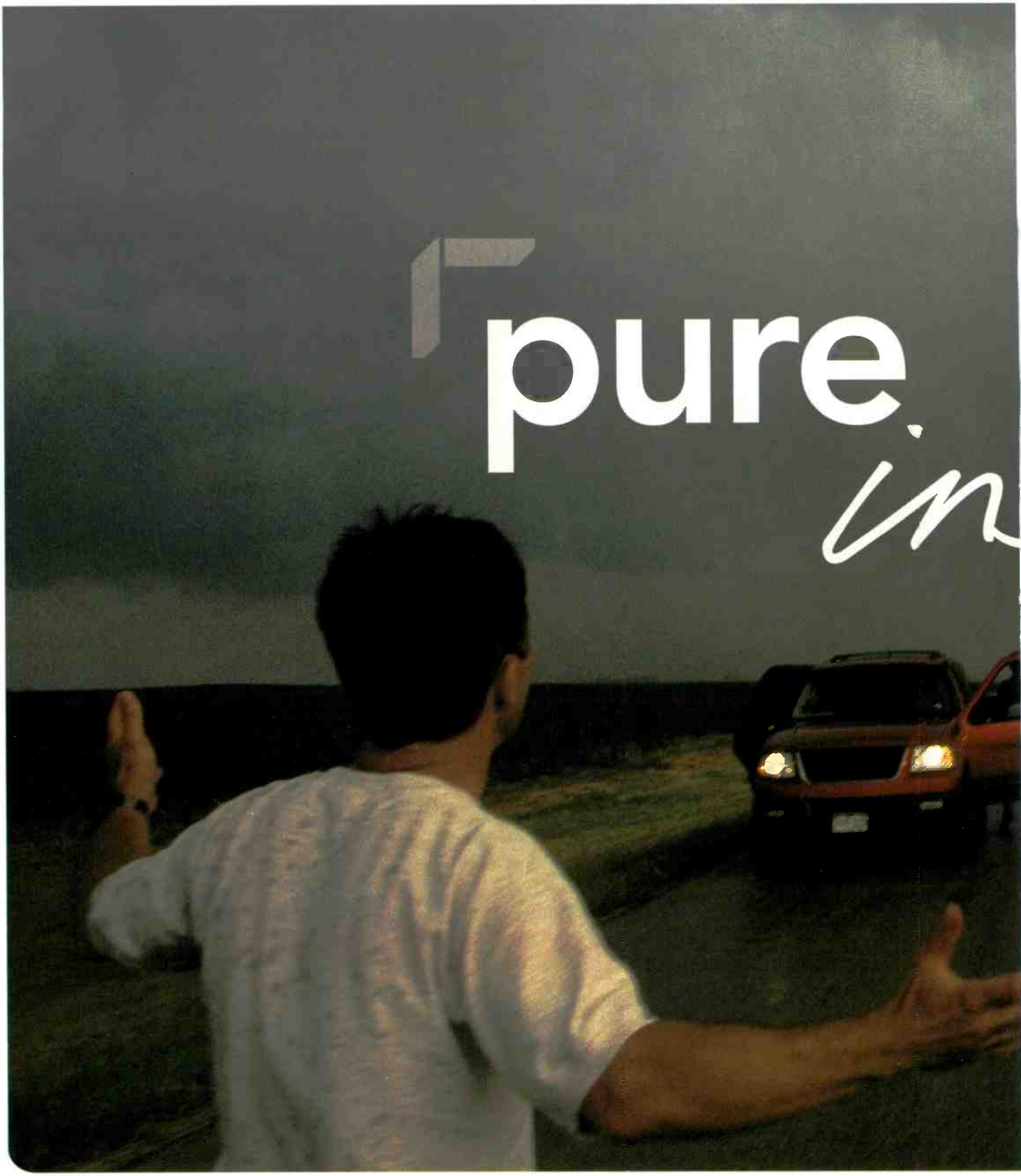
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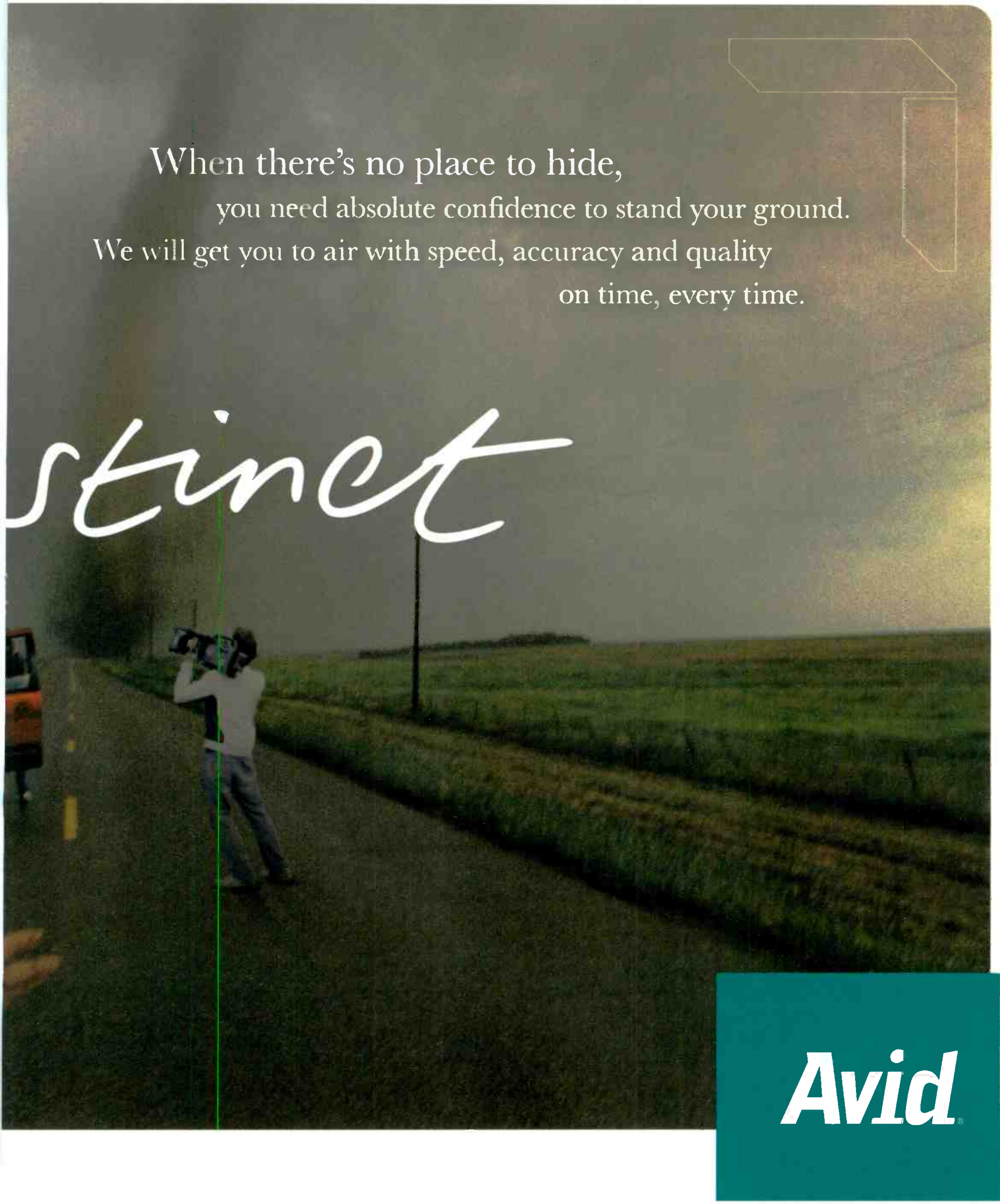
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BroadcastEngineering®

FEATURES

BEYOND THE HEADLINES

DIGITAL HANDBOOK

continued on page 8

THIS MONTH'S FREEZEFRAME QUESTION

Do you know your phase? Subcarrier to horizontal phase (SCH) refers to the ______ relationship between the ______ edge of ______ sync (at the 50 percent amplitude point) and the zero crossings of the color burst. The error is expressed as SCH phase and is expressed in ______ of subcarrier phase. The question was taken from Keith Jack's book, "Video Demystified," Fifth Edition, available from Focal Press.

Readers submitting winning entries will be entered into a drawing for *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-November" in the subject field and send it to: editor@broadcastengineering.com. Correct answers received by Jan. 1, 2008, are eligible for the drawing.

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TABLE OF CONTENTS (CONTINUED)

VOLUME 49 | NUMBER 11 | NOVEMBER 2007

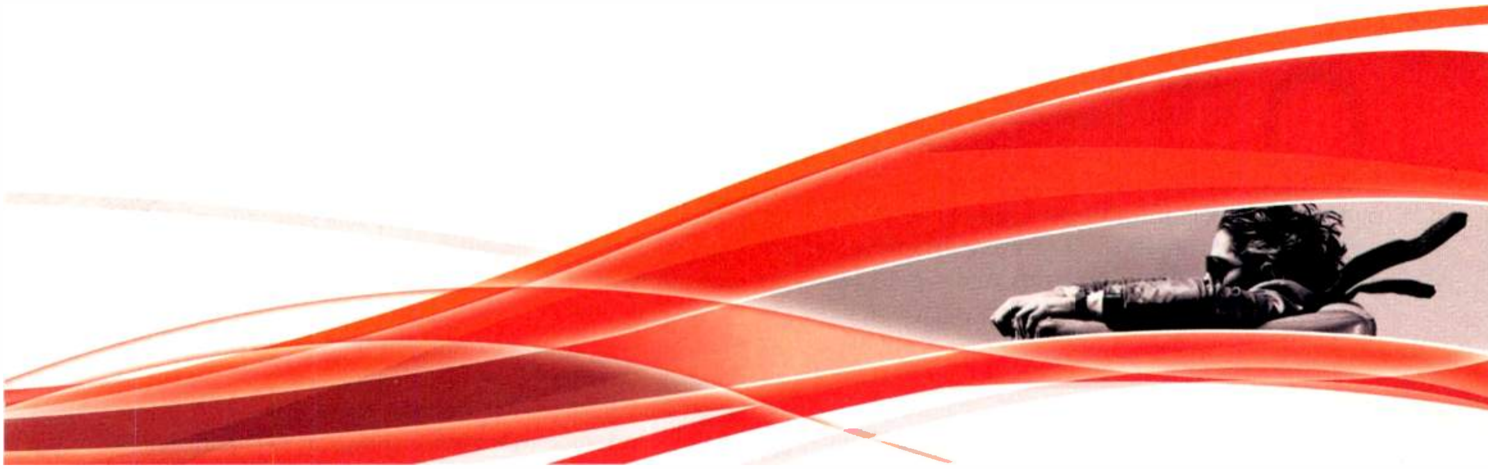
ON THE COVER:
UMTV has two identical, digital, HD-ready production control rooms.

SEPTEMBER'S FREEZEFRAME ANSWER

Q. Who is credited with developing the modern audio tape recorder, which was based on the German AEG Magnetophon? What famous singer/actor invested money in what company to make the device a commercial success?

A. John (Jack) Mullin developed the recorder. Bing Crosby financed the commercial development. Ampex was the company.

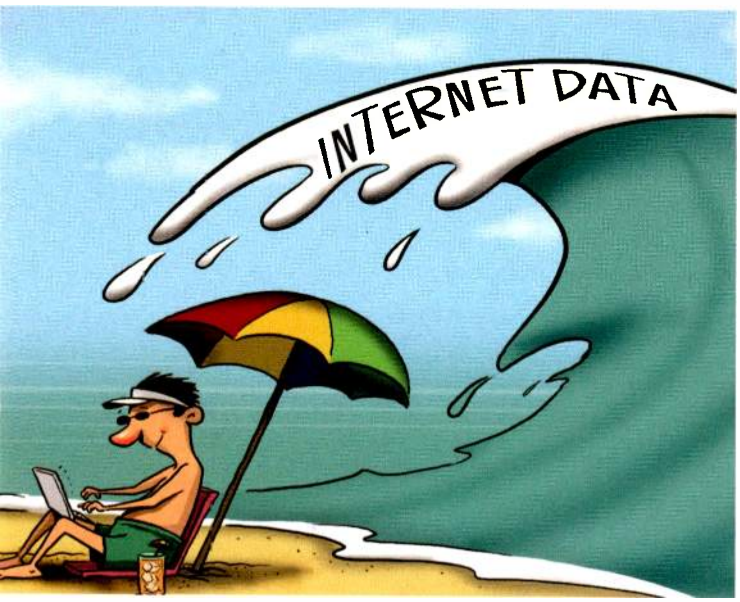
READERS WHO ANSWERED CORRECTLY:
Tom Alderson, Jim Barnes, Don Norwood, Karl D. Sargent, Jim Wulliman



Incoming: the exaflood

Question: What is an exaflood?

My first computer, a Radio Shack TRS-80, had 16K of memory and used a cassette tape for data I/O. Today, one of my several computers has 500GB of RAM and a Blu-ray DVD writer, capable of writing 36MB/s of I/O. Every data measurement is in at least mega if not giga terms. And even tera and peta are becoming more common. What's next? It appears the next scaling term may be exa.



While reading a report about the growth of data being passed around the Internet, I came across a new term, *exaflood*. It's based on the exabyte, which is 2^{60} bytes of data. Being unfamiliar with the exabyte, I tried to put a handle on its relative size.

Consider that a page of typed information requires about 2KB of data storage. The complete works of Shakespeare would then occupy about 5MB of data. So far, these sizes are understandable.

Now, fill your favorite pickup truck with copies of the works of Shakespeare. That tallies about 1GB of data in the truck. Finally, imagine 1 billion book-filled trucks. That's what an exabyte looks like. To say an exabyte is large is an understatement.

Discovery Institute fellow Bret Swanson wrote in his January 2007 *Wall Street Journal* editorial that a coming exaflood (exabytes) of data might exceed the available bandwidth of the Internet. His comments set the blogosphere chattering about how video, because of the large file sizes, could be the death of the Internet. "Woe is me," they cried.

While overstated, there is something to the huge increase in the amount of data being sent via the Internet. The research firm IDC released a study this year indicating that in the last year alone, some 161 exabytes (161EB) of digital information were created and copied. This represents 3 million times the equivalent data from all the books ever written! The issue, according to these researchers, is that the Internet may be approaching its capacity.

It's not just regular Internet users that are to blame. Bango, a mobile web service company, says that mobile phone-accessed Internet rose by 300 percent last year. And with mobile video just over the horizon, expect that consumption to explode.

By 2010, video downloading and streaming will account for as much as 90 percent of Internet bandwidth traffic. Consider that the Web site YouTube consumes as much bandwidth today as the entire Internet did in 2000. The popular Web site downloads up to 100 million videos daily. Researchers predict that by 2010, the data generated by just 20 U.S. homes will equal that used by the entire Internet in 1995.

Those of us who were early to the computer age often like to reminisce about the good old days, but the real excitement lies in new technology — more powerful computers, smaller drives providing increased storage and HD TV sets where the images almost pop off the screen. Wow, that's where it's at, and Internet delivery will be part of that tomorrow.

Bring on the exaflood.

Now, if I could just figure out how to get HD video into that TRS-80. **BE**

Brad Dick
EDITORIAL DIRECTOR
Send comments to: editor@broadcastengineering.com

Resources

"The Broadband Factbook," Internet Innovation Alliance
"The Internet's Capacity to Handle Fast-Rising Demand for Bandwidth" and "The Exabyte Internet," US Internet Industry Association (USIIA)
"The Coming Exaflood," Bret Swanson, *Wall Street Journal*

Revisiting "Competition is ugly"

Dear editor:

I work in the cable business and take strong exception to your statement at the end of "Competition is ugly" in September 2007. You say "free enterprise doesn't apply to cable TV because for most viewers, there is no competition. Most would call that a monopoly. Cable just calls it business."

I live in Dallas. The cable penetration rate here hovers between 30 percent and 40 percent. Are the remaining 60 percent to 70 percent of the people not watching television? I think they are, either with DISH Network, DIRECTV, AT&T U-verse, Verizon FiOS or an antenna. If the cable company has only one-third of the market, there is pretty effective competition here.

Leslie W. Read
Cable Television Technical Support

Editor responds:

In March, *Multichannel News* reported that the U.S. cable penetration dropped to a 17-year low of 61.3 percent. The Dallas-Fort Worth market was mentioned as one of the markets hardest hit, with 48.5 percent of TV households there paying for TV from an alternate delivery platform. However, that means that cable's penetration in Dallas-Fort Worth is 51.5 percent, not 30 to 40 percent as you suggested.

Part II

Dear editor:

I thoroughly enjoyed your article about cable competition and the à la carte issue in the September 2007 editorial. I somewhat agree with what Alex Nogales and Brian Dietz are saying. The satellite-delivered services to the cable companies are compensated on a per customer basis. Bundle this in with other more popular viewed satellite channels, and they stay afloat. By themselves — and I bet they have the marketing data to show this — their viewership would be small enough to put them out of business.

Check out the cable TV top 10 programs for this week on nielsenmedia.com. Most of them are sports programs. The cable viewing public has decided what it wants to watch, and I guess freedom of choice is discrimination.

Cable companies do not have a monopoly. There is plenty of competition from DBS, the Internet (podcasting, music videos, etc.), telcos and now your handy little cell phone, all of which have video and audio services galore.

As far as competition in a particular community for wired cable services is concerned, this has been tried without much success. In El Cajon, CA, two new cable companies opened up franchises in the 1980s, and it was a giant mess. Three times the underground construction caused homeowners to complain about having so many pedestals in their yards. There is only so much real estate on the poles for proper clearances. Cox had the majority, and it did lower its rates in El Cajon. Being the big guy on the block crushed it. A cable company needs so many customers per mile to make it, just like the minority satellite television provider.

Personally, I would like to see everything pay-per-view. Want to watch season one, episode nine of "M*A*S*H?" You could download it right now, watch it when you want and keep it on your hard drive for the future. With more than 30 years engineering experience in cable TV, telecommunications, broadcasting and now DBS, I can say this is where things are headed. Broadcasters should wise up and start marketing their products instead of continuing to sell time because that time no longer exists.

Daniel Farey
Field Engineering
Echostar Satellite

Test Your Knowledge!

See the Freezeframe question of the month on page 6.

Send answers to editor@broadcastengineering.com

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Mastering DTV viewers

Linear thinking has broadcasters stuck in the past.

BY CRAIG BIRKMAIER

The DTV transition is now 10 years old. In the first half of 1997, the FCC adopted the ATSC standard for DTV broadcasting and established the rules for the DTV transition, which was supposed to end Jan. 1 of this year.

The FCC's transition schedule was placed on hold thanks to an amendment to the 1997 Budget Act. The amendment required 85 percent of homes in a market to be able to receive DTV broadcasts before a broadcaster would be forced to return its NTSC channel.

Last year Congress passed another budget amendment that established Feb. 17, 2009, as the end date for NTSC broadcasts. The bill also authorized the National Telecommunications and Information Administration (NTIA) to develop a subsidy program for digital-to-analog converter boxes that will allow existing NTSC receivers to work with DTV broadcasts. (See "Web links" on page 18.) Beginning in January 2008, consumers will be able to obtain up to two coupons worth $40 each toward the purchase of these NTIA approved, but severely crippled, converter boxes, which are expected to sell for $60 to $75.

In June of 1997, ACM's *netWorker* magazine published an article in which I was highly critical of two things. One was the process that created the ATSC standard. Second, I criticized broadcasters who lacked — and still do — the vision to develop and deploy a DTV system capable of bringing the broadcast industry into the 21st century. (See "Limited Vision: The Techno-Political War to Control the Future of Digital Mass Media" in "Web links.") Such a system would have allowed broadcasters to fully use the digital processing capabilities and standards now commonly used by consumers in new generations of computers, handheld devices and the TV set-top boxes deployed by competitors in the DBS and cable industry.

The computer and Internet services industries I supported throughout the process to develop the ATSC standard lost that battle. Ten years later, other than HD and the ability to multicast several linear channels, broadcasters have little to offer in terms of features and services that could make over-the-air television a viable business for the future.

The NTIA converter box program is a missed opportunity. Rather than enabling new market opportunities, it keeps the NTSC laggards firmly locked into the linear past.

The NTIA converter box program is a missed opportunity. Rather than developing a new digital platform capable of enabling new market opportunities for broadcasters, it keeps the NTSC laggards firmly locked into the linear past.

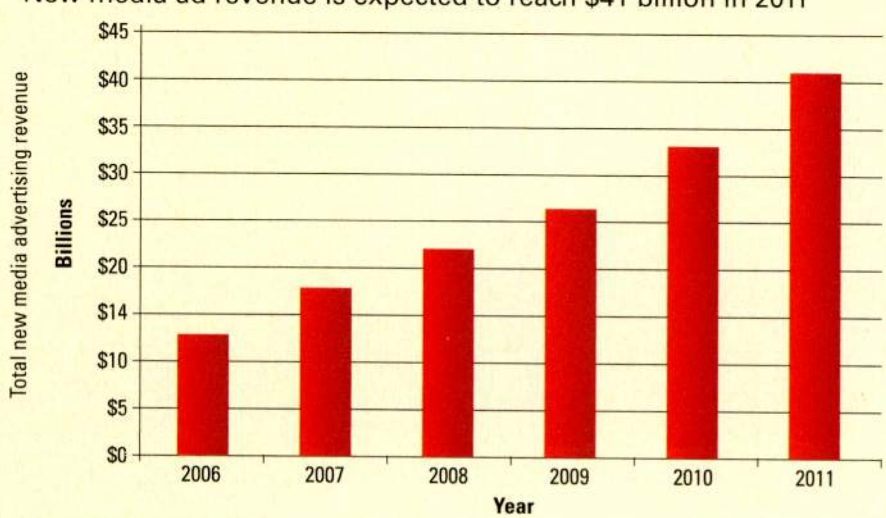
The opportunity to develop more capable DTV receivers and set-top boxes still exists. One example is an HD-capable receiver with a personal video recorder. Broadcasters, however, have not shown interest in evolving beyond the tired old formula of delivering linear program content that is overstuffed with commercials. These commercials are often inserted using another relic of the 20th century, the master control switcher.

The team I backed may have lost that battle, but it is winning the war,

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

Internet, IPTV, mobile TV and in-game ad revenue increasing

New media ad revenue is expected to reach $41 billion in 2011



Source: MultiMedia Intelligence www.multimediaintelligence.com

at least in terms of defining the technologies and standards being used to deliver digital media content to the masses. The media conglomerates, which still have a stranglehold on the distribution of high value content produced by Hollywood and college/professional sports franchises, have shown little interest in updating their broadcast operations and those of their affiliates. Instead they are turning to the Internet to develop new business opportunities, just as their viewers are turning to the Internet to download content and access news and information that broadcasters simply do not make available in a relevant manner. Consumers are learning that they can access what they want, when they want it. They also know they can consume TV content anytime, not just when it is broadcast.

Multiplexing objects for local composition

A decade ago, much of what I wrote in "Limited Vision" was theoretical. The notion that a broadcaster could rely on a TV receiver or set-top box to handle functions that have traditionally been relegated to the master control switcher was too big a leap from the old linear time and channel programming model. The concept that the receiver should be the point of composition of content from multiple sources, including the Internet, was nothing less than the ranting of a heretic.

A decade later, consumers rely on this new model of local object composition routinely via Web browsers. A Web page is delivered as a group of objects, often from multiple servers that insert ads, or handle the more complex task of streaming real-time video. These objects are composed for presentation using powerful graphics chips that handle video scaling, anti-aliased graphic overlays and transitions, including fades, dissolves and digital effects that required expensive broadcast digital video effects systems in the early '90s. (See Figure 1 on page 18.) This computing and graphics processing power is now moving to handheld devices and new generations of boxes that connect to the big screen in the family room.

The technologies and standards needed to put a master control switcher in every television in your market are not only available, but also they are cheap. In addition, they

Consumers can access what they want, when they want it.

can solve a variety of problems with the traditional way that DTV facilities have been designed, while providing a platform broadcasters could use to develop new revenue streams. An added benefit of delivering objects (files) to DTV receivers is that stations could realize a major improvement in compression efficiency. This helps maintain quality while freeing up bits for new revenue-generating services.

Consider something as commonplace as a fade to black or a crossfade between two video streams. This stuff drives entropy-based compression algorithms like MPEG-2 and the newer MPEG-4 part 10 (H.264) video codec nuts. When a fade takes place in a station's master control switcher, the encoder must try to deal with the fact that there is no redundancy in each successive frame of the fade. The result is often more like a fade to block than a fade to black.

The fade can be performed in the receiver by sending a few bytes of data instructing the receiver to fade out the current stream. Crossfades can

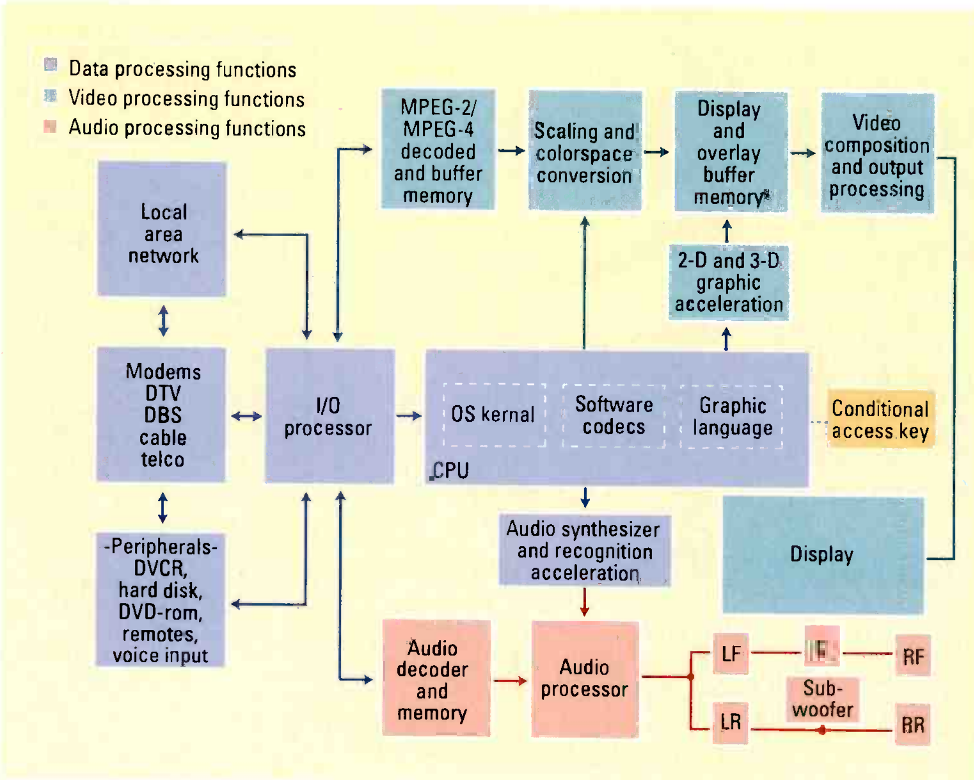


Figure 1. Typical architecture of a modern DTV appliance

also be accommodated by sending both streams and letting the receiver do the transition.

How about those annoying logo bugs? Where do you insert the bug so that it can be seen on all televisions in your market? If you put it in the lower right corner of a 16:9 program, viewers watching your station on one of the new NTIA authorized boxes will not see it, as only the 4:3 portion of the program will be displayed. If the bug is placed in the 4:3 safe area, it will be in the wrong place on 16:9 screens. If the bug is sent as an overlay object, it can be placed in the correct location for any display, or the viewer could elect not to display it at all.

The ability to implement such features is not difficult. The MPEG-4 standard provides the tools for all of these features and much more. An HTML browser integrated in the receiver could do many of these tasks and bring the Internet to the big screen in the family room.

What is lacking is the will of broadcasters to let go of their linear past and become part of the new digital information infrastructure. In place of the master control switcher, a server would deliver program streams and other services as part of the station's digital multiplex.

Far more important, commercial breaks could offer capabilities that are impossible when a station creates a linear stream for the encoder. For example, multiple commercials could be delivered simultaneously, and the receiver could pick out the commercial to display based on locale (zip code) or content (demographics). If this sounds overly complex, consider that this is already happening on some cable systems using off-the-shelf set-top boxes with MPEG-2 decoders.

Visible World developed the authoring tools and headend server technology that has been delivering highly customizable commercials for several years. (See "Web links.") The system sends out multiple streams using different PIDs in the MPEG-2 transport stream along with composition metadata. The receiver uses the metadata to compose different versions of the commercial based on market localization or demographic requirements. The headend gear can overlay time-sensitive information when the streams are played out.

Web links

- NTIA Digital-to-Analog Converter Box Coupon Program *www.ntia.doc.gov/dtvcoupon*
- "Limited Vision: The Techno-Political War to Control the Future of Digital Mass Media," ACM *netWorker*, June 1997 *http://www.pcube.com/pdf/limited.pdf*
- Visible World *www.visibleworld.com*

Broadcasters need a viable platform

The ATSC is busy again developing a standard for mobile, portable and handheld devices. There is a parallel effort to add new compression capabilities to the standard to serve these devices. H.264 is likely to be authorized for new services that will be delivered to these new mobile, portable and handheld devices.

It's a start, but it misses the target by a wide margin. Broadcasters need a well-defined platform that supports the services needed to compete in the 21st century. Failing to do so could leave broadcasters at a competitive disadvantage as content moves to the Internet and is delivered to competitive platforms. These platforms will make those old analog TVs look more like a 19th century light bulb than a 21st century information appliance. BE

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

Send questions and comments to: craig.birkmaier@penton.com

Must-carry rules set

After the DTV transition, all cable subscribers must still be able to view local broadcast signals.

BY HARRY C. MARTIN

As of Feb. 17, 2009, all U.S. TV stations are expected to cease broadcasting in analog and commence digital-only operations. For viewers with digital tuners and cable customers subscribing to digital cable service, this changeover should not be a problem.

For the 40 million households that subscribe to analog-only cable service, things could be different. Lacking the necessary equipment to decode DTV signals, many of these viewers will be reliant on their cable companies to provide a viewable signal.

With this in mind, the FCC adopted rules that will help ensure cable subscribers can still watch their local TV stations after the DTV transition. Until now, there were no rules mandating how digital broadcast signals would be provided to analog-only subscribers.

The new rules will require cable operators to provide the digital signal of local TV stations to their analog subscribers in an analog format. Alternatively, the signals may be provided in just the digital format, but only if all subscribers have the necessary equipment to view digital signals. The FCC also affirmed that cable operators must carry HD broadcast signals without material degradation.

Viewability requirement

The new rules do not mandate dual carriage as many broadcasters had urged. Rather, they are based on the Communications Act's requirement that cable operators deliver local broadcast signals in a manner that is viewable by all subscribers. To meet this viewability requirement, cable operators can either:

1. Ensure that all of their subscribers have the necessary equipment to view digital signals by providing digital set-top boxes, or
2. Downconvert broadcasters' digital signals into analog for their analog subscribers. Digital subscribers would still receive the digital signal.

Effect on small operators

The FCC did not adopt an exception for small cable operators, as some in the cable industry wanted. Instead, systems with channel capacities of 552MHz or less may request waivers of the new rules based on an economic hardship.

The new rules affect only those stations being carried pursuant to the FCC's must-carry rules. Stations that elected to negotiate for retransmission consent will continue to operate under the terms of their retransmission consent agreements. In addition, the new rules have an expiration date of three years after the transition date, with the expectation that the FCC will revisit the continued need for the rules by 2011.

At the same time, the FCC reaffirmed that cable systems must carry HDTV signals in the HDTV format, consistent with the current standards prohibiting material degradation of broadcast signals. The FCC did not, however, adopt a "carry all the bits" requirement sought by some broadcasters. Rather, cable operators may use compression technology to preserve bandwidth as long as it does not materially degrade the broadcast signal. In addition, the picture quality of such signals must remain at least as good as the quality of any other programming carried on the system.

Industry reaction

The FCC's decision drew predictable responses. The NAB agreed with the decision, saying the ruling was a particular boon to viewers of Spanish language and religious stations, many of which rely on must carry to reach viewers. The American Cable Association, which represents small cable operators, disagreed. It predicted that some small operators would have to shut down due to the burdensome requirements. The NCTA, which represents many large cable operators, had previously announced a voluntary plan for dual carriage, so it was more sanguine about the decision. Still, the NCTA urged the FCC to "act quickly" to provide relief to "very small systems." BE

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

? Send questions and comments to: harry.martin@penton.com

Dateline

- December 1 is the deadline by which TV stations in Colorado, Minnesota, Montana, North Dakota and South Dakota must file their biennial ownership reports with the FCC.
- December 1 also is the deadline for TV and Class A stations in the following states and territories to place their annual EEO reports in their public files and post them on their Web sites: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.
- Feb. 17, 2009, is the DTV transition date when all analog broadcasts, except by translators, LPTV and Class A stations, must cease.

Monitoring networks

Maintaining digital networks can be less complex with the right automated tools.

BY ALDO CUGNINI

With broadcasting shifting to digital facilities, maintenance of operations is becoming more of an exercise in managing information technology. The lines between video and data are blurring, and with that comes the need to oversee systems the way computer systems are managed.

When is digital not really digital?

SMPTE 259 was developed to carry digital video in serial form, using simple coaxial cables. The standard allows for carrying either digitally sampled composite NTSC, or 10-bit 4:2:2 component video. When carrying the former, the receiving (decoding) equipment can make use of traditional analog waveform monitors and vectorscopes. This is because the color burst is carried in the signal, and a standard vectorscope uses this as a reference to drive the display. The component signal, of course, has no color burst, so any vectorscope used to analyze such a signal must be able to monitor the Cr and Cb components to produce a meaningful display.

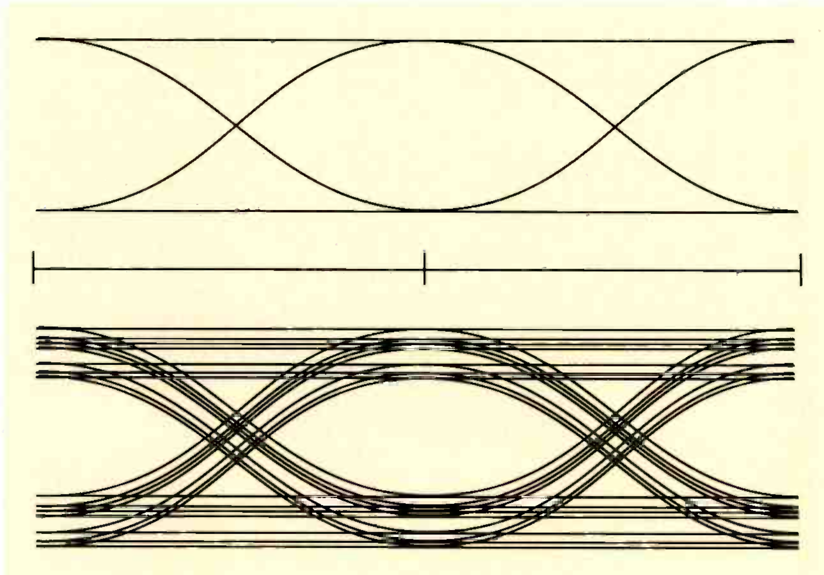


Figure 1. Eye diagrams showing clean and dirty digital signals

Also useful to digital video networks is a serial digital video measurement device that will indicate the condition of the digital signal. Ideally, a binary digital signal will transition between two states, logically called "1" and "0." In practice, all signals are band-limited. This results in signals with rounded edges.

In practice, all signals are band-limited. This results in signals with rounded edges.

One efficient way to control this effect is to use a raised cosine filter that constrains bandwidth while simultaneously producing signals with sampling points that are well-defined. (See the top of Figure 1.)

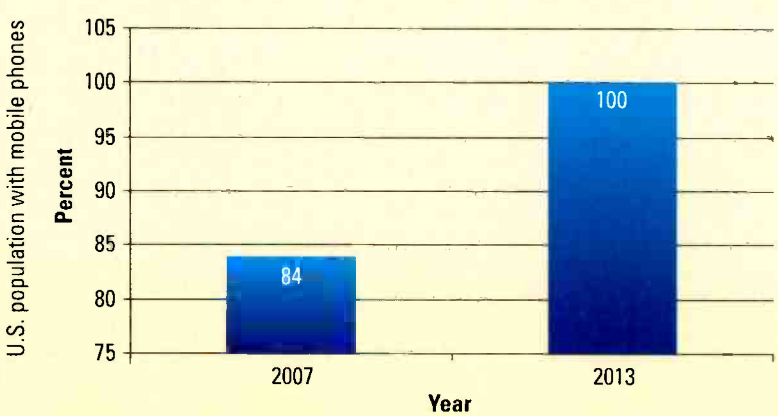
The eye diagrams in Figure 1 represent multiple transitions overlaid on

FRAME GRAB

A look at tomorrow's technology

84 percent of people to own mobile phones by end of 2007

100 percent of consumers will own mobile phones by 2013



Source: SNL Kagan *www.snlkagan.com*

one another. The tick marks indicate the sampling instants for the receiving circuit. In practice, an actual signal will look more square than this.

The lower part of the figure is an illustration of what happens when there are transmission errors. When transmission is over a cable, we don't usually receive interference or noise from other signals. However, all cables are lossy, and some cables may not be terminated correctly, or in fact may be damaged.

These conditions will cause amplitude and phase errors in the received digital signal, the result being a closing of the eye. Thus, when sampled by a receiving circuit, some errors may be produced when the input signal-to-noise ratio (SNR) is compromised.

If there is little or no FEC built into the signal, errors will result, usually causing sparklies in the received video. This specific artifact, however, only accompanies uncompressed video.

If compressed video is carried on a faulty interface, the effect will depend on the compression scheme and will usually produce large blocks of errors.

Statistical multiplexing adds a layer of complexity

With multicasting now available to DTV broadcasters, program and system monitoring becomes more complex. A typical scenario is shown in Figure 2, including multiple programs and data. In order to use bandwidth efficiently, a statistical multiplexer (stat mux) dynamically allocates bandwidth to each service.

Another trick employed by these devices is to delay one of the streams momentarily when several bit rate peaks are imminent across the streams. Then all the peaks don't line up and exceed the capacity of the channel.

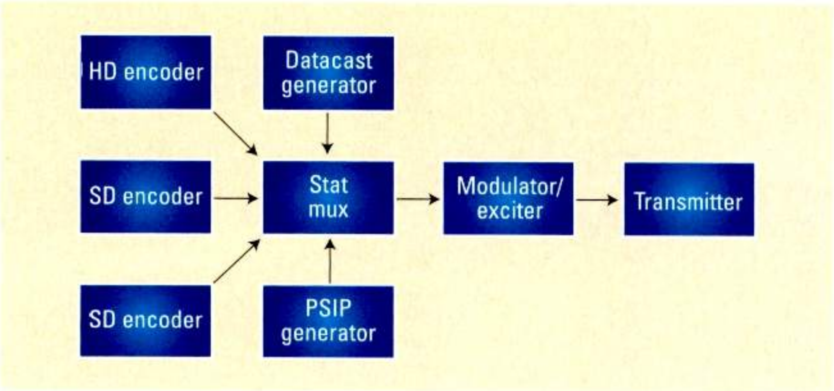


Figure 2. A typical multicast scenario involves new elements.

As the bit rate changes for each service, quality of all programs will be affected, depending on the complexity of the video material and prioritization set up in the device. Therefore, close monitoring of the programs and bit rates is essential.

Ideally, the bit rate history of each program should be scrutinized on an ongoing basis so that an accurate assessment of the overall program quality is always known. In addition, transmitting variable bit rate streams, while compliant with ATSC, may nonetheless cause problems in some decoders. A careful assessment of various consumer decoders is strongly suggested when statistical multiplexing is employed.

Transport and transmission analyzers ease monitoring

While some monitoring tools may be integrated into stat mux equipment, not all manufacturers provide the means for detailed analysis of their devices' operation. (Some don't want this to be known, as a competitive measure.)

However, inexpensive transport analyzers are available. An Internet search on "MPEG analyzer" will turn up various programs that can interface with a wide range of PC-based ATSC tuners, or they can be set up to capture the bit stream from other equipment. These programs can decode MPEG-2 tables with ATSC and other extension, and show PID bit rates and PID usage with percentage displays for each PID. Transport streams can also be input from a file. Some of these programs are even free.

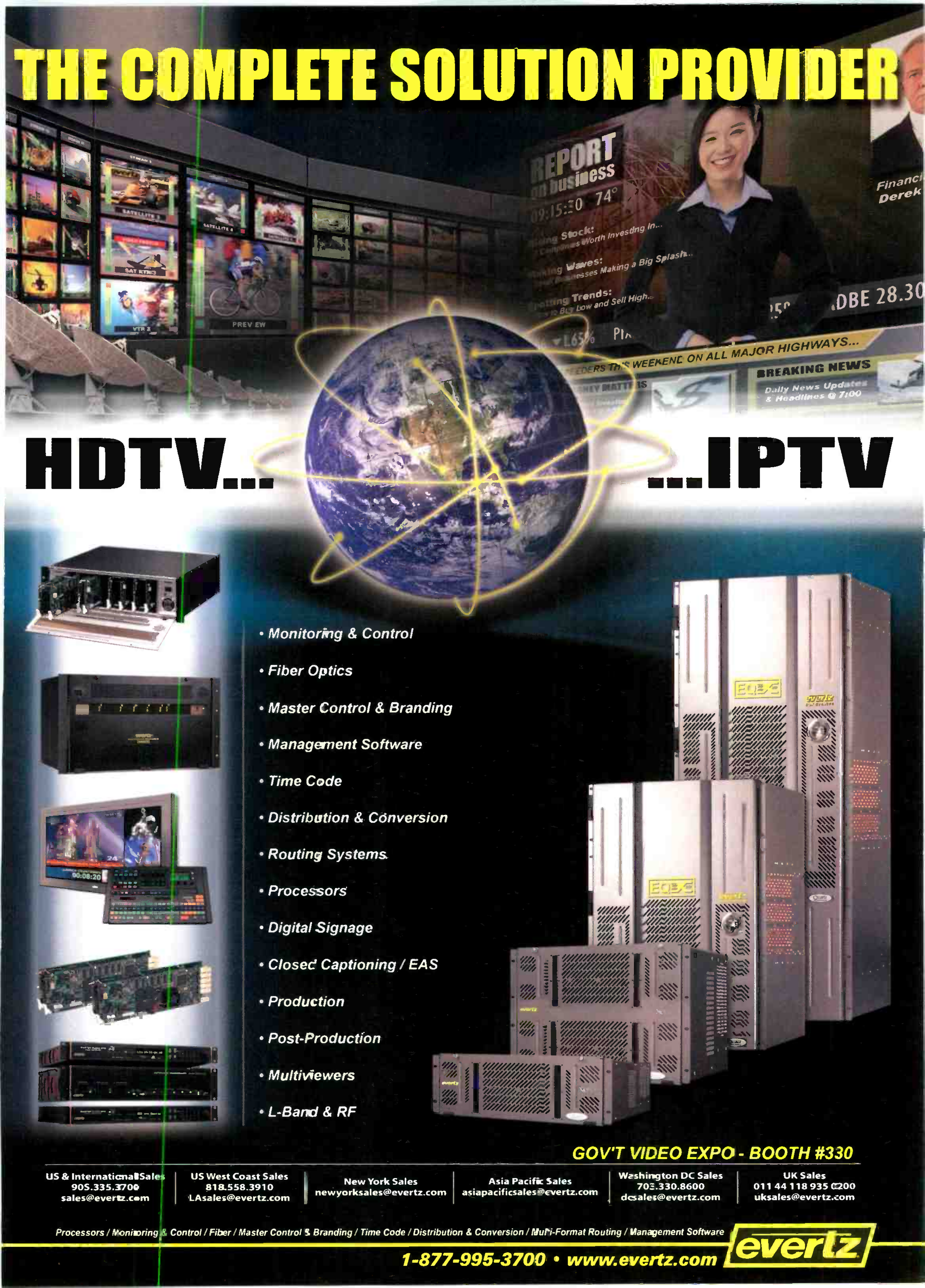
On the transmission side, several available analyzers will display occupied spectrum, constellation diagrams, eye diagrams, SNR, error vector magnitude and tap equalizer graphs. With alarms available on bit error rate and other parameters, these systems can be used for DTV confidence monitoring.

IT networks impact your budget and operation

Digital video is increasingly being handled using an IT infrastructure. While it is generally the purview of the IT administrator to both plan and maintain an information network, knowledge of the load on such a system can give advanced warning of trouble spots.

Both software- and hardware-based analyzers are available, depending on budget and required maintenance. Software systems are generally simpler to use and are less expensive, although the capabilities are usually more limited than their

With multicasting now available to DTV broadcasters, program and system monitoring becomes more complex.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hardware counterparts. There are, nonetheless, hardware analyzers that offer high-quality performance at a good price.

By simply plugging into the network or installing software on a network-connected PC, an analyzer can identify servers, routers, switches, video processors and printers — anything with an IP address. Then it can monitor the network for faults.

When a network problem occurs — for example, when a router does not respond, or when a video server runs out of disk space — the system can send alerts by e-mail or SMS text messaging. Many of these parameters can be monitored remotely from anywhere on the Internet using a simple Web browser, so long as a unique IP address exists for each device, and those devices are reachable through any firewalls.

As tempting as it may be to set up wireless networks at a broadcast plant, it's probably a bad idea.

A word about Wi-Fi networks

As tempting as it may be to set up wireless networks at a broadcast plant, it's probably a bad idea in all but the most mission-uncritical applications. It all comes down to the availability and reliability of the connections. There are various 802.11 technologies available.

To make a long story short, routers and client adapters that support both 2.4GHz and 5GHz operation will give the highest dependability, with connections that use the best available channels. With that said, if you still want to use Wi-Fi for some auxiliary functions, it will be easier to support if you get an RF analyzer, such as an inexpensive USB-dongle 2.4GHz spectrum analyzer.

The good and the bad

Digital networks bring additional complexity to maintaining good video. In some instances, the added potential work can be offset by automated monitoring tools. Good planning upfront, as in any endeavor, will minimize headaches later on. BE

Aldo Cugnini is a consultant in the digital television industry.

? Send questions and comments to:
aldo.cugnini@penton.com

Video production network design

Build a fast network with capacity to handle the traffic.

BY BRAD GILMER

You are probably familiar with Ethernet technology and what it takes to put a network together. It is pretty basic stuff really. You buy a switch or two, wire them together, configure the network parameters of the clients, and you are ready to go. This approach works well for a simple office network, but what if you want to build an Ethernet network primarily intended for video production?

Characteristics of video production networks

There are several things that distinguish a video production network from an office network. Some of these are the size of the files being moved, a requirement to support streaming professional video, nonblocking routing and high network availability (management). Some factors that are important to an office network but may not be important to a video production network include Internet connectivity and e-mail connectivity.

The size of the files and the requirement for support of streaming video create unique demands that are not found in office networks. In a typical office network, a graph of network usage shows many peaks and valleys. Networking technology takes advantage of the valleys (lulls in network traffic) by buffering data at a switch until bandwidth is available. (See Figure 1.) When the network traffic density increases, there is less time for switches to empty their buffers. As a result, low priority packets may be discarded at the switch.

In video applications, a graph of network usage shows a much higher overall density, meaning there are relatively fewer peaks and valleys. This is because video files are large, creating higher overall network demand, and because professional video streaming can require a lot of bandwidth on a continuous basis. If your network is not designed properly, as video-related traffic increases, switches will start to discard packets, and network errors will result. Since we can anticipate that this network will have unusually high overall network traffic density, it is imperative to build a fast network with enough capacity to handle the traffic. Fortunately, this is not as expensive as it once was.

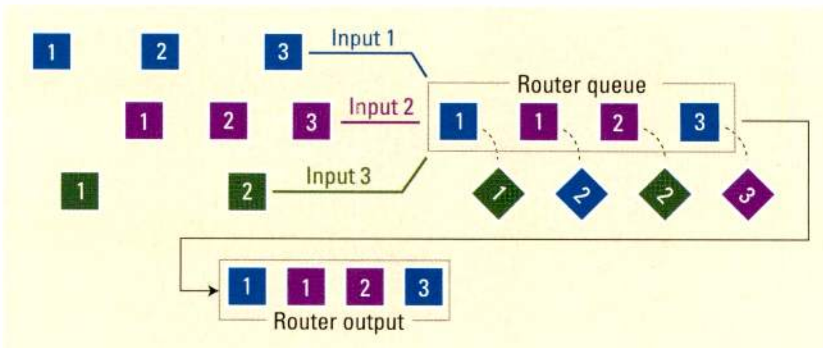

Figure 1. A network device will discard packets when it runs out of capacity. Throttling the rate at the input can reduce the network congestion.

How to build a fast network

There are several things you can do to build fast networks. One solution is to use high-speed connections to the client, but you may want to think this through carefully. Our first reaction as engineers may be that we need to provide the fastest possible connection to every computer on the network. This may not be the case and may actually affect overall network performance. Why? The faster the client connection, the more bandwidth that client will require on the backbone of the network.

A better solution may be to consider what the maximum bandwidth on the backbone of the network will be and then decide what would be a reasonable amount of bandwidth to allocate to each network client. Some switches allow the user to configure the maximum bandwidth allowed over a particular port. Setting this parameter would allow you to use a high-bandwidth media such as fiber, but to limit the ingress traffic from each port so as not to overburden your backbone. This approach allows you to throttle connections at the source rather than indiscriminately discard packets somewhere in the network.

Adding GigE to the mix

In the past, it was common to purchase switches with 10/100 ports and a backbone GigE connection. This allowed the designer to assume that on a six-port switch, for example, the backbone link would never be saturated, because the maximum aggregate speed of all the switch ports (six ports x 100Mb/s = 600Mb/s) would not overburden the backbone connection (1000Mb/s). However, GigE

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switches are becoming common.

If you have a six-port switch and each port is capable of 1000Mb/s, then the single GigE backbone connection will be overloaded. This is known as a blocking switch. A blocking switch does not have enough capacity to support all ports operating simultaneously at their full speed. Actual throughput of these switches is less due to networking overhead and other considerations.

Before you implement a solution, be sure you actually have a problem. The six-port GigE switch you purchase from an office superstore probably does not have a 6Gb backplane. In fact, the switch may use a GigE as the uplink connection to the backbone. If this is the case, the maximum bandwidth available to the backplane is 1000Mb/s. This does not mean that the switch is internally limited to 1000Mb/s. Check the switch specifications. The switch may be able to support several simultaneous GigE connections between ports within the same switch. With a GigE uplink port, there will definitely be a bottleneck on the way from the switch to the backbone.

Let's assume for a minute that you have a switch that has a high-capacity backplane. Perhaps internally, the switch can handle 4Gb/s. If you only have GigE connections on the switch, how can you get a high-speed connection to your backbone? The answer is port aggregation, sometimes also known as teaming.

Teaming several ports together creates a virtual port that aggregates together the bandwidth of several ports into a single virtual connection. On a 12-port GigE switch, if you aggregate three GigE ports to use as a teamed connection to the facility backbone, you can create a 3Gb/s connection between that switch and the backbone. Now you have a very fast pipe to the backbone. Of course, you may have just moved the problem upstream. Be sure that the backbone switches have the backplane capacity to handle these very high-speed connections.

Monitoring the network

Depending on the nature of the video production network, you may require high network availability, especially for mission-critical applications. Managed switches, especially in the backbone, give you the ability to monitor the network's health and to determine network usage trends. These can be very useful in anticipating outages and taking action before they occur.

For example, if one of the managed backbone switches reports that it is nearing capacity, it is time to budget for a larger switch. Also, if the switch reports an intermittent connection to one of its ports, this could be an early warning that a patch cord is going bad. This gives you the opportunity to replace the patch cord before it fails completely.

Outside connections

Another consideration when designing video networks is what sort of connectivity the network will have to the outside world. In some facilities, the production network is totally isolated from the outside world, meaning there are no Internet connections and no e-mail. In other facilities, Internet and e-mail are a vital part of the overall user experience. Much has been written about Internet, firewalls and e-mail security. I do not have much to add here except to say that if you do decide to connect these networks to the Internet, be sure you take adequate precautions. BE

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

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HD is not just what we do.

Digital audio processors

Digital technology offers precise, repeatable control over a production's sound.

BY ALDO CUGNINI

Signal processing for analog broadcast is a combination of two functions: control of perceived sound (for competitive advantage), and meeting FCC constraints on transmission modulation and occupied spectrum. With analog modulation, any processing applied to the audio has a direct effect on the RF signal, so the baseband and RF are closely intertwined.

With digital transmission, however, the two realms are essentially decoupled, but new interdependencies have emerged. Surround channels, multiple programs and repurposing all add another layer of complexity.

While analog inputs and outputs are typically found on digital processing equipment, minimizing the number of analog-to-digital conversions (and vice versa) will improve your overall signal quality. It will also reduce the potential for level mismatching. The same is true for other processors — equalizers, presence enhancers, de-essers and the like.

In addition, all digital signals are subject to clock jitter when performing A/D and D/A conversions. This is because all clocking signals have a certain amount of noise on them. If a signal is sampled or reconstructed with a noisy clock, then the sampling instants will be modulated in time by a filtered version of this noise signal. (See Figure 1.) This filtering is a characteristic of the clocking circuits employed in the various converters. The result is an increase in the noise floor of the signal, degrading its quality.

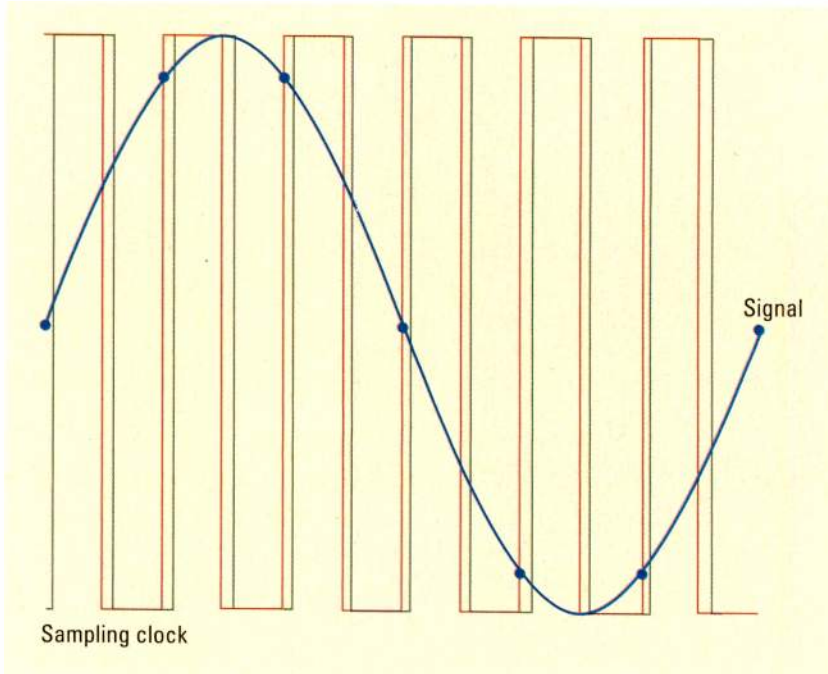


Figure 1. Sampling clock jitter degrades signals

Dynamics control

Audio level compression (as differentiated from bit rate compression) has been a contentious topic since the days of Top 40 radio. Aggressive compression was originally intended to be a competitive tool to provide a louder sound, with commensurate higher modulation density and therefore higher perceived signal-to-noise ratio (SNR) — at least for AM radio. With the crossover to FM, overmodulation did not cause distortion, but ran the risk of violating FCC regulations.

With TV sound, broadcasters tended to relax the compression, because the video and program content were the primary competitive drivers. Nonetheless, intentionally disparate processing continues to be controversial when it comes to commercial loudness. A sample compression characteristic is shown in Figure 2 on page 36.

While analog inputs and outputs are typically found on digital processing equipment, minimizing the number of analog-to-digital conversions will improve your overall signal quality.

Early work at CBS Labs and elsewhere established various metrics

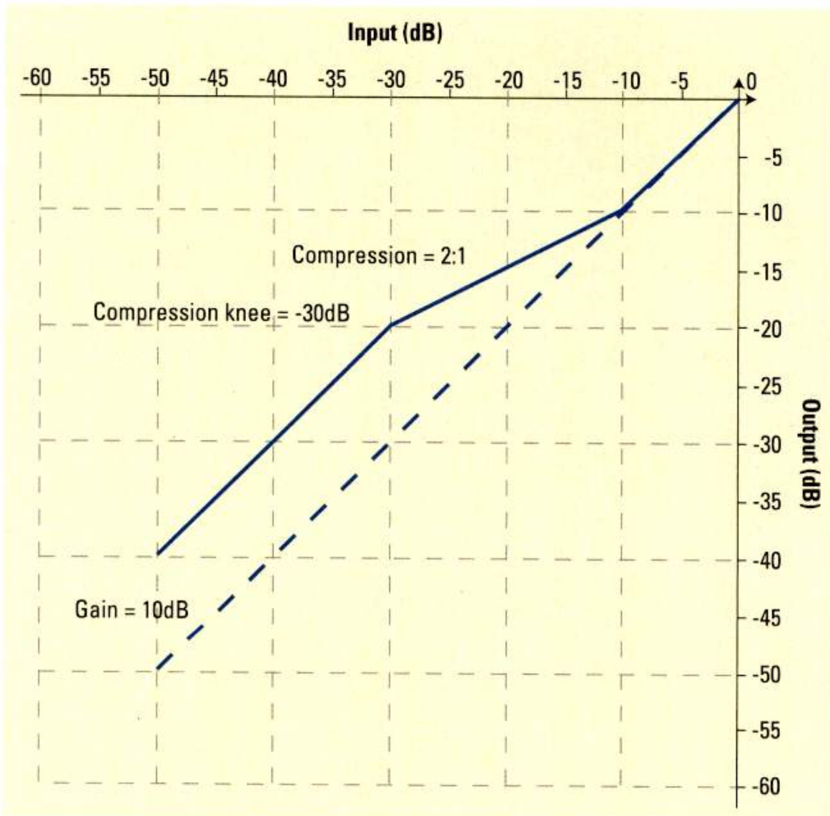


Figure 2. Level compression changes the dynamics of a signal.

for measuring program loudness. These algorithms have since been incorporated into several broadcast processors, and operators now have the capability of better control over program-to-program level consistency.

However, the ability to control a signal does not mean that setup is straightforward. Access to too many parameters, such as target level, minimum and maximum gain, and rate of gain change, may give the operator fits when attempting to install a unit — especially if the unit is solely controlled through software. To save yourself the trouble, look for presets for these functions, and see if they pass your own (or your golden listener's) quality judgment.

Peak limiting has also been used in analog broadcasting both for regulatory and competitive purposes. With digital processing, it's important to ensure that analog input and output levels, along with any digital level changes, all maintain the signal within its normal operating range. Too low a signal will degrade the SNR, while too high a signal will run the risk of clipping.

With digital processing, it's important to ensure that analog input and output levels, along with any digital level changes, all maintain the signal within its normal operating range.

Surround sound

Surround sound is a topic all to itself, but there are differences between true surround, artificial surround and spatial enhancement.

True 5.1 multichannel sound consists of five channels plus low-frequency effects (LFE), all with perfect separation between them. A signal sent on one channel will have virtually no crosstalk to the other channels.

Artificial surround creates a multichannel experience by matrixing surround information onto a stereo pair, then decoding this at the receiver and creating additional surround channels. This type of surround has limited separation between the main and surround channels, sometimes as low as 3dB.

Spatial enhancement creates an ambiance effect by enhancing or delaying the difference component of the left and right signals.

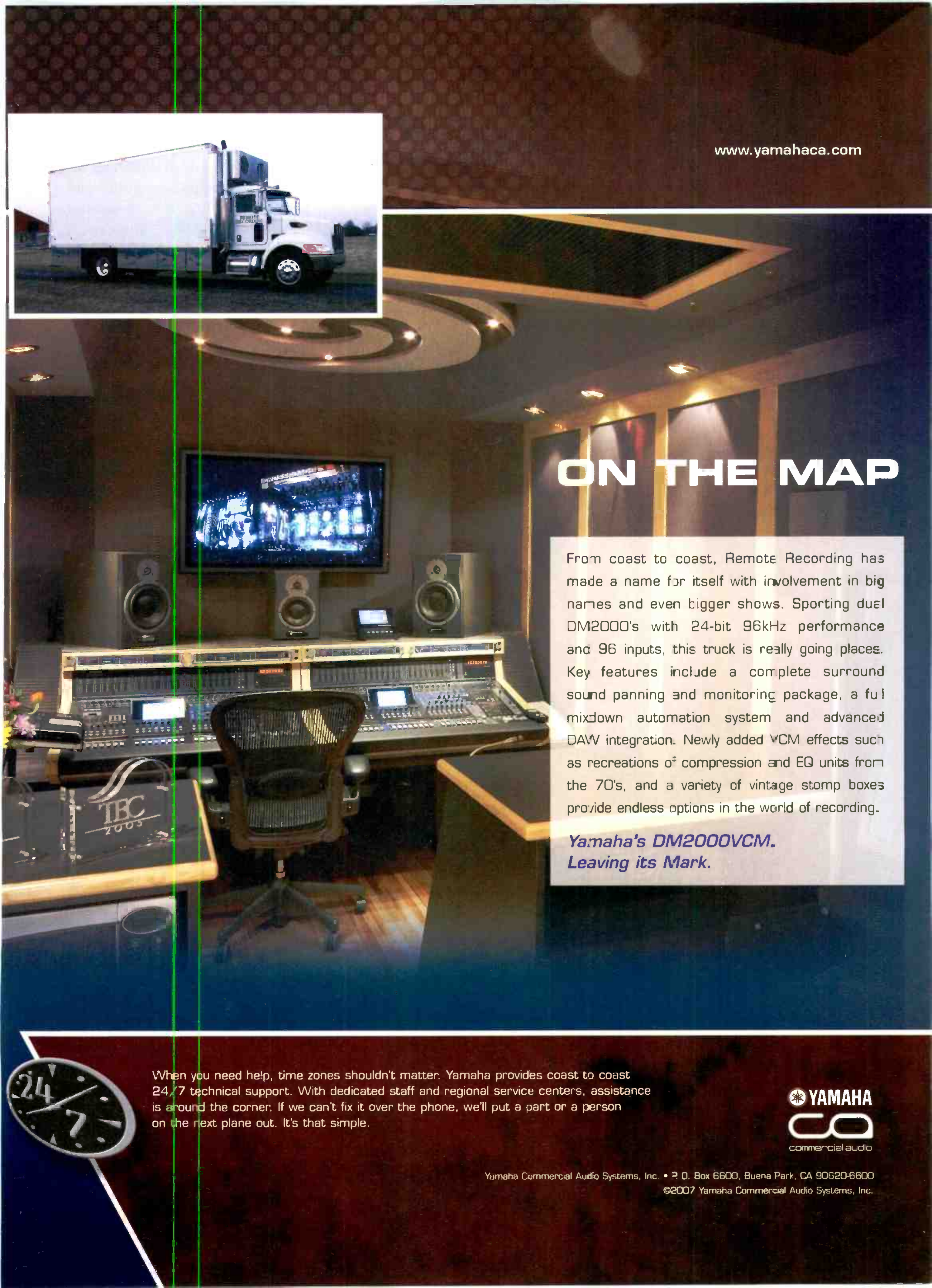
Bit rate compression

Before digital transmission, all audio signals undergo compression. While the amount of compression is left up to the operator, the small amount of bandwidth savings that might be enjoyed at the lowest bit rates is not worth the corresponding decrease in quality.

An increasing amount of material, in addition, is already archived or sourced in a compressed format. While it may be tempting to avoid complexity by decoding these signals — even down to analog — each additional conversion degrades the quality of the signal. This is especially true for cascaded compression operations, where compression artifacts can become exaggerated.

For this reason, manufacturers now make equipment that can intelligently transcode signals, using knowledge of preceding compression operations.

Moving video signals around a plant often involves SDI interfaces, and these can be used to transport audio as well. SDI audio embedders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and de-embedders perform this function. Usually, two stereo pairs can be carried this way, using AES3 linear (uncompressed) digital audio. Compressed audio can also be carried by encapsulating Dolby-E or AC-3 signals within the AES3 stream, for example.

Time compression and expansion

There are various ways to change the timing of audio programs. In order to maintain lip sync, of course, any change in the duration of a program must be performed together with the associated video.

Time base adjustment is sometimes performed by a processor that uses a gate function to detect and modify interword separation. Such processing is limited to speech only and has a high SNR.

Sophisticated processing will implement a form of Fourier transform in order to change the time duration without affecting the pitch of the audio. Since this transform must be finite in length, there is a splicing rate and overlap that must be optimized for the signal. Ordinarily, the user will not have access to these or other parameters of the transform, but check your product to see if you do.

Sophisticated processing will implement a form of Fourier transform in order to change the time duration without affecting the pitch of the audio.

As always, some experimentation with different equipment setups may be needed to get your desired results. Keep in mind that this will be dependent on the program material. Unless you're comfortable with these changes, it's best to leave it to a default or preset condition. However, make a long-term plan to continually monitor your audio in a representative viewer/listener environment. You'd be surprised what sneaks through for long periods of time without operator adjustment. **BE**

Aldo Cugnini is a consultant in the digital television industry.

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Broadcast U.

The University of Miami updates its control rooms and studios to prepare students for the ever-advancing business of broadcasting.

BY LLOYD HICKS

UMTV at the University of Miami is one of the largest university television stations. At its core are the teachings of the School of Communication, which directs the broadcasting futures of thousands of students. The station serves the campus and its surrounding community with original news and feature shows, as well as MTV-U, the MTV university cable network.

Desires for advancement

The university wanted its station capabilities to be on a technological level with today's television networks and their outlets. The system had to be intuitively simple to operate and maintain. And the equipment would include server-based playout devices with manual VTR-type controls.

While the budget didn't permit HD integration at this time, a pathway was designed and installed to enable an HD upgrade to be accomplished efficiently and economically.

Phase one

Two nearly identical control rooms were needed to facilitate teaching and production, each with its own studio. Professional Communications Systems (PCS) was chosen to integrate the total rebuild on a challenging schedule in the fall of 2006. The integration began in a staging area at the company's Tampa, FL, headquarters. Cable was placed and racks were populated while classes were still in session.

Over Thanksgiving weekend last year, the university staff removed all existing equipment, and PCS moved

Photo: UMTV has two identical, digital, HD-ready production control rooms. Each control room employs a Wheatstone digital audio console, an Avid Deko graphics system, a Grass Valley Kayak production switcher and a Grass Valley M-322D iDVR video digital recorder.

Three 50in Panasonic high-definition plasma panels are driven by Miranda Kaleido multi-image systems, enabling signal input from any source and unlimited custom configurations. They also show audio levels and on-air tally. The console is a Grass Valley Kayak production switcher in a 2.5 M/E configuration.

in the new racks and other components, and completed the installation.

Equipment setup

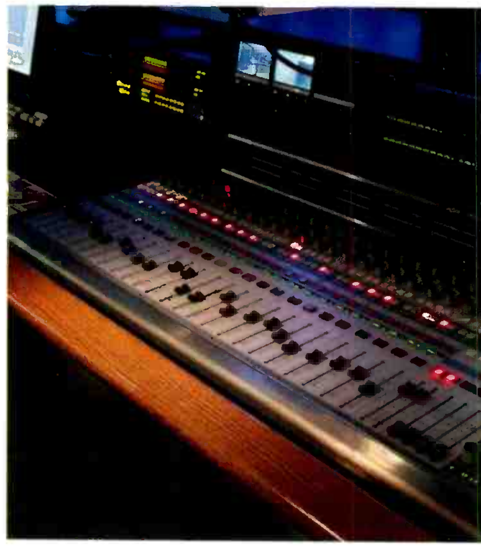
The two existing production control rooms were transformed into state-of-the-art serial digital control rooms, running embedded audio on the SDI signal. They are integrated with one another through the newly created master control room, featuring a 128 x 128 Grass Valley Concerto router, which is at the heart of the new production studios.

The facility features shared resources, including graphics and audio mixing. The format is 4:3 throughout, with the capability of simulating 16:9 using aspect ratio converters that work in both directions.

The station also has external tie lines to a courtyard and another building, providing remote broadcast capabilities to anywhere on the university campus IPTV network.

Each of the production control room systems includes three large HD plasma monitors driven by Miranda multi-input display processors, iControl monitoring and Densité distribution, conversion and embedding, as well as Clear-Com Eclipse Media digital intercoms.

In addition to the Grass Valley master control and router, each room employs a Grass Valley 2.5 M/E production switcher with a full complement of HD-compatible keyers, chroma keyers and color correctors, with a six-channel RAM recorder.



A Wheatstone D7 digital audio mixer is the digital audio control center for the system. It uses a common electronics frame located in the equipment room and has a control panel located in each of the two identical production control rooms assigned to separate studios.

Five Grass Valley multichannel videodisk recorders provide 320 hours of storage, touch-screen control panels and simultaneous play-and-record in

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either MPEG or DVCPRO 50Mb/s.

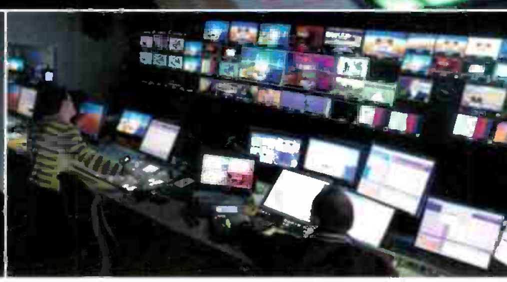
The new Grass Valley master control replicates what students will find in the industry as they enter the field of broadcasting. The new systems also provide cost savings in security, power, A/C and maintenance. Large HD plasma monitors driven by Miranda multi-input display processors also lessen the amount of equipment required in the studio control rooms.

Phase two

This just-completed integration added a new, two-camera studio and control room, as well as a Vyvx fiber-optic connection to the Level 3 network. Vyvx connects the new studio and control room to the TV world beyond the campus and UMTV's 600,000 Comcast homes in Coral Gables, FL. The system has analog-to-digital and digital-to-analog conversion both into and out of the Vyvx, and will enable live or delayed Vyvx fiber transmissions.

The new facility and system are accessible for use by outside organizations, by arrangement with

The equipment room houses most of the electronic frames in the system. The electronics frame (shown upper right) of the Clear-Com Eclipse Digital Matrix intercom system is placed on a rack in the equipment room in a secure location, separate from the two new control rooms. Also in the equipment room are Miranda Densité frames (shown middle right), containing all of the audio and video distribution, conversion, scaling, embedding/de-embedding systems and the Kaleido multi-image drivers.



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the university. Currently, the metropolitan area's daily newspaper, the *Miami Herald*, uses the facilities to produce a daily Internet program titled "What the 5!" presented online at *miamiherald.com*. This is expected to precipitate additional third-party programming production at the school.

Also, NBC has used the Vyvx link to produce an interview at the university's medical facility with a medical professional who is an expert on the pacemaker. This interview was fed to the NBC-Now 24/7 satellite news service.

While this capability is still in its infancy at the university, its cutting-edge character and additional usage are anticipated to present additional learning opportunities for students, staff and educators.

The studio can stand alone, yet is fully integrated into UMTV's existing system. It is able to use all the capabilities of the master control of the two studios in the previous integration, such as cameras, sources, routing, timing, intercom, audio and graphics.

The studio can stand alone, yet is fully integrated into UMTV's existing system.

Challenges that were overcome include fitting the new control room into limited space, within a limited budget, and making it fully functional by drawing resources from the existing master control system in another location.

In the remodeled studios with legacy Sony DXC50 triax cameras, QTV LCD prompters were added. LCD talent monitors were added in the set desk. PCS rewired both existing studios, adding connection panels and integrating legacy and new components into the new system.

Continued on page 48

Broadcast U.

Technology at work

Avid Deko
Brightline
- SeriesONE fluorescent studio lighting
- Studio CycSeries fluorescent RGB studio lighting
- 16-channel, two-set control and dimmer system

Clear-Com Eclipse Median Digital Matrix intercom system
Crown D75A amplifier
Evertz 5600 master sync and clock system with changeover
Florical AirBoss server
Grass Valley
- Concerto SD/HD router
- Indigo AV production switcher
- Kayak switcher
- M322-D iDVR system video digital recorder

Harris VTM-2000 multiformat monitor system
Harvey Scenic custom consoles
Ikegami HC-D57 cameras
JBL Control 5 wall-mounted speakers
Libec pneumatic pedestals
Marshall SDI LCD broadcast monitors
Middle Atlantic WR-44-32 rack system
Miranda
- Densité HD/SD processing converter
- iControl monitoring and control system
- Kaleido multi-image display processors

Panasonic
- AJ-SD930 DVCPRO recorder
- TH-37PH9UK SDI plasma monitor

QTV LCD teleprompters
Sennheiser EW122 wireless microphone systems
Wheatstone D7 digital audio mixer
Wohler LM30-4 SDI
Vyvx fiber-optics

Design team

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- Lloyd Hicks, regional manager
- Troy Pazos, installation manager

University of Miami
- Tomas Ortiz, director of engineering and operations, School of Communication
- Paul D. Driscoll, Ph.D, broadcasting program director
- Sam L. Grogg, Ph.D, dean, School of Communication
- School of Communication faculty members

Continued from page 46

Equipment setup

The Vyvx studio contains two Ikegami HC-D57 cameras with full multicore control units and remote control units. Cameras are in studio version configuration with Fujinon zoom lens and are mounted on Libec pneumatic pedestals with 17in LCD QTV teleprompters fed via CCU and powered from camera head. Cameras are full 16:9 SDI compliant.

The switcher is a Grass Valley Indigo AV production model with 16 inputs and can accept both SDI and HDSDI signals. The switcher includes a digital audio mixer with motorized faders and can accept analog and digital signals. The audio signals are then embedded into the SDI output. The switcher's robust production tools for wipes, fades, special effects and keys can all be controlled from a built-in touch panel.

Recording and playback of SDI signals can be performed from the Grass Valley M322-D iDVR system, which has two simultaneous record and two play output channels operating at either 25Mb/s or 50Mb/s. SDI signals may also be recorded or played back from the Panasonic professional AJ-SD930 DVCPRO 25MB/s or 50Mb/s videocassette recorder. Both units feature processing and embedding AES/EBU digital audio with the SDI signal.

All significant signals are monitored via a Harris VTM-2000 multiformat on-screen monitor system, which handles both SDI and AES/EBU signals.

Studio talent audio is processed via four Sennheiser EW122 UHF wireless microphone systems. Their IFB, as well as all production and technical intercom communications, is processed by a Clear-Com Matrix digital system and is interconnected to master control for access to any of the other university studio facilities.

The switcher includes a digital audio mixer with motorized faders and can accept analog and digital signals. The audio signals are then embedded into the SDI output.

The embedded SDI signals are remotely selected and routed via a Grass

To best use the compact space in the Vyvx control room, a Middle Atlantic WR-44-32 rack system was used, which enables installation and servicing via a moving/rotating cabinet.

Valley router with 128 x 128 capacity using an Encore control system.

The production display monitors are Marshall SDI LCD broadcast monitors with multiple input selections.

The character generator graphics unit is an Avid Deko system with ClipDeko, 2-D motion and automation. The system is networked to other Deko systems in master control for optimum flexibility.

Embedded program audio is monitored via a Wohler LM30-4 SDI 30 segment horizontal LED level meter display unit.

Studio talent playback is displayed on a Peerless mounted 37in Panasonic TH-37PH9UK SDI plasma monitor. Audio is monitored by JBL Control 5 wall-mounted speakers driven by a Crown D75A amplifier.

All distributed analog and digital video signals are routed and processed by a Miranda Densité system, which also utilizes frame synchronizers and audio muxes.

To best use the compact space in the Vyvx control room a Middle Atlantic WR-44-32 rack system was used, which enables installation and servicing via a moving/rotating cabinet. The production console was custom built to customer's requirements by Harvey Scenic.

The Brightline series of high-speed 3200k grid-mounted fluorescent lighting fixtures was selected to optimize studio space and reduce heat and power loads. Fixtures included both RGB 6-lamp cyc lights and two or four 55watt dimmable fixtures controlled by a 16-channel, two-scene dimmer system.

Conclusion

Students, staff and visiting organizations are now creating, cable-casting, webcasting and broadcasting original programming to the university campus and 600,000 homes in the Coral Gables, FL, area. BE

Loyd Hicks is regional manager for Professional Communication Systems.

Teleprompting trends

Tightly integrated systems deliver the total package.

BY MICHAEL ACCARDI

The biggest trend in today's teleprompter systems is that they must incorporate other devices. In the old days, prompter systems just delivered the script to the anchor and talent, but new demands placed on the broadcast industry require today's systems to deliver more visual information to the talent on the set.

Integration

Prompter systems now include devices like on-air monitors below the prompter itself. This enables the talent to actually see who they're interviewing or what the video is while they're doing a voice-over. Another example is placement of a SMPTE time-code clock on the prompter assembly. This allows the talent to have that information on the set as well.

In the past, some broadcasters used to jerry-rig these devices onto their prompter assemblies. Today, as broadcasters update their prompters, they're asking manufacturers to integrate these different elements into one system.

Autoscript's TFT17HB 17in High Bright teleprompter is integrated with a TallyPlus camera numbering system, which has a large LED indicator, and a ClockPlus SMPTE time-code clock.

Flatter, lighter screens

One technological change that revolutionized prompting in 2000 was the development of flat-screen monitors. Today, LED screens are replacing fluorescent-based screens. LED screens deliver brighter images, with lower power consumption and increased longevity. Currently, these LED units are only suitable for smaller units, but larger units should be available by NAB2008.

The light weight of these flat

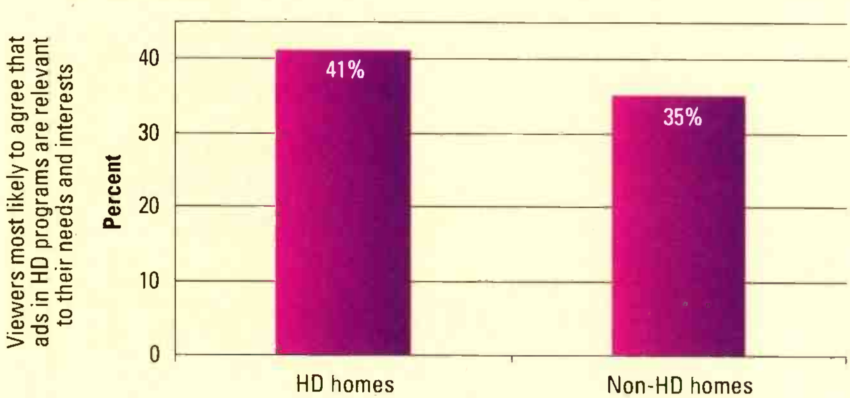
One technological change that revolutionized prompting in 2000 was the development of flat-screen monitors.

FRAME GRAB

A look at the consumer side of DTV

Access to HDTV content slightly affects viewing behavior

More HD viewers think ads are relevant than SD viewers



Source: Knowledge Networks *www.knowledgenetworks.com*


calrec.com
MIX 1 PART ACTION WITH
5.1 PARTS PASSION

prompter screens versus the old CRT monitors has made it possible to deliver larger screen studio teleprompters. In addition, it has made it possible to add on-air monitors below them, while still reducing the overall weight of the prompting assembly.

While flat-screen monitors have allowed portable, smaller teleprompters for field use, smaller screen teleprompters are at odds with another trend: The average age of broadcast talent is skewing older. The limit on the small size of a prompter has little to do with technology and more to do with the

By building from the ground up, it's possible to deliver brighter and smoother scrolling units while increasing longevity.

eyesight of the talent. Field prompters used to average about 12in; today they tend to be 15in. Studio teleprompters used to average 15in; now they're 17in and 20in.

Purpose-built systems

As broadcasters have come to depend more on their teleprompters both in the studio and in the field, they're also willing to buy purpose-built teleprompters instead of prompters built with off-the-shelf parts. When prompter manufacturers use off-the-shelf parts, they don't hold up for the long haul. By building from the ground up, it's possible to deliver brighter and smoother scrolling units while increasing longevity. Broadcasters have shown they're willing to pay for quality that will last.

Automation

As pressures to reduce costs increase at the stations, broadcasters are looking for new ways to improve productivity. One way to do so is to interface the prompter with newscast automation systems through the MOS protocol. This allows news-story writers to encode instructions into their scripts so that when the reading line in the teleprompter passes those instructions, it triggers the automation to make a camera move, display a graphic, or roll and take video. This enables the station to do a more sophisticated newscast with a smaller technical staff.

New scrolling capability

With the increased use of prompting in the studio, broadcasters find themselves increasing hours for teleprompter operators. Of course, no station wants to increase hours, so today manufacturers have developed multiple foot-controllers in the studio to allow the news talent to scroll their own scripts. Some systems even employ voice-recognition technology to allow the teleprompter to scroll itself by identifying exactly where the talent is in the news copy.

New teleprompters also feature wireless control so that the person scrolling the text, whether it be the news talent or a technician, isn't tethered to a specific location. For example, wireless foot-controllers quickly allow a camera in the newsroom to move its shot to the individual reporter's desk. This gives the reporter instant control of the teleprompter without running cumbersome cables.

In the field

There's also a demand to take telecasts that traditionally have been done in the studio out into the field. Recently, a major network put its evening news telecast on-location in Iraq. The prompting system, as with the rest of the technical setup, had to be able to make the anchor feel just as comfortable delivering the newscast as she would have been in the New York City studios.

Broadcasters are popping up on building tops to get shots of bombs bursting in war zones, and then ducking down to keep from being shot themselves. This puts a whole new set of criteria in play to develop a prompter that doesn't require cables and that is light enough to

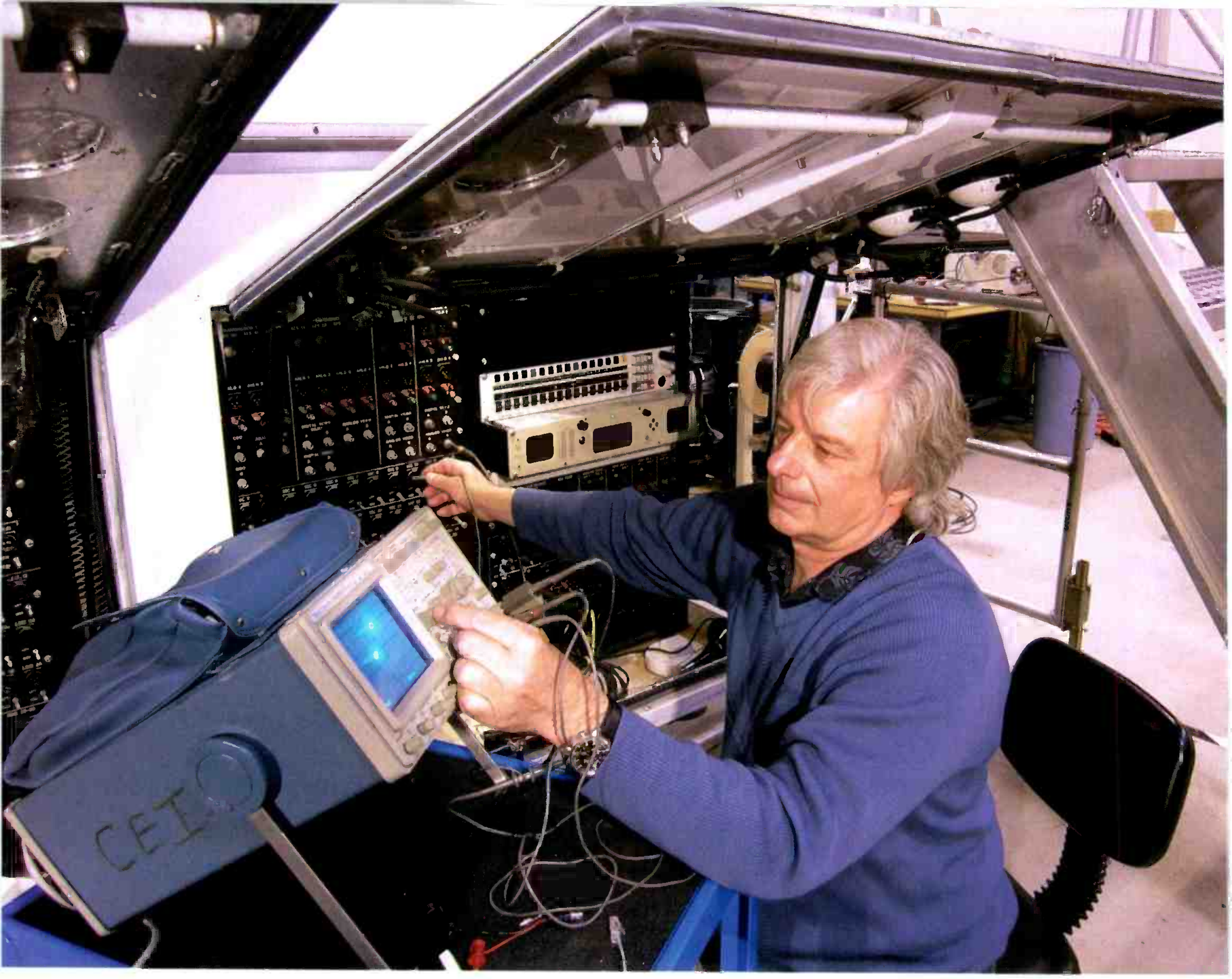
Prompting has come a long way recently, from cumbersome CRT-based units to lightweight and compact flat-screen models.

move quickly. Purpose-built tripod and prompter systems can eliminate the need for a separate computer, mounting plate and many of the bracket parts. They can also reduce weight significantly, allowing for use of a lighter weight fluid head and tripod.

Conclusion

Prompting has come a long way recently, from cumbersome CRT-based units to the lightweight and compact flat-screen models. Prompter assemblies have also become carriers for other devices such as on-air monitors and time displays to deliver more information to the talent. Through voice-activated prompting, the system can scroll itself. Eliminating cabling and the weight of the field prompting system has enabled broadcasters to report from new places. BE

Michael Accardi is president for Autoscript.



Test & measurement tools

In this DTV age, monitoring is more important than ever.

BY JOHN LUFF

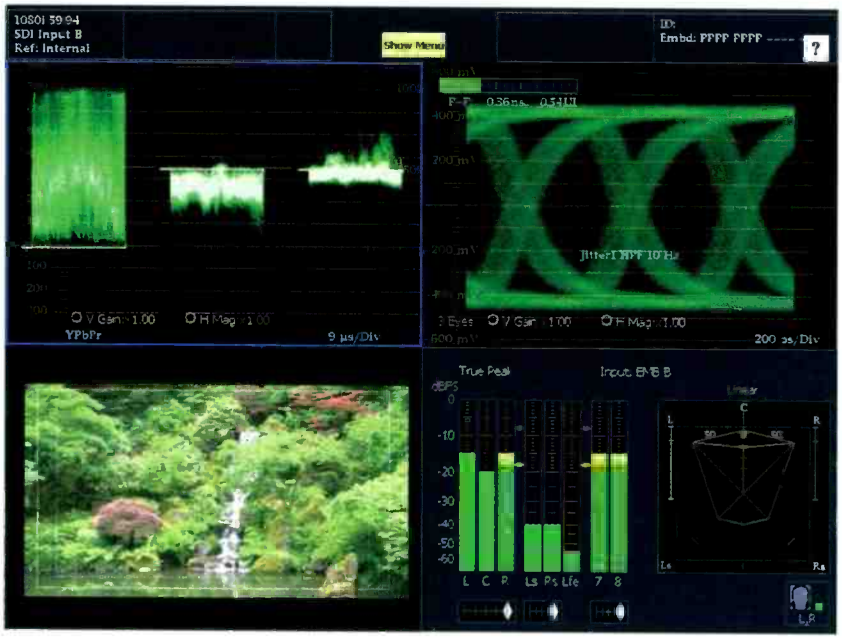
Today's technology spans generations of products used in systems with interconnections that vary from coax carrying analog video to high-speed networks on fiber-optic cable carrying multiple gigabits per second of file transfers. This presents challenges to those responsible for designing and maintaining facilities that use complex and often misunderstood technology tools. Fortunately, as computer power has grown, it has facilitated human interfaces that make technology more approachable. This allows complex systems to be understood at fundamental levels, or viewed with simple pass- and fail-oriented tools.

Video testing

Today's broadcast facility is almost guaranteed to contain both analog and digital signals. In fact, it likely supports analog SD as well as digital HD signals. We often forget that reference signals today are still analog color black, with NTSC or PAL characteristics. Most modern facilities use SMPTE 259M (270Mb, component digital signals), or SMPTE 292M (1.485Gb component HD digital signals) for interconnection. During this extended change from analog to digital, and from SD to HD facilities, we need to embrace tools that help us bridge multiple worlds.

Waveform monitors have been a part of TV facilities since the first monochrome television went on-air in the late 1930s. For decades, they helped us adjust and understand signal degradation. The first units were actually special-purpose oscilloscopes tailored to the amplitude of the TV

Photo: Andy Solywoda, senior field engineer for CEI, makes final adjustments on a BET mobile truck.



Tektronix's WFM7120 waveform monitor features a quad display that enables broadcasters to accurately analyze content with just a glance.

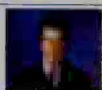
signal. The featured special display times that showed frame and line detail in analog TV signals. When color replaced B&W in the 1960s, new, partially solid-state waveform monitors were developed. Today, that lineage continues with powerful tools that can display the line rate waveform of active video as well as vector displays, gamut displays, and picture and sound information.

Today, CRT instruments have been increasingly replaced by digital, often color, displays that allow sophisticated views of audio, video, picture, vector display, signal jitter and data analysis. Though we often think traditional CRT waveform monitors and vectorscopes are disappearing, they aren't. The flexibility of instruments that are based on digital technology, however, brings many new features, along with the replacement of CRT technology, for which it is increasingly hard to find replacement parts. Like TV sets and professional monitors, the industry is moving to more modern technology and the benefits that color displays afford.

Conventional instruments with internal displays offer flexible HD and SD inputs, and decoding of ancillary data carrying audio and other information. Rasterizers can perform the same digitization and analysis functions but output to external displays. These rasterizers have become common in modern systems because they offer much larger display areas and can input to monitor wall processors over VGA and DVI connections.

Since the 1980s, there has been a steady growth in products that

If a facility control system is integrated with monitoring and display, a holistic and powerful combination is formed.

Entry No.	Face Thumbnail	Segment Start	Segment End	Segment duration	Audio Offset
0		09:25:05	09:25:15	10	0.5 frame (16.5msec) late
			09:25:17	12	0.3 frame (9.9msec) late
			09:25:19	14	0.1 frame (3.3msec) late
			09:25:21	16	0.1 frame (3.3msec) late
			09:25:23	18	0.1 frame (3.3msec) early
			09:25:25	20	0.3 frame (9.9msec) early
			09:25:27	22	0.3 frame (9.9msec) early
			09:25:29	24	0.4 frame (13.2msec) early
			09:25:31	26	0.5 frame (16.5msec) early
			09:25:33	28	0.5 frame (16.5msec) early
			09:25:35	30	0.5 frame (16.5msec) early
			09:25:37	32	0.6 frame (19.8msec) early
			09:25:39	34	0.6 frame (19.8msec) early
			09:25:41	36	0.6 frame (19.8msec) early
1		09:25:43	09:25:53	10	0.5 frame (16.5msec) early
			09:25:55	12	0.5 frame (16.5msec) early
			09:25:57	14	0.5 frame (16.5msec) early
			09:25:59	16	0.4 frame (13.2msec) early
			09:26:01	18	0.3 frame (9.9msec) early
			09:26:03	20	0.3 frame (9.9msec) early
			09:26:05	22	0.3 frame (9.9msec) early
			09:26:07	24	0.2 frame (6.6msec) early
			09:26:09	26	0.3 frame (9.9msec) early
			09:26:11	28	0.4 frame (13.2msec) early
			09:26:13	30	0.4 frame (13.2msec) early
			09:26:15	32	0.4 frame (13.2msec) early
			09:26:17	34	0.4 frame (13.2msec) early
			09:26:19	36	0.1 frame (3.3msec) early
			09:26:21	38	0.3 frame (9.9msec) late
			09:26:23	40	0.3 frame (9.9msec) late
			09:26:25	42	0.3 frame (9.9msec) late
			09:26:27	44	0.3 frame (9.9msec) late
			09:26:29	46	0.1 frame (3.3msec) early

Pixel Instrument's LipTracker compares selected sounds in the audio with the mouth shapes that create them in the video. When the event logging is enabled, the audio offset measurements are written to an HTML file.

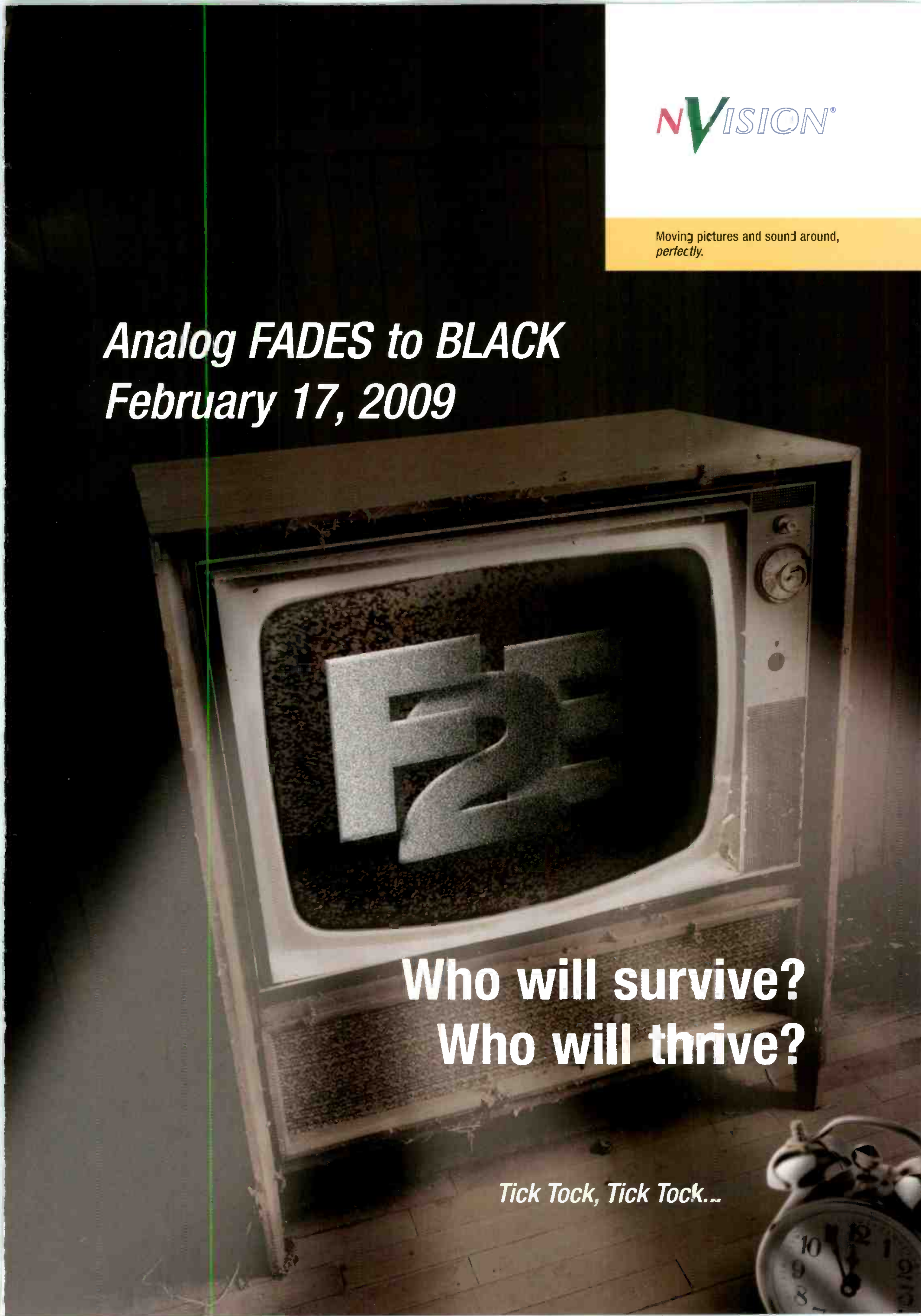
automate parts of a facility's monitoring needs. Fully automatic systems have replaced those from the 80s. Manufacturers now build systems that monitor signals and send alarms when signals are out of a tolerance window.

Such automated monitoring is also done by companies not normally thought of as test and measurement specialists. These manufacturers build monitoring systems that can be embedded in a facility. This powerful technique allows remote full-time sampling of common parameters, such as audio and video levels. It also enables comprehensive alarms for conditions that might be detrimental to operations, such as signal presence and freeze detection. When aggregated in a system using SNMP monitoring or proprietary user interfaces, entire networks of widely dispersed facilities can be monitored from a central site. For example, a cable network might monitor its reception by headend facilities where advertising revenue is particularly important. Broadcasters can build complex centralized monitoring for stations centrally programmed, or just keep track of the quality of their stations' transmitted signal.

Often, these remote monitoring systems are combined with displays that are integral to multiplexed monitor walls. If a facility control system is integrated with monitoring and display, a holistic and powerful combination is formed. Alarms can trigger actions that might correct for problems sensed. For example, a frame synchronizer that has failed can automatically be replaced by a spare. Used in a thoughtfully constructed system, these remote monitoring capabilities extend the reach of operators and maintenance personnel.

Portable instruments are particularly valuable when building facilities and working on remote location productions. Some portable monitors come with generators included for SD and HD signals.

Continued on page 63


NVISION®
Moving pictures and sound around,
perfectly.
Analog FADES to BLACK
February 17, 2009
F2E
Who will survive?
Who will thrive?
Tick Tock, Tick Tock...

Fade to Black
The analog to digit

Five players from across the broadcast industry are battling it out – trying to beat the FCC deadline for conversion from analog to digital delivery. Watch as they maneuver their way around the obstacles and try to improve their positions in a fiercely competitive field.

What will they do next? Who can they trust?

George

Director of Engineering, 15-station TV group

With an ambitious vision gleaming in his head, George convinced corporate management to invest enough capital to "do it right." Will he go power mad, or stay focused on his goals?

George's plan:

- Consolidate operations into 5 regional facilities
- Go all HD, up-converting SD sources to HD, and down-converting HD master control feed to SD as needed
- Engineer for maximum resiliency and redundancy
- Allow for future growth

What NVISION built for George:

- Independent, expandable master control for each station
- Shelf spares ensure fast recovery from any malfunction
- Redundancy options protect all signal paths and provide full router control even if a system controller fails.
- Router expands up to 256x256 with modules, or 512x512 with a second frame.

See the whole package at
www.nvision.tv/george

Doris

General Manager, two public TV stations in middle America

She's a 20-year broadcast pro, but no engineer. Now she has to design and spec the right system to convert to digital, yet leverage her legacy in analog. Can she do it on a "charitable" budget?

Doris's plan:

- Replace 15 year-old analog routing system with digital
- Originate one HD program stream in prime time
- Originate four SD streams in daytime
- Unique branding and independent programming for each station

What NVISION built for Doris:

- A cost-effective master control system supporting 2 HD channels and 8 SD channels
- A cost-effective all digital routing system comprised of a 32x16 HD router and a 32x32 SD routing system
- Single cost-effective router control system for both routers

See the whole package at
www.nvision.tv/doris

NVISION will show you how to win the game.
Why settle for survival? We can show you how to use the conversion to digital and HD as an opportunity to achieve your goals and improve your competitive position in your market. It's easier and more affordable than you ever imagined with NVISION technology and expertise.

#1 authority in analog to digital conversion
#1 in HD technology
#1 in future-proofing your investments with scaleable designs

Continued from page 58

Pixelmetrix's DVStation uses a single-ended architecture. The system can monitor thousands of parameters within hundreds of digital television signals in real time.

Increasingly, it is important to have optical test equipment in a facilities when long links between devices are installed on fiber. Power level, signal presence and optical time domain reflectometer (OTDR) capabilities are important. Some devices can detect a signal in a fiber without opening it or disturbing the signal being passed. Test instruments like power meters, when coupled with a calibrated source, can permit accurate testing of optical quality for installed cabling.

Audio testing

Audio levels and phase are common tests. With the introduction of multichannel sound in DTV, it is important to know the levels of the signal as well as what aural image it represents. Many manufacturers of video test equipment have also included audio test options for embedded and discrete audio signals (analog and digital). In addition to the usual cast of TV test equipment manufacturers, many audio console manufacturers have designed audio-only monitors that show phase and level for two- to eight-channel monitoring.

Subjective loudness can be monitored and compared to the dialnorm value contained in the metadata of a Dolby E encoded stream. There are also handheld, portable devices available that test AES, and Dolby AC3 and Dolby E compressed streams carried on AES paths.

A serious issue for all broadcasters is lip sync. Until recently, there were few methods of testing for lip sync, though methods for correcting it were easily available. Now several methodologies exist, both in-service and out-of-service. Out-of-service systems and backhaul links can be qualified for A/V delay

A serious issue for all broadcasters is lip sync. Until recently, there were few methods of testing for lip sync.

to less than one frame of video. Other systems work in-service by comparing audio with the faces of people on-camera and using a sophisticated algorithm that figures out A/V delay.

Compressed bit stream analysis

It no longer suffices to test baseband quality because compression systems introduce nonlinear distortions that can be quite disturbing to viewers. As a result, two important classes of test instruments are aimed at verifying the quality of the bit stream delivered over DTV, or any compressed link or system. The most prevalent is bit stream verification and compliance testing. Systems analyze the syntax in the MPEG-2 transport stream and display statistics about the content of the stream, including syntax errors that can lead to problems in the decoder or home receiver.

Beyond the syntax, however, there are issues related to the quality of the content itself. Subject viewing is not always a good way to qualify a link because if the content stresses the system only occasionally, it may be difficult to catch errors that won't be accepted by the home environment. Fortunately, several manufacturers offer products that correlate double-blind studies of video artifacts and their impact on viewer perception of quality to numeric scores used as a measurement of picture impairments. Devices that test in an open loop, or in-service, can monitor quality on a daily basis. Systems that test in a closed loop, or out-of-service, may be better suited to evaluate equipment under consideration for purchase, or in design laboratories.

Conclusion

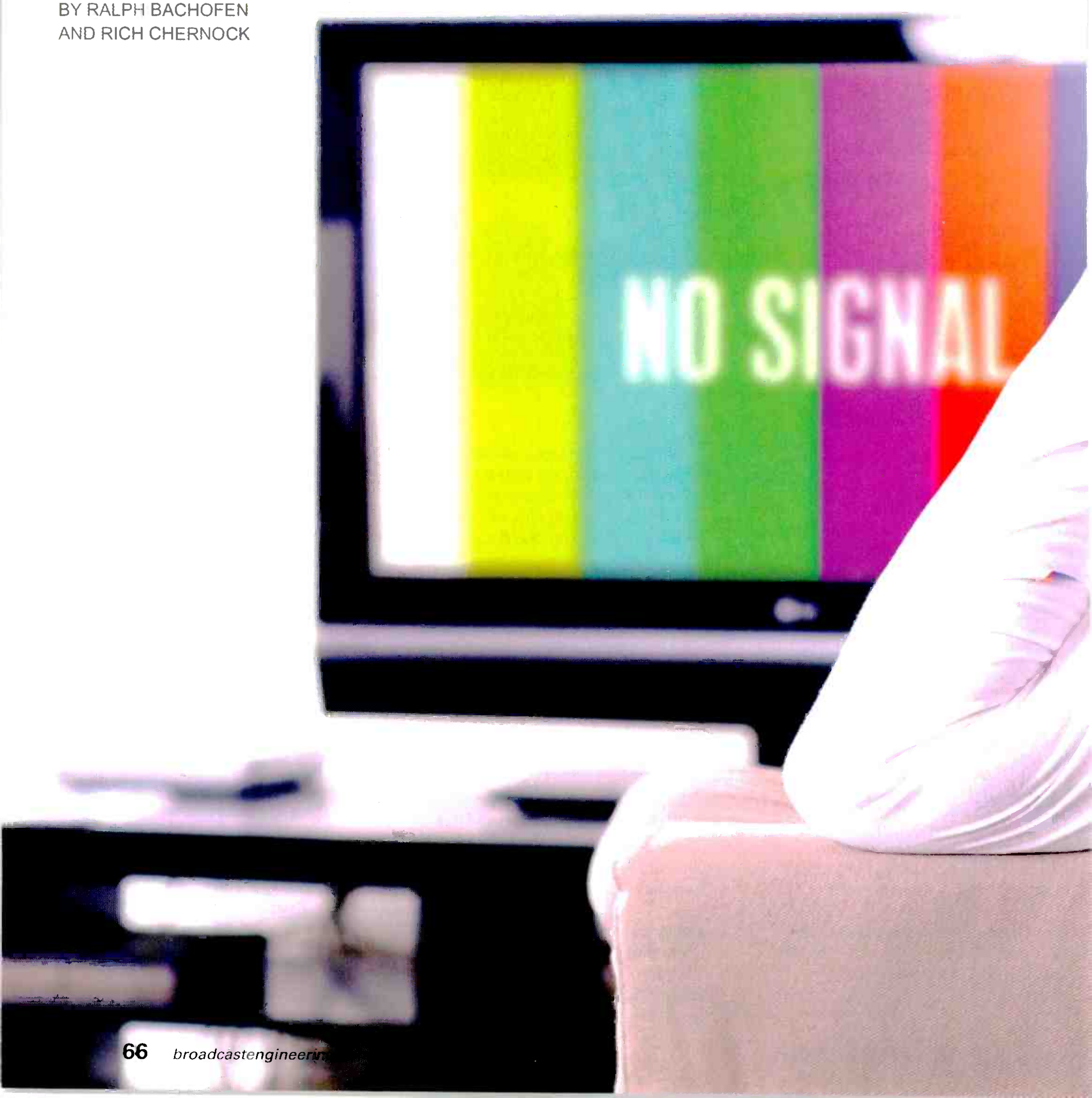
Test and measurement equipment is moving toward more sophisticated analysis of trends and hands-off monitoring. As systems move inexorably toward less baseband and more compressed content, it will be important for most facilities to invest in tools that can both monitor quality and adherence to standards for compression systems and transmission equipment. Beauty is in the eye of the beholder, and with compressed video, that is only a statistically significant viewer, not an objective measuring device like waveform monitors of old. BE

T&M equipment is moving toward more sophisticated analysis of trends.

John Luff is a broadcast technology consultant.

ATSC bit stream verification

BY RALPH BACHOFEN AND RICH CHERNOCK

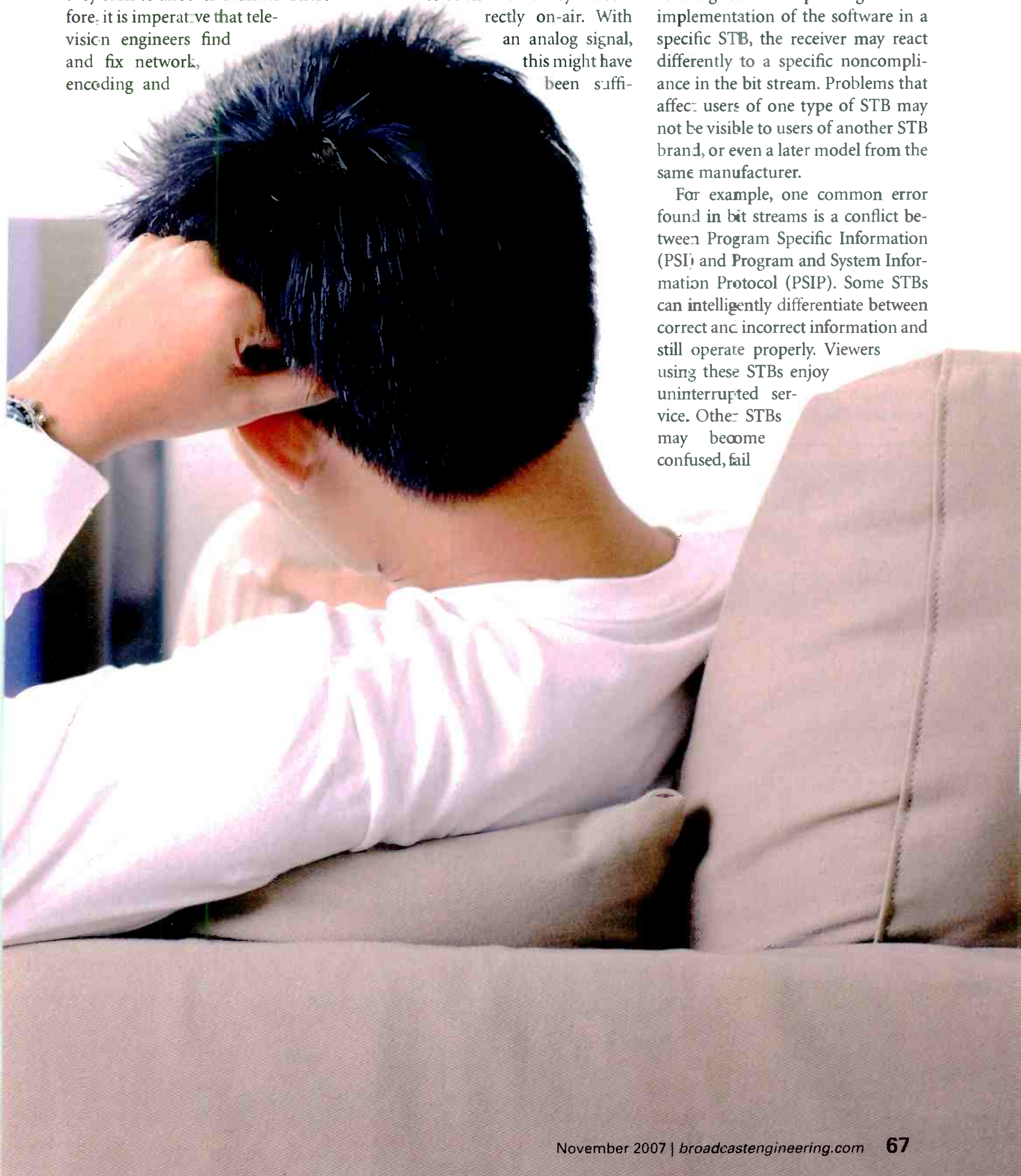


When viewers encounter such difficulties as audio lip sync, blocking or black screens, they turn to another channel. Therefore, it is imperative that television engineers find and fix network, encoding and transmission problems before their viewers become aware of them.

Many broadcast stations use set-top boxes (STBs) and video monitors to confirm that they are correctly on-air. With an analog signal, this might have been sufficient. Digital broadcasting, however, introduces another element to the monitoring equation — software.

Every digital STB has software running on it. Depending on the implementation of the software in a specific STB, the receiver may react differently to a specific noncompliance in the bit stream. Problems that affect users of one type of STB may not be visible to users of another STB brand, or even a later model from the same manufacturer.

For example, one common error found in bit streams is a conflict between Program Specific Information (PSI) and Program and System Information Protocol (PSIP). Some STBs can intelligently differentiate between correct and incorrect information and still operate properly. Viewers using these STBs enjoy uninterrupted service. Other STBs may become confused, fail



to display video, or even refuse to tune to the correct channels.

If a content provider is using one of these STBs to monitor its network, the engineers in the media center or control room are essentially blindfolded. They may never see problems in the delivered stream.

ATSC created a recommended practice (A/78) to address this problem. Although ATSC standards strictly define the contents and characteristics of the DTV emission transport stream, there are several interactions and interrelationships among components that can create momentary noncompliances. Successful tuning and display of programs can be ensured if the transport stream adheres to the applicable specifications.

Unfortunately, due to the complexity of an ATSC stream, there may be times when minor noncompliances are inevitable. Another difficulty driven by the complexity revolves around the severity of an error. Some errors, while violations of the standards, do not produce a perceived quality issue for the viewer. When minor errors trigger alarms, they can produce operator fatigue. When red lights frequently flash for inconsequential problems, important alarms often go ignored.

In the development of A/78, this problem was recognized, and addressing it became part of the design. Error types are now classified by severity, ranging from unwatchable to invisible. This kind of distinction allows manufacturers of monitoring devices to use filtering techniques, which show the broadcaster only those problems that matter and hide (while still logging) those that don't.

Figure 1 shows a single reference analysis point for proper signal verification in an idealized system. However, several additional monitoring points should be considered.

A/78 identifies transport stream issues by type, which helps operators better identify the potential root cause of the problem. Here are some of the key error types to monitor:

- *PSI errors.* An ATSC conformant transport stream is also required to be MPEG-2 conformant. Therefore, an ATSC transport stream must include the two mandatory PSI tables: the Program Association Table (PAT) and the Program Map Table (PMT).
- *PSIP errors.* The PSIP is the glue that holds the DTV signal together. The purpose of PSIP is to describe data at the system and event levels, and to define an abstract collection of programs (a virtual channel). Problems with PSIP can cause viewing or EPG difficulties.
- *Timing model and buffering errors.* Timing is the key to the MPEG-2 encoding and decoding processes. The

MPEG-2 standard defines a model for the system timing, adherence to which allows independent design of encoders and decoders that can interoperate. An MPEG-2 decoder's 27MHz reference clock needs to be synchronized with the equipment that is creating the encoded stream.

- *Consistency errors.* Before a receiver can decode a transport stream, it must identify the relationship between components in the stream. Some components contain audio and video (elementary streams), and other components contain information describing the relationship between them (metadata). The receiver uses metadata to identify each component, determine its function and select an appropriate set of components when the user selects a virtual channel for decoding. Conflicts within the metadata are called consistency errors. Consistency errors can result in broken decoding,

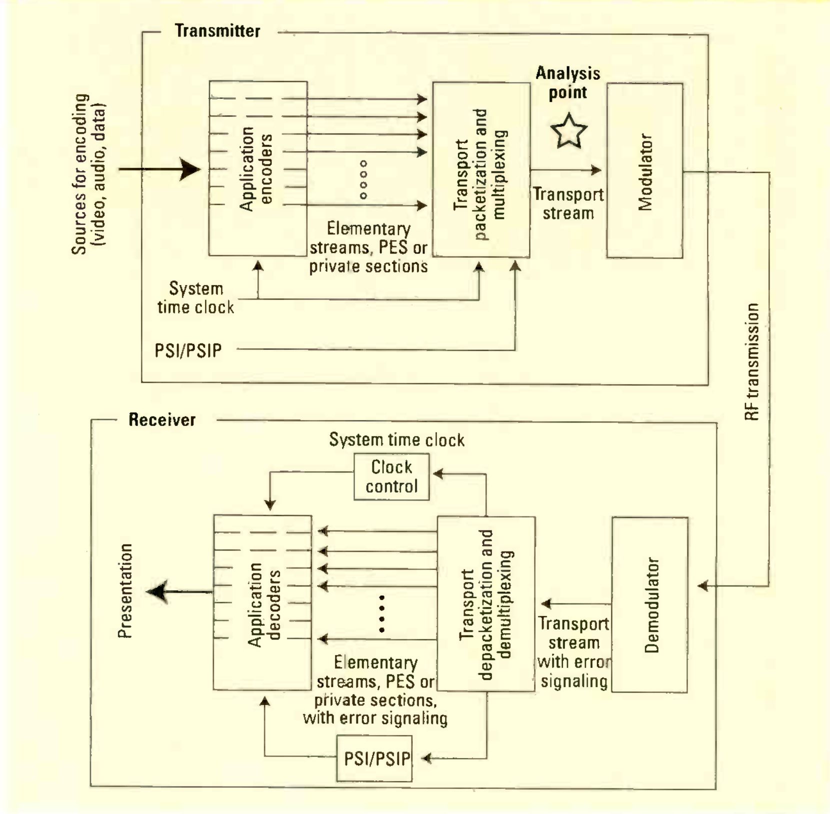


Figure 1. Reference analysis point in the DTV system from ATSC A/78A

missing system components (such as closed captioning) and missing program guide information.

- *General errors.* These errors cover a variety of problems and are typically transport-related.

Each error type is provided with a defined error severity:

- *Transport Stream Off Air (TOA).* The station is effectively off-air as the transport stream errors are severe enough that transport-level logical constructs are damaged beyond utility. Receivers cannot tune and decode anything within the broadcast. The complete or repeated absence of sync bytes is an example of this level of error.
- *Program Off Air (POA).* A main service (virtual channel) is flawed to the point that that the service is effectively off-air for conformant/reasonable receiver designs. This could involve improperly constructed program elements or incorrect/missing signaling about elements. The absence of an entry in the virtual channel table (VCT) for a service is an example of this type of error.
- *Component Missing (CM).* One of the program components that is signaled by PSIP or the PMT as being present is either not there or cannot be found and decoded. One example is a mismatch between the video packet ID (PID) signaled in the service location descriptor (SLD) and the actual PID used for the video elementary stream.
- *Quality of Service (QOS).* Parameters are out of specification by such a margin that a significant fraction of the receivers can be expected to produce flawed outputs. In many cases, the broadcast is viewable, but may exhibit some form of degradation to the viewer. An example is the master guide table (MGT) cycle time being somewhat larger than the specification, which causes slower than normal channel-change tuning.
- *Technically Non-Conformant (TNC).* Violates the letter of the standard, but in practice will have little effect on the viewing experience. Errors of this type should be corrected, but do not have the urgency of higher severity errors. An example is a single instance of a 152ms MGT cycle time (with the remainder of the MGTs coming at less than 150ms intervals).

By using monitoring devices that adhere to ATSC A/78, a broadcaster can quickly be informed of any problems that will impact video quality. When there are multiple issues, this kind of top-down monitoring will help the engineer resolve the most important issues first. In this way, a broadcaster can proactively ensure that his transmission will provide a quality viewing experience. BE

Ralph Bachofen is director of project management and marketing, and Rich Chernock is director of technology for Triveni Digital.

Delivering broadcast content via SFN

BY BRETT JENKINS

ION Media Networks used a field test van to collect measurements from 32 test locations during an SFN trial in New York City.

Over the past several months, ION Media Networks and several partners have been testing technology to enable the use of a single-frequency network (SFN) to improve broadcast coverage in New York City. After 9/11 and the destruction of the broadcast location used by most stations atop the World Trade Center, there was a great need for coverage improvement.

Since that time, ION and many other broadcasters have been using a transmitter location from the Empire State Building. However, having so many broadcasters crowded onto one tower has made it virtually impossible to replicate the coverage once provided by facilities at the World Trade Center. There is insufficient space on the tower for appropriate antennas to accommodate all the transmitters. An alternative is desperately needed.

The alternative

ION and its partners performed testing during the summer and fall of 2007. The testing involved sites provided by Richland Towers and used technology that has been proposed to the Advanced Television Systems Committee (ATSC) by Samsung and Rohde & Schwarz. This system was shown at NAB2007 as part of the Samsung and Rohde & Schwarz A-VSB demonstration. However, ION wanted

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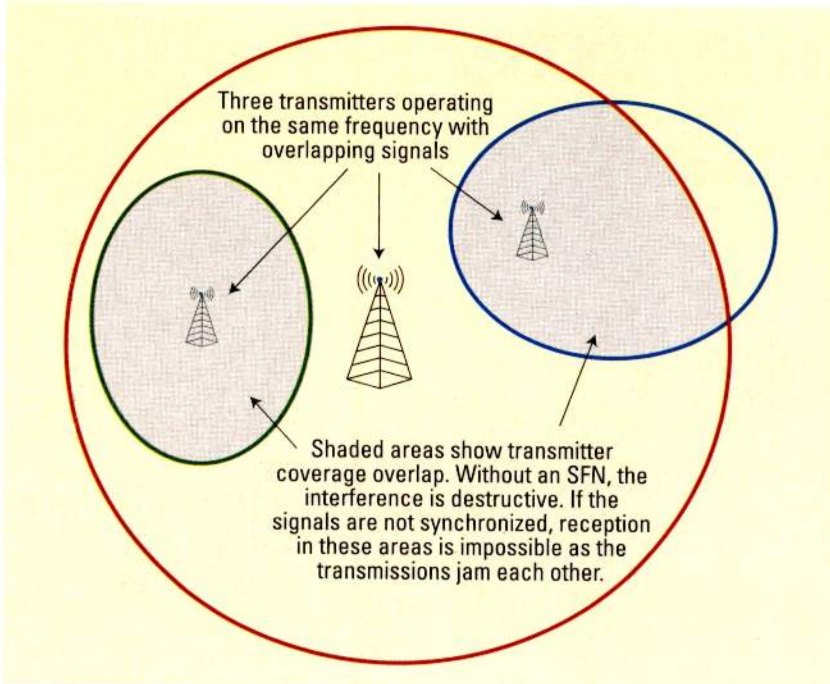


Figure 1. Illustration of an SFN with multiple transmitters

to see how the technology would stand up in a difficult reception environment like New York City. It also wanted to investigate whether an SFN system in New York could be a long-term alternative to other solutions such as the Freedom Tower project.

First, the basics

So what is a single-frequency network? In a nutshell, an SFN is a broadcast system that allows for the operation of multiple transmitters on the same frequency. (See Figure 1.) These transmitters are controlled by not interfering with each other, even though they occupy the same spectrum. To understand how the technology works, you have to know a little bit about the way the DTV standard was originally designed.

The ATSC standard was not originally meant to be used in SFN mode. In fact, one of the properties of an ATSC exciter is that its output appears to be somewhat like random noise regardless of the input data stream. This is done purposefully. If there is a potential for interference, uncorrelated noise can be much less damaging than correlated signals or periodic signals. Given this property of the ATSC signal, if two transmitters are using the same frequency in the same location, they will jam each other, even if they are presented the exact same, perfectly synchronized input. Somehow the exciter outputs must be synchronized together so that they emit the output signal at the same time. The ATSC system adds a framing structure to the data being transmitted. In normal ATSC exciters, this framing structure is not linked to any particular point in time. So an exciter is free running, and it begins the frame and all of its internal randomizing and coding processes at a non-deterministic point in time.

In order to overcome these properties of the ATSC transmission system, exciters in an SFN system must be controlled so that they each treat the input stream in the exact same way. If this is done properly, the transmitters will no longer behave as jammers. Instead, the multiple signals received at a particular location will look like echoes of the same transmitter. In most receive locations, the equalizer in the receiver can cancel the echoes, and the signal can be decoded normally.

Synchronization is key

Synchronization is the first step in setting up an SFN. The system for the New York City testing used a device called a VSB Frame Initialization Packet (VFIP) inserter. The VFIP inserter takes a transport stream input and inserts a special packet into the stream. The packet signals when the downstream exciters should start their framing sequence. All the exciters in each transmitter in the network receive the VFIP and are then synchronized to begin framing the data at the same point in time.

Then there is one more job to do, and the VFIP takes care of this too. The ATSC exciter has a trellis coder as part of its processing. The trellis coder normally starts in an initial condition that may not be deterministic. In an SFN, the trellis states of all the exciters in the network need to be set the same way. So the VFIP contains a special byte pattern. When the pattern is sent through the exciter, it forces the trellis coder to be set to a known state regardless of its initial condition. In summary, the VFIP is able to signal the exciter so that all the relevant processes are synchronized to a known point in time.

Synchronization is the first step in setting up an SFN. The system for the New York City testing used a device called a VFIP inserter.

Testing the SFN in New York City

Now that we know how to accomplish synchronizing ATSC exciters for SFN operation, we can look at the practical setup of the SFN testing in New York City. (See Figure 2 on page 78.)

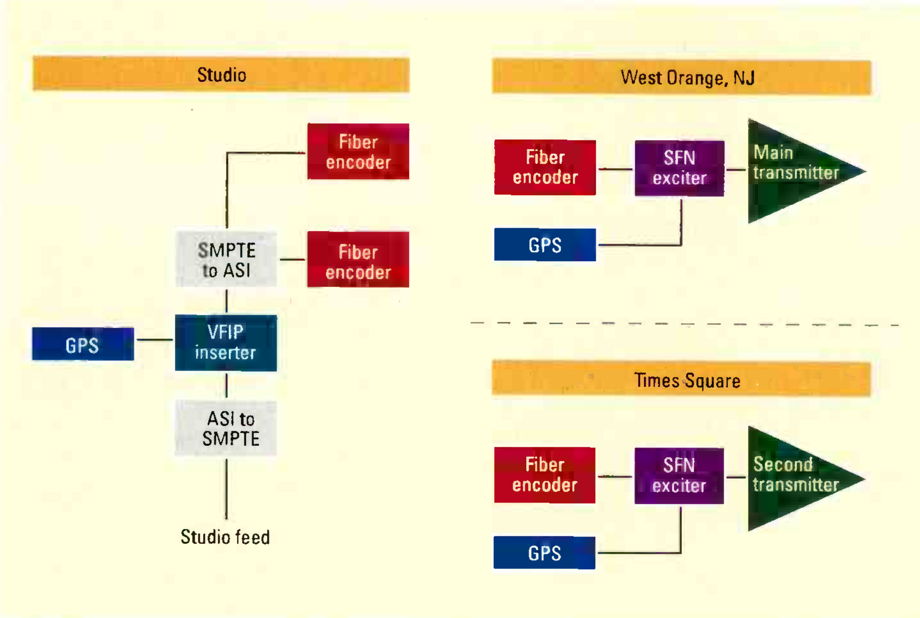


Figure 2. A block diagram of the test setup in New York City

Two transmitters were used for the tests. The main transmitter was located in West Orange, NJ, and a secondary transmitter was located in Manhattan at Four Times Square. The main transmitter already provides coverage to most of the market. The secondary transmitter's job was to improve the coverage in Manhattan and parts of Long Island where the New York City skyline was acting as a shield to the main signal.

Measurements were taken at 32 test locations throughout the New York City market area, including locations in the Bronx, Brooklyn, Long Island, Manhattan, Queens, Staten Island and northeastern New Jersey. At each test location, field strength, signal quality, ability to receive a picture and various other measured parameters for the SFN were taken. There was a noticeable improvement in the areas to the east of Manhattan (including Long Island and Queens) with the secondary transmitter on, compared with measurements taken only from the West Orange main transmitter signal. In areas where the West Orange signal was dominant, there was no negative impact caused by the Four Times Square transmitter at any of the tested locations.

Interference

Even with the SFN synchronization, there are areas where interference is predicted. This is due to the fact that in some cases, the relative strengths and time spacing of multiple signals received might be out of the range of the equalizer in the receiver.

Care is taken in the design of the SFN to minimize those areas by controlling various antenna parameters

The SFN might offer an attractive alternative to a single transmitter site.

and adjusting the fixed delay between various transmitters. In our test network, those interference areas were designed to be mostly in areas over water. However, there were some important areas where interference was predict-

Inside the field test van, ION was able to measure each test location's signal quality and the ability to receive a picture.

ed, notably in northeastern New Jersey and Staten Island. Yet, our field measurements showed better than expected results at the tested sites with the secondary transmitter on. Some sites in the areas to the north of Manhattan, including the Bronx, showed coverage challenges for the SFN. As part of our continued testing, another site is being investigated for this area.

Conclusion

The two-transmitter SFN system worked well. The system provided signal strength and quality improvements at nearly all of the test locations. In many locations, the signal strength measurements were very close to those from the transmitter on the Empire State Building. With another one or two transmit sites, the SFN might offer an attractive alternative to a single transmitter site. **BE**

Brett Jenkins is the director of technology strategy and development at ION Media Networks and is currently the chair of one of the ATSC ad hoc groups working on a new standard for mobile TV broadcast.

Making the connection

Cable and connectivity must work together in order to be effective.

BY STEVE LAMPEN

Information technology depends on reliable connections from point to point. Of course, at the ends you can put wireless devices, but those are really just the last few feet. Wireless backbones are a lot harder. As our demand for bandwidth goes up, it becomes increasingly harder for reliable wire and wireless connections.

The vast majority of data cabling in the Americas is unshielded twisted pairs (UTP). With one exception in this article, we will concentrate on UTP.

As most installers know, cable and connectivity must work together to be effective. The problem is that connectorization, for a lot of reasons, is not easy. This is why the cable-connector interface is where most network systems fail. Table 1 lists the reasons why networks fail at the connector.

Reason	Effect	Comment
Wrong wiring order	No connections	EIA/TIA 568 A or B
Wrong plug	Reduced bandwidth	Using Cat 5e connector on Cat 6 cable
Poor wiring	Crosstalk, reflection	Take a wiring class

Table 1. Network systems fail at the connector for many reasons.

Reasons for failure

The real problem for broadcasters is that their architecture for broadcast facilities is often different from classic network wiring. To explain that, we need to look back in history. Back around 1990, we were living in a Cat 3 world. Cat 3 was the first four-pair data cable. It had a bandwidth of 16MHz. It was easy to put in. (Heck, it's now the telephone cable standard.)

At that time, some industry players did a few surveys to find out why networks failed. The No. 1 answer was owner-installed plugs. Yes, those RJ-45 male plugs were put on poorly or with the wrong wiring order, and the network just didn't work. As a result, many manufacturers provided RJ-45 jacks (female) and sold patch cords. They could then control the male plugs, since they made the patch cord themselves.

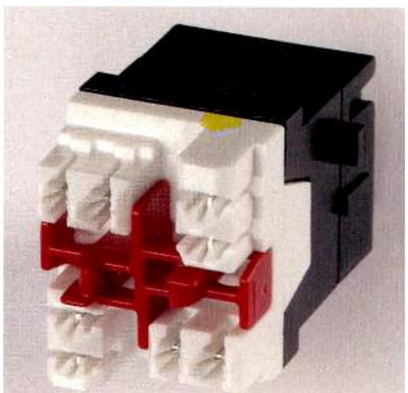


Figure 1. The red portion of this 10Gig jack helps users keep the cable pairs in the right order.

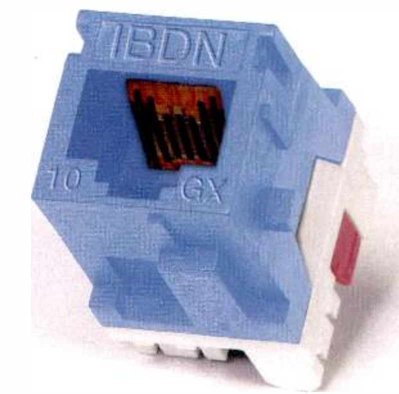


Figure 2. The front of this RJ-45 jack features a flexible printed circuit, where the spaces between the traces have been cut out. This gives impedance stability previously unknown.

This continued through Cat 4 (now dead and gone), Cat 5 (ancient) and Cat 5e (the common low-end). However, finding plugs for Cat 6 (the good stuff) and Cat 6a (augmented Cat 6 and top-of-the-line) is difficult. There are a few advertised, but the failure rate is alarming — up to 70 percent for some nice-looking connectors.

With the jack-and-patchcord style of networking, you're home free. That usually means a plastic wallplate with square holes (called keystone). You punch down the wires on the jack, which is quite easy, so it's difficult to get the wiring order wrong. Click the jack into the wallplate, and put the plate into the box in the wall. Then buy a patchcord of the correct length, and plug in the end-user.

It works great in an office. For broadcasters, however, this often doesn't work. Broadcasters want to go from Point A to Point B, like with audio and video cable. What are you going to do with the jack? Hang it in mid-air? No, what you want is a plug on each end of the cable.

And there lies the problem. You can buy the fanciest, bonded-pair, Cat 6, but if you put a 5e plug on it, you have a cable with 5e performance. You might as well have put in 5e cable and saved some money!

Prevention

Here's what I suggest. First, take the installation team to some data networking/installation classes. Learn how professional network installers put that stuff in. Second, insist that part of the course be the wiring of RJ-45 male plugs.

Third, buy one of the really good (and expensive) handheld testers, and take a class on how to use it. Nothing reveals how good an installation is like real live testing.

Fourth, write or e-mail all those plug and jack manufacturers, and ask for the data on the male plugs they will sell to you (many of the plugs are not for sale). Look especially at the Cat 6 data, and maybe even get some samples. Send the manufacturers a piece of the cable you want to use and have them put a connector on each end. Then you can test that cable in your new tester. If they can do it, theoretically, you can do it.

Of course, after choosing, you'll have to spend a few bucks on RJ-45 crimp tools as well.

Unfortunately, my scenario falls apart when we get to Cat 6a. This is

Buy one of the really good handheld testers, and take a class on how to use it. Nothing reveals how good an installation is like real live testing.

10GBASE-T, or 10Gb/s networking cable. The standard 10Gig cable has a bandwidth of 500MHz per pair. To attain as much futureproofing as possible, this is the way to go.

At those frequencies, the emission of signals is a huge problem, and the slightest error can crash a system. This is why it's so hard to put in. Figure 1 shows a 10Gig jack. Most jacks line the wires up in a row so you can punch them down. This is fine for Cat 5e or 6, but way too much crosstalk for Cat 6a.

With the 10Gig jack, the pairs are at right angles to each other. (Of course, you remember being told that if you cross a power cord with an audio snake, do it at right angles.) That little red thing helps keep the pairs in the right order.

The front of this jack is equally

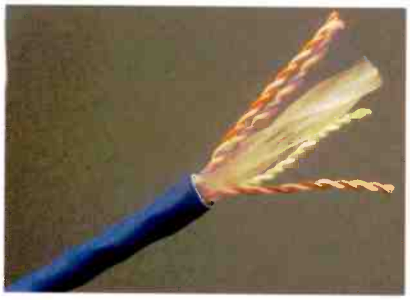


Figure 3. In this Cat 6a cable from Belden, the divider to push the pair apart is now extended so it will also push the cables apart. You can see the effect of the pusher in the jacket — kind of lumpy, but it allows 10Gig to go the whole 100m.

weird. (See Figure 2 on page 82.) It's still a RJ-45, but those are not eight little wires anymore. That's a flexible printed circuit in there, where the spaces between the traces have been cut out. This gives impedance stability previously unknown.

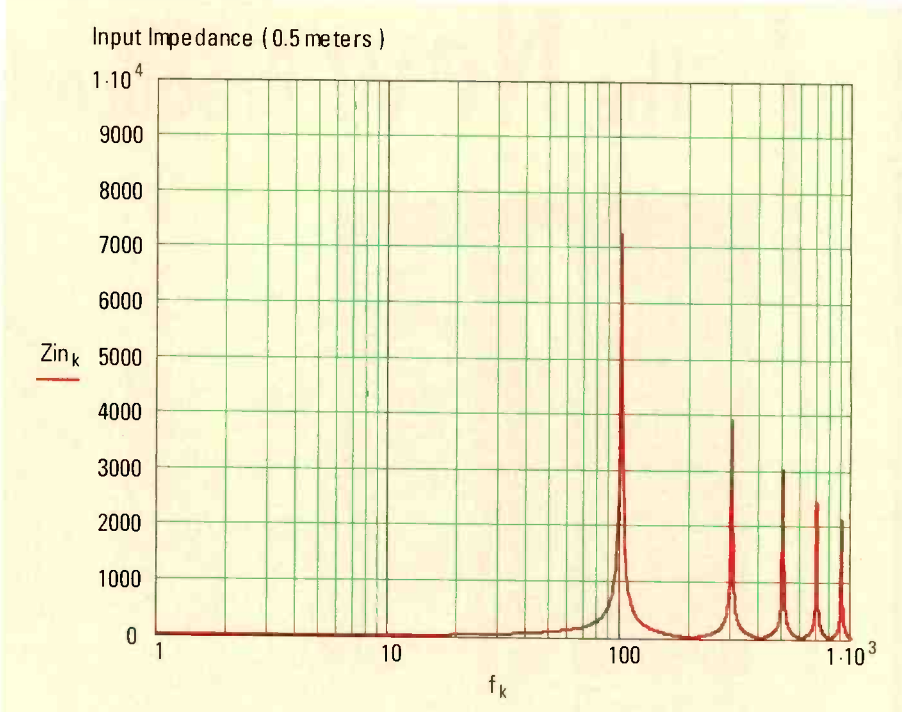


Figure 4. Ground loop problems can occur at many points in the system. The result of the ground loop problems shown here looks like an open circuit at every quarter wavelength.

Options

So what can you do? To go as far in the future as possible, go Cat 6a. However, this means figuring out how to make the plug-and-patchcord system work for your facility.

The simplest option is Cat 5e, where everything is easy to put in, including plugs. It allows the flexibility to do whatever you want, including point-to-point wiring.

Or you can put in Cat 6, and strong-arm the connector guys to provide plugs that will actually work. Cat 6, by the way, will carry a 10Gig signal for 55m, until the cables interfere with each other and fail because of alien crosstalk. That's why Cat 6a cable has something in it that pushes the other cables away. (See Figure 3.)

Some manufacturers are making 10Gig with individually shielded pairs. Those cables would be the easy way to 10Gig, but they are much harder to install, with the shields and drain wires. Also, at 500MHz, a low impedance to ground is needed to effectively get rid of noise. But a low impedance is hard to get even at moderately high frequencies.

You can always put in a high-performance cable and use it for low-performance applications.

Ground loop problems (unknown in the UTP world) can also occur. To fix this, cut one ground. The result looks like an open circuit at every quarter wavelength, shown in Figure 4.

There is one other option. You can always put in high-performance UTP cable and use it for low-performance applications. You could easily put a Cat 5e plug (or jack) on 10Gig. It then would be a 5e cable, until you come back and put a 6a plug on it in the future. This, of course, assumes that there will be a 6a plug available for field installation in the future!

Besides all these options, the one thing that I strongly encourage is to get educated. Whether you like it or not, you are now a data dude. Learn all that you can. BE

Steve Lampen is a multimedia technology manager for Belden.

Nutmeg Audio Post

Client demands for 5.1 mixing and HD viewing capability drove the studio toward upgrading.

BY JONATHAN S. ABRAMS

In upgrading our existing capabilities, we wanted Nutmeg Audio Post to be a studio where the clients do not have to worry about their finishing format. We also wanted to accommodate the increasing demand for 5.1 mixing, from commercials through long-form programming.

The Yamaha DM1000 console offers Nutmeg Audio Post calibrated monitoring level control. The unit also saves space with its included HUI emulation.

The basics

To accomplish these goals, we switched from Doremi Labs' V1 hard disk video recorders to Avid Mojo SDI for tighter video integration with Digidesign Pro Tools|HD 2 Accel systems. The Mojo SDI allows us to equip each of our nine studios with nonlinear video for use during the mixing sessions, improving the workflow for session preparation. This changeover liberates a total of 16RU across both of our machine rooms, which is plenty for our Sony SRW-5500 and Panasonic AJ-HD3700B multiformat recorders.

To address the 5.1 mixing needs, we moved from Yamaha's O2R to the company's DM1000 console. We wanted to equip the studios with a device that had a calibrated monitoring level control so that at a glance, the engineer could determine the control room monitoring level. It also offers access to downmixing and bass management with as few operations as possible.

The challenges

One of the greatest challenges was meeting the expectation that clients want to view their content in HD while in the studio. Anyone can take the composite downconverted output and route it to an NTSC display. But clients finishing in HD expect to view their content in HD. To accomplish this, we upgraded our displays to Panasonic TH-50PH9UK 50in and Pioneer PDP-6070HD 60in plasmas.

Three studios are designed so the mixer has a video display in addition to the plasma mounted overhead for the clients. In these studios, there is a Panasonic BT-LH1700W LCD display. All of the Panasonic displays have SDI inputs. The Pioneers have AJA HD10C2 SDI-to-component converters.

> **One of the greatest challenges was meeting the expectation that clients want to view their content in HD while in the studio.**

By looking at the back panel of our multiformat recorders, it is clear that the HD-SDI output must be used to view the program in HD. The choice to have SDI signal paths to all of the displays allows us to provide the best-quality video in SD while meeting HD viewing requirements.

The DM1000, in addition to being a fine surround console, has had a positive effect upon our studio designs. The unit includes HUI emulation, so it is no longer necessary to have a control surface and a console in the studio. At the press of a button, 16 faders within the Pro Tools session are accessible. The ability to remove a dedicated control surface streamlines the number of objects on the desk at the mixer's position and on rolling stands near the sweet spot.

Choice decisions

The decision to purchase the SRW-5500 (with downconversion and Digital Betacam playback options)

and AJ-HD3700B was driven by our clients needs. With that as the starting point, other decisions were made with both flexibility and client assurance in mind. The displays were chosen for their picture quality and their screen sizes for the existing viewing distances.

The displays were calibrated by an ISF certified calibrator. This allows our clients to view the picture in the mixing suite and be confident that it looks exactly as it should.

The bass management functions of the DM1000 allow us to monitor how the 5.1 mix will sound in a home environment. This provides the mixers with reassurance that their efforts are heard as intended, while giving clients realistic expectations.

New needs

In the machine room, the move to HD created the need to be able to measure the HD video signal in addition to SD. To achieve this, we replaced our Tektronix 1720 and 1730 with a WFM7000 multiformat waveform monitor. We added a Harris Leitch Panacea Lite switcher for maintaining a digital video signal path from

Decisions were made with both flexibility and client assurance in mind. The displays were chosen for the existing viewing distances.

playback to monitoring. To maintain synchronization between all of the equipment in the machine room, we installed an Ensemble Designs Avenue signal integration system. The Avenue serves as our master sync generator and can generate video references for NTSC and PAL, as well as HD tri-level sync references.

We have finished projects on HDCAM SR for MHD and on HDCAM for New Harbor Entertainment. The New Harbor Entertainment program "She's Moving In" required a 5.1 mix. Since HDCAM only allows for four audio channels, this required us to use Dolby E, which we can also offer to any other client finishing on HDCAM. Some projects we've finished on D-5HD include a spot for the Dodge Nitro through BBDO, Miller Lite through Crispin, Porter + Bogusky, and American Express through Ogilvy. BE

Jonathan S. Abrams is chief technical engineer for Nutmeg Audio Post.

WDRB-TV in full HD

The station used Nucomm technology to ignite its "Thunder Over Louisville" broadcast.

BY GARY SCHRODER

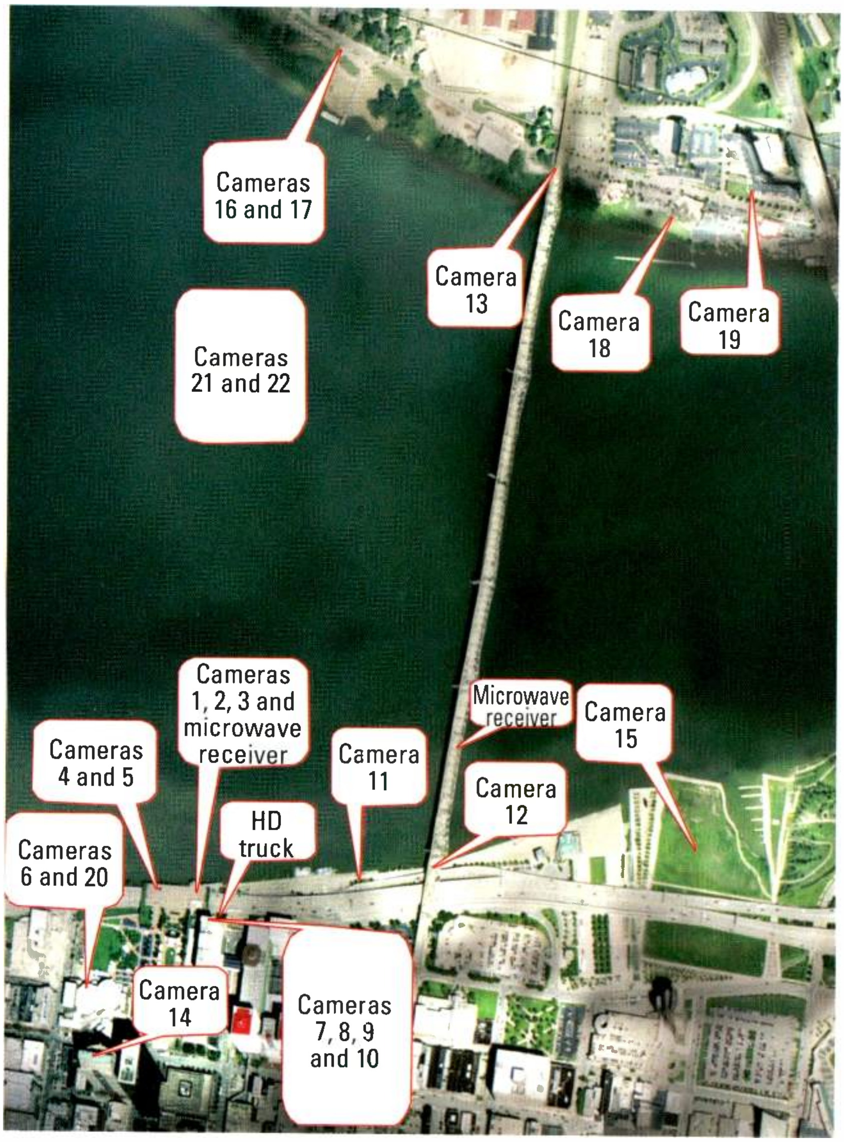
Every spring, Louisville, KY, hosts an event called "Thunder Over Louisville," which occurs two weeks before the Kentucky Derby. The event serves as the opening ceremonies of the Kentucky Derby Festival and attracts nearly one million attendees. Programming includes an air show in the afternoon and a fireworks display at night.

Each year, the festivities are aired by a different local TV station. This year's coverage was hosted by WDRB-TV, Fox-41, which decided to broadcast the event entirely in HD, a first for this program. HD production was provided by F&F Productions, which deployed 22 HD cameras in strategic locations on both sides of the Ohio River.

This year's fireworks presentation occurred on the Ohio River. The station positioned five HD cameras nearly 5000ft across the river. This created a new set of challenges that needed to be solved. Additionally, the station's news director, Barry Fulmer, wanted to use a roving/nontethered HD camera to obtain a shot of the spectators and a skyscraper camera shot that normally would have required the street being blocked off to fly triax up 300ft.

Sky's the limit

To address these concerns, WDRB's engineering team turned to Nucomm and its digital microwave technology. While performing a roving camera shot in analog would ordinarily be an easy task, using this method to capture all of the action in HD was much more difficult. To tackle this obstacle, the broadcast team chose Nucomm's CamPac2 HD/SD wireless microwave transmitter unit, equipped with an omnidirectional antenna.



To achieve the maximum coverage of the Louisville, KY, "Thunder Over Louisville" fireworks presentation, WDRB-TV used 22 HDTV cameras. The camera position that proved most challenging was Camera 15, the roving reporter shot. Obtaining an HD microwave shot from that location was accomplished using a Nucomm CamPac2 with a quad diversity antenna located on the 2nd Street Bridge (just north of the Camera 12 position).

The camrea's wireless link included an integrated MPEG HD encoding and variable bandwidth COFDM modulation that was used to build a mechanical roving reporter. The unit, set for 16MHz, 16-QAM, transmitted a 36Mb/s HD signal to a quad sector antenna. That antenna was mounted on the handrail of the 2nd Street Bridge, where a Newscaster DR quad

WDRB-TV, Fox-41, used the Nucomm CamPac2 HD digital microwave system to provide live HD images and interviews from its roving reporter in the midst of the Louisville, KY, Thunder Over Louisville event.

diversity receiver working on Channel 2 at 2GHz was connected via fiber to the production truck, which was parked 2500ft away on 4th Street. The CamPac2 transmitter block was fed with a standard HD-SDI video stream and analog line level audio that was embedded from the field reporter's wireless microphone.

Using the wireless transmitter allowed WDRB to embed the audio and perform the various levels of necessary compression in order to comply with the 2GHz channel boundaries presented within one lightweight pack. This eliminated the need for lugging heavy, cumbersome encoders typically used for HD-SDI to ASI conversion.

Roving cameras were used to overcome the 3500ft between the crowds and the production truck. With the bridge receive site 2500ft from the production truck, a set of Stratos fiber-optic units provided by Bexel transmitted an HD-SDI signal back to the truck. One set of these units (a transmitter and receiver combo) can transport a single ASI or HD-SDI stream over fiber. The fiber was single mode, 9 microns with ST connectors.

To properly capture the F16 fighters in the air show, the team established a camera shot from the 300ft-tall Humana Tower, which was 1500ft from the production truck. Instead of enduring many hours of pulling triax, this setup was easily achieved in an hour's time using Nucomm's Channel Master TX1 transmitter and companion RX1 receiver. This portable link provided HD in ASI format back to the truck.

Sparking communication

The signals from the other 17 cameras were transported back to the truck using either triax or 15,000ft of fiber optics. For the fibered cameras, F&F Productions used Telecast Fiber Systems SHED and HDX units. The HDX unit converts the camera signals from HD-SDI to fiber, and the SHED converts the optical signal back to HD-SDI. One of the strongest features of these fiber units is that all cameras had full CCU control, including intercom. The locations across the river that had talent also had an extra audio channel. Two fibers were allocated for each camera location, and WDRB had two extra fibers in the run for each camera location in case problems arose.

The Nucomm quad diversity sector antenna was used to receive HD microwave signals from a roving camera equipped with the company's CamPac2 transmitter positioned within the crowd in the foreground.

Thunderous applause

At the end of the production, WDRB was extremely pleased with the performance and the quick setup of the Nucomm microwave links. The equipment is made to last, as it features a military-style and water-resistant architecture. The hardware has a robust design that is durable and user-friendly. Navigating through the menus for switching channels or data rates was easily performed without research or reference. BE

Gary Schroder is chief engineer at WDRB-TV, Fox-41, in Louisville, KY, and WMYO-TV, a My Network affiliate, in Salem, IN.

Multi-image displays

Today's holistic systems boast flexibility.

BY JOHN LUFF

I am often struck by the similarity between control rooms of 40 years ago and those of today. Of course there have been changes, but the primary functions haven't changed much. An audio person listens to the mix on speakers, the technical director controls the video on-screen using a switcher, and the director picks shots from an array of monitors in front of him. One thing that has changed is the monitor wall.

Increased flexibility

Modern digital techniques have changed the technology we use in fundamental ways. In an interesting parallel to the sampling in a CCD, monitors are no longer scanned with lines, top left to bottom right. Like a CCD, the image is formed all at once, and the entire screen is refreshed one frame at a time.

Flat-panel displays are like large memories with a light shining from them. If you can treat the surface of a display as memory, it's easy to see how you can write to any part of the memory independently.

Imagine an arbitrarily large monitor, like the 103in monster plasma and LCD displays manufacturers build for bragging rights. That display of more than 30sq-ft could hold a lot of information. (The resolution would be limited to 21 pixels per inch if it was 1920 x 1080). Thirty-five years ago, a monitor wall that large would have sufficed a lot of control rooms. It might have held two dozen monochrome monitors that were likely 8in to 12in diagonal, plus a deluxe 19in program monitor and a clock mounted in racks with spaces for cooling.

Today the flexibility is pretty astounding. The layout is completely fluid and can be adjusted at will, with no space between virtual displays on the plasma canvas. Monitors can be an arbitrary size due to the high-quality resizing engines built into display processors. The layout can be stored and recalled at will, allowing reconfiguration between shows, or perhaps when one of several displays gives up the ghost during a show. Tally lights, always the bane of a design engineer's existence, are built-in and include naming nomenclature to boot.

Miranda's Kaleido-X multiroom, multi-image processor was recently installed in Télé-Québec's production control area. The processor includes a router and is housed in a single, expandable chassis.

Generally, display processors, or multi-image displays, are many-channel DVEs. Most can combine the outputs of SD and HD sources, computer outputs and internally stored graphics for backgrounds and virtual monitor edges. Often, internally generated clocks are possible in various formats. Some systems permit monitoring other parameters, such as embedded and discrete audio (levels and phase), closed captioning, V-chip data, teletext, aspect ratio and safe area markers, and even test and measurement data. Such flexibility does not come cheap, in complexity or cost, but it allows monitoring in ways that individual monitors could never replicate. Need a 36in program monitor surrounded by 11 small monitors? Unlike 10 years ago, this is possible today. Tie such a system to a routing system or production switcher, which can pass tally information forward, and the display processor will make the facility appear transparent to operators.

Easy expansion

The physical structure of these systems can allow for expansion to many outputs and support for various inputs. This happens in one of many ways. Some systems have internal routing switchers that permit HD, SD, analog and computer inputs (DVI and VGA) to be switched to any position on the display surface. One company even provides an output from that internal router to connect to external devices, like test and measurement systems or program bypass switching. Some systems have a fixed number of inputs to a single internal matrix, often in groups of 32. Others have methods of connecting multiple systems into much larger virtual systems where the number of inputs can grow to well beyond 100.

In an interesting twist in virtual display routing, at NAB2007, one manufacturer introduced a system that lives inside of an existing router instead of requiring the router to be added to the display. This approach yields less external wiring and vastly expands the number of available inputs, essentially without practical end. Coupled with multiple output capability, systems that have flexible structures can adapt to any useful monitoring application, from large network operations centers, to mobile units, IPTV headends, production control rooms and central equipment rooms where QC functions might be combined.

Master control operators benefit from having a high-resolution display that can credibly show high-resolution virtual monitors in a complex matrix display.

Resolution

Output flexibility is particularly important. Two years ago, it was rare to find a flat panel that supported a full 1920 x 1080 image. However, when displays capable of 1080p were introduced to the consumer market, it changed everything. Now it is commonplace to use at least that much display resolution in professional displays.

Following in the footsteps of Apple's 30in Cinema and Gateway's new XHD 3000, both with 2560 x 1600 pixel resolution, it will become more commonplace to up-res HD sources on larger monitors. Master control operators benefit from having a high-resolution display that can credibly show high-resolution virtual monitors in a complex matrix display. New display technologies, like organic LEDs, promise to drive that resolution even higher in the next few years.

Window on the world

An important attribute in multi-image displays is their integration with other devices and control software. Devices that focus heavily on the integration of control applications with monitoring systems result in holistic systems that allow the display and monitoring applications to work closely together. This enhances the workflow, particularly in master control applications. The display environment is suited to the task at hand, and it evolves as operators troubleshoot problems.

As these systems become more complex and technically capable, it will be hard to choose between them. Maximum display resolution and support for advanced features like SMPTE Active Format Descriptor (AFD), metadata display and tie-in to SNMP monitoring systems will enhance the lifetime of multi-image displays. If that 103in display becomes a 4K window on the world, the days of discrete monitors will be numbered. **BE**

John Luff is a broadcast technology consultant.

? Send questions and comments to:
john.luff@penton.com

GF-Quad Dolly — Grip Factory Munich

Dolly operates on almost all straight or round tracks with skateboard or track wheels; features a quick-release system for changeover to pneumatic wheels and a three-stage steering system that enables front-wheel, four-wheel and rear-wheel steering; can navigate a circle with a 31in radius in four-wheel mode; includes lockable steering angles to repeat straight or curved moves.

+49 89 31901290; www.g-f-m.net

OctaMic II — RME

Preamp features eight-channel 192KHz/24-bit mic/line preamplification; new features include an improved input circuit design that allows for a maximum input level of +21dBu with a gain range from 0dB to 50dB, improved signal to noise ratio, improved THD, larger housing that optimizes heat dissipation, internal wide-range power supply with line filter, stable 48V phantom power and a choice of sync sources: internal clock, AES/SPDIF or Word Clock.

330-259-0308; www.rme-audio.com

Weatherscape XT — Metra

Graphical weather presentation technology now features new material editor function that enables users to create weather shows and scenes that are fully customized and change according to meteorological data; simplifies the user interface to enable easy interaction with shader values, which allow better high-res mapping capabilities, realistic lighting effects, textured land and water, and greater integration with weather information.

+64 4 4700 700
www.metra-media.com

IFB100 — Zaxcom

Transmitter operates on the 2.4GHz wavelength; transmits a single RF carrier, containing time code, IFB audio and remote control signals, to any number of TRX900 wireless systems, giving users the ability to record a group of channels and play them back as a virtual multitrack recording; accepts SMPTE time code and balanced audio at line level; 125mW power output provides a 300ft range for transmission of IFB audio and 1000ft for time code transmission and remote control signals.

973-835-5000; www.zaxcom.com

Century DV/HDV filter kit — Schneider Optics

Five-filter kit for DV/HDV cameras features a neutral density 0.6 solid filter that reduces transmission by 75 percent, a neutral density 0.6 soft edge graduated filter the employs a surface that's 50 percent clear and 50 percent with a neutral density of 0.6, a polarizer that reduces glare and reflections; a black frost half diffusion filter to flare highlights, mute colors and tone down contrast, and a skin tone enhancer warming filter.

818-766-3715
www.schneideroptics.com

Digital Wireless Microphone system — Sony

System consists of DWT-B01 transmitter, DWR-S01D receiver and DWA-01D adapter; transmits 24-bit/48KHz digital audio in a specific frequency bandwidth; delivers a wide dynamic range of more than 106dB and a wide frequency response of 20Hz to 20KHz; transmits digitally modulated, encrypted data to minimize the risk of interception; enables a significant increase in the number of simultaneous operations in comparison to current analog wireless systems.

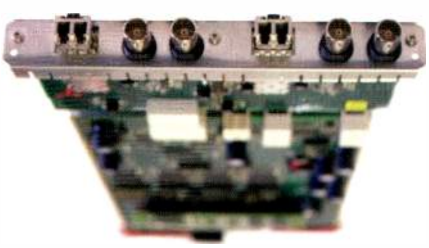
800-686-7669; www.sony.com/proaudio

Bebob Box-HVR — 16x9

Mounting system for adding Sony's HVR-DR60 portable hard disk recorder to Sony camcorders attaches underneath the camera between the baseplate and tripod plate; features a smooth-glide drawer that provides easy access to the recorder's screen and controls, as well as a quick-lock mechanism that anchors the drawer open; central thumbscrew allows for easy horizontal/vertical adjustment of the rods to accommodate different camera models.

661-295-3313; www.16x9inc.com

MADI-108 G2 — Riedel Communications



MADI card provides a MADI interface that allows the integration of the Artist intercom platform with digital audio router systems; facilitates the connection of the intercom panels to the audio router using the router's infrastructure for panel distribution; card is cascadable, with each card adding eight channels to the MADI signal for up to a maximum of 64 channels.

818-563-4100; www.riedel.net

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Broadcast Engineering is proud to introduce an ongoing series of monthly webcasts covering key technical and operational issues. In these one-hour long events, attendees can learn while at their desktops or home computers. A broadband connection is all that's needed.

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COMING IN DECEMBER

Workflow in a Mixed IT/ Broadcast Hardware Environment

Presented by John Luff

December 11, 2007 – 2:00 pm EST

December's webcast focuses on building an efficient workflow in a mixed IT/broadcast hardware environment. It will focus on integrating current and new technology into a cohesive and efficient workflow. From networking connectivity to file sharing, many aspects of building your facility workflow will be covered. Don't be left out, join us for this important webcast.

The instructor is consulting engineer and *Broadcast Engineering* magazine writer John Luff.

Sponsored by Quantel

COMING IN JANUARY

Getting ready for February 2009: Analog goes dark

Presented by John Luff and Jeremy Ruck

January 8, 2008 – 2:00 pm EST

If you are like most stations, there may be a few tasks not yet completed in preparation for the February 2009 analog shutoff. But, have you considered everything? Could you be overlooking something? Let these experts help your station through the transition.

XB20UB — Gepco

X-Band unbalanced guitar/instrument cable features a heavy gage (20AWG) oxygen-free copper conductor for maximum conductivity and corrosion resistance, two densely stranded 95-percent copper braid shields combined with a semiconductive PVC layer to provide exceptional EMI/RF rejection and low triboelectric handling noise, and a flexible, easy to strip, abrasion-resistant outer jacket.

800-966-0069; www.gepco.com

DMC-842 — RME

Multichannel interface for digital mics acts as a power supply and control device; allows mics to be to be synchronized; enables control data for adjusting gain, polar patterns, hi-pass filter and compression settings to be sent; includes analog line level outputs, the ability to switch the digital phantom power on or off on individual channels, and a Windows-based software application to adjust the various parameters.

330-259-0308; www.rme-audio.com

Algogear VNR-1000HD/SD — Algolith

HD/SD video noise reduction cards provide a reprogrammable core, allowing users to repurpose the cards' functionality, increase picture quality when used as a post-processor, reduce bandwidth requirement when used as a preprocessor to the encoder, and allow for two or four independent channels to be processed simultaneously.

514-335-9867; www.algolith.com

Radio Meltdown — Blastwave FX

Collection of two DVDs contains 2500 effects, including 300 5.1 surround-sound elements, featuring music in eight categories: beats, beds, musical elements, production elements, station IDs, stingers, voice-overs and 5.1 surround-sound elements; sounds are recorded at 24-bit 96K and delivered as HD 24-bit 48K WAV, 5.1 surround-sound and MP3 files; collection can be clicked and dragged onto any hard drive, and is catalogued with embedded metadata for easy search and retrieval.

**860-967-0973
www.blastwavefx.com**

ExtremeStor-iTrax — GlobalStor Data

Server features a solid-state 64-bit iSCSI and NAS operating system; appears as a local disk drive on any computer connected to the LAN or WAN; allows users on every host system on the network to see and share all stored data; available in configurations ranging from an eight-drive solution with RAID protection onboard, to a 36-drive version with multiple levels of RAID redundancy.

818-701-7771; www.globalstor.com

MediaVault MV5100 — Ciprico

Eight- (MV5108) or 16- (MV5116) drive PCIe SAS or SATA II storage array based on the new PCIe external expansion and cable connection standard; expands PC, server or a workstation's core logic PCIe bus outside of the box; features capacities ranging from 2TB to 16TB of high-performance SATA II storage; can achieve in excess of 1GB/s transfer rates when fully populated with SATA II or SAS disk drives.

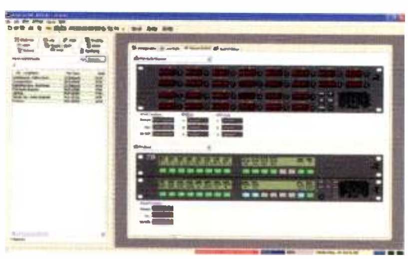
763-551-4000; www.ciprico.com

583s — LaChapell Audio

Vacuum tube preamp delivers less than 70dB of gain with a typical non-weighted EIN of -120dB referencing 150Ω load; features a 12AX7/ECC83 tube and a frequency response of 12Hz to 70KHz; uses the Cinemag CMMI-10 or the optional Jensen JT-115k input transformer, with a maximum output of less than 26dBu.

**209-383-3486
www.lachapellaudio.com**

Director 5601 — Riedel Communications



Configuration software enables the engineer to see all actions of the user on the panel; features editable configurations, programmable logic functions, customizable signalization throughout the system and an audio patch function that facilitates all internal routing and DSP aspects of any control panel of an Artist system; new functions include a scheduler to change the configuration at a preset time, an events function to load configuration changes, and a set input/output gain function for gain control for four-wire and digital partyline ports directly from the panel.

818-563-4100; www.riedel.net

pArtScience SpaceArray — Auralex Acoustics

Wooden acoustical treatment combines hemispherical acoustical diffusion with a quality wood finish; provides superior performance without visual patterning; 24in by 24in paulownia wood panels install easily; has passed fire rating tests in accordance with ASTM E84 and acoustical tests in accordance with ISO 17497-1.

317-842-2600; www.auralex.com

H4 SuperMINI — Holophone

Camera-mountable surround microphone features Dolby Pro Logic II encoding technology, an integrated multichannel preamp and monitor, an audio zoom button, an auxiliary center channel microphone input (XLR) for attaching an external shotgun or wireless lavalier microphone, virtual surround headphone output with gain control and tricolored LED monitor.

416-362-7790; www.holophone.com

BrightDrive — Bright Systems

Features new technologies suited for high-end post applications and broadcasting workflows that require many lower resolution data streams; enables clients to play four streams of 2K from a single workspace; increases the maximum number of data streams to 64 streams of 2K; delivers disk recording and playback for uncompressed HD 422 to compressed HD/SD applications.

888-477-3700; www.4bright.com

Overture 2 — Echolab

M/E control surface includes operational features in the Opera1-M/E series; incorporates new features including a look-ahead preview, a complete set of transition options, programmable macro keys, traditional DSKs and a dedicated playback block that enables automated control of third-party products directly from the control panel.

978-715-1020; www.echolab.com

BD-R/BD-RE — Maxell

Single-layer 8cm Blu-ray write-once (BD-R) and rewritable (BD-RE) discs provide a recording capacity of 7.5GB, allowing the disc to store one hour of full HD picture quality at 1920 x 1080; feature a hard coat layer to protect the recording surface from scratches, dust and fingerprints.

800-533-2836; www.maxell.com

DAP-1781 — Miranda Technologies

High-quality, 24-bit digital audio processor card processes up to eight discrete channels of audio using four AES inputs/outputs; functions as a standalone discrete audio processor as well as with a range of video cards for processing embedded audio; uses Linear Acoustic upMAX technology to provide high-performance stereo to 5.1 conversion; creates an adjustable multichannel signal that is downmix compatible.

973-683-0800; www.miranda.com

EtherCon Cat 6 — Neutrik

Cable solution designed for Cat 6 cables includes a metal housing for RJ-45 cable connectors; includes a chuck-type strain relief with a separate push-pull locking mechanism; receptacle accepts a standard RJ-45 cable end in addition to EtherCon Cat 6 patch cable; available in custom lengths.

732-901-9488; www.neutrik.com

UniPatch GigE Patch Panel — ADC KRONE

Professional-grade patching system with a high-density card frame system based on the company's Direct-Edge LSA-PLUS termination system; features Cat 5e channel compliance, Cat 6-compliant patch keyed to ensure proper patching, 21 circuits per panel rated for 30,000 insertions and/or withdrawals, easily removable wire management bar option, normal-through or straight-through availability and test access, patch, cross-connect, and monitor functions in 100Ω-balanced transmission systems having a common bit rate and operation up to 1000Mb/s.

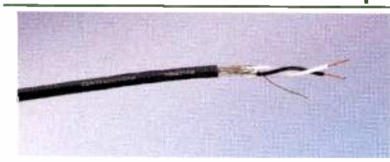
800-366-3889; www.adckrone.com

KE 900 — beyerdynamic

Camera receiver features a 24MHz bandwidth compatible with the company's Opus 900 wireless system, an LC display that indicates the battery level of the transmitter, frequency and channel, squelch and AF/RF level; enables users to select one interference-free frequency from 100 preprogrammed UHF frequencies to be transmitted via infrared to a corresponding pocket or handheld transmitter.

800-293-4463
www.beyerdynamic.com

XB401FB — Gepco



X-Band double-shielded single-pair analog cable features conductors made from 24AWG oxygen-free copper for maximum conductivity and corrosion resistance, a 95-percent TC braid and a 100-percent foil shield for exceptional RF/EMI noise rejection, and an extra flexible, easy to strip outer jacket.

800-966-0069; www.gepco.com

SuperLoader 3A — Quantum

Autoloader features availability on the LTO tape drive platform, beginning with LTO-3, and a tape-based file system and network-attached storage that is MXF-aware; provides up to 6.4TB of high-performance, removable, networked storage; accommodates one or two magazines, each holding eight data cartridges, in a 2RU enclosure.

408-944-4000; www.quantum.com

ExtremeStor-Capella — Globalstor

Fibre Channel host 4GB storage solution scales between 16TB and 80TB; expands online capacity at both SAS and SATA II disk levels; features next-generation enterprise dual-disk architecture that simplifies management and growth for a full range of mid to complex applications; includes embedded Web-based GUI; offered in single or dual active controller, both of which run failover/failback operations through onboard redundant data paths to back end dual-ported SAS and SATA disk drives.

818-701-7771; www.globalstor.com

Messenger IP — Nucomm

System consists of a 1RU encapsulator and 1RU decapsulator; enables broadband IP connectivity between an ENG truck or OB van and the broadcast studio; in trickle mode, live video and IP traffic are sent simultaneously, and the live video reduces the IP traffic to a rate of 100Kb/s to 1Mb/s; in broadband mode, nearly the entire link is dedicated to IP traffic and the user either turns off the MPEG encoder or removes the video source to the encoder, creating a transport stream nearly full of null packets.

908-852-3700; www.nucomm.com

RFX-RMR-II — RF Central

Rack-mounted receiver operates in 2GHz frequency band and receives SD/HD signals, outputting composite video, SDI (HD) or DVB-ASI; features analog, digital and fully embedded audio outputs and a fully upgradable COFDM decoder; demodulation modes include OPSK, 16-QAM and 64-QAM with auto detection.

717-249-4900; www.rfcentral.com

DSF-3 — SoundField

Digital surround decoder provides a complete all digital, mic-to-multichannel output surround mic system; allows decoding of SoundField mic or B-format signals to digital 5.1 surround or stereo audio (or both simultaneously) at any sample rate; features five-segment LED input level meters and separate output level controls for each of the six channels in the 5.1 signal.

+44 1924 201089
www.soundfield.com

Pro-Convert — Solid State Logic

Translation application enables DAW users to convert session files from one format to another; can handle many commonly used formats, including the latest versions from AES31, Audition, Cubase, Final Cut Pro, Nuendo, OMF, Open TL, ProTools, SADiE, Sequoia, Sonic Studio, Soundscape, Tascam BU and Vegas.

212-315-1111
www.solid-state-logic.com

AESX series — Wireworks

Cable series includes single-pair, providing two signal paths and available in 10ft to 100ft lengths, and eight-pair, allowing for 16 digital signal paths configured with XLR fanouts on each end, 110Ω AES/EBU digital cable assemblies; studio select model features 26-gauge conductors for added flexibility in 10ft to 50ft lengths, and road-tough model features extra low loss 24-gauge conductors and super durable cable jacket in 10ft to 250ft.

800-642-9473; www.wireworks.com

OpticalCon — Neutrik

Upgrade to solid, ruggedized-protected fiber-optic connector system extends the outdoor capabilities of the system, sealing the connector against dust and water while retaining its IP65 connection; increases the reliability and maximizes the uptime for fiber-optic connection systems; enables up to four copper wires to run power or data signals through.

732-901-9488; www.neutrik.com

Imaging Elements — Blastwave FX

Comprehensive HD imaging library with 2500 sound effects on two DVDs contains production elements, logos, distortions, low-frequency effects, musical elements, drones, compositions and 5.1 surround-sound elements; sounds are recorded at 24-bit 96K and delivered as HD 24-bit 48K WAV, 5.1 surround-sound and MP3 files; collection can be clicked and dragged onto any hard drive; is catalogued with embedded metadata for easy search and retrieval.

860-967-0973
www.blastwavefx.com

Deva 5.8 — Zaxcom

Hard-disk audio recorder system features eight integrated hardware faders, an internal DVD-RAM drive and a Flash media slot; records 10 tracks of audio directly to a CompactFlash card mounted on the control panel for quick, easy transfer; integrates with the Deva Mix-12.

973-835-5000; www.zaxcom.com

AV-HS400 — Panasonic

Compact multiformat, eight-input/output video switcher works with inputs from most video sources and PCs; outputs to projectors, plasma, LCD, LED dot matrix or CRT displays; features a built-in 10-bit, eight-channel frame synchronizer that eliminates the need to genlock when switching between camera or asynchronous sources; produces a single stream of continuous content for any video application.

800-528-8601
www.panasonic.com/broadcast

Proteus — Neptune Digital

Digital signage system powered by an ARM9/DSP chipset offers features such as scrolling text, RSS feed support, dynamic pictures/text, user-defined scenario layouts and scheduled playlist and content uploads; includes a LAN connection, but can be upgraded with a USB wireless or Bluetooth dongle and 3G HSDPA device; stores media content on an internal 2.5in hard drive or SD card, and can support live video streaming from the server.

+386 5 393 2477
www.neptune-digital.com

MHEG Developer — Strategy & Technology

Integrated environment provides all the tools necessary to produce final code that can then be tested on a set-top box via TSDeveloper; comes equipped with a fully featured editor to allow MHEG source code to be created and edited; supports an ASN.1 data compiler/encoder and MHEG desktop engine to provide the complete environment.

303-926-4933; www.s-and-t.com

Emerge ECMS2000U — Avocent

Updates to the small form factor digital workstation extension products for users on GigE networks enable users to back-rack broadcast-quality servers without impacting post-production operations; deliver high-res digital/analog video, rich color depth and CD-quality audio; compatible with a wide range of user interface devices; includes extension of USB mass storage devices.

866-286-2368; www.avocent.com

LC-3001 — Barco

High-res 30in LCD screen offers color-accurate images in a WQXGA resolution (2560 x 1600); designed for high-density video monitoring in professional applications; features integrated Backlight Optical Stabilization Technology, a non-reflective optical filter and dedicated sensor and software to conserve gray scale; display can be calibrated to an absolute color temperature, gamma and brightness target.

678-475-8000; www.barco.com

EPC2607 — Cisco

Channel-bonded cable modem with an embedded media terminal adapter integrates VoIP services for deployment of triple-play broadband services providing speeds of 50Mb/s to 100Mb/s; supports downstream channel bonding defined by CableLabs' DOCSIS 3.0 specifications, and automatic discovery of bonding groups; features backward-compatibility for use as a single-channel cable modem with Euro-DOCSIS 1.2/1.0 and 2.0 networks.

408-526-4000; www.cisco.com

AV2000 MultiMedia Cabling — Wireworks

Cabling system combines audio, HD video, data and control signals through a hybrid connector; allows each cabling system to match specific equipment requirements; consists of three components: the Access Point, the Umbilical and the Link; features rugged metal housing that incorporates a superior strain relief, and 16-gauge precision formed brass pin and socket contacts with proprietary gold plating.

800-642-9473; www.wireworks.com

Alchemist IP — Snell & Wilcox

File-based frame-rate standards conversion software runs on standard PC infrastructure hardware; delivers transparent conversion of file-based video, audio and metadata between the 625/50 (PAL) and 525/60 (NTSC) video standards and vice versa; requires little user setup; provides simple drag-and-drop or automated operation.

212-481-2416; www.snellwilcox.com

iTX On Demand — OmniBus Systems

New version of software-based broadcast automation and playout system simplifies the process of creating VOD material by allowing broadcasters to transmit conventional channels and save VOD-ready content from the same iTX workflow and hardware without having to reingest or reformat material explicitly for VOD use; creates everything from low-res files for Web download or mobile phones through HD MPEG-4 files with Dolby surround sound for broadband IPTV applications.

303-237-4868; www.omnibus.tv

CINEBENCH R10 — MAXON Computer

New version of benchmarking suite for testing processor and graphics card performance contains new test scenes especially designed to meet the demands of state-of-the-art hardware; CPU test renders a 3-D scene photo realistically and applies more functions, including area light sources, procedural shaders and multilevel reflections; graphics card tests require that the computer execute a camera flight at maximum speed to determine graphics performance.

877-264-6283; www.maxon.net

DIVAnalyse — Front Porch Digital

In-path content analysis program performs on both SD and HD content many times faster than real time, leveraging a proprietary hardware-based accelerator board to assist in the process; enables control systems such as MAM, newsroom or automation to define which content should be analyzed as part of the CSM process; features scalability that enables any number of DIVAnalyse engines to be added to exisiting DIVArchive infrastructure.

303-440-7930; www.fpdigital.com

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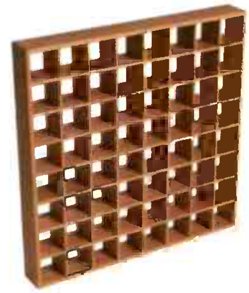
I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

H.264/AVC decoder — MainConcept

Decoder offers real-time decoding speeds in various profiles and levels supported by the standard; enables the user to decode every DVB-S2 channel that broadcasts H.264/AVC; features Baseline, Main and High Profile support, symmetric multiprocessing, hardware decoding, color space converting, deinterlacing, chroma upsampling, fields reordering and MMX, and SSE and SS2 optimizations.

925-463-4857
www.mainconcept.com

pArtScience SpaceCoupler — Auralex Acoustics



Wooden acoustical treatment optimizes acoustical environments for a wide range of performance and recording styles; provides an acoustical boundary interaction between loosely coupled spaces; generates a low-level reverberant tail to create a full sound even in small footprint spaces; has passed fire rating tests in accordance with ASTM E84 and acoustical tests in accordance with ISO 17497-1.

317-842-2600; www.auralex.com

SLA8000 — Rohde & Schwarz

DAB broadcast transmitter for low-power range of 174MHz to 240MHz can be operated on a desktop or installed in a rack and comes in three power models: 75W, 150W and 300W; features prepared pre-correction curves, an integrated SFM adapter for data synchronization, front-panel LEDs and operation on AC supplies from 90V to 265V; supports N+1 (including 1+1) standby configurations.

410-910-7800
www.rohde-schwarz.com

H3-D Surround Microphone — Holophone

Portable multichannel surround-sound microphone delivers 5.1 channels with no external mixing or signal manipulation required; supports multichannel recording devices; features five mic capsules for the five perimeter channels with a multidirectional pickup pattern and 20Hz to 20KHz frequency response and a discrete LFE microphone with a 20Hz to 100Hz frequency response; includes 15ft Monster cable that terminates in six separate six-pin Neutrik XLR connectors.

416-362-7790; www.holophone.com

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Cypher 4.0 — Widevine Technologies

Downloadable conditional-access and DRM system enables telco, cable, Internet, mobile and satellite service providers to support an unlimited number of subscribers and assets using a single content security solution for protecting delivery to all major consumer devices, including set-top boxes, PVRs and PC-based consumer devices; supports more than 40 consumer devices and 12 middleware and 15 VOD vendors; offers more than 900Mb/s encryption and more than 240 channels in a single appliance.

206-254-3000; www.widevine.com

DIVAgrid — Front Porch Digital

Intelligent nearline storage system scales to deliver increased bandwidth and content protection; contains up to 7TB of RAID 5 protected storage per node; built on a DIVArchive high-bandwidth content movement engine platform; features interoperability with company's in-path content transcoding solution and/or automated quality assurance product, DIVAnalyse.

303-440-7930; www.fpdigital.com

iCR v2.5 — Snell & Wilcox

Upgrade to industrial content mastering and repurposing workstation enables fully automated content mastering and repurposing with advanced real-time QC monitoring; allows users to create high-quality, error-free digital masters of their content and repurpose them for distribution; supports uncompressed video and codecs, including DV, DVCPRO, QuickTime and Flash video, as well as the MXF file format.

212-481-2416; www.snellwilcox.com

Nx8600 — Rohde & Schwarz

Liquid-cooled, high-power transmitter supports analog and digital TV standards (ATSC, DVB-T/H) and output power of up to 6kW (digital) or 16kW (analog) in one rack; features typical standby operations offered, including remote maintenance and diagnostics via different interfaces, automatic digital equalization or maintenance during operation; can be operated and monitored via the Internet by Web browser or SNMP protocol.

410-910-7800
www.rohde-schwarz.com

AJ-HPX3000 — Panasonic

Five-slot, P2 shoulder-mounted camcorder comes equipped with five 32GB P2 cards to allow extended recording times of 320 minutes in AVC-I 50, 160 minutes in AVC-I 100 and 160 minutes in DVCPRO HD; uses three high-density 2.2-million pixel CCDs, 14-bit A/D conversion and 12-pole matrix color correction to produce 4:2:2, 10-bit 1920 x 1080 HD images; achieves a high F10 sensitivity at 2000lux (at 1080) and a minimum illumination of .064lux (at +56db gain-up).

800-528-8601
www.panasonic.com/broadcast

CINEMA 4D R10.5 — MAXON Computer

Enhanced version of the rendering program software features a new DWG import filter, new modeling (connect, dissolve and spin edge) and lighting tools, new MOCCA tools, accelerated HAIR rendering, and extended functionality in the HUD, which now allows data to be dragged and dropped directly into the viewport; allows multiple users to work on the same project simultaneously by breaking a scene into parts.

877-264-6283; www.maxon.net

Emerge DM2000 Desktop Manager — Avocent

Ethernet-based switching solution delivers unlimited distance over Ethernet for greater flexibility in the video editing suite and DVI video support for rich media production; provides digital KVM, audio, USB switching and extension with advanced support for extension of USB mass storage devices and widescreen resolutions up to 1366 x 768; operates within the boundaries of a typical IP network with no special infrastructure required.

866-286-2368; www.avocent.com

Networked Broadcast Monitoring System v2.1 — Barco

Hardware/software suite enables operators to monitor the broadcast process more efficiently and visualize real-time video content on rear-screen projection modules or LCD panels; includes standalone display controller and three hot-swappable modules that are front-accessible; NGP-001 Display Controller allows users to display as many as 64 video sources on two high-res screens; eight-channel NGS-103 input module captures SDI and composite video signals, encodes them in JPEG2000 and streams them over a GigE network; NGS-104 Communication and Interface Module and NGS-107 General Purpose IO Module provide connectivity to legacy and third-party equipment.

678-475-8000; www.barco.com

Instant Replay2 — 360 Systems

Self-contained production studio and spot player records better-than-CD-quality audio directly to hard disk, edits it and provides playback from 50 hot keys; stores 24 hours of stereo on its large internal hard disk; features a 100Mb Ethernet port for file transfer, 16/24-bit, 44.1/48kHz recording formats, WAV file support and balanced +4dBu and unbalanced -10dBV audio I/O.

818-991-0360; www.360systems.com

For Sale

Career

Help Wanted

BROADCAST MAINTENANCE ENGINEER/TECHNICIAN

CPAC, the Cable Public Affairs Channel, based in Ottawa, Canada is seeking a full time Broadcast Maintenance Engineer/Technician. Candidate must have a post secondary degree in electronics or a related discipline and a minimum of 5 years of experience in the maintenance and operations of a broadcast television facility. Duties include support of a live production environment, repair of all associated broadcast equipment, and, assisting with the installation, design, and integration of new facilities. Experience with automation systems, satellite operations, fibre, I.T. networks and administration, Avid NLEs and iNews, are preferred. For full description please visit: **www.cpac.ca**

Help Wanted

Help Wanted

Bloomberg

THE COMPANY

Bloomberg's media services include the global BLOOMBERG NEWS® service with more than 2,000 Professionals in 125 bureaus worldwide; the BLOOMBERG TELEVISION® 24-hour business and financial network produced and distributed worldwide on 10 separate channels in seven languages; BLOOMBERG RADIO services which provide up-to-the-minute news on XM, Sirius and WorldSpace satellite radio around the world and on WBBR 1130AM in New York; and Bloomberg.com, a top-ranked financial news site. In addition, Bloomberg publishes award-winning Bloomberg Markets magazine and BLOOMBERG PRESS® books for investment professionals.

THE ROLE

Bloomberg TV has a challenging opportunity within the Broadcast Engineering Team. The person in this role will be responsible for performing and coordinating maintenance of equipment as needed to support live broadcast operations. We will look to this Engineer to be proactive and troubleshoot production and on-air issues. This individual will also be responsible for updating transmitter/shift logs, conducting tests, diagnostics evaluations, and executing checklists to discover equipment and/or system anomalies. The person in this role will also have the opportunity to coordinate and install new components and systems, as well as to create and update engineering documents and diagrams. The ideal candidate will have a strong knowledge of technical TV and radio broadcasting equipment (including cameras, robotics, VTR's, routing equipment, and production switchers). The candidate should also have knowledge of broadcast automation systems and a thorough understanding of PC hardware and software operations. The person in this role should possess strong troubleshooting skills and have the ability to work independently and quickly in high-pressure situations. The role may include work on evenings, nights, and weekends.

QUALIFICATIONS

- Bachelor's degree or equivalent
- Strong knowledge of technical TV and radio broadcasting equipment
- Flexibility with hours (evenings, nights, weekends)

Interested candidates should apply online by visiting ***www.bloomberg.com***
akaplan4@bloomberg.net • 212-617-5453

Help Wanted

ENGINEER TV NETWORK CN8 THE COMCAST NETWORK

Position Summary: Responsible for maintenance and repair of production and transmission facilities and operations in our Washington, D.C. based studio. Assists in the design, implementation, maintenance, enhancement and troubleshooting of transmission problems, editing workstations, remote production gear, playback systems and live studio functions. Accountable for the DC engineering budget and recommends future enhancements and capital expenditures. Provides engineering support to all CN8 engineering departments as required.

Maintains production and transmission engineering activities for the DC studio; Repairs production and or transmission equipment as required. Purchases replacement parts as necessary. Manages assigned budget. Maintains relationships with outside vendor sources; Directly involved in the installation, maintenance, testing and repair of equipment and systems and playback (all video equipment); Work is reviewed from a short- to mid-term perspective and against objectives, budgets and schedules. Helps set priorities, with senior engineering management, production and programming; Develops and enforces policies and procedures; Ensure scheduled maintenance and repairs are complete at studio, remote, ENG and editing facilities; Coordinate repairs to studio equipment and editing facilities; Oversee and responsible for technical set-up of studio, remote and ENG facilities; Coordinate with engineering management to achieve repairs and maintenance to facilities outside of his/her skill level; Other duties as assigned. Please apply at **www.comcast.com #54103**

CHIEF ENGINEER

RAYCOM MEDIA, one of the nation's largest broadcasting groups, with many Southeast stations, is reviewing Chief Engineer candidate resumes for future positions. The Chief Engineer has the responsibility for studio and transmitter operations, technical maintenance, building facilities and information systems. The position is also responsible for involvement in departmental operating and capital budget preparation. This is a very hands on position. You must be able to identify problems and repair equipment for both the studio and transmitter operation. Computer knowledge and information systems support are also part of the position's responsibilities. Candidates with strong technical maintence skills who would like to become a Chief Engineer are encouraged to apply. Send resume and salary requirements to: **chiefengineer@raycommedia.com** EOE/ MFDV

POSITIONS AVAILABLE

Innovative Technologies, Inc. (ITI) a leading-edge systems integrator of television/AV Systems seeks energetic, talented individuals for the following positions: Sr. Broadcast Design Engineer; Sr. Audio Visual Engineer; Integration Manager; Web Developer; A/V Technicians. ITI offers a competitive salary and benefits package. Visit our website at www.iti-corp.com for details. Send resumes to work@iti-corp.com or contact HR at 703.322.9400 x 101 or 127

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TV TECHNICIAN

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The ideal candidate will have: BS/BA, Technical Degree or Military Training – with SBE Certification and/or FCC General Class License a plus; 3-5+ years of experience as a Technical Maintenance Engineer in a broadcast or cable production facility; component-level maintenance and repair experience on a variety of production equipment including Sony HDCam, Digibeta, Beta SP, production switchers & routers, GV and BTS routing switchers, Chyron Duet and Infinit graphic systems, and Panasonic DVC Pro; thorough knowledge of Windows/Mac/Unix-based operating systems and LAN/WAN platforms; AutoCad proficiency; significant installation/project experience; ability to trouble-shoot and work around problems in a fast-paced live broadcast environment.

MSG Media is a union facility that operates 24 hours a day. Your work schedule will include nights and weekends. Madison Square Garden offers attractive compensation and benefits.

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- **Go to www.thegarden.com**
- **Click on Employment**
- **Attach resume, cover letter and salary requirements**

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CHIEF ENGINEER

We are searching for an engineering professional to work in a state of the art broadcast facility in the Reno Lake Tahoe area. Duties will include maintaining Low and High power UHF transmitters, Wireless Networks and video streaming equipment. This job maintains transmission equipment in multiple locations in the northern Nevada area. Project management experience desired. Good communication skills in corporate environment and professional appearance a must. FCC or SBE certification a plus. Pappas Telecasting is an equal opportunity employer and a drug free environment. Salary DOE. Please send resume to: jocon@pappastv.com

BROADCAST ENGINEER

Outdoor Channel, America's leader in outdoor television, is seeking a Broadcast Engineer at its Temecula, CA Broadcast Center. The ideal candidate will possess experience in broadcast systems ranging from Apple X-SAN Raid, Edit Bay Systems, Station Automation, Play-out servers, Routers, MPEG Video Compression, Satellite Uplinks, Facilities infrastructure maintenance and more. College degree or relevant experience is required. If interested please e-mail resume with cover letter to **vwindham@outdoorchannel.com**

Help Wanted

ASSISTANT DIRECTOR 3

The University of Miami is proud to be recognized as "Company of the Year" by South Florida CEO magazine. It is our core commitment to growth that has earned us this distinct honor, captured the attention of high profile community leaders, and is attracting incredible talent from all over the world.

The Department of Operations and Engineering in the School of Communication at the University of Miami is seeking an assistant director of operations and engineering. This is a highly technical position that would be working closely with the director and be responsible for all the technological needs of the school. Must be able to work with minimal supervision. The ideal candidate will have a High School Diploma or equivalent and a minimum of five years television/film maintenance experience, strong technical skills and two years experience of Information Technology in a digital master control room with video over IP environment. Society Broadcast Engineering certification or Federal Communication Commission license a big plus. Salary: Competitive.

Interested candidates please apply online at www.miami.edu/careers and submit your resume. (Keyword: 000601) EO/AAE

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Live, via satellite!

It's the technology we take for granted.

BY ANTHONY R. GARGANO

A largely unheralded 50th anniversary passed us by last month. On Oct. 4, 1957, Americans woke up to headlines that the Soviet Union had successfully launched the world's first space satellite. Not much of a payload by today's standards, Sputnik I was a basketball-size, 183lb orb that contained what would be viewed today as a Stone Age telemetry transmission capability.

Leading up to Sputnik

The Sputnik launch was rooted in events that had occurred several years earlier. In 1952, the International Council of Scientific Unions decided to establish July 1, 1957, through Dec. 31, 1958, as the International Geophysical Year (IGY). The period was selected to coincide with the predicted peak timing of the current sunspot cycle. Subsequently, in October 1954, the council challenged its members to launch an artificial earth satellite during the IGY for the purpose of mapping the earth's surface.

On July 29, 1955, the White House confidently announced plans to launch an earth-orbiting satellite. This new satellite program was intended to be the U.S. contribution to the IGY, and the White House said that the scientific data would benefit scientists of all nations.

In that era of A-bomb shelters and air raid drills, such a success by our reviled cold war enemy was the height of embarrassment to the United States. The Russians quickly trumped Sputnik I the next month when they launched another Sputnik satellite. The world was stunned on Nov. 3, 1957, when Sputnik II, a half-ton satellite, carried the first living passenger into space — Laika, a stray dog from the streets of Moscow. The U.S. embarrassment was prolonged when it failed its first attempt to launch a satellite in December 1957. Finally, on Jan. 31, 1958, the United States successfully launched Explorer I.

This began the space age and the evolution of satellite technology to the state of the art we know today. But think about what it was like to provide up-to-the-minute broadcast coverage in the days before there was a plethora of satellites, with transponders available for easy scheduling, enabling live coverage of events around the world.

> **The "Times" reported that CBS' coverage of the coronation was the "birth of international television."**

The real-time race

Satellite coverage of the wedding of Prince Charles and Lady Diana Spencer enabled the largest audience ever, an estimated 750 million people worldwide, to watch the fairytale spectacle playout in real time. The challenge of that broadcast was a far cry from the one faced by CBS and NBC news departments when some years earlier, during those Byzantine-era presatellite days, the networks struggled to provide same-day coverage of the coronoation of Queen Elizabeth II in London.

In order to provide the first same-day coverage of an event on another continent, the networks undertook a planning and logistics nightmare. The year was 1953, the introduction of videotape was still several years away, and film and kinescope capture ruled. The networks sent production teams to London, chartered aircraft with seats removed to make room for film processing and editing equipment, and the race was on between CBS and NBC to see who could air the first coronation footage. One of the more comical episodes, although I am sure not comical to those involved, occurred at the conclusion of the coronation when the taxi rushing the CBS film and crew to London's Heathrow Airport ran out of gas!

Interestingly, although it was NBC who edged out CBS by just minutes to be first on-air with coronation footage, it was the Canadian Broadcasting Corporation (CBC) that had actually trumped both of the U.S. television networks.

The CBC aired film that had been flown from London to Goose Bay, Canada; Goose Bay to Labrador, Canada, by jet aircraft; on to Montreal by Canadian fighter jets and then helicoptered to the CBC network facility. Determining in the final minutes that CBS was about to beat them, after several frantic phone calls, NBC secured the lines and the OK to pick up and air the CBC's coverage. A hollow NBC victory at best, it was CBS that aired its own shot and edited film report of the coronation during its evening broadcast and earned plaudits in the following day's "New York Times." The June 3 edition of the "Times" reported that CBS' coverage of the coronation was the "birth of international television."

Sputnik I's batteries ran out by Oct. 26, 1957. With a useful life of just 22 days, we have come a long way since that first historic and shortly lived beep … beep … beep … BE

Anthony R. Gargano is a consultant and former industry executive.

? Send questions and comments to: anthony.gargano@penton.com

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